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Application of an Intervention Program for Families and Patients with an Eating Disorder

Aplicación de un programa de intervención en familiares y pacientes con un trastorno de la conducta alimentaria

Doctorando
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Programa de Doctorado en
Salud Pública, Ciencias Médicas y Quirúrgicas


We'll do everything and we'll be
good and happy and beautiful

Sedmikrásky (1996)

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Esta tesis doctoral se presenta por compendio de publicaciones, de acuerdo con el Artículo 18 de la Normativa de Estudios de Doctorado de la Universidad Miguel Hernández de Elche, aprobada el 29 de mayo de 2020, que regula los programas de Doctorado del Real Decreto 99/2011.

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La Dra. Yolanda Quiles Marcos, Profesora Titular del Departamento de Ciencias del Comportamiento y Salud

CERTIFICA

Que la presente tesis doctoral, titulada "Aplicación de un programa de intervención en familiares y pacientes con un trastorno de la conducta alimentaria", ha sido realizada por D. Álvaro Ruiz Maciá bajo nuestra supervisión y a mi juicio reúne las condiciones para ser defendida ante el Tribunal correspondiente para optar al grado de Doctor.

Elche, 27 de octubre de 2025

Directora de la tesis
Dra. Yolanda Quiles Marcos

La Dra. Dña. *María del Mar Masiá Canuto*, Coordinadora del Programa de Doctorado en **Salud Pública, Ciencias Médicas y Quirúrgicas**

INFORMA:

Que D./Dña. Álvaro Ruiz Maciá ha realizado bajo la supervisión de nuestro Programa de Doctorado el trabajo titulado **"Aplicación de un programa de intervención en familiares y pacientes con un trastorno de la conducta alimentaria"** conforme a los términos y condiciones definidos en su Plan de Investigación y de acuerdo al Código de Buenas Prácticas de la Universidad Miguel Hernández de Elche, cumpliendo los objetivos previstos de forma satisfactoria para su defensa pública como tesis doctoral.

Lo que firmo para los efectos oportunos, en Elche a 5 de noviembre de 2025

Profa. Dra. Dña. *María del Mar Masiá Canuto*
Coordinador/a del Programa de Doctorado en Salud Pública, Ciencias Médicas y Quirúrgicas

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"Through it I wanted to bring myself closer to the higher sources of life. I should have prepared myself for this over a long period by invoking in my omission a higher, impersonal self, since "nectar" is not for mortal lips"

Ronald David Laing.

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List of Abbreviations and Acronyms

AESED: Accommodation to Illness Symptoms Scale
AN-P: Anorexia Nervosa Purgative subtype
AN-R: Anorexia Nervosa Restrictive subtype
AN: Anorexia Nervosa
BED: Binge-eating Disorder
BMI: Body Mass Index
BN: Bulimia Nervosa
CAPS: Child and Adolescent Perfectionism Scale
CASK: Caregiver Skills Scale
CBT-ED: Cognitive Behavioural Therapy for Eating Disorders
CCSTW: Collaborative Care Skills Training Workshops
CFA: Confirmatory Factory Analysis
CFI: Comparative Fit Index
CIA: Clinical Impairment Assessment
DASS-21: Depression and Anxiety Stress Scales
DSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
ECHO: Experienced Carers Helping Others
ED: Eating Disorder
EDEQ: Eating Disorders Examination Questionnaire
EDQOL: Eating Disorders Quality of Life
EDSIS: Eating Disorders Symptom Impact Scale
FBT: Family Based Treatment
FQ: Family Questionnaire
HeRQoLED: Health-Related Quality of Life in Eating Disorders
MANTRA: Maudsley Anorexia Treatment for Adults
MCAR: Missing Completely at Random
MLR: Maximum Likelihood estimation with Robust standard errors
NICE: National Institute for Health and Care Excellence
OCIR: Obsessive-Compulsive Inventory Revised
OSFED: Other Specified Feeding and Eating Disorder
QoL: Quality of Life
QOLED: Quality of Life Eating Disorders
RCI: Reliable Change Index
RCT: Randomized Controlled Trial
SF-12: Health Survey
SPSS: Statistical Package for the Social Sciences
SRMR: Standardized Root Mean-Square Residual
SSCM: Specialist Supportive Clinical Management
SUCCEAT: Supporting Carers of Children and Adolescents with Eating Disorders
TAU: Treatment As Usual
TLI: Tucker-Lewis Index
USMIA: Child and Adolescent Mental Health Unit
VAS: Visual Analogue Scale

Abstract

Eating disorders (ED) are severe, multifactorial mental illnesses with a high relapse rate and represent a major public health concern, particularly among adolescent and young adult women. They significantly impair quality of life across multiple domains; among disease-specific tools, the EDQOL stands out for its psychometric strength, though it has not yet been validated for Spanish populations. Treatment for EDs is complex and multidisciplinary, requiring more targeted and integrative interventions that provide continuous support throughout the course of treatment. There is a critical need to develop effective interventions aimed at improving care for these patients (Quiles et al., 2025). ECHOMANTRA consists of a digital intervention for carers (ECHO; Experienced Carers Helping Others; Treasure et al., 2007; 2015) and a digital, brief, guided adaptation of the Maudsley Anorexia Nervosa Treatment for Adults (MANTRA; Schmidt et al., 2014) for patients. This doctoral thesis, presented as a compendium of articles, is based on a randomized controlled trial designed to evaluate the effectiveness of the novel ECHOMANTRA intervention for adolescent patients with EDs and their caregivers, as well as complementary articles to support outcome interpretation.

The following articles present the main intervention study, including the trial protocol, feasibility testing, caregiver outcomes, and final results of the trial:

Article 1

This study aimed to describe the study protocol of a randomized controlled trial for evaluating the effectiveness of an adaptation of a novel intervention for patients and carers (ECHOMANTRA) to be implemented as an add-on to treatment as-usual (TAU).

Design: A multi-center pilot randomized controlled trial (RCT) with a repeated-measures design across four time points.

Participants: 140 female adolescent patients diagnosed with an ED (DSM-5 criteria) and their carers will be invited to participate.

Intervention: Participants are randomly assigned to receive either ECHOMANTRA plus TAU or TAU alone.

Outocomes: Primary outcomes will be patient psychological well-being and ED symptoms, and secondary outcomes will include body mass index, obsessive-compulsive symptoms, perfectionism, motivation to change and psychosocial adjustment. For carers, outcome variables will include psychological well-being, expressed emotion, accommodation and enabling behaviors, burden, and care skills.

Discussion: The results from this trial will establish the effectiveness of ECHOMANTRA and may reveal whether and to what extent this novel intervention can optimize outcomes during and following inpatient treatment. This study will also provide the adaptation of the ECHOMANTRA in the Spanish context for inpatient/daycare/outpatient treatment.

Article 2

The aim of this study was to evaluate the effectiveness of the ECHOMANTRA program, applied together with the usual treatment, in a 15-year-old adolescent girl with anorexia nervosa (AN) and her mother.

Method: A single case design and pre-post measures were used, as well as follow-up at 3 and 6 months. The patient was assessed for: eating pathology (EDE-Q), emotional state (DASS-21), psychosocial adjustment (EQ-5D-5L and CIA 3.0) and motivation to change. In the mother: expressed emotion (FQ), symptom impact (EDSIS), accommodation to illness (EAISA), emotional state (DASS-21) and her caregiver skills (CASK) were assessed. Both programs consisted of 8 on-line sessions, which were conducted individually and on a weekly basis.

Results: The results showed a reduction in AN symptomatology, increased BMI, improved emotional state, motivation to change and psychosocial adjustment; and in the mother, improved emotional state and caregiving skills, and reduced accommodation to illness, expressed emotion and the impact of symptoms. These changes were maintained at follow-up. Both patient and family valued the program as satisfactory.

Discussion: Both the acceptability and efficiency of treatment for AN may be improved by using ECHOMANATRA to prepare for transition from inpatient care, by giving support to both patients and their carers.

Article 3

This study aimed to analyze the efficacy of adding the ECHO program to the TAU of relatives through a novel format based on individual intervention and with an online format and to examine the acceptability and feasibility of this new format.

Method: The study design was multi-center, randomized, controlled, with a longitudinal design and comparing two parallel groups. A total of 108 family members participated.

Results: indicated that relatives from both groups, TAU and ECHO + TAU, showed improvements in expressed emotion, accommodation, impact of the ED, emotional well-being, and caregiver skills. However, effect sizes in the ECHO + TAU group were slightly larger than the TAU group. In addition, the changes were greater in depression and caregiver skills when the ECHO component was added. Most caregivers (81.48%) completed the ECHO and indicated a high level of satisfaction with the program.

Discussion: These results suggest the efficacy and the feasibility of adding the ECHO intervention program to the usual treatment in an individual online format.

Article 4

This study evaluated the efficacy acceptability, and feasibility of ECHOMANTRA as an add-on to TAU for adolescent ED patients and their carers, using an individualized online format.

Method: A multicenter, randomized controlled trial compared two parallel groups (TAU + ECHOMANTRA vs. TAU alone) with 108 patient-carer dyads.

Results: Patients in both groups showed improvements in BMI, ED symptoms, emotional state, quality of life, confidence in change, obsessiveness, and perfectionism, with larger effects in the ECHOMANTRA + TAU group. Carers in both groups improved in expressed emotion, accommodation, perceived ED impact, and emotional well-being, with greater effects in the ECHOMANTRA + TAU group. Only carers in this group improved in caregiver skills. Completion rates were high (patients: 87.04%, carers: 81.84%), with strong satisfaction.

Discussion: ECHOMANTRA is an effective, feasible online intervention that enhances outcomes for adolescent ED patients and carers when added to standard care.

Alongside the main intervention study, two foundational studies were conducted to support the interpretation of trial outcomes: a psychometric validation of the Spanish version of the EDQOL and an investigation of clinical determinants of quality of life (QoL) in adolescents with AN.

Article 5

The aim of this study was to examine the psychometric properties of the Spanish version of the EDQOL among ED patients.

Method: 141 female ED patients, with a mean age of 18.06 years (SD = 6.31), completed the EDQL in addition to the Eating Disorder Examination Questionnaire (EDEQ), the Depression, Anxiety and Stress Scales (DASS-21), the Clinical Impairment Assessment (CIA 3.0) and the Health Survey (SF-12). We calculated item/scale characteristics, internal consistency and bivariate correlations with other measures of quality of life and adjustments. We assessed the goodness-of-fit of the 4-factor model using confirmatory factors analysis and explored the sensitivity of change following skill-based interventions.

Results: The fit of the 4-factor model was acceptable (Root Mean Square Error of Approximation: 0.07, Standard Root Mean Square Residual: 0.07). Cronbach's alpha was excellent for the total (.91) and acceptable for all subscales (0.78–0.91). The construct validity was found with measures of psychological distress, depression, anxiety, quality of life and clinical impairment. The psychological and physical/cognitive scales and the EDQOL global scale were responsive to change.

Discussion: The Spanish EDQOL version is a useful instrument to assess quality of life in ED patients and to evaluate outcomes of skills-based interventions.

Article 6

This study aimed to evaluate the relationship between the severity of ED-related psychopathology and clinical impairment in adolescents with AN as well as their perception of health-related quality of life.

Method: Eighty-six Spanish young women with AN completed a set of questionnaires assessing ED pathology, clinical impairment, and quality of life. The set included the following instruments: the Eating Disorder Examination Questionnaire, Clinical Impairment Assessment, Short Form-12 Item Health Survey, and the Eating Disorder-Specific Heath-Related Quality of Life instrument. Descriptive and regression analyses were applied to identify associations between variables.

Results: Higher scores on clinical impairment domains were associated with greater impairment of mental and physical health. Moreover, clinical impairment domains and concerns due to ED were related to a lower quality of life.

Discussion: Adolescents with AN have a poor quality of life. Moreover, the findings suggest that the clinical features of impairment may serve as severity indicators of quality of life.

Resumen

Los Trastornos de la Conducta Alimentaria (TCA) son enfermedades mentales graves y multifactoriales, con una alta tasa de recaída. Éstos representan un importante problema de salud pública, especialmente entre adolescentes y mujeres jóvenes. Los TCA afectan significativamente la calidad de vida en diversas esferas; entre las herramientas específicas para evaluarla en TCA, el EDQOL destaca por sus propiedades psicométricas, aunque aún no ha sido validado en población hispanohablante. El tratamiento de los TCA es complejo y multidisciplinario, y requiere de intervenciones más específicas e integradoras que brinden apoyo continuo a lo largo del proceso terapéutico. Por ello, existe una necesidad crítica de desarrollar intervenciones efectivas orientadas a mejorar la atención de estos pacientes. El ECHOMANTRA consiste en una intervención online para cuidadores (ECHO; Experienced Carers Helping Others; Treasure et al., 2007; 2015) y una adaptación online, breve y guiada del tratamiento Maudsley Anorexia Nervosa Treatment for Adults (MANTRA; Schmidt et al., 2014) dirigida a los pacientes. Esta tesis doctoral, presentada como un compendio de artículos, se basa en un ensayo controlado aleatorizado diseñado para evaluar la efectividad del Programa ECHOMANTRA en pacientes adolescentes con TCA y sus cuidadores, así como en artículos complementarios para apoyar la interpretación de resultados.

Los siguientes artículos presentan el estudio principal de intervención, incluyendo el protocolo del ensayo, un caso único, los resultados en cuidadores y los resultados finales del ensayo:

Artículo 1

Este estudio tuvo como objetivo describir el protocolo de estudio de un ensayo clínico aleatorizado controlado para evaluar la eficacia de una adaptación de una intervención para pacientes y cuidadores (ECHOMANTRA), que se implementará como complemento al tratamiento habitual (TAU, por sus siglas en inglés).

Diseño: En un ensayo piloto multicéntrico aleatorizado, con un diseño de medidas repetidas en cuatro momentos temporales.

Participantes: Se invitará a participar a 140 pacientes adolescentes mujeres con un diagnóstico de TCA (según criterios del DSM-5), junto con sus cuidadores.

Intervención: Los participantes serán asignados aleatoriamente para recibir la intervención ECHOMANTRA como complemento al TAU o solo el TAU.

Resultados: Los resultados primarios serán el bienestar psicológico de las pacientes y los síntomas alimentarios; los resultados secundarios incluirán el índice de masa corporal, síntomas obsesivo-compulsivos, perfeccionismo, motivación para el cambio y ajuste psicosocial. Para los cuidadores, las variables de resultado incluirán el bienestar psicológico, la emoción expresada, conductas de acomodación, la carga del cuidado y las habilidades de atención.

Discusión: Los resultados de este ensayo permitirán establecer la eficacia del Programa ECHOMANTRA y podrían revelar si esta intervención puede optimizar los resultados durante y después del tratamiento hospitalario. Este estudio también proporcionará la adaptación del Programa ECHOMANTRA al contexto español para su uso en tratamiento hospitalario o ambulatorio.

Artículo 2

El objetivo de este estudio fue evaluar la efectividad del programa ECHOMANTRA, aplicado junto al tratamiento usual, en una adolescente de 15 años con anorexia nerviosa (AN) y su madre.

Método: Se utilizó un diseño de caso único y medidas pre-post, con seguimiento a los 3 y 6 meses. En la paciente se evaluó: sintomatología alimentaria (EDE-Q), estado emocional (DASS-21), ajuste psicosocial (EQ-5D-5L y el CIA 3.0) y motivación al cambio; y en la madre: emoción expresada (FQ), impacto de los síntomas (EDSIS), acomodación a la enfermedad (EAISA), estado emocional (DASS-21) y habilidades de cuidadora (CASK). Ambos programas constaban de 8 sesiones online individuales y semanales.

Resultados: Los resultados mostraron una reducción en la sintomatología de AN, aumento del IMC, mejora del estado emocional, motivación al cambio y ajuste psicosocial; y en la madre, mejoró el estado emocional y las habilidades de cuidado, y disminuyó la acomodación a la enfermedad, la emoción expresada y el impacto de los síntomas. Estos cambios se mantuvieron en el seguimiento. Ambas valoraron el programa como satisfactorio.

Discusión: La aceptabilidad y la eficiencia del tratamiento de la AN puede mejorarse utilizando el ECHOMANTRA para preparar la transición de la atención hospitalaria, apoyando a las pacientes y familiares.

Artículo 3

Este estudio tuvo como objetivo analizar la eficacia de añadir el programa ECHO al TAU dirigido a familiares, mediante un formato novedoso basado en una intervención online individual, así como examinar la aceptabilidad y viabilidad de este nuevo formato.

Método: El diseño del estudio fue multicéntrico, aleatorizado, controlado, con un enfoque longitudinal y con la comparación de dos grupos paralelos. Participaron un total de 108 familiares.

Resultados: Los familiares de ambos grupos, TAU y ECHO + TAU, mostraron mejoras en la emoción expresada, acomodación, impacto del TCA, bienestar emocional y habilidades del cuidador. Sin embargo, los tamaños del efecto en el grupo ECHO + TAU fueron ligeramente mayores que en el grupo TAU. Además, los cambios fueron más significativos en la depresión y habilidades del cuidador cuando se añadió el componente ECHO. La mayoría de los cuidadores (81.48%) completaron el programa ECHO y manifestaron un alto nivel de satisfacción con el mismo.

Discusión: Estos resultados sugieren la eficacia y viabilidad de añadir el programa de intervención ECHO al tratamiento habitual, en un formato individual y online.

Artículo 4

Este estudio evaluó la eficacia, aceptabilidad y viabilidad de ECHOMANTRA como complemento al TAU para pacientes adolescentes con TCA y sus cuidadores, utilizando un formato individualizado en línea.

Método: Se llevó a cabo un ensayo clínico aleatorizado y multicéntrico que comparó dos grupos paralelos (TAU + ECHOMANTRA vs. solo TAU) con 108 díadas de paciente-cuidador.

Resultados: Las pacientes de ambos grupos mostraron mejoras en el IMC, síntomas del TCA, estado emocional, calidad de vida, confianza en el cambio, obsesividad y perfeccionismo, con efectos mayores en el grupo ECHOMANTRA + TAU. Los cuidadores de ambos grupos también

mejoraron en emoción expresada, acomodación al síntoma, percepción del impacto del TCA y bienestar emocional, observándose efectos mayores en el grupo ECHOMANTRA + TAU. Solo los cuidadores de este grupo mostraron mejoras en las habilidades del cuidador. Las tasas de finalización fueron altas (pacientes: 87.04%, cuidadores: 81.84%) y se reportó una alta satisfacción.
Discusión: El ECHOMANTRA es una intervención en línea eficaz y viable que mejora los resultados en pacientes adolescentes con TCA y sus cuidadores cuando se añade al tratamiento estándar.

Junto con el estudio principal de intervención, se llevaron a cabo dos estudios complementarios para respaldar la interpretación de los resultados del ensayo: una validación psicométrica de la versión en español del EDQOL y una investigación de los determinantes clínicos de la calidad de vida (QoL) en adolescentes con AN.

Artículo 5

El objetivo de este estudio fue examinar las propiedades psicométricas de la versión en español del EDQOL en pacientes con TCA.
Método: Un total de 141 pacientes mujeres con TCA, con una edad media de 18.06 años (DE = 6.31), completaron el EDQOL junto con el Eating Disorder Examination Questionnaire (EDE-Q), las Escalas de Depresión, Ansiedad y Estrés (DASS-21), la Clinical Impairment Assessment (CIA 3.0) y la Encuesta de Salud (SF-12). Se calcularon las características de los ítems/escalas, la consistencia interna y las correlaciones bivariadas con otras medidas de calidad de vida y ajuste. Se evaluó el ajuste del modelo de 4 factores mediante análisis factorial confirmatorio y se exploró la sensibilidad al cambio tras intervenciones basadas en habilidades.
Resultados: El ajuste del modelo de 4 factores fue aceptable (RMSEA: 0.07, SRMSR: 0.07). El alfa de Cronbach fue excelente para la escala total (.91) y aceptable para todas las subescalas (0.78–0.91). Se encontró validez de constructo en relación con medidas de malestar psicológico, depresión, ansiedad, calidad de vida y deterioro clínico. Las subescalas psicológica y física/cognitiva, así como la escala global del EDQOL, fueron sensibles al cambio.
Discusión: La versión en español del EDQOL es un instrumento útil para evaluar la calidad de vida en pacientes con TCA y para valorar los resultados de intervenciones basadas en habilidades.

Artículo 6

Este estudio tuvo como objetivo evaluar la relación entre la gravedad de la psicopatología asociada a los TCA y el deterioro clínico en adolescentes con AN, así como su percepción de la calidad de vida relacionada con la salud.
Método: Ochenta y seis mujeres jóvenes españolas con AN completaron un conjunto de cuestionarios que evaluaban la psicopatologia de TCA, el deterioro clínico y la calidad de vida. El conjunto incluyó los siguientes instrumentos: el Eating Disorder Examination Questionnaire (EDE-Q), la Clinical Impairment Assessment (CIA), la Encuesta de Salud de 12 Ítems (SF-12) y el Eating Disorders Quality of Life (EDQOL). Se aplicaron análisis descriptivos y de regresión para identificar asociaciones entre las variables.

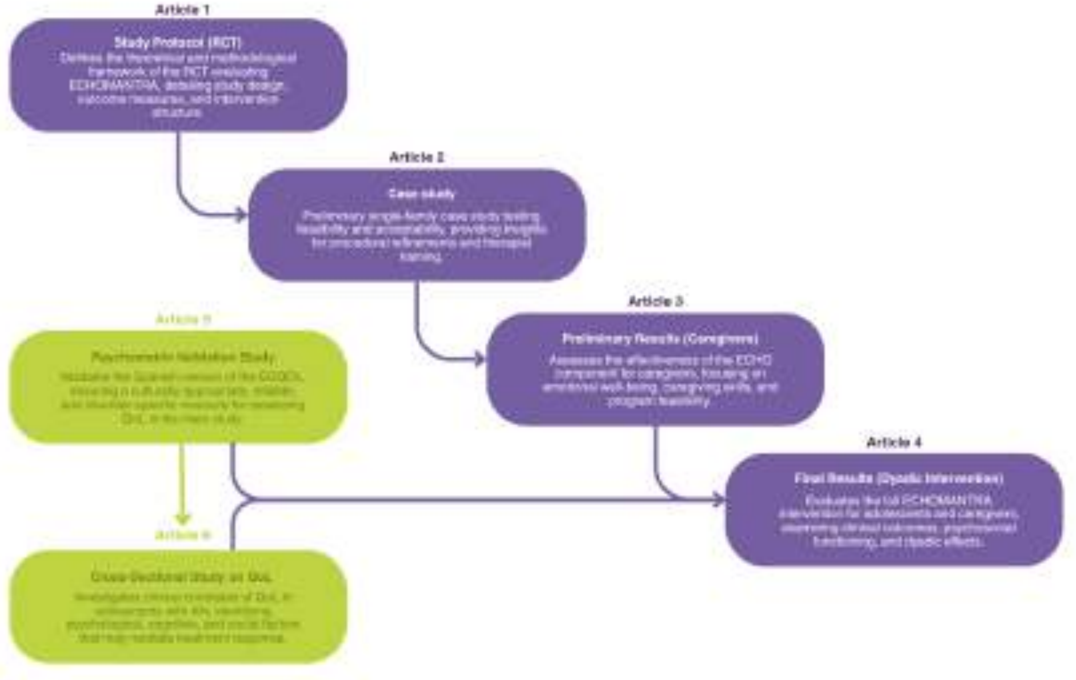
Resultados: Puntajes más altos en los dominios de deterioro clínico se asociaron con un mayor deterioro de la salud mental y física. Además, los dominios de deterioro clínico y las preocupaciones relacionadas con el TCA se asociaron con una menor calidad de vida.

Discusión: Las adolescentes con AN presentan una calidad de vida pobre. Asimismo, los hallazgos sugieren que las características clínicas del deterioro pueden servir como indicadores de la gravedad en la calidad de vida.

1. Thesis Structure and Sequential Research Program

This thesis is organized as a cohesive "Build-and-test" research program, in which the constituent articles form a conceptually unified and sequential trajectory. The program integrates preliminary feasibility work, core intervention evaluations, and complementary measurement studies to provide a comprehensive understanding of the ECHOMANTRA intervention and its impact. Figure 1 provides a visual overview of how the studies are conceptually and methodologically connected, illustrating their cumulative contribution to the overarching research aims.

Figure 1| Sequential structure of the thesis and interrelations among studies.



Arrows represent the conceptual continuity across studies, from protocol development (Article 1) and feasibility testing (Article 2) to full intervention evaluation (Articles 3–4) and complementary psychometric and QoL investigations (Articles 5–6).

Principal study

Article 1: Study Protocol

The first article outlines the registered randomized controlled trial (RCT) protocol, defining the trial architecture, study design, participant characteristics, intervention components, and outcome measures. This establishes the methodological foundation for all subsequent studies.

Article 2: Case Study

The second article presents a preliminary single-case study exploring the impact of the intervention in one participating family. Serving as a bridge between the theoretical design and practical implementation, this study enabled refinement of both the intervention materials and procedures in real-world clinical settings. It also provides initial evidence of feasibility and acceptability, offering formative insights that directly informed adjustments to the intervention protocol and therapist training for the subsequent full-scale RCT.

Articles 3 and 4: Core Intervention Evaluations

Articles 3 and 4 report the main outcomes of the intervention. Article 3 focuses on caregivers, evaluating the effectiveness, acceptability, and feasibility of the ECHO program delivered online. Article 4 presents the final results for both adolescents and caregivers, comparing outcomes between the experimental group (TAU + ECHOMANTRA) and the control group (TAU alone). Together, these articles form the core empirical evaluation of the intervention.

Foundational articles

Articles 5 and 6: Foundational Measurement Articles

The final two articles provide foundational support for the interpretation of trial outcomes.
Article 5 presents the psychometric validation of the Spanish version of the Eating Disorders Quality of Life (EDQOL) questionnaire. This article contributes a culturally appropriate and psychometrically robust measurement instrument, thereby improving the reliability and interpretability of outcomes from the main intervention.
Article 6 reports a cross-sectional study investigating QoL correlates in adolescents with AN. This study enriches the contextual understanding of quality of life as a key treatment outcome, directly underpinning the conceptual rationale for ECHOMANTRA's emphasis on emotional, cognitive, and interpersonal domains.

Collectively, the six articles illustrate a cumulative methodological trajectory:

(1) conceptualization and protocol design (**Article 1**);

(2) feasibility assessment and refinement (**Article 2**);

(3) evaluation of the caregiver component (**Article 3**);

(4) full-scale integrated intervention trial (**Article 4**);

and (**Articles 5–6**) two complementary studies—a psychometric validation and a cross-sectional investigation—that provide essential empirical foundations for the assessment and interpretation of treatment outcomes.

By explicitly presenting this sequence, the thesis demonstrates how each study builds upon the previous one, forming a cumulative and methodologically coherent program that integrates intervention evaluation with measurement validation and epidemiological contextualization.

2. Introduction to Eating Disorders

Eating Disorders (EDs) are serious mental health conditions with a multifactorial etiology (Suarez-Albor et al., 2022). In individuals affected by EDs, concerns related to food, body image, and weight often become central, frequently overshadowing other important aspects of their lives (Campos del Portillo et al., 2024).

Currently, according to the most recent version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR; American Psychiatric Association, 2022), three main disorders are identified. Anorexia nervosa (AN) is characterized by restricted energy intake, an intense fear of gaining weight or becoming fat, and a distorted body image. AN is classified into two subtypes: the restricting type (AN-R), where weight loss is achieved through dieting and exercise, and the binge-eating/purging type (AN-P), which involves binge eating and/or purging behaviors. Bulimia nervosa (BN) is characterized by recurrent episodes of binge eating followed by compensatory behaviors to prevent weight gain (vomiting, laxatives, diuretics or other medications, fasting, or excessive exercise), along with constant self-evaluation. Binge-eating disorder (BED) involves episodes of excessive food intake in a short period, accompanied by a sense of loss of control, but without subsequent compensatory behaviors.

Additionally, atypical forms of EDs are recognized under the category of Other Specified Feeding or Eating Disorders (OSFED). This category includes atypical AN (meeting all criteria for AN except significant underweight), subthreshold BN and subthreshold BED (where frequency or duration criteria are not fully met), purging disorder (purging without binge eating), and night-eating syndrome (recurrent episodes of nocturnal food intake). These presentations are clinically significant, often associated with comparable distress and impairment to threshold EDs (Dang et al., 2024).

Community-based research indicates that the overall lifetime prevalence of all DSM-5 EDs among adolescent and young adult females ranges from 5.5% to 17.9%. More specifically, the global prevalence of AN is estimated to range from 0.8% to 6.3%, BN from 0.8% to 2.6%, and BED from 0.6% to 6.1%. OSFED show a prevalence ranging from 0.6% to 11.5% among young women (Silén & Keski-Rahkonen, 2022).

EDs currently represent a significant public health concern, particularly among adolescents and young women (Silén & Keski-Rahkonen, 2022). They have significant physical, psychological, social, and familial consequences for those affected (López & Treasure, 2011; Nagl et al., 2016; van Eeden et al., 2021). EDs are characterized by chronic and severe symptoms, a high degree of comorbidity, and are associated with the highest mortality rate among all psychiatric disorders (Fichter & Quadflieg, 2016; Nordbø et al., 2012; Van Alsten & Duncan, 2020; van Eeden et al., 2021). Furthermore, longitudinal studies have demonstrated a notable persistence of ED symptoms over time (Tomba et al., 2019).

Consequently, these disorders have proven to be highly disabling, not only in terms of their clinical impact but also in terms of their economic burden, with annual healthcare costs exceeding those of the general population by 48% (Treasure et al., 2020; van Hoeken et al., 2020).

Given the substantial public health impact of eating EDs and their wide-ranging consequences, it is crucial to address the full scope of impairment they entail and to delineate the central focus of both research and clinical practice.

3. Quality of life in Eating Disorders and its evaluation.

EDs have long been known to be associated with a wide range of impairments in physical and psychological domains. Patients with long-standing EDs also experience significant disruptions in other areas of daily life, including work or study, family, social, and leisure domains (Jenkins et al., 2011; Wikler et al., 2014). Therefore, recovery in EDs should not be defined solely by symptom improvement—such as frequency of restrictive, binge, and purging behaviors, psychological symptoms, or diagnostic severity—but also by the extent to which patients' overall lives are affected by the disorder in key social, familial, and academic/occupational domains (Engel et al., 2009).

Quality of Life (QoL) has emerged as a core outcome in ED recovery, reflecting broader aspects of personal functioning and well-being that are only partially captured by symptom change. Literature reviews indicate that individuals with EDs experience more severely impaired QoL than those with other psychiatric illnesses, including severe depression, and compared with healthy controls (Jenkins et al., 2011; Wikler et al., 2014; de la Rie et al., 2015). Despite the availability of numerous QoL instruments, concerns remain regarding their content validity and suitability for use in mental health populations (van Krugten et al., 2021). QoL assessment can involve generic measures, applicable across conditions, and disease-specific measures, focused on a particular disorder or population. In EDs, generic measures may fail to capture the full magnitude of disability or to discriminate between diagnostic groups (Engel et al., 2006; Fayers et al., 2000), whereas disease-specific instruments are more sensitive to the severity of impairment and treatment response (Engel et al., 2009).

Traditionally, clinical research and practice have primarily emphasized outcomes related to symptom severity and healthcare utilization. In recent years, however, there has been growing interest in self-reported, dimensional, and transdiagnostic outcome measures, with QoL increasingly recognized as a key focus (Correll et al., 2025). Recognizing QoL as a central recovery outcome emphasizes the importance of including both symptom-based and broader functional measures in research and clinical practice.

Five instruments have been developed to assess QoL specifically in EDs: Eating Disorders Quality of Life (EDQOL, Engel et al., 2006), Health-Related Quality of Life in Eating Disorders (HeRQoLED, Las Hayas et al., 2006; and the short version HeRQoLED-s, Las Hayas et al, 2010), Eating Disorders Quality of Life Survey (EDQLS, Las Hayas et al., 2006) and Quality of Life Eating Disorders (QOLED, Abraham et al., 2006). Tirico, Stefano and Blay (2010) conducted a systematic review in which analyzed the characteristics of specific QOL instruments for EDs, and they concluded that the EDQOL, the HeRQoLED and the EDQLS presented adequate development procedures and psychometric properties. Furthermore, a recent metaanalysis study carried out by van Krugten and colleagues (van Krugten et al., 2021) assessed the content validity and the suitability of existing QOL instruments for use in economic evaluations in mental health problems. This study concluded that among the specific instruments for assessing QOL in EDs, only the EDQOL included the seven dimensions, identified by Connell and colleagues, known to be important to the QOL of people with mental health problems (Conell et al., 2012; Conell et al., 2014).

EDQOL is a disease-specific health related QOL self-report questionnaire designed for disordered eating patients (Engel et al., 2006). It is a 25-item scale with four subscales (Psychological, Physical/Cognitive, Work/School, and Financial) and a meaningful total score.

This questionnaire has good psychometric properties, EDOOL has shown high internal reliability that ranged from 0.86 to 0.95 and it has demonstrated adequate convergent and discriminant validity. An advantage of this questionnaire compared to others is that it includes only 25 items. It is well known that short instruments are more useful in epidemiological studies, clinical trials, and clinical practice, as short questionnaires improve compliance of patients and response rates and improve the quality of responses (Coste et al., 1997). EDQOL may be useful as an outcome measure in clinical research, as a means of assessing patient improvement (or deterioration) in treatment. The development and validation study of the EDQOL showed that this instrument is sensitive to group differences between disordered eating and non-disordered eating groups, it differentiates groups based on symptom severity, it explains more symptom severity and group-related variance than a generic QOL instrument (Engel et al., 2006). This questionnaire has shown excellent psychometric properties including adequate reliability and validity, in its Italian, Japanese and German versions (Meneguzzo et al., 2021; Tagay et al., 2011; Yoneda et al., 2020).

To date, there are no studies that have adapted and validated the EDQOL in Spanish ED patients. The existing Spanish version of the HeRQoLED (Las Hayas et al., 2006) and the short version HeRQoLED-s (Las Hayas et al., 2010) have shown adequate psychometric properties and its reduced version facilitates the assessing of the QOL, but it has been criticized because it focuses predominantly on symptoms and behaviors (Adair et al., 2007) and doesn’t assess other important domains affected in ED such as work/school, financial or autonomy (van Krugten et al., 2021).

Considering the extensive effects of EDs on QoL, understanding current treatment approaches is crucial to evaluate how they target both clinical symptoms and functional outcomes.

4. Treatment in Eating Disorders

The treatment of EDs is complex and often requires a multidisciplinary approach, involving various healthcare professionals. International clinical guidelines, such as those from the National Institute for Health and Care Excellence (NICE, 2017), identify psychological therapies as the first-line treatment for EDs. Manualized Family-Based Therapy (FBT) is typically recommended as the primary treatment approach for AN in adolescents, while for adult cases of AN, individual therapies such as Cognitive Behavioral Therapy for Eating Disorders (CBT-ED), Specialist Supportive Clinical Management (SSCM), focal psychodynamic therapy (FPT), and the Maudsley Model of Anorexia Nervosa Treatment for Adults (MANTRA) are recommended (Monteleone et al., 2022). Although several of these approaches have demonstrated superiority over treatment-as-usual conditions, no single therapy has consistently outperformed others in terms of efficacy (Byrne et al., 2017; Schmidt et al., 2016; Zipfel et al., 2014). For BN, FBT is recommended for adolescents, while CBT-ED is advised for adults. CBT-ED is also regarded as the primary treatment option for adults with BED; however, there are currently no evidence-based guidelines for treating BED in adolescents (Monteleone et al., 2022).

Outpatient care remains the first-line treatment for EDs due to its relatively lower cost and less disruptive nature compared to inpatient or residential programs (Dalle-Grave et al., 2013). However, inpatient admissions for EDs have increased significantly in several European countries, despite guidelines generally recommending it as a last resort (Treasure et al., 2022). And the first year following discharge from inpatient care is marked by a high risk of relapse, and a substantial number of patients fail to achieve treatment goals (Berends et al., 2018; Herpertz-Dahlmann et al., 2014; Meule et al., 2021; Wales et al., 2016).

Despite the wide range of therapeutic approaches and levels of care currently available, the treatment of ED continues to present considerable challenges. These disorders are not only complex in their clinical presentation but also persistent and difficult to manage over time. Remission rates remain modest, with estimates ranging between 40% and 60% (Eddy et al., 2017; Linardon, 2018; Steinhausen, 2002; Zipfel et al., 2015). Moreover, a significant obstacle in clinical practice lies in maintaining patient engagement, as many individuals struggle with motivation, treatment adherence, and sustained recovery over the long term (Daugelat et al., 2023).

These difficulties highlight the importance of developing more targeted and integrative interventions that can effectively address the multifactorial nature of EDs while providing continuous support throughout the course of treatment (Treasure et al., 2012; Dalle-Grave & Calugi, 2020).

4.1. MANTRA

Maudsley Model of Anorexia Nervosa Treatment for Adults

The Maudsley Model of Anorexia Nervosa Treatmenf for Adults (MANTRA; Schmidt et al., 2014; Schmidt et al., 2019) is a tailored and integrative psychotherapeutic approach designed for individuals with chronic AN. This treatment is based on the Cognitive-Interpersonal Maintenance Model of Anorexia (Schmidt & Treasure, 2006; Treasure & Schmidt, 2014). This model proposes that AN typically develops in individuals who exhibit anxious and perfectionist/obsessional traits. Furthermore, the model suggests that the disorder is maintained by four key maintaining factors:

- A rigid, detail-focused, and perfectionist information-processing style, accompanied by a pronounced fear of making mistakes.
- Difficulties in the socioemotional domain, manifested in the avoidance of experiencing and expressing emotions within close relationships.
- In line with these difficulties, individuals with AN often develop a set of beliefs about the role the disorder plays in their lives and the secondary benefits they derive from it.
- Close others may inadvertently maintain AN through high levels of expressed emotion or through accommodating and enabling behaviors.

Additionally, starvation and malnutrition intensify all of these problems, thereby creating a feedback loop between the consequences of the disorder and its maintaining factors (Schmidt, et al., 2014). Thus, the intervention seeks to disrupt these patterns by supporting emotional processing, fostering adaptive behaviors, and improving interpersonal functioning, particularly during the shift from intensive treatment settings to everyday life.

The Cognitive-Interpersonal Maintenance Model of Anorexia Nervosa is a distinct framework from the classical Cognitive Behavioral Therapy model for Eating Disorders (CBT-ED), which predominantly focuses on concerns related to food, weight, and shape as the core psychopathology of the disorder. Treatments based on this model aim to identify and challenge cognitions related to these aspects as a key therapeutic tool for behavioral change. However, although on the surface these patients may appear preoccupied with aspects of their ED, such concerns are actually symptoms of deeper issues related to social relationships and emotional processing (Schmidt et al., 2014). This model suggests that a different style, focus, and structure of treatment may be beneficial for the treatment of this patients.

MANTRA is a cognitive-interpersonal treatment for patients with AN that incorporates relevant findings from research in neuropsychology, personality, and social cognition in patients with AN; it includes addressing both intra- and interpersonal maintaining factors; it is modularized, with a clear hierarchy of procedures and steps tailored to the needs of the individual patient (Schmidt et al., 2014). The program is delivered through a modular framework that allows customization based on the individual's challenges and therapeutic goals. It was designed as an outpatient treatment for adults with AN, and typically, consists of 20 to 40 weekly individual sessions, in addition to 4-5 monthly follow-up sessions. Furthermore, MANTRA includes elements of guided self-help and is accompanied by a workbook-style patient manual, based on the principles outlined by Carroll and Nuro (2002). This manual is used flexibly by both therapist and patient, who work together to decide which sections are most relevant to address.

Thus, MANTRA is manual-based and includes nine core modules:

- “Getting Started” focuses on exploring motivation for change, reflecting on life with and without AN, identifying pro-AN beliefs and the disorder’s role, using externalization, and examining how AN has impacted personal values.
- “Working with support” involves identifying key support people, understanding their perspectives, evaluating helpful and unhelpful interactions, and planning how to involve them effectively.
- “Nutrition” covers assessing medical risk, understanding calorie needs for weight maintenance and gain, educating about starvation effects, healthy eating habits, managing bingeing, and creating a personalized nutritional change plan.
- “My anorexia: why, what, and how” allows patient and therapist co-develop a personalized understanding of what maintains the disorder.
- “Goals and experiments” centers on setting goals and using behavioral experiments to achieve them.
- “Exploring thinking styles” focuses on increasing awareness of rigid or detail-focused thinking, understanding its impact, and developing cognitive flexibility, big-picture thinking, and effective problem-solving skills.
- “The emotional and social mind” addresses the role of emotions, improving emotional awareness and expression, managing overwhelming feelings, gaining perspective on others’ emotions, and developing self-compassion in the context of relationships.
- “Identity” explores the relationship between anorexia and self-identity, encourages envisioning one’s best possible self, and supports the development and practice of a new identity beyond AN, inspired by personal values, strengths, and role models.
- “Moving forward” focuses on maintaining progress, identifying potential challenges, building a recovery toolkit, and developing personal mottos to support a fuller, more meaningful life.

To enrich the learning experience, MANTRA incorporates various therapeutic elements that are integrated throughout the treatment. These include reflective tasks such as writing exercises that facilitate emotion expression and regulation, drawing from the foundational concepts of James Pennebaker, such as letters to the illness (viewed as both a friend and an enemy). Also, the use of metaphorical representations (e.g., family dynamics illustrated through animal roles), and metaphors or mottos that capture and evoke key insights the patient needs to remember. Additionally, patients work with conceptual models such as the "vicious flower" and the "flourishing self," which visually represent maintaining factors of the disorder and techniques for promoting change.

Another important aspect is the therapeutic style, which is based on motivational interviewing (Miller & Rollnick, 2002). This means that the therapist adopts a warm, empathetic, reflective, responsive, and collaborative stance, while also being highly strategic in guiding the patient toward recovery, using the principles of behavioral change (Abraham & Mitchie, 2008).

MANTRA was specifically developed for the outpatient individual treatment of adults with AN and has demonstrated its efficacy in this population by improving BMI and emotional well-being, and reducing ED symptoms (Byrne et al., 2017; Fernández & Quiles, 2024; Giel et al., 2015; Schmidt et al., 2012, 2016; Startup et al., 2021). More recently, it has also been applied to adolescent patients and has shown to be an effective treatment for reducing eating-related symptoms and improving BMI (Wittek et al., 2023).

MANTRA has also been implemented in various formats, durations, and settings. While it has most commonly been delivered in an individual format, it has also been adapted for group-based interventions (Giel et al., 2015; Adamson et al., 2019; Cardi et al., 2024). Similarly, although it has typically been conducted face-to-face, online delivery formats have also been tested (Giel et al., 2015; Cardi et al., 2024). The most frequently used format has consisted of 20 to 30 sessions; however, considerable variation has been reported, with the minimum number of sessions being five (Adamson et al., 2023).

With regard to its integration into treatment plans, MANTRA has been employed both as a standalone primary intervention (Byrne et al., 2017; Giel et al., 2015; Schmidt et al., 2012, 2015, 2016; Wittek et al., 2023) and in combination with treatment as usual (TAU) (Adamson et al., 2019; Startup et al., 2021; Wade et al., 2011). Specific adaptations have included its integration with motivational interviewing sessions (Wade et al., 2011), the combination of brief individual therapy with MANTRA group sessions (Startup et al., 2021), and its implementation alongside both TAU and the ECHO intervention (Adamson et al., 2019; Cardi et al., 2019).

As highlighted in a recent systematic review by Fernández & Quiles (2024), MANTRA appears to be an effective treatment regardless of the format of delivery (face-to-face or online), number of participants (individual or group), or patient age (adults or adolescents).

4.2. ECHO

Experienced Carers Helping Others

Involving the family in the treatment of EDs is a key strategy for recovery, as it strengthens patients' social networks and reduces isolation and loneliness, both of which contribute to the maintenance of the disorder (Levine, 2012; Sepúlveda et al., 2020; Treasure & Nazar, 2016). In fact, interventions directed at both patients and their caregivers have been shown to improve health outcomes (Monteleone et al., 2022). Furthermore, the inclusion of family members in treatment is recommended by clinical guidelines such as those from the National Institute for Health and Care Excellence (NICE, 2017) and the American Psychiatric Association (APA, 2023), since recovery from EDs often involves many years of treatment and can lead to emotional, familial, and financial strain (Treasure et al., 2021).

Involvement of caregivers in treating EDs has been approached through various therapeutic models. Despite differing methodologies, these interventions generally aim to provide caregivers with practical strategies and skills to better manage the ED challenges and improve relational dynamics (Hannah et al., 2021). One notable intervention is the Collaborative Care Model, also known as the *New Maudsley Approach*, developed by Professor Treasure and colleagues.

The *New Maudsley Approach* emphasizes the importance of interpersonal dynamics in the maintenance of EDs and aims to empower caregivers with communication and coping skills to address patients' emotional and behavioral challenges, thereby fostering a more constructive family environment (Treasure et al., 2003; 2011). Unlike traditional treatment models led exclusively by professionals, this therapeutic approach promotes a shared-care strategy, recognizing caregivers as active and central participants in the treatment process. Working in close collaboration with clinical staff, caregivers support the individual throughout their recovery journey (Treasure et al., 2011).

The core principles of this model are detailed in the manual Skills-based Learning for Caring for a Loved One with an Eating Disorder: The New Maudsley Method (Treasure et al., 2007; 2011), which offers caregivers practical guidance and tools to enhance their role during the recovery process. This approach draws upon the Caregiver Stress and Coping Model for eating disorders (Treasure et al., 2003; 2007), and identifies several key areas for intervention: providing education to enhance caregivers' resilience; introducing techniques to reduce high levels of emotional expression and the reinforcement of disordered behaviors; and offering strategies for effective communication and behavioral support that facilitate patient recovery.

Several intervention formats have emerged based on this model and guide. Among them are the Collaborative Care Skills Training Workshops (CCSTW; Goodard et al., 2011; Whitney et al., 2012), Austria's adaptation for adolescent patients' caregivers called Supporting Carers of Children and Adolescents with Eating Disorders (SUCCEAT; Philipp et al., 2021; Truttman et al., 2020), and the Experienced Carers Helping Others (ECHO; Rhind et al., 2014). These programs share a common goal: equipping caregivers with the knowledge and skills to better support their loved one's recovery while safeguarding their own well-being. Common elements across these interventions include psychoeducation, reduction of symptom accommodation, lowering expressed emotion, enhancement of communication through Motivational Interviewing principles, and the development of coping and problem-solving abilities (Treasure et al., 2015).

ECHO is a guided self-help skills training intervention in which caregivers are provided with a set of resources, including a book (Treasure et al., 2007), five instructional DVDs, and a supplementary guide. These materials are combined with five to ten support phone calls delivered by trained peer mentors (Adamson et al., 2019; Hibbs et al., 2015; Hodsoll et al., 2017; Magill et al., 2016). This intervention targets the interpersonal elements of the Cognitive Interpersonal Maintenance Model of AN and includes three main components: information to strengthen family members' coping in their role as caregivers; skills to reduce their expressed emotion and symptom accommodation; and skills for positive communication and behavioral change in order to support their loved ones' recovery. More specifically, this programme provides information to reinforce how family members cope in their role as carers; it teaches them how to reduce and manage their expressed emotion and symptom accommodation, and to deal with difficult and problematic situations that arise. In addition, ECHO teaches skills for positive communication and behavior change so carers will be able to support their loved ones in their recovery.

Research has demonstrated that intervention programs developed from this model not only reduce levels of burden, anxiety, and depression in caregivers, but also improves expressed emotion and coping skills (Hodsoll et al., 2017; Magill et al., 2016; Quiles et al., 2016). Moreover, positive outcomes have been observed in patients as well, including symptom reduction, fewer hospital readmissions, lower healthcare costs, and decreased social isolation, an element often linked to the maintenance of EDs (Hibbs et al., 2015; Hodsoll et al., 2017; Magill et al., 2016; Treasure et al., 2016, 2021).

5. The ECHOMANTRA program: Origin and Adaptation.

Given the significant impact in QoL, alongside the high rates of morbidity, relapse, and mortality associated with EDs (Fichter & Quadflieg, 2016; Nordbø et al., 2012; Tomba et al., 2019; van Eeden et al., 2021; van Hoeken et al.,2020), there is a critical need to develop effective interventions aimed at enhancing care for these patients (Quiles et al., 2025). In response to this, Dr Janet Treasure's team developed the intervention program ECHOMANTRA, in their TRIANGLE[1] study, a skill-sharing intervention for adult patients with AN and their carers, which aims to facilitate the transition from inpatient hospital treatment to daily life and to the community (Cardi et al., 2017).

ECHOMANTRA consists of a digital intervention for carers (ECHO; Experienced Carers Helping Others; Treasure et al., 2007; 2015) and a digital, brief, guided, aftercare adaptation of the Maudsley Anorexia Nervosa Treatment for Adults (MANTRA, Schmidt et al., 2014) for patients. Both programs, the ECHO and the MANTRA are based on the Cognitive Interpersonal Maintenance Model of Anorexia Nervosa (Schmidt & Treasure, 2006; Schmidt et al., 2014; Treasure & Schmidt, 2013), which was developed in order to propose a theoretical basis to the scientific community that would synthesize the most important internal and interpersonal maintaining factors of this disorder. These factors are perfectionism/cognitive rigidity, avoidance tendencies, pro-anorectic thoughts, and response from close others (family members), characterized by high expressed emotion and enabling and accommodating behaviors.

In the TRIANGLE trial, the ECHOMANTRA materials consisted of an online workbook and a library of video clips featuring lived experience recovery narratives and role-plays of carer skills (Clark-Bryan et al., 2024; Cardi et al., 2017). Patients and carers randomised to the ECHOMANTRA intervention received access to the study's website with all this material. The workbook and videos covered information on the factors that contribute to and maintain the illness, while also offered tips for behavior change. The same topics were explored within eight different group settings, which included patient-only, carer-only, and joint patient-carer sessions, which were moderated and facilitated by research assistants. We have adapted this format into our research: both MANTRA and ECHO were delivered in eight sessions, following the same contents as in the original study. However, based on the preliminary results in the UK (Ambwani et al., 2023; Adamson et al., 2019; Cardi et al., 2024; Clark-Bryan et al., 2024), we decided to change the delivery format. In our study, ECHOMANTRA was delivered online via videocall and the sessions did not follow a discussion group format. The qualitative results of the original study showed that the online group format was sometimes considered by patients as triggering and draining, and at times, they perceived a sense of competitiveness within the patient group. In addition, due to the limited engagement to the intervention materials, original authors concluded

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[1] The TRIANGLE symbolizes the triadic collaboration central to the intervention: patient, caregiver, and clinician

that a more personalized approach is necessary, one that matches the characteristics of the participants, such as their readiness to change and the duration and severity of the illness (Cardi et al., 2024; Clark-Bryan et al., 2024). In the present study, ECHOMANTRA will consist of eight online psychoeducation and individually tailored intervention sessions aimed at improving participant adherence and adequately address the contents and protocol of MANTRA and ECHO. Workbooks and videos will also be used.

Another difference in this research is that, in the original study, the participants were only adult AN inpatients or those in day care treatment, along with their carers, as the main objective was to evaluate whether this program improved the transition of these patients from the hospital resource to their community. In our study, adolescent ED inpatients, day care treatment and outpatients were also included, since the MANTRA program was originally designed for outpatients, and it has also been shown to be effective in adolescents and includes content that is common and important to address across the spectrum of EDs, such as illness as identity, motivation to change, emotion regulation, and avoidance tendencies (Fernández & Quiles, 2024; Wittek et al., 2023).

Thus, ECHOMANTRA was designed not to replace the usual treatment provided in specialized ED units, but to be used as an add on.

6. Aims and hypothesis of the thesis

The primary aim of this research is to evaluate the effectiveness of a novel intervention (ECHOMANTRA) for adolescent patients with ED and their caregivers. Delivered as an adjunct to treatment-as-usual (TAU), this intervention seeks to improve clinical outcomes in adolescents while enhancing caregiver skills and well-being.

Hypotheses:

- Adolescent patients receiving the combined intervention (TAU + ECHOMANTRA) will show significantly greater improvements in key clinical outcomes, including body mass index (BMI), ED symptomatology, emotional state, psychosocial functioning, perfectionism, and motivation to change.

- The clinical benefits of the combined intervention (TAU + ECHOMANTRA) will be maintained in both the short term (6 months) and the medium term (12 months).

- Caregivers in the experimental group will present better emotional well-being and lower illness accommodation, expressed emotion and burden in comparison to caregivers in the control group.

- Caregivers in the experimental group will develop more effective ED-specific caregiving skills than those receiving TAU alone.

Aims and contribution of each article to Program-Level Hypotheses:

In this context, the six following articles were developed, each contributing specific evidence toward testing the overarching program-level hypotheses.

Articles 1–4 constitute the core intervention research program:

Article 1: Study Protocol

This study aimed to describe the study protocol of a randomized controlled trial for evaluating the effectiveness of an adaptation of a novel intervention for patients and carers (ECHOMANTRA) to be implemented as an add-on to TAU. This study establishes the overall design, participant characteristics, intervention components, and outcome measures. This article lays the methodological foundation for testing the program-level hypotheses.

Article 2: Case Study

This study aimed to evaluate the effectiveness of the ECHOMANTRA program, applied together with the usual treatment, in a 15-year-old adolescent girl with AN and her mother. Beyond assessing the effectiveness of the ECHOMANTRA, this study assessed feasibility and acceptability in a real-world clinical context, informing refinements to the intervention protocol and therapist training—thus supporting the integrated program effects hypothesis.

Article 3: Preliminary Results – Caregivers

This study aimed to analyze the efficacy of adding the ECHO program to the TAU of relatives through a novel format based on individual intervention and with an online format and to examine the acceptability and feasibility of this new format. The study also examined the program's acceptability and feasibility among participants. This article directly addresses the caregiver outcomes hypothesis.

Article 4: Final Results

This study aimed to assess the efficacy of the ECHOMANTRA intervention for adolescent ED patients and their caregivers, comparing outcomes between the experimental group (TAU + ECHOMANTRA) and the control group (TAU alone). This article tests both patient clinical outcomes and caregiver outcomes, providing evidence for the integrated program effects.

Complementing this core program, two foundational studies were conducted to strengthen methodological and interpretive foundations of the trial:

Article 5: Psychometric Validation Study

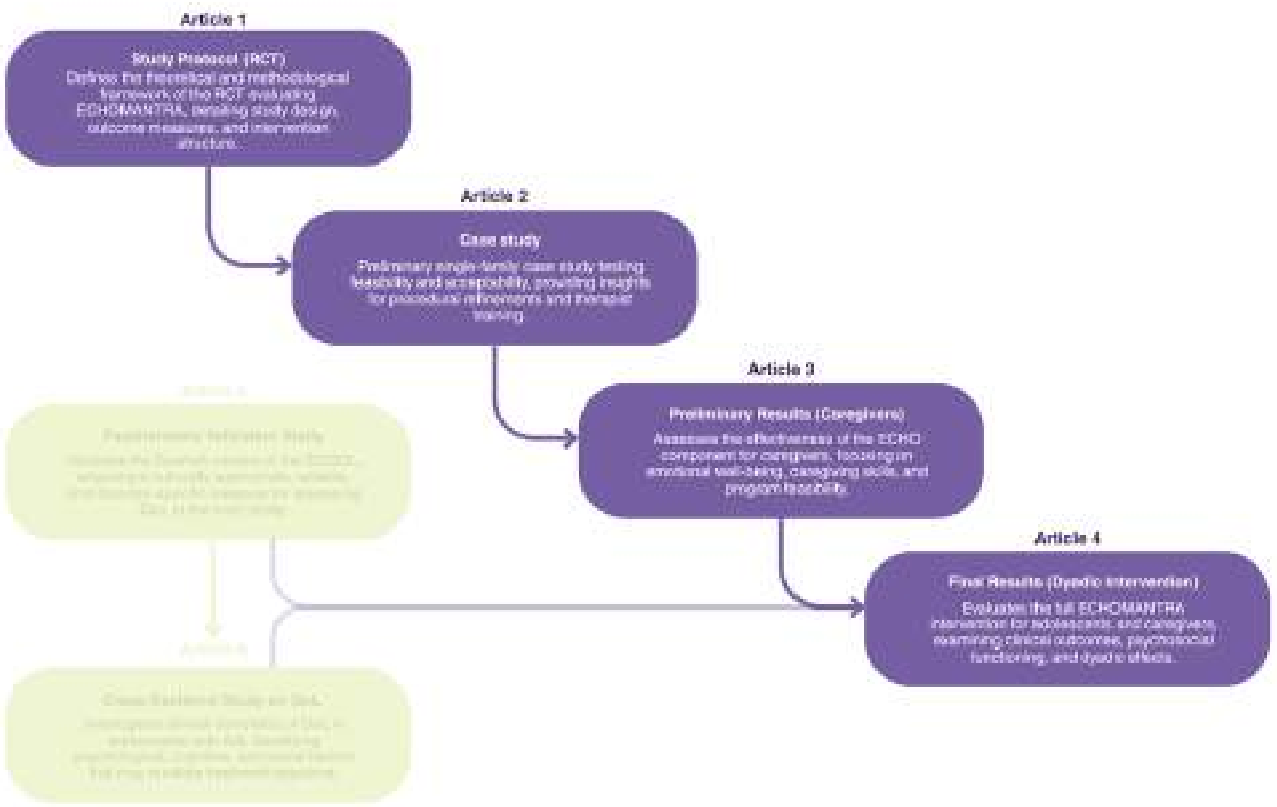
This study aimed to examine the psychometric properties of the Spanish version of the Eating Disorders Quality of Life (EDQOL) among ED patients. This psychometric validation guaranteed that this key outcome measure was culturally and linguistically appropriate for use in the study. By providing a reliable and valid measurement tool, this article strengthens the assessment of patient outcomes within the program, particularly in relation to QoL.

Article 6: Cross-Sectional Study on Quality of Life

This study aimed to evaluate the relationship between the severity of ED-related psychopathology and clinical impairment in adolescents with AN as well as their perception of health-related QoL. This study contextualizes intervention results and supports the integrated program effects hypothesis by identifying the domains through which ECHOMANTRA may influence adolescent functioning.

Together, the aims of these studies create an integrated framework that combines intervention development and feasibility testing with measurement validity and contextual understanding, highlighting the interdependence of each study in contributing to the development and testing of overarching program-level hypotheses.

Principal study



Introductory Note

This study constitutes the central axis of this doctoral thesis. It is a randomized controlled trial designed to evaluate the efficacy of the ECHOMANTRA intervention, specifically adapted for adolescent patients with an ED and their caregivers, as an adjunct to TAU. All articles included in this thesis have been derived from the data generated by this study.

7.1. Article 1

Adaptation and Implementation of an Intervention Program on Spanish Carers and Adolescent Patients With an Eating Disorder: Study Protocol of a Randomized Controlled Trial

Introductory Note

The present section is based on a previously published study protocol, which outlined the initial design and methodology planned for the research project. However, certain modifications were made during the actual implementation of the study due to methodological and practical considerations.

In order to provide a faithful and transparent account of the study as it was ultimately conducted, the protocol presented here has been adapted to reflect the final version that was implemented.

A dedicated subsection at the end of this chapter, titled Modifications to the Original Study Protocol, will detail each of the changes made in comparison to the original publication.

Method

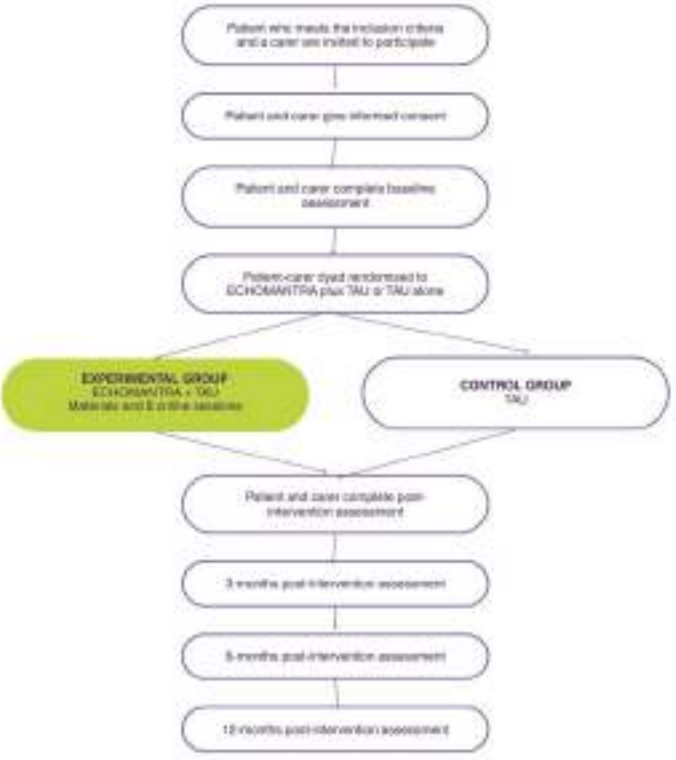
This study has been registered on the ISRCTN registry (Trial Identifier: ISRCTN43554732). CONSORT 2010 for parallel group randomized trials (Schulz et al., 2010) is specifically observed in reporting this trial

Study Design and Procedure

This is a multi-center, pilot, randomized, controlled, blind, superiority study with two parallel groups. Ethical approval is granted by the Ethics Committees of the respective hospitals to which the ED units belong (see Appendix) and the Ethics Committee of the University Miguel Hernández.

Assignment to the control or experimental group will be carried out using a computer-generated randomized sequence, with1:1 treatment allocation. The research assistant at each center will conduct a semi-structured interview to evaluate participants and confirm fulfillment of the inclusion/exclusion criteria. Patients who are receiving ED treatment (either as inpatients or day-patients) and fulfill the inclusion criteria, will be invited to participate in the study together with a carer. By “carer” we refer to someone who usually takes care of the patient outside the hospital/day-center and lives with her. Patients and carers will receive detailed information on the study and will be asked for a written informed consent to be able to participate. After submitting the consent form, participants will be invited to complete the baseline questionnaires and will then be randomly assigned to either (1) ECHOMANTRA in addition to TAU or (2) TAU only (see Figure 2). The ECHOMANTRA-guided skills-sharing intervention will include materials and eight online sessions (one per week) for carers and patients, while treatment duration will be 8 weeks.

Figure 2 | Study design flow diagram



Participants

Patients

Patients will be recruited from seven different specialist inpatient/day-patient ED units (list of hospitals that participated in the study available in the Appendix). This study will involve adolescent girls who have received an ED diagnosis according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria (American Psychiatric Association, 2013), including diagnoses of AN, BN, and OSFED. The inclusion criteria will be as follows: (1) aged between 12 and 19, (2) no psychiatric comorbidity, (3) receiving treatment for ED in a specialist inpatient/daypatient ED unit, (4) a family member willing to participate in the study and (5) ability to manage an electronic device (e.g.,mobile phone, computer, laptop or tablet) and the Internet in order to access the online sessions, (6) a native Spanish speaker or understands native level Spanish. Patients will be asked to nominate a carer to whom the researcher will invite to participate in the trial. One carer per patient will be permitted, and this should be a primary carer, somebody who usually takes care of the patient outside the hospital/day-center and lives with her.

Carers

For carers/family members the inclusion criteria will be as follows: (1) living with the patient, (2) not suffering from a serious medical or psychiatric condition (this information will be assessed through a self-report), (3) ability to access an electronic device (e.g., mobile phone, computer, laptop or tablet) and the Internet in order to access the online sessions, and (4) a native Spanish speaker or understands native level Spanish.

Randomization

After screening and consent, patients and their carers will be randomized as a dyad using a randomized computer-generated sequence. A full randomization procedure macro will be applied saving the “seed” (SEED = 13012021) to reproduce the exact selection. Randomization will be facilitated by S. L., a colleague from the Behavioral Sciences and Health Department, who will not be involved in this study. Once the allocation has been assigned, no changes can be made. Those randomized to the intervention arm (ECHOMANTRA + TAU) will have access to the intervention materials.

Sample size

An intention-to-treat method will be used to calculate sample size, considering the hypotheses for the primary outcome variables. Power calculations will be based on power determination for longitudinal designs with attrition (Hedeker et al., 1999), an alpha of 0.05, four assessment points (with baseline serving as a covariate), dropout rate of 40% and a fixed autoregressive coefficient of 0.40. A group size of 40 patients per group would provide 80% power with a bilateral $p < 0.05$ to detect a clinically significant change in eating pathology (overall Eating Disorder Examination Questionnaire, EDE-Q, of 0.45 points), assuming a standard deviation of one for the overall EDE-Q change scores (Hedeker et al., 1999), and also to detect a difference in mean weight gain of one BMI point, which, based on previous research, would be clinically important to detect (Agras et al., 2000; Byrne et al., 2017). Therefore, if a sample loss of approximately 40% is taken into account, the participation of at least 70 participants per group will be required.

Interventions / Treatment Arms

Treatment as Usual

It is not feasible to use a standardized comparison treatment, as doing so would require special adjustments across different settings. Thus, each participating center will adhere to its own procedures for TAU. It is expected that ED units within Spain's public health care system follow the Clinical Practice Guidelines established by the National Health System (Ministerio de Sanidad y Consumo, 2009). This guidelines highlight the importance of supporting families in coping with the situation, raise awareness and guide them to adopt positive changes in family routines. And to increase understanding of the illness, its causes, consequences, and available treatments.

The 24-hour hospitalization centers that participate in this study — Hospital Universitario La Fe (Valencia), Reina Sofia (Murcia), and San Juan (Alicante) — offer multidisciplinary care provided by teams that include a nutritionist/endocrinologist, psychologist, physician, and nurse. This care includes monitoring physical health risks, nutritional rehabilitation, education on healthy eating, and nutrition guidelines. Furthermore, psychological therapy is employed to help modify thoughts, behaviors, attitudes, and emotions that sustain the ED. Once a patient stabilizes and reaches a healthy body mass index, they are discharged and monitored during follow-up visits to evaluate progress and determine if further treatment is needed in an outpatient or day hospital setting.

At the day hospitals of CREA (Centro de Recuperación Emocional y Alimentaria), ADANER (Asociación en Defensa de la Atención a la Anorexia Nerviosa y Bulimia), and Hospital de La Fe in Valencia, patients receive continuous care that allows for a gradual transition from inpatient to outpatient treatment. Care is interdisciplinary, encompassing dietary support, therapeutic feeding, psychological interventions, and school support. Psychological treatments include weekly individual CBT-ED, along with psychoeducational group sessions focusing on topics like nutrition, emotional regulation, body image, social skills, and problem-solving strategies. Patients generally attend Monday through Friday, for about 6 hours daily. Parents are also invited to participate in psychoeducational support groups that meet bi-monthly.

At the outpatient units of Hospital de la Fe in Valencia, Hospital Reina Sofía (Murcia), Hospital de Castellón, Hospital La Ribera (Valencia) and CREA, the usual care includes psychological interventions aimed at modifying the cognitive, emotional, and behavioral patterns that maintain the ED. Nutritional and medical support is provided as needed.

The TAU-only (control condition) group will have no access to the intervention materials or the ECHOMANTRA intervention sessions. At the end of the study, individuals randomized to the TAU-only condition will be offered the self-help components of the intervention.

Treatment-as-Usual Plus Patient and Carer Skills-Sharing Intervention (ECHOMANTRA)

In the experimental group, the adaptation of the ECHOMANTRA program will be implemented. The contents of the intervention will be translated into the Spanish language and adapted to a Spanish-speaking cultural context.

Patients

Based on the interpersonal model of AN, the “MANTRA” part of the ECHOMANTRA intervention addresses patients’ modifiable characteristics, such as difficulties in emotional regulation, interpersonal relationships and eating. The intervention includes a workbook with an emphasis on specific behavioral change strategies. The workbook is organized into eight chapters that correspond to the contents of the eight sessions of the program.

MANTRA will involve eight, weekly, individual online sessions lasting 60 min, which will be delivered by assistant psychologists trained in the model. During the sessions, the trained psychologist will encourage patients to reflect on the information and exercises proposed in the workbook. They will also carry out a series of activities taken from the MANTRA program to further develop the contents included in the corresponding chapter of the workbook.

Each session will be themed following the structure of the patient workbook. Specifically, the focus of each session will be as follows: the first and second sessions will be on psychoeducation and motivation to change; the third session will be on skills to develop acceptance and self-compassion; the fourth and fifth sessions will be on skills to improve social functioning and to explore thinking styles; the sixth session will be on emotion management; and the seventh and eighth sessions will be on planning for the transition through goal setting, use of social support and implementation intentions. Table 1 provides an overview of the content included in the MANTRA intervention.

For a more detailed description of the exercises, see Schmidt et al. (2014).

Carers

Carers allocated to the intervention group will receive a carer workbook.

ECHO will involve eight, weekly, individual online sessions, lasting 60 min, which will be delivered by assistant psychologists trained in the model. During the sessions, the trained psychologist will encourage discussion about the information and exercises proposed in the workbook. In addition, for a deeper understanding of the contents of each session presented in the workbook, carers will read and do activities from the book “Skills based caring for a loved one with an eating disorder: The New Maudsley Method” (Treasure et al., 2007; Spanish version: Los trastornos de la alimentación: guía práctica para cuidar de un ser querido Treasure et al., 2011). These sessions will also include some of the video-clips from the Digital Versatile Disc (DVD) for carers “How to Care for Someone with an Eating Disorder”[2]. This DVD includes practical strategies and techniques to help carers develop skills and knowledge to help their loved one move toward recovery and to look after their own wellbeing by following the “New Maudsley Approach.” This book and the DVD are designed to help carers develop self-reflective skills in order to develop confidence, compassion and the courage to take risks.

Both resources will show them how to experiment with changes in their caring behavior so they can be more helpful to a loved one suffering from an ED.

The workbook and online sessions will provide a skills training program that includes training in stress management, communication (based on motivational interviewing techniques), strategies to reduce accommodation and expressed emotion and to increase extinction training

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[2] http://www.succeedfoundation.org/work/pre_order_dvd

and new habits at home via effective social support. Table 1 provides an overview of the content included in the MANTRA intervention.

Table 1 | Contents of the ECHOMANTRA intervention

Contents of the Maudsley Anorexia Nervosa Treatment for Adults (MANTRA) adaptation	
Session 1	Psychoeducation: Better understanding eating disorders. Strategies to motivate change.
Session 2	Psychoeducation: Understanding the origin and maintaining factors of eating disorders.
Session 3	Acceptance and self-compassion training.
Session 4 & 5	Exploration of thinking styles and development of skills to improve social functioning.
Session 6	Emotion management training.
Session 7 & 8	Planning the transition from the hospital setting to daily life, goal setting training, use of social support, and addressing the intention to implement these principles.

Contents of the Experieced Carers Helping Others (ECHO) adaptation	
Session 1	Program presentation and psychoeducation. Understanding the multifactorial origin of the ED: Predisposing, precipitating, and maintaining factors
Session 2	Description of the Model of Carer Coping
Session 3	Symptom accommodation Resilience as the transformative ability
Session 4	Description of the Cognitive Interpersonal Maintenance Model of Eating Disorders. Understanding patterns of relationship with the person with the problem through the animal metaphors. How to create distance and provide warmth and guidance
Session 5	Effective communication strategies based on the Motivational Interviewing approach. Listening strategies: basic skills of motivational interviewing such as asking open-ended questions, providing support, reflecting, and summarizing. Communicating with compassion
Session 6	Communication skills training and practice.
Session 7	Problem-solving and goal-setting skills training and practice.
Session 8	Review of the content covered during the intervention and practice of the given skills. Relapse prevention

Outcomes

Patients

This study will consider primary and secondary outcomes measured at the four evaluation points: baseline (T0), postintervention (T1), 3-month follow-up (T2), 6-month follow-up (T3), and 12-month follow-up (T4)

The following will be assessed as primary measures: ED symptomatology and psychological well-being. Secondary outcomes will include the following: BMI, psychosocial adjustment, perfectionism, obsessive-compulsive symptomatology, motivation to change and hospital readmission.

Instruments

Ad-hoc sociodemographic data questionnaire which includes details such as age, gender, and education.

Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Berglin, 1997) will be used to assess behaviors, attitudes, and feelings related to eating and body image in EDs. This instrument consists of four subscales: eating restraint, concern with weight, concern with shape, and concern with eating. Higher scores indicate greater symptomatology. The Spanish validation study demonstrated internal consistency ranging from α = 0.74 to α = 0.93 for the subscales and α = 0.93 for the total scale (Peláez-Fernández et al., 2013).

Depression and Anxiety Stress Scales (DASS-21) (Lovibond & Lovibond, 1995) will be used to assess the emotional well-being. This instrument comprises 21 items divided into three subscales that measure emotional states: depression, anxiety, and stress. Each item is scored on a scale from 0 ("did not apply to me at all") to 3 ("applied to me very much or most of the time"). The total score is obtained by summing the item scores, with a possible range from 0 to 63, where higher scores reflect greater emotional distress. The DASS-21 has demonstrated adequate internal consistency, with reliability values ranging from α ≥ 0.70 to α ≥ 0.84 in the Spanish validation study (Bados et al., 2005).

Clinical Impairment Assessment (CIA 3.0) (Bohn & Fairburn, 2008) will be used to assess psychsocial impairment. It consists of three subscales: personal, social, and cognitive impairment. Higher scores indicate greater psychosocial impairment. The Spanish validation study demonstrated internal consistency of α = 0.90 (Martín et al., 2015).

Health Survey (SF-12) (Ware et al. 1996) will be used to measure health-related QoL. It consists of 12 items that assess physical and mental health across eight dimensions: physical functioning, role limitations due to physical health, role limitations due to emotional health, social functioning, pain, general health perceptions, vitality, and mental health. The scores are summarized into two component scores: the Physical Component Summary (PCS) and the Mental Component Summary (MCS), providing an overall assessment of an individual's health status. The Spanish validation study demonstrates good psychometric properties with reliability values of α ≥ 0.85 and α ≥ 0.78, respectively (Vilagut et al., 2008).

Eating disorders quality of life (EDQOL) (Engel et al., 2006) will be used to measure ED-specific health-related QOL. It is a 25-item scale with four subscales: Psychological, Physical/Cognitive, Work/School, and Financial. The Spanish validation study demonstrated internal consistency ranging from α = 0.78 to α = 0.91 for the subscales and α = 0.91 for the total score (Quiles et al., 2024).

Motivation to Change Rule. Derived from the Motivational Interviewing framework by Miller and Rollnick (1999), this rule includes two items: "How important is it for you to make a change?" and "How confident are you in your ability to make this change?" Respondents rate their answers on a scale from 1 to 10. Higher scores reflect a stronger motivation to change.

Child and Adolescent Perfectionism Scale (CAPS) (Flett et al., 1997) will be used to assess perfectionism in children and adolescents. It consists of two dimensions: Self-Oriented Perfectionism, which evaluates unrealistic self-impositions, and Socially Prescribed Perfectionism, which assesses the pressure exerted by others to achieve unrealistic goals. The Spanish validation study demonstrated internal consistency of α = 0.87 (Castro et al., 2004).

Obsessive-Compulsive Inventory Revised (OCIR) (Foa et al., 2002) will be used to assess the severity of obsessive-compulsive symptoms. It consists of 42 items that evaluate both obsessions and compulsions across different domains, such as washing, checking, ordering, and intrusive thoughts. The items are rated on a 5-point Likert scale, ranging from 0 ("not at all") to 4 ("extremely"). Higher scores indicate greater severity of obsessive-compulsive symptoms. The Spanish validation study demonstrates good psychometric properties with reliability values ranging from α ≥ 0.63 and α ≥ 0.86 for the subscales (Fullana et al., 2005).

Acceptability and Feasibility of ECHOMANTRA. Patients in the ECHOMANTRA group will complete a custom Participant Feedback Form at the end of the intervention. This form includes 16 Likert-scale items (rated from 1 to 10) to assess usefulness and overall satisfaction with the study. Additionally, the therapist will record attendance, completion of tasks between sessions, and engagement with reading materials for each session.

Table 2 provides an overview of outcomes and instruments used.

Clinical assessment

Health care providers from the 24-hour, day care, or outpatient units will submit the following patient information: BMI, diagnosis, age at onset of disorder, evolution of illness over time (duration), admissions prior to current one, comorbidity and readmission after being discharged.

Carers

For carers the following outcome measures will be considered: emotional state, expressed emotion, impact from and accommodation to eating symptoms, and coping skills.

Instruments

Ad-hoc sociodemographic data questionnaire which includes details such as age, gender, and education.

Depression and Anxiety Stress Scales (DASS-21) (Lovibond & Lovibond, 1995; Bados et al., 2005).

Family Questionnaire (FQ) (Wiedemann et al., 2002) will be used to assess the expressed emotion. This instrument comprises 20 items divided into two subscales: Critical Comments and Emotional Over-Involvement, with 10 items each. Each item is scored on a scale from 1 ("never/rarely") to 4 ("very often"), and the total score is calculated by summing the item scores, ranging from 20 to 80. Higher scores reflect greater levels of expressed emotion. The FQ has demonstrated adequate psychometric properties in the Spanish validation study, with reliability values of α ≥ 0.83 for Critical Comments and α ≥ 0.72 for Emotional Over-Involvement (Sepúlveda et al., 2014).

The Eating Disorders Symptom Impact Scale (EDSIS-S) (Sepúlveda et al., 2008a; Sepúlveda et al., 2008b) will be used to assess the impact of ED symptoms. The instrument comprises 24 items distributed across four subscales: Nutrition Impact, Guilt, Dysregulated Behaviors, and Social Isolation. Each item is scored on a scale from 0 (never) to 4 (nearly always), with total scores obtained by summing the items, ranging from 0 to 96. Higher scores indicate a greater impact of the ED on the caregiver over the previous month. The Spanish validation of the EDSIS-S demonstrated adequate internal consistency, with reliability values ranging from α ≥ 0.74 to α ≥ 0.83 for the subscales and α ≥ 0.88 for the total scale (Carral-Fernández et al., 2013).

The Accommodation to Illness Symptoms Scale (AESED) (Sepúlveda et al., 2009) will be used to assess the degree of family accommodation to illness symptoms. The instrument comprises 33 items distributed across five subscales: Avoidance and Modifying Routine, Reassure Seeking, Meal Ritual, Control of Family, and "Turning a Blind Eye". Participants rate each item using a 5-point Likert scale, ranging from 0 (never) to 4 (nearly always). The total score is the sum of the items, with scores ranging from 0 to 132. Higher scores indicate a greater degree of family accommodation to the illness. The Spanish validation of the instrument demonstrated adequate internal consistency, with reliability values ranging from α ≥ 0.74 to α ≥ 0.89 across the subscales (Quiles et al., 2016).

The Caregiver Skills Scale (CASK) (Hibbs et al., 2015a; Hibbs et al., 2015b) will be used to assess the skills of caregivers in supporting patients with EDs. The instrument comprises 27 items distributed across six subscales: Bigger Picture, Self-care, Biting-your-Tongue, Insight-Acceptance, Emotional Intelligence, and Frustration-Tolerance. Each item is scored on a visual analogue scale ranging from 0 to 100, and the total score is calculated as the mean of the items. Higher scores reflect greater caregiver skills, which can benefit patients with EDs. In the Spanish validation study, the instrument demonstrated adequate psychometric properties, with reliability values ranging from α ≥ 0.71 to α ≥ 0.75 across the subscales (Vintró-Alcaraz et al., 2018).

Acceptability and Feasibility of ECHOMANTRA. Carers in the ECHO arm will complete a “Participant Feedback Form,” created ad hoc for completion at the end of the intervention. It consists of 12 Likert-type items (e.g., Do you think the sessions have been useful to improve your experience as a caregiver?), ranging from 1 (nothing at all) to 10 (very much), and assessed participants' experiences and satisfaction with the study. They will be asked to provide their views regarding the following: what they found beneficial and/or challenging, what they enjoyed and/or did not like, the transferability of ECHO skills to their routine, and their suggestions for further improvements to the intervention. In addition, the therapist will also record attendance, completion of tasks between sessions, and engagement with reading materials for each session.

Table 2 provides an overview of outcomes and instruments used.

Table 2 | Outcome and measures / instruments

	Outcome	Measure / Instrument	References
Patients			
1	Body mass index		
2	ED symptomatology	Eating Disorder Examination (EDEQ)	Fairburn & Berglin, 1997; Spanish validation (SV): Peláez-Fernández, Labrador, & Raich, 2013
3	Psychological well-being	Depression, Anxiety and Stress Scales (DASS-21)	Lovibond & Lovibond, 1995; SV: Bados et al., 2005;
4	QoL	Eating Disorders Quality of Life (EDQoL)	Engel et al., 2006; SV: Quiles et al., 2023
		Health Survey SF-12	Ware et al. 1996; SV: Vilagut et al., 2008
5	Psychosocial adjunstment	Clinical Impairment Assessment (CIA3.0)	Bohn & Fairburn, 2008; SV: Martín et al., 2015
6	Perfectionism	Child and Adolescent Perfectionism Scale (CAPS)	Flett et al., 1997; SV: Castro et al., 2004
7	Obsessive-compulsive symptoms	Obsessive-Compulsive Inventory Revised (OCIR)	Foa et al., 2002; SV: Fullana et al., 2005
8	Motivation to change	Regla de Motivación al cambio de la Entrevista Motivacional	Miller & Rollnick, 1999
9	Adherence to treatment	Drop-out rate, number of sessions completed and task completion between sessions	
10	Patient feedback form	Patients' satisfaction and experiences in the study	
Carers			
1	Psychological well-being	Depression, Anxiety and Stress Scales (DASS-21)	Lovibond & Lovibond, 1995; SV: Bados et al., 2005;
2	Expressed emotion	Family Questionnaire (FQ)	Wiedemann et al., 2002; SV: Sepúlveda et al., 2014
3	Burden	The Eating Disorders Symptom Impact Scale (EDSIS-S)	Sepúlveda et al., 2008a; Sepúlveda et al.2008b; Carral-Fernández et al., 2013
4	Accomodation to illness	The Accommodation to Illness Symptoms Scale (AESED)	Sepúlveda et al., 2009; SV: Quiles et al., 2016
5	Care skills	The Caregiver Skills Scale (CASK)	Hibbs et al., 2015a; Hibbs et al., 2015b; SV: Vintró-Alcaraz et al., 2018
6	Carer feedback form	Carers' satisfaction and experiences in the study	

Blinding

Given the nature of the study design, all participants and therapists will be aware of the treatment condition.

The person responsible for creating the sequence of randomization will not belong to the research team and will not have other role in this research project. The researcher responsible for making the analyses will be a specialist in statistical methodology and only will participate in this aspect of the study. The research assistant who administers the assessment at each time period will not deliver the intervention. The statistician will be blinded to the condition allocated to the patients and their carer.

Discussion

The treatment of EDs should include patients and carers in order to improve patients' outcomes and adherence (Treasure & Nazar, 2016). In this sense, ECHOMANTRA is an intervention that can improve outcomes during and following intensive care for adolescents with AN (Cardi et al., 2017; Adamson et al., 2019). ECHOMANTRA should reduce patients' distress and ED symptoms. For carers, outcomes have been related to a reduction in distress and an improvement in their skills.

ECHOMANTRA is protocolized in eight sessions, so it can be replicated in different contexts, such as an inpatient, day-care, or outpatient units. It was designed to be affordable, scalable, and to potentially have a wide reach (Cardi et al., 2017). Treatment sessions will be developed online, which will allow both patients and family members to adapt their learning and improvement in therapeutic skills to their daily routine in order to increase engagement. This design will make it possible to overcome some of the obstacles that make it difficult for participants to adhere, especially carers.

This is a multi-center trial, which will take place in three different types of services (inpatient, day-care, and outpatient units). It will allow us to evaluate intervention effectiveness according to the therapeutic context and its impact on the generalizability of the data. Also, MANTRA was originally developed for adult AN patients. This study will examine the usefulness of the MANTRA treatment program for adolescents with other EDs and not just AN, thereby enhancing current knowledge about potential treatments for these patients.

This trial has some limitations. First, the MANTRA protocol will not only be administered to patients with AN, but also to those with BN and OSFED. Second, all original protocols have been translated into Spanish and will be used without a prior pilot study. Third, there may be difficulties for both members of the dyad (patient and carer) to be involved in the intervention during all sessions. To promote adherence, the schedule for each session will be individually arranged with each participant. Finally, particular attention will be paid to potiential difficulties in maintaining adherence in the control group. To address this, they will be offered the self-help components of the intervention at the end of the study.

The strengths of this study include its randomized controlled design and the use of standardized, protocolized therapist-guided intervention. Additionally, the individualized nature of the interventions for both patients and carers enhances the robustness of the trial.

Clinical implications will be related to improving psychological treatment for ED. In our opinion, findings from the ECHOMANTRA trial will be able to optimize ED treatment and improve our knowledge about the factors that maintain the illness for those with a severe and enduring ED. An additional benefit could be found in the assessment of MANTRA's effectiveness for BN and OSFED and not only for AN.

Finally, this article outlines the protocol for a study that should improve treatment in ED patients. We have outlined the components of the ECHOMANTRA intervention and have clearly stated the research methodology as recommended in CONSORT 2010 guidelines (Schulz et al., 2010).

7.1.1. Modifications to the Original Study Protocol

The initial design and methodology for the research project that constitutes the core of this doctoral thesis were outlined in the original study protocol published by Quiles et al. (2021):

> Quiles, Y., Quiles, M. J., León, E. M., Roncero, M., Ruiz, Á., España, M., Romero, C., & Elvira, V. (2021). Adaptation and Implementation of an Intervention Programme on Spanish Carers and Adolescent Patients With an Eating Disorder: Study Protocol of a Randomized Controlled Trial. Frontiers in Psychology, 12, 697916. https://doi.org/10.3389/fpsyg.2021.697916

However, several modifications were introduced during the implementation phase, due to both methodological refinements and practical considerations. These changes are detailed below:

Expansion of participating recruiting sites

Originally, the study involved three specialized units in the treatment of ED helping with recruitment and located in the regions of Valencia and Murcia: the Eating Disorders Unit at Hospital Universitario de San Juan de Alicante, the Day Hospital of the CREA (Centro de Recuperación Emocional y Alimentaria), and the Day Hospital of the ADANER (Asociación en Defensa de la Atención a la Anorexia Nerviosa y Bulimia). Subsequently, four additional clinical sites of recruitment were incorporated: the Eating Disorders Unit at Hospital Universitario La Fe in Valencia, the Eating Disorders Unit at Hospital Reina Sofía in Valencia, and the Eating Disorders Unit at Hospital Universitario de Castellón.

Extension of follow-up assessments

The original design proposed four assessment time points: baseline, post-intervention, and follow-ups at 3- and 6- months post-intervention. However, a 12-month follow-up assessment was later added. This modification was introduced in order to assess the long-term sustainability of the treatment effects, given that ED are chronic conditions with high relapse rates. Evaluating outcomes over an extended period allows for a more comprehensive understanding of the intervention's lasting impact, particularly regarding caregiver burden, adolescent symptomatology, and family functioning.

Removal of the “Parents vs. Anorexia” instrument

Although initially included to assess parents’ perceived efficacy of their role in treatment, the “Parents vs. Anorexia” questionnaire (Rhodes et al., 2005) was ultimately excluded from the study. Its Spanish adaptation and validation, which was planned as part of this doctoral research, did not yield adequate psychometric properties. Given the lack of reliability and construct validity in the adapted version, it was considered methodologically inappropriate to retain this instrument as an outcome measure.

Exclusion of the EQ-5D-5L instrument

Although this instrument was included in Article 2, it was ultimately excluded from the core evaluation protocol. The decision was based on its limited contribution to the specific objectives of the study, as it did not provide sufficiently specific data related to the psychological variables under investigation.

These modifications were carefully considered and implemented to enhance the scientific rigor, feasibility, and clinical relevance of the study while maintaining alignment with the overarching research objectives.

7.2. Article 2

Effectiveness of the Implementation of the Echomantra Program in an Adolescent with Anorexia Nervosa and Her Caregiver: A Case Study

Introductory Note

The following article presents a case study conducted as part of the initial phase of implementing and evaluating the intervention proposed in this thesis. This case study was designed as a pilot to explore how the intervention functioned in a real-world context, assess its feasibility, and identify areas for improvement. In particular, it served to help the psychologists responsible for delivering the intervention to adjust the session materials and refine the intervention protocol. The insights gained from this preliminary evaluation were crucial for optimizing both the content and structure of the program, ensuring a more effective and contextually appropriate implementation in subsequent stages.

Case Description

Patient Identification

C. is a 15-year-old Spanish adolescent. She is currently in the fourth year of secondary education. She comes from an upper-middle socioeconomic background. She lives with her parents (both 45 years old and working as teachers) and her 17-year-old older sister.

This patient has been diagnosed with AN-R and is receiving care at a specialized ED treatment center under a day hospital program. This profile is one of the most common and representative in clinical practice, which justifies her selection for this study.

The study was approved and positively evaluated by the ethics committee of Miguel Hernández University, and informed consent was obtained from both the patient and her family member agreeing to participate in the research.

Reason for Consultation

C. was admitted to the day hospital after being referred by the Child and Adolescent Mental Health Unit (USMIA) with a diagnosis of AN-R, in accordance with DSM-5 criteria. Given the stage of the illness and her mother's willingness to participate in the treatment, it was considered that C. could benefit from the implementation of the ECHOMANTRA Program.

History of the Problem

Since childhood, C. had been a competitive swimmer. According to her, swimming served as a bonding activity with her father (who was also her coach) and as a defining role within the family: her sister was "*the studious one*," and she was "*the swimmer*." However, she suffered a knee injury and had to stop swimming, which strained the father-daughter relationship and led to a five-month rehabilitation process.

During this period, coinciding with the COVID-19 lockdown, C. began to feel uncomfortable with her body and developed a fear of gaining weight due to physical inactivity. She adopted a vegetarian diet, progressively reduced her food intake, and increased physical exercise in an effort to "*change her body to how she wanted it*." C. identifies the thinness caused by muscle atrophy in her injured leg as the trigger for the disorder. She describes her mother as having a permissive parenting style and her father as authoritarian, with a predominantly passive-aggressive and hostile communication pattern at home. During parental arguments, C. saw herself as a communication bridge between them and as the emotional link in the family, being the only one with a good relationship with both parents. She states that, when she openly exhibited symptoms of the disorder, family conflicts decreased, verbalizing: "*Since I've been sick, they don't argue as much*."

These factors resulted in a 10 kg weight loss, fear of weight gain, increased compulsive exercise, depressed mood, and distress in social relationships. She later consulted a nutritionist who, according to her parents, reinforced dietary restriction. She also received treatment from a private psychologist, where she addressed depressive symptoms, expressed anger related to her injury, managed her parents' marital difficulties, and worked on interpersonal skills.

Later, she was seen by a private psychiatrist who, due to her low BMI (13.9 kg/m^2), recommended home-based admission with complete rest, allowing her to continue her studies from home. He also referred her case to USMIA, where she was diagnosed with AN-R and hospitalization at the provincial ED Inpatient Unit was recommended. Her parents rejected this option, and instead the specialized ED center was proposed, where she was admitted weeks later under a day hospital regimen. This is where the study intervention was carried out.

According to information provided by her mother, she expressed uncertainty regarding her daughter's condition, feelings of guilt, emotional overinvolvement, monitoring of her daughter's behavior, frequent seeking of reassurance from the therapist, and a stated need for more knowledge about EDs.

Assessment Strategies

The following instruments were used:

With the patient:

Ad-hoc Questionnaire on Sociodemographic and Clinical Variables. The clinical variables were completed by the psychologist who treated her at the day hospital. These included: diagnosis, duration of the ED, previous treatments and hospitalizations, pharmacological treatment, and body mass index (BMI).

Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Beglin, 1997; Peláez-Fernández, Labrador, & Raich, 2013).

Depression, Anxiety and Stress Scales (DASS-21) (Lovibond & Lovibond, 1995; Badós et al., 2005).

The Child and Adolescent Perfectionism Scale (CAPS) (Flett et al., 1997; Castro et al., 2004).

EQ-5D-5L. Developed by the EuroQol Group (2009) and validated in the Spanish population by Hernández et al. (2018). Evaluates difficulties across five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Includes a Visual Analogue Scale (VAS) to assess self-perceived health from 0 to 100.

Clinical Impairment Assessment (CIA 3.0) (Bohn et al., 2008; Martín et al., 2015).

Motivation to Change Ruler.

Acceptability of the MANTRA. At the end of the intervention, the patient completed a “Participant Feedback Form,” created ad hoc. It consisted of 16 Likert-type items, ranging from 1 (nothing at all) to 10 (very much), and assessed patient's experience and satisfaction with the intervention.

With her caregiver:

Family Questionnaire (FQ) (Wiedemann et al., 2002; Sepúlveda et al., 2014).

Eating Disorders Symptom Impact Scale (EDSIS) (Sepúlveda et al., 2008a; Sepúlveda et al., 2008b; Carral-Fernández et al., 2013).

Depression, Anxiety and Stress Scales (DASS-21). As above, used to assess emotional distress in the family member.

Accommodation and Enabling Scale for Eating Disorders (EAISA) (Sepúlveda, Kyriacou, & Treasure, 2009; Quiles et al., 2016).

The Caregiver Skills Scale (CASK) (Hibbs et al., 2015a; Vintró-Alcaraz et al., 2018).

Acceptability of the ECHO. At the end of the intervention, the caregiver completed a "Participant Feedback Form," created ad hoc. It consisted of 12 Likert-type items, ranging from 1 (nothing at all) to 10 (very much), and assessed caregiver's experience and satisfaction with the intervention.

For further details about the instruments, refer to Table 2.

Topographic and Functional Analysis

Based on information gathered from the initial interview, clinical history, and psychometric instruments, a functional relationship has been established between antecedent and maintaining variables in C.'s ED.

As vulnerability factors (O, organism) within her learning history, the following were identified: the injury and rehabilitation process, experienced as a loss of reinforcers due to the breakdown of her identity and the father-daughter relationship; marital conflicts; a predominantly passive-aggressive and hostile communication style at home; the perception of a permissive parenting style from her mother and an authoritarian style from her father; and a self-oriented perfectionist and self-demanding cognitive style. In terms of biological variables, there is evidence of a family history of AN in the extended family.

Triggering factors (S, stimulus) include remote external events such as real body dysmorphia caused by physiological muscle atrophy in the injured leg, the COVID-19 lockdown (which increased social isolation, physical inactivity, and family conflict) as well as the restrictive diets prescribed by the nutritionist she consulted. Internal remote triggers included a depressed mood, thoughts related to thinness, body dissatisfaction, and loss of identity. Immediate external triggers included the five daily meals scheduled and enforced rest; internal triggers included preoccupation with food, weight, and body shape, as well as negative emotions.

Motor responses (R) mainly included food restriction and excessive physical exercise. Physiologically, she exhibited severe anxiety and moderate stress. Cognitively, she experienced ruminative thoughts about food, body shape, and weight, along with fear of gaining weight.

Consequences (C) included external reinforcers such as increased attention and care from her parents, expressed emotion (emotional overinvolvement and monitoring of her behavior), and a decrease in marital conflicts; all of which acted as reinforcers of illness-related behavior. Relationships with peers and her sister ceased, the latter distancing herself from C. as a result of the disorder. Internal consequences included a sense of control and satisfaction related to weight loss and the avoidance of distress by adhering to self-imposed dietary rules, all of which reinforced the disorder.

Study Design

This was a single-case experimental design (N=1), using the basic A-B model (Montero & León, 2007). The case serves as its own control, and the intervention's effect is measured based on established therapeutic goals. Pre- and post-treatment assessments were conducted, along with follow-ups at 3 and 6 months.

Intervention

Objectives

The central objective of this case study was to support the patient's transition from day-treatment to community life by promoting clinical improvement, psychosocial adjustment, and overall well-being through a structured intervention involving both the patient and her family caregiver.

Specific objectives were established as follows:

Patient

1. Reduce AN symptomatology
2. Increase BMI
3. Improve emotional well-being
4. Increase motivation for change
5. Improve psychosocial adjustment
6. Decrease perfectionism

Family caregiver

1. Improve emotional well-being
2. Improve caregiving skills
3. Reduce accommodation to symptoms
4. Reduce expressed emotion
5. Reduce the impact of symptoms

Treatment Implementation

The patient simultaneously received the standard treatment at the day treatment center (TAU) and the study intervention (ECHOMANTRA).

Treatment as Usual (TAU)
Included nutritional rehabilitation, psychiatric and psychological intervention, which consisted of weekly cognitive-behavioral therapy for EDs (CBT-ED) and participation in psychoeducational therapeutic groups on nutrition, emotional regulation, body image, social skills, and problem-solving. She attended the center from Monday to Friday for six hours per day and had two meals on-site.

ECHOMANTRA Program

The ECHOMANTRA program was translated and adapted into Spanish. For further details about the intervention, refer to Article 1.

High adherence was achieved: both the patient and her family member had 100% attendance and task completion. Additionally, therapists reported having established a strong therapeutic bond with both the patient and the family member.

Results

Qualitative Analysis

Patient

At the end of the intervention, the patient rated the sessions as very satisfactory and helpful for addressing her ED. She reported that they helped her understand the ED and the factors that contributed to its onset and maintenance, improve her motivation for recovery and her social relationships, adopt a more self-compassionate attitude, understand thinking styles, and manage her emotions. She highlighted their usefulness in planning the transition from the day treatment center, setting goals, and improving problem-solving throughout the recovery process.

Caregiver

Her mother also evaluated the intervention positively, finding the sessions useful for understanding the ED, improving her experience as a caregiver, developing tools to handle conflictive situations, and enhancing her communication with her daughter (becoming more compassionate and less critical).

Quantitative Analysis

Patient

ED Pathology (EDE-Q): Initially, the patient's scores exceeded the clinical cutoff (≥4) on all subscales (Figure 3). After the intervention, considering the scores and the Reliable Change Index (RCI) and follow-ups, there was a significant reduction in all subscales, bringing scores below the clinical threshold (Table 3).

For behavioral items: "Regular dieting behaviors" decreased from 23–27 days in the last month to none. "Regular episodes of excessive exercise" were reduced from 2–3 days per week to 1.

Table 3 | Reliable Change Index (RCI) for EDE-Q scores

	T0-T1	T0-T2	T0-T3
Restriction	-4.49*	-5.55*	-5.02
Eating concern	-1.48*	-2.62*	-2.43*
Shape concern	-0.36*	-5.24*	-5.61*
Weight concern	-0.47*	-3.31*	-3.31*
Global score	-1.60	-4.01*	-3.90*

*Significant reduction (p<0.05)

Body Mass Index (BMI): The patient's BMI increased from 14.50 kg/m^2 to 16.90 kg/m^2 after the intervention, and to 18.90 kg/m^2 at follow-up.

Emotional State (DASS-21): At baseline, the patient scored 33, corresponding to severe depression and anxiety, and moderate stress (Figure 4). By the final follow-up, this was reduced to a score of 6, below clinical thresholds, showing improvement percentages ranging from 58.33% to 100% across subscales and total score.

Figure 3 | Scores in ED symptomatology, obtained through the EDE-Q

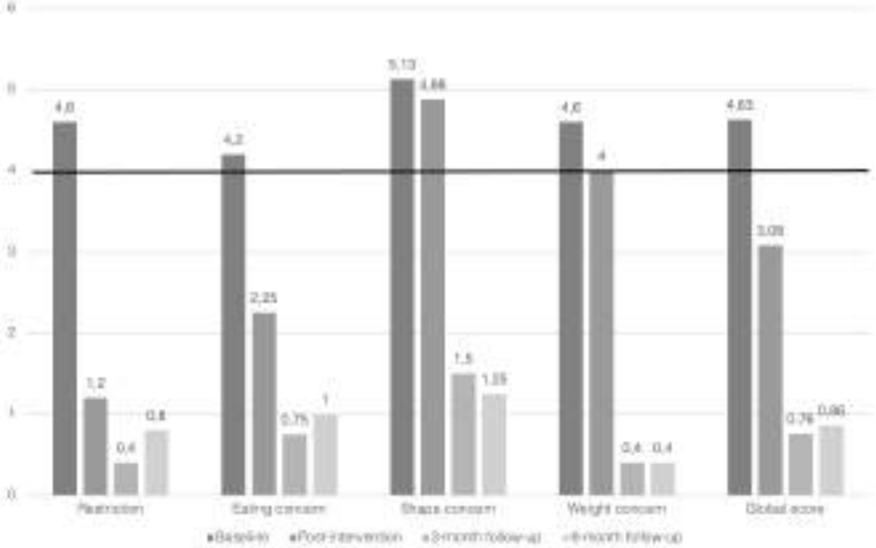
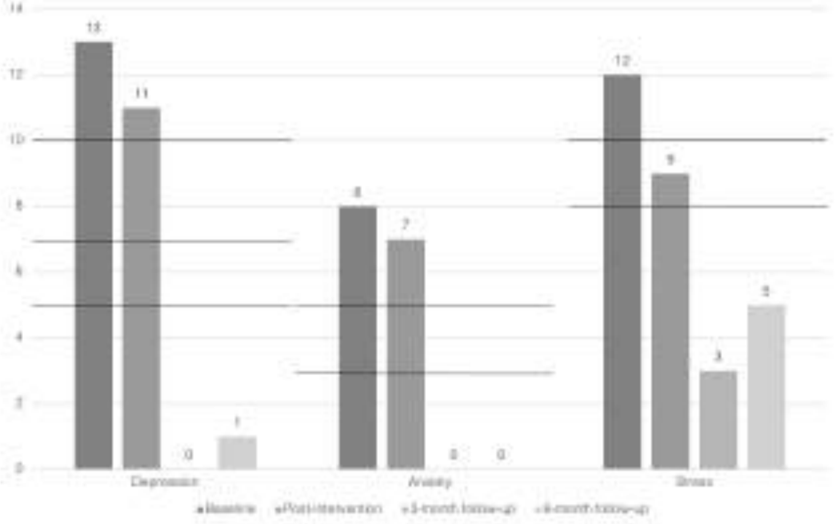


Figure 4 | Scores on emotional state, obtained via the DASS-21



Motivation for Change: Initially, the patient rated the importance of change as 8 and her confidence in her ability to change as 6. These increased to 10 and 9, respectively, after the intervention.

Psychosocial Adjustment: On the EQ-5D-5L, the patient initially reported mild problems in performing daily activities, mild pain/discomfort, and moderate anxiety/depression. At the 6-month follow-up, she only reported mild anxiety/depression.

On the Visual Analogue Scale (VAS), she rated her perceived health as 75 at baseline and 89 at final follow-up.

On the CIA 3.0, her initial direct score of 33 was reduced to 8 at the final follow-up. Scores across the dimensions also improved, with percentages ranging from 50% to 90.91%.

Perfectionism (CAPS): Initially, the patient scored 35 in self-oriented perfectionism, 20 in socially prescribed perfectionism, and 55 in the total scale. At the 3-month follow-up, these scores dropped to 19, 14, and 33 respectively, indicating improvements of 30% to 45.71%. However, these changes were not maintained at the later follow-up, with scores increasing beyond original levels: 35 (self-oriented), 25 (socially prescribed), and 60 (total).

Caregiver

Expressed Emotion (FQ): Initially, the mother obtained direct scores of 31 on the total scale, 10 in critical comments, and 21 in overprotection, all below the clinical cutoff. At the final follow-up, these scores were reduced, with improvement percentages ranging from 30% to 61.29%.

Symptom Impact (EDSIS): Initially, the mother scored 9 in social isolation, 15 in guilt, 16 in nutrition, 6 in dysregulated behaviors, and 46 in the total scale. These scores decreased after the follow-ups, with improvements ranging from 50% to 86.67%.

Symptom Accommodation (EAISA): Initially, the mother scored 26 in avoidance and behavioral modification, 7 in reassurance seeking, 2 in food rituals, 16 in family control, and 51 on the total scale. At the final follow-up, all scores were significantly reduced, showing improvements between 68.75% and 88.46%. The subscale score for "turning a blind eye" remained at 0 throughout all assessments.

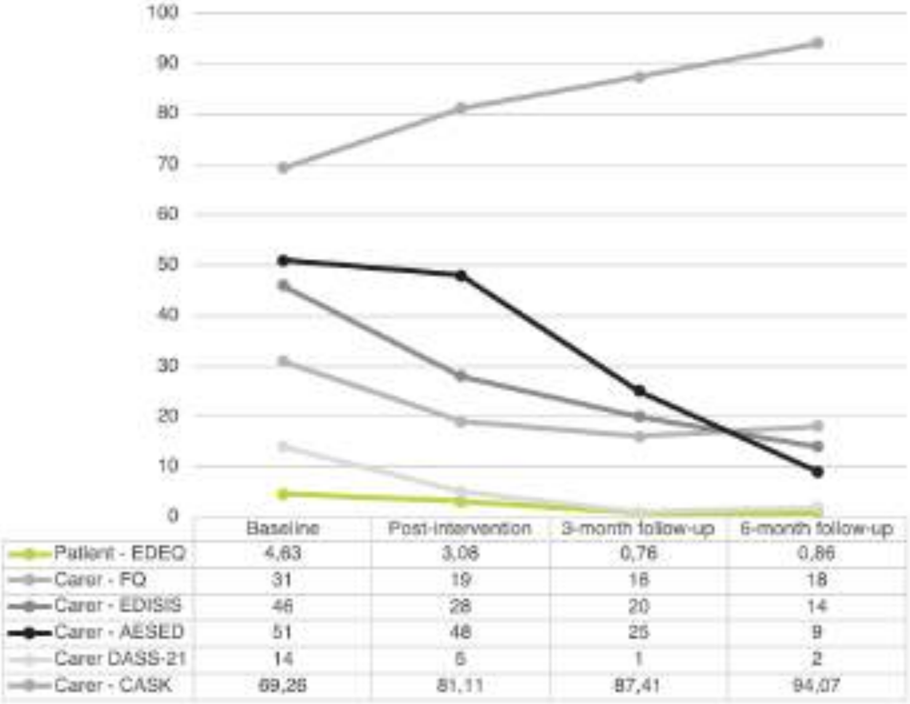
Emotional State (DASS-21): Initially, the mother had a direct score of 14, equivalent to moderate depression. After follow-ups, her score was reduced to 2, reflecting improvements between 66.67% and 100%.

Caregiving Skills (CASK): At baseline, the mother had a total average score of 69.26, which increased to 94.07 after follow-ups. All subscale scores improved, with percentage increases ranging from 34.29% to 85.71%.

Temporal Evolution

Figure 5 shows the temporal progression of the patient's scores on ED pathology (EDE-Q) and her mother’s scores on expressed emotion (FQ), symptom impact (EDSIS), symptom accommodation (EAISA), emotional state (DASS-21), and caregiving skills (CASK).

Figure 5 | Temporal evolution of raw scores on the scales



	Baseline	Post-intervention	3-month follow-up	6-month follow-up
Patient - EDEQ	4,63	3,08	0,76	0,86
Carer - FQ	31	19	16	18
Carer - EDISIS	46	28	20	14
Carer - AESED	51	48	25	9
Carer DASS-21	14	5	1	2
Carer - CASK	69,26	81,11	87,41	94,07

Discussion

The primary objective of this study was to examine the effectiveness of the ECHOMANTRA program, as a complement to TAU, in an adolescent with AN admitted to a day hospital, to improve the transition from hospitalization to community life.

Following the intervention, improvements were observed in the therapeutic goals set for the patient: a reduction in AN symptomatology, increased BMI, improved emotional state, greater motivation for change, and enhanced psychosocial adjustment. Improvements were also seen in the family member's outcomes: better emotional state and caregiving skills, and reductions in illness accommodation, expressed emotion, and the impact of symptoms. These changes were maintained, and in some cases even increased, during the follow-up period. Additionally, both the patient and the family member provided a positive subjective evaluation of the program, reflected in good adherence to the intervention.

Due to the observational nature of this study, direct causal relationships between variables cannot be established. Nevertheless, based on the results obtained, a decrease in AN symptomatology was observed in the patient, which occurred alongside improvements in the caregiver's skills and reductions in both expressed emotion and symptom accommodation by the family member. These results highlight, as supported by existing scientific literature, the association of these family-related variables with the optimization of therapeutic outcomes, underscoring the importance of involving families as active agents in the change process (Salerno et al., 2016; Philip et al., 2021).

Despite the observed improvements in AN symptomatology and other variables, no changes were found in the patient's perfectionism. As hypothesized in the literature, perfectionism tends to remain stable during and after partial recovery from an ED, defined as the cessation of ED symptoms and weight restoration (e.g., Bardone-Cone et al., 2007; Nilsson et al., 2008; Serrano et al., 2018). This supports the hypothesis that perfectionism is not a state linked solely to the active phase of the disorder, as a unidimensional cognitive entity, but rather a multidimensional personality construct with a stable temporal tendency (Hewitt & Flett, 1991). However, other studies suggest that when full recovery is defined more strictly, perfectionism levels in recovered individuals do not differ from those in healthy controls (Bardone-Cone et al., 2010).

After completing the study intervention, the patient continued receiving treatment as usual in an outpatient setting.

This study has significant clinical implications, as it provides evidence of the effectiveness of a program that, when used in conjunction with TAU, yields positive outcomes in addressing AN-R in adolescents. Furthermore, ECHOMANTRA is structured into eight sessions, making it easily replicable in various settings, such as a day hospital or inpatient unit. The program was designed to be affordable, scalable, and have broad applicability (Cardi et al., 2017). The treatment sessions were conducted online, allowing both patients and family members to incorporate the learning and development of therapeutic skills into their daily routines, and helping to increase engagement with the intervention. This design helps to overcome some of the barriers that typically hinder participant adherence, especially among family members.

Among the limitations of this study, it should be noted that, being a single-case design, the results cannot be generalized; the positive disposition of both the family and the patient toward receiving the intervention may have influenced the outcomes presented. In addition, the assessment tools were self-reported, which may have affected the validity of the results. It also cannot be determined whether the changes observed in the patient were due to the ECHOMANTRA program or to TAU. Therefore, future randomized controlled trials are needed, such as those currently being conducted by Cardi et al. (2017) and Quiles et al. (2021), to better assess the program's effectiveness.

Despite these limitations, we can conclude that the ECHOMANTRA program, as a complement to TAU, has been effective in supporting the transition from hospital care to everyday life in an adolescent patient with AN. Therefore, this program emerges as an intervention with beneficial effects on improving AN symptomatology and the well-being and skills of the family member, as well as in maintaining therapeutic change after discharge. It represents a suitable tool for addressing this transition not only in adult populations but also in adolescents.

7.3. Article 3

Assessing the effectiveness and feasibility of the Experienced Carers Helping Others program in relatives of adolescents with eating disorders using an online application format with individual sessions.

> **Introductory Note**
>
> The following article presents an early evaluation study conducted as part of the implementation phase of the intervention protocol described in this thesis. This study focused specifically on gathering preliminary insights from family members of the participants, with the aim of understanding the potential impact of the intervention.

Method

Participants

Family participants (N = 108) comprised 92 women (85.2%) and 16 men (14.8%); age range: 30–64; M=48.43; SD = 5.26 were recruited from seven different specialist inpatient/day-patient/outpatient ED units spread throughout Spain. To be eligible for this study, carers had to meet the inclusion criteria as proposed in Article 1. Carers were excluded from the study if they were suffering from a serious medical or psychiatric condition and if their daughter declined to participate in the study. Both parents were invited to participate in the study, and in the case that they were assigned to the experimental group, both could receive the ECHO program sessions. However, only the data from one of them were considered for the data analyses, usually the one who attended the sessions more frequently.

Respect patients, and following the same guidelines as the original ECHOMANTRA study (Cardi et al., 2017), only women with an ED participated in this study. In addition, it is important to note that the MANTRA program was designed for it to be applied to women. Therefore, patients were included if they fulfilled the inclusion criteria proposed in Article 1. Patients were asked to nominate a carer to whom the researcher invited to participate in the study.

Instruments

Clinical and socio-demographic data. Sociodemographic questionnaire ad-hoc.

Clinical data of the patients was completed by the health care providers at the unit and included diagnosis, illness duration, and care level.

Emotional wellbeing. Depression and Anxiety Stress Scales (DASS-21; Bados et al., 2005; Lovibond & Lovibond, 1995). Specifically, the reliability estimates for the present sample ranged from α ≥ 0.79 to α ≥ 0.87 in the subscales, and α ≥ 0.92 in the global score.

Expressed emotion. Family Questionnaire (FQ; Sepúlveda et al., 2014; Wiedemann et al., 2002). The reliability estimates for the present sample were α ≥ 0.71 and α ≥ 0.83, respectively, in each subscale and α ≥ 0.86 in the global score.

Caregiving burden. Eating Disorders Symptom Impact Scale (EDSIS-S; Carral-Fernández et al., 2013; Sepúlveda, Lopez et al., 2008; Sepúlveda, Whitney et al., 2008). The reliability estimates for the present sample ranged from α ≥ 0.65 to α ≥ 0.85, respectively, in each subscale and α ≥ 0.85 in the global score.

Illness accommodation. Accommodation to Illness Symptoms Scale (AESED; Quiles et al., 2016; Sepúlveda et al., 2009). The reliability estimates for the present sample ranged from α ≥ 0.71 to α ≥ 0.85, respectively, in each subscale and α ≥ 0.91 in the global score.

Caregiver skills. Caregiver Skills Scale (CASK; Hibbs et al., 2015; Vintró-Alcaraz et al., 2018). The reliability estimates for the present sample ranged from α ≥ 0.60 to α ≥ 0.72, respectively, in each subscale and α ≥ 0.87 in the global score.

Acceptability and feasibility of the ECHO. Carers in the ECHO arm completed a "Participant Feedback Form" and the session facilitator documented session attendance, task compliance between sessions, and reading material completion for each session.

For further details about the instruments, refer to Table 2.

Procedure

Design

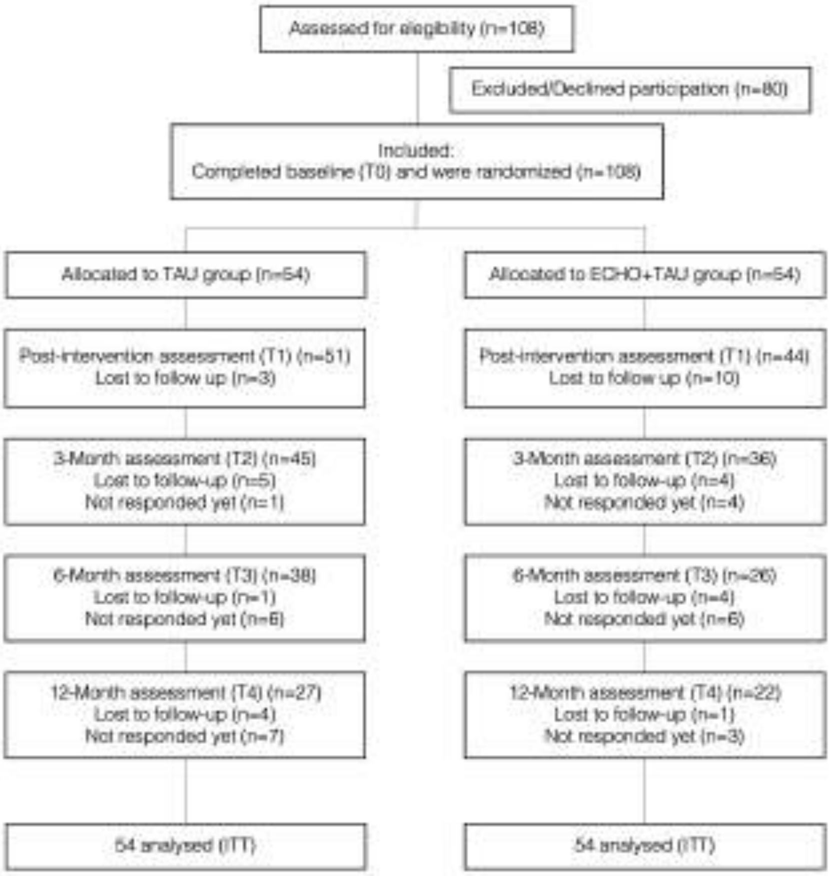
This study employed a longitudinal RCT design and 12-month follow-ups. For further details on the design, refer to Article 1.

Carers completed self-report questionnaires provided by the research assistant at their corresponding time points. As the patients also received an intervention, they had to complete the battery of questions at the same time intervals as the carers were assessed. Nonetheless, in this study we only present the data and results corresponding to family members.

One hundred and eight carers agreed to participate: 54 were allocated to the TAU-only group and 54 to the ECHO group. Questionnaire completion rates were for TAU-only: 94.44% in T1, 83.33% in T2, 70.37% in T3 and 50% in T4; and for ECHO + TAU: 81.44% in T1, 66.67% in T2, 48.25% in T3 and 40.74% in T4.

Figure 6 shows the CONSORT diagram for the study.

Figure 6 | CONSORT diagram flow



Interventions

For further details on the interventions in both groups, refer to Article 1.

Data analysis

Independent research assessors, who were unaware of the treatment allocations, conducted pre-randomization evaluations (baseline: T0), at 2 months (T1; end of the treatment in ECHO group), at 6 months (T2), at 9 months (T3), and at 12 months (T4).

We used IBM SPSS Statistics 27.0. First, baseline sample characteristics between the ECHO + TAU and TAU group were compared using t test for continuous variables and X2 test for categorical variables. All formal statistical analyses were based on an intent-to- treat principle with all participants analyzed in the condition arm to which they were assigned. Missing data for both groups were imputed using multiple imputation based on fully conditional Markov chain Monte Carlo (Schafer, 1997). In both groups, it was proved that all the missing data were Missing Completely at Random (MCAR) because the Roderick Little test was not significant in any case. As a result, the final analyses were based on the pooled results of five separate imputations.

We conducted general linear models to evaluate the change in outcome variables over all five assessment time points for the ECHO + TAU and TAU group (within factor: time, between factor: ECHO vs. TAU). A significant time × group interaction effect indicates a difference in change between the two cohorts. A significance level of 0.05 was used. Pairwise comparisons were performed following a significant main effect of time (Bonferroni's test).

Effect sizes were calculated using partial eta squared. Partial eta-squared indicates the percentage of variance in the dependent variable attributable to a particular independent variable. A commonly used interpretation is to refer to effect sizes as small (η = 0.2), medium (η = 0.5), and large (η = 0.8) based on benchmarks suggested by Cohen (2013).

Results

Participant characteristics

After screening and baseline assessment, 54 participants were included in the ECHO + TAU group and 54 in TAU. Baseline sociodemographic data and clinical characteristics of their daughters are shown in Table 4. We found no differences between groups in sociodemographic and clinical characteristics measured at baseline.

Table 4 | Demographic, psychosocial and clinical variables at baseline.

Carers	Total sample (N=108)	Experimental Group (N=54)	Control Group (N=54)	
Gender				
Male	N=16 (15.0%)	N=8 (14.8%)	N=8 (14.8%)	χ^2=,01
Female	N= 92 (85.0%)	N=46 (85.2%)	N=46 (85.2%)	p=,97
Age	M= 48.39 (SD=5.23)	M= 49.19 (SD=5.89)	M= 47.59 (SD=4.37)	t=-1,59 p=,11
Employment status				
Employed	N=78 (72.9%)	N=36 (66.7%)	N=41 (78.8%)	
Unemployed	N=18 (16.8%)	N=11 (20.3%)	N=7 (13.5%)	χ^2=3.77

Job training	N=1 (0.9%)	N=0 (0%)	N=1 (1.9%)	p=.29
Other	N=10 (9.3%)	N=7 (13.0%)	N=3 (5.8%)	
Educational status				
First level	N=11 (10%)	N=8 (14.8%)	N=3 (5.56%)	
Second level	N=8 (7%)	N=4 (7.4%)	N=4 (7.41%)	χ^2=9.13
Third Level	N=4 (4%)	N=3 (5.6%)	N=1 (1.85%)	p=.11
Vocational training	N=23 (21%)	N=6 (11.1%)	N=17 (31.48%)	
University degree	N=59 (55%)	N=31 (57.4%)	N=28 (51.85%)	
Other	N=3 (3%)	N=2 (3.7%)	N=1 (1.85%)	
Marital status				
Married/Living together	N=82 (76%)	N=42 (77.77%)	N=40 (74.1%)	
Divorced/Separated	N=20 (19%)	N=9 (16.66%)	N=11 (20.1%)	χ^2=1.40
Single	N=5 (5%)	N=3 (5.55%)	N=2 (3.7%)	p=.71
Other	N=1 (1%)	N=0 (0%)	N=1 (1.9%)	
Relationship with the sufferer				
Mother	N=90 (83%)	N=44 (81.5%)	N=46 (85.10%)	
Father	N=15 (14%)	N=7 (13.0%)	N=8 (14.81%)	χ^2=3.07
Other	N=3 (3%)	N=3 (5.6%)	N=0 (0%)	p=.22
Patients				
Age	M=14,94 (SD=1.56)	M=15.02 (SD=1.43)	M=14.85 (SD=1.43)	t=-.55 p=,58
Diagnosis				
AN-R	N=76 (70%)	N=37 (72.22%)	N=39 (72.22%)	χ^2=.47
AN-P	N=11 (10%)	N=5 (9.26%)	N=6 (11.11%)	p=.93
BN	N=5 (5%)	N=3 (5.56%)	N=2 (3.70%)	
OSFED	N=16 (15%)	N=9 (16.67%)	N=7 (13.12.96%)	
Illness duration (months)	N=20,37 (SD=18.81)	M=23.45 (SD=24.27)	M=17.28 (SD=10.30)	t=-1.50 p=,14
Care level				
Hospitalization	N=20 (18.5%)	N=8 (14.8%)	N=12 (22.2%)	
Day care	N=58 (53.7%)	N=29 (53.7%)	N=29 (53.7%)	χ^2=2.12
Outpatient	N=30 (27.8%)	N=17 (31.5%)	N=13 (24.1%)	p=.55

Comparisons between

In Table 5, we present the means, standard deviations, and results of the general linear model analysis, including effect sizes, for the outcomes measured at the five evaluation times for both conditions. The analysis revealed a statistically significant main effect of time in all outcome variables (all p values ≤ 0.01) indicating improvements in emotional well-being, expressed emotion, caregiving burden, accommodation to illness, and care skills in both groups, except for criticism measured with the expressed emotion measure (FQ), the subscale “turning a blind eye” of the illness accommodation scale (AESED), and in the subscales “bigger-picture,” “biting your tongue,” “emotional intelligence,” and “frustration-tolerance” of the caregiver skills scale in the TAU group ($p > 0.05$). Statistically significant time × group interaction effects were observed regarding the Emotional Over-involvement, $F(3.27) = 2.47$, $p < 0.05$, $\eta p^2 = 0.02$; emotional well-being (with the total score of the DASS-21), $F(3.57) = 3.19$, $p < 0.05$, $\eta p^2 = 0.03$; depression, $F(3.40) = 3.27$, $p < 0.001$, $\eta p^2 = 0.03$; avoidance, $F(3.62) = 3.72$, $p < 0.01$, $\eta p^2 = 0.03$; caregiver skills (total score of the CASK), $F(3.64) = 3.78$, $p < 0.01$, $\eta p^2 = 0.03$; as well as self-care and insight acceptance CASK subscales, indicating a greater improvement in these outcomes in ECHO + TAU group compared to TAU.

In Figure 7, we present the profile plots (interaction plots) of these relationships. No time × group interaction effects were observed for the other outcome variables (all p values > 0.05).

With regard to effect sizes of the change in outcome variables in the ECHO + TAU group, we found low to medium effects for the expressed emotion (total score of the FQ) and emotional over-involvement subscale. We observed low to medium effects for the caregiving burden (total score of the EDSIS) and two out of the four subscales. We identified low to medium effects for the emotional well-being (total score of the DASS-21) and the subscales depression and stress. We also noted low to medium effects for the Illness accommodation (total score of the AESED) and two out of the five subscales. Finally, we observed low to medium effects for the total score of the caregiver skills and the subscale insight-acceptance. Furthermore, medium to large effects were found in the "nutrition impact" subscale of the caregiving burden scale and in the "avoidance" subscale of the illness accommodation measure.

Within the TAU group, we observed low to medium effects for various outcome measures. These included the expressed emotion total score and its emotional over-involvement subscale, the caregiving burden total score and three of its four subscales, the "stress" subscale of the emotional well-being measure, the illness accommodation total score and three of its five subscales, as well as the "self-care" subscale of the caregiver skills scale. Notably, we did not find any medium to large effects in this group. In fact, effect sizes tended to be higher in the ECHO + TAU group compared to the TAU group.

Acceptability and feasibility of the intervention

Most of caregivers (81.48%, n = 44) completed the ECHO intervention, accomplishing 43.97% of the tasks between sessions and reading the contents of the workbook on 75.29% of occasions.

Ten family members did not complete the program: five carers chose not to finish the intervention voluntarily, two patients required admission to a more intensive resource; thus, caregivers decided to cease their participation, two caregivers did not complete the intervention due to the patients decided not to participate, and one did not respond to contact attempts. Participant feedback on the intervention is presented in Table 6. As shown in the table, participants indicated a high level of satisfaction with the ECHO

Table 5 | Results of general linear models analyzing outcomes in the ECHO and TAU groups.

	T0	T1	T2	T3	T4				
	M (DT)	M (DT)	M (DT)	M (DT)	M (DT)	Time	Bonferroni	η_p^2	Time x group
FQ									
ECHO	28.38(8.15)	24.98(6.74)	22.24(6.37)	23.14(6.09)	19.93(5.14)	F(2.72)=21.93; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T4***; T3>T4*	0.29	F(3.28)=1.303; p=0.27
TAU	29.23(8.01)	28.58(8.10)	25.72(7.67)	25.24(8.11)	21.70(4.62)	F(3.72)=15.28; p<.001	T0>T2*; T0>T3*; T0>T4***; T1>T2*;T1>T3*; T1>T4**;T2>T4**; T3>T4*	0.22	
Critical comments									
ECHO	10.64(5.15)	9.86(3.99)	8.61(3.35)	10.11(3.34)	8.56(2.79)	F(3.25)=4.96 p<.01	T2<T3*; T3>T4*	0.08	F(3.72)=0.52; p=0.70
TAU	11.20(4.42)	10.73(5.01)	10.12(4.82)	10.46(4.92)	9.43(2.50)	F(3.77)=2.32; p=0.6	-	0.04	
Emotional over-involvement									
ECHO	17.74(4.17)	15.08(3.79)	13.60(3.93)	12.91(3.62)	11.22(3.13)	F(2.73)=47.20; p<.001	T0>T1***;T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4***; T3>T4***	0.47	F(3.27)=2.47; p=0.05
TAU	18.03(5.08)	17.84(5.04)	15.58(4.31)	14.66(4.03)	12.67(2.96)	F(3.48)=25.47; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T2**; T1>T4***; T2>T4***; T3>T4**	0.32	
EDSIS									
ECHO	36.03(13.48)	26.43(12.86)	21.35(10.86)	20.74(9.73)	15.30(6.01)	F(2.92)=47.82 p<.001	T0>T1***;T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4***; T3>T4***	0.47	F(3.55)=2.14; p=0.08
TAU	37.53(11.81)	33.51(14.21)	27.86(12.26)	25.20(10.79)	17.83(7.53)	F(3.58)=39.41; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2*;T1>T3***; T1>T4***; T2>T4***; T3>T4***	0.42	
Nutritional impact									
ECHO	12.11(5.03)	7.46(4.35)	6.03(3.69)	5.45(2.83)	3.48(1.89)	F(2.81)=63.97; p<.001	T0>T1***;T0>T2***; T0>T3***; T0>T4***; T1>T2*;T1>T3**; T1>T4***; T2>T4***; T3>T4***	0.54	F(3.48)=1.19; p =0.31
TAU	13.08(4.33)	10.20(5.17)	7.74(4.66)	7.13(3.85)	4.68(2.62)	F(3.67)=46.39; p<.001	T0>T1***;T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4***; T3>T4***	0.46	
Guilt									
ECHO	9.90(4.98)	7.73(3.94)	5.78(3.43)	5.93(3.13)	5.41(2.70)	F(2.79)=21.77; p<.001	T0>T1*;T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3**; T1>T4***	0.29	F(3.48)=1.70; p=0.16
TAU	10.27(5.03)	9.44(4.79)	7.69(3.91)	7.28(3.47)	5.81(2.94)	F(3.17)=21.34; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4***; T3>T4*	0.28	
Dysregulated behavior									
ECHO	5.51(4.83)	4.61(4.23)	3.54(3.52)	4.30(3.39)	2.85(1.87)	F(2.76)=8.17; p<.001	T0>T2***;T0>T4**; T3>T4*	0.13	F(3.49)= 1.20; p=0.31
TAU	5.04(3.19)	5.08(3.77)	4.59(3.82)	4.60(3.05)	3.35(2.60)	F(3.78)=3.96; p<.01	T0>T4*; T1>T4*	0.07	
Social isolation									
ECHO	8.5(4.18)	6.58(3.73)	5.95(3.67)	5.04(2.36)	3.68(2.05)	F(2.78)=27.13; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4***; T3>T4***	0.34	F(3.59)= 1.94 p= 0.11
TAU	9.13(4.31)	8.79(4.56)	7.73(3.79)	6.52(3.49)	4.17(1.98)	F(4)=25.09; p<.001	T0>T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4***; T3>T4*	0.32	

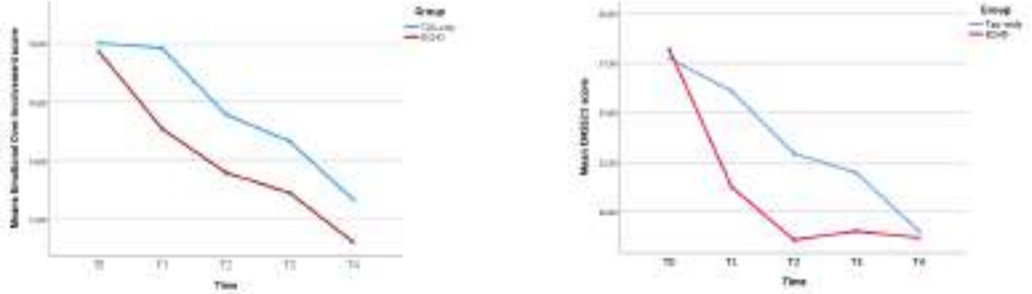
Table 5 (continuation)

	T0	T1	T2	T3	T4				
	M (DT)	M (DT)	M (DT)	M (DT)	M (DT)	Time	Bonferroni	η_p^2	Time x group
DASS-21									
ECHO	18.19(10.56)	11.25(8.22)	8.57(6.35)	9.03(6.56)	8.68(5.52)	F(2.46)=26.62; p>.001	T0>T1***: T0>T2***; T0>T3***; T0>T4***; T1>T2**	0.33	F(3.57)=3.19; p=.02
TAU	17.73(11.37)	16.09(12.13)	12.93(11.16)	11.97(10.74)	9.03(5.87)	F(3.70)=10.46; p<.001	T0>T2**; T0>T3**; T0>T4***; T1>T4***	0.16	
Depression									
ECHO	18.19(10.56)	3.86(3.48)	3.05(2.64)	3.33(2.59)	3.13(2.35)	F(2.24)=16.65; p<.001	T0>T1*; T0>T2**; T0>T3**; T0>T4**	0.24	F(3.40)=3.28, p<.001
TAU	5.78 (4.30)	5.49(4.42)	4.44(4.47)	4.53(4.06)	3.24(2.40)	F(3.61)=60.05; p<.001	T0>T4*; T1>T4**	0.10	
Anxiety									
ECHO	3.67(3.65)	2.21(2.60)	1.56(1.78)	1.87(2.15)	1.70(1.66)	F(2.25)=10.09; p<.001	T0>T4**; T1>T4**	0.16	F(3.22)=1.80, p=.14
TAU	3.84(3.73)	3.57(3.98)	2.69(3.28)	2.46(3.16)	1.70(1.94)	F(3.61)=44.67; p<.001	T0>T1*; T0>T2***; T0>T3*; T0>T4**	0.10	
Stress									
ECHO	8.03(3.64)	5.14(2.90)	4.21(2.71)	3.93(2.58)	3.82(2.18)	F(3.12)=33.98; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***;T1>T4**	0.39	F(3.81)=2.22; p=,07
TAU	8.15(4.58)	7.05(4.59)	5.81(4.02)	5.02(4.13)	4.20(2.52)	F(4)=14.27; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T3*; T1>T4***	0.21	
AESED									
ECHO	46.61(20.17)	35.27(15.28)	28.15(14.15)	25.72(11.88)	18.80(8.05)	F(2.68)=41.84; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4***; T3>T4***	0.44	F(3.17)=0.77; p=.52
TAU	49.28(21.05)	42.30(20.68)	36.22(17.61)	32.18(14.54)	23.30(11.26)	F(3.49)=29.00; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4***; T3>T4***	0.35	
Avoidance									
ECHO	17.61(7.05)	12.09(5.40)	9.14(5.00)	8.31(4.24)	6.15(3.53)	F(2.94)=53.91; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4***; T3>T4*	0.50	F(3.63)=3.73; p=.01
TAU	18.30(6.98)	16.15(7.28)	13.92(7.10)	11.97(10.74)	7.30(4.32)	F(4)=37.12; p<.001	T0>T2**: T0>T3***; T0>T4***; T1>T3***; T1>T4***; T2>T4***; T3>T4***	0.41	
Reassurance seeking									
ECHO	10.63(7.40)	7.93(4.99)	5.79(3.80)	5.61(3.33)	4.25(2.35)	F(2.35)=22.22; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3*; T1>T4***; T2>T4*; T3>T4*	0.30	F(2.78)=38.32; p=.94
TAU	11.81(6.97)	8.95(7.31)	7.38(5.87)	7.28(4.49)	5.56(3.49)	F(3.01)=16.68; p=<.001	T0>T2***; T0>T3***; T0>T4***; T1>T4**; T3>T4*	0.24	
Meal ritual									
ECHO	3.50(4.06)	3.17(3.36)	2.73(3.33)	2.07(1.97)	1.37(0.96)	F(2.69)=6.74; p<.001	T0>T4**: T1>T4**; T2>T4*; T3>T4*	0.11	F(3.42)=0.32; p=.81
TAU	4.38(5.49)	3.91(4.87)	2.85(2.95)	2.47(2.59)	1.81(1.71)	F(2.67)=6.54; p<.01	T0>T4**: T1>T4**; T2>T4*	0.11	

Table 5 (continuation)

	T0 M (DT)	T1 M (DT)	T2 M (DT)	T3 M (DT)	T4 M (DT)	Time	Bonferroni	η_p^2	Time x group
AESED									
Control of family									
ECHO	12.69(6.47)	10.52(4.84)	8.89(4.13)	7.96(3.61)	5.84(2.66)	F(2.75)=25.38; p<.001	T0>T2**: T0>T3***; T0>T4***: T1>T2*; T1>T3**; T1>T4***; T2>T4***; T3>T4**	0.32	F(3.27)=0.32; p=.83
TAU	13.09(5.43)	11.68(5.53)	10.32(4.42)	9.36(3.84)	7.10(3.32)	F(3.60)=17.71; p<.001	T0>T2*: T0>T3**; T0>T4***: T1>T3*; T1>T4***; T2>T4***; T3>T4**	0.25	
Turning a blind eye									
ECHO	2.19(2.93)	1.70(2.26)	1.61(2.29)	1.87(1.61)	1.15(1.07)	F(2.86)=3.20; p=.03	T3>T4**	0.06	F(3.27)=0.84; p=.87
TAU	2.03(2.83)	1.70(1.66)	1.78(2.29)	1.98(1.96)	1.40(1.33)	F(3.18)=1.23; p=.30	-	0.02	
CASK									
ECHO	70.98(11.65)	77.32(9.43)	79.47(8.30)	1.87(1.61)	82.15(7.19)	F(3.46)=17.33; p<.001	T0<T1*; T0<T2***; T0<T3**; T0<T4***; T1<T4**	0.25	F(3.64)=3.79; p=.01
TAU	71.89(10.52)	70.69(11.40)	74.76(10.51)	73.82(11.28)	23.30(11.26)	F(4)=6.69; p<.001	T0<T4**; T1<T4**; T3<T4*	0.11	
Bigger picture									
ECHO	75.98(13.27)	79.69(10.47)	80.75(9.20)	80.15(11.00)	83.51(7.66)	F(2.97)=5.38; p<.01	T0<T4**	0.09	F(3.28)=1.72; p=.16
TAU	77.29(12.61)	76.05(11.95)	78.62(12.03)	77.38(11.77)	79.34(9.40)	F(3.42)=1.22; p=.31	-	0.02	
Self-care									
ECHO	58.89(18.89)	72.37(13.18)	75.12(11.53)	77.69(10.73)	81.09(8.45)	F(2.25)=31.43; p<.001	T0<T1***; T0<T2***; T0<T3***; T0<T4***; T1<T4***; T2<T4***	0.37	F(3.40)=4.19; p<.01
TAU	59.24(18.08)	60.36(19.59)	66.86(16.07)	69.19(13.84)	77.25(9.79)	F(3.73)=19.99; p<.001	T0<T2*; T0<T3**; T0<T4***; T1<T3*; T1<T4***; T2<T4***; T3<T4**	0.24	
Biting-your-tongue									
ECHO	70.52(16.96)	72.44(14.46)	77.17(13.90)	72.89(15.91)	80.82(10.20)	F(4)=6.50; p<.001	T0<T4***; T1<T4**; T3<T4**	0.11	F(4)=1.30; p=.27
TAU	69.73(16.32)	67.78(17.39)	70.37(14.42)	71.62(12.52)	74.77(12.17)	F(3.80)=2.41; p=.09	-	0.04	
Insight-acceptance									
ECHO	61.14(19.90)	73.51(14.05)	77.53(11.63)	76.46(12.00)	79.58(8.96)	F(2.68)=22.28; p<.001	T0<T1**; T0<T2***; T0<T3***; T0<T4***; T1<T4*	0.30	F(3.42)=7.82; p<.001
TAU	68.30(18.31)	63.94(18.48)	69.52(17.35)	70.10(16.07)	74.31(12.88)	F(3.83)=4.24; p<.01	T1<T4**	0.07	
Emotional intelligence									
ECHO	73.81(15.77)	78.36(12.58)	79.38(11.44)	80.75(10.13)	81.85(7.73)	F(3.07)=5.31; p<.01	T0<T4**	0.09	F(3.70)=1.92; p=.11
TAU	74.01(14.95)	72.59(15.28)	77.22(12.17)	73.92(14.17)	78.91(10.09)	F(4)=2.95; p=.02	-	0.05	
Frustration-tolerance									
ECHO	76.89(13.22)	82.53(9.36)	82.47(8.35)	81.27(9.08)	83.27(7.01)	F(3.13)=4.71; p<.01	T0<T4*	0.08	F(3.63)=1.61; p=.18
TAU	75.93(12.63)	75.40(12.60)	78.91(11.63)	76.96(13.17)	79.61(8.55)	F(4)=2.09; p=0,8	-	0,04	

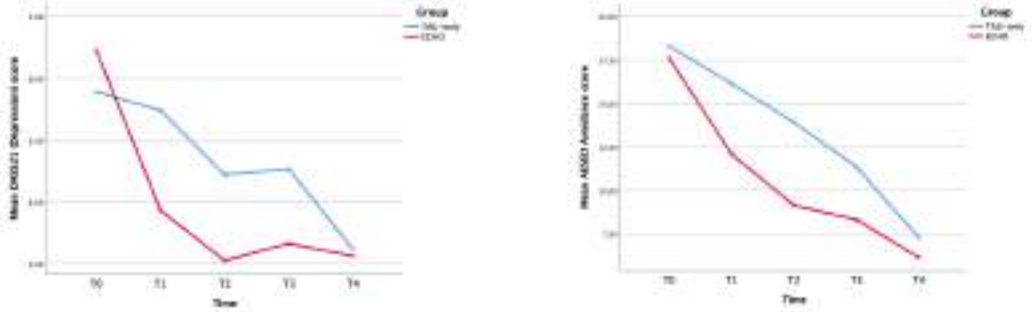
Figure 7 | Profile plots: Changes regarding the mean (a) emotional over-involvement, (b) total score DASS-21, (c) depression subscale, (d) avoidance subscale, (e) total score CASK, (f) self-care subscale, and (g) insight and acceptance subscale.


(a) emotional over-involvement

(b) total score DASS-21

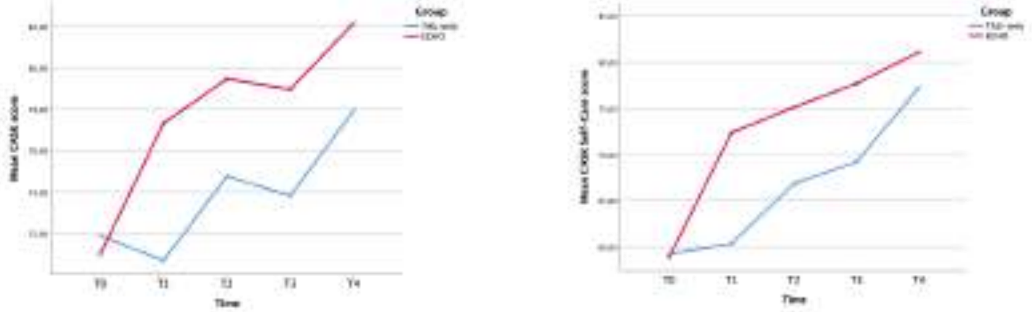
(c) depression subscale

(d) avoidance subscale



(e) total score CASK

(f) self-care subscale



(g) insight and acceptance subscale

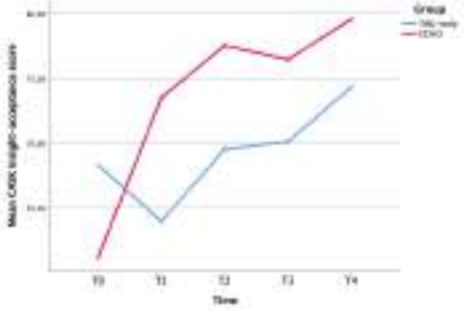


Table 6 | Carer feedback on the ECHO intervention

	M (SD)	Range
1. Do you believe the sessions have been helpful in improving your experience as a caregiver?	9.41 (0.88)	7-10
2. Do you believe the sessions have been helpful in…		
2.1. Better understanding what an eating disorder is?	9.30 (0.82)	7-10
2.2. Better understanding how the eating disorder developed and why it continues to persist?	8.80 (1.32)	6-10
2.3. Having more skills and tools to address your daughter's eating problem?	9.48 (0.82)	7-10
2.4. Improving your communication with your daughter?	9.25 (1.10)	5-10
2.5. Using motivational interviewing and active listening strategies in your communication with your daughter?	9.30 (0.88)	7-10
2.6. Having a more compassionate and less critical communication with your daughter regarding the eating disorder?	9.36 (0.89)	7-10
2.7. Having more strategies to handle challenging situations with your daughter, such as mealtime?	9.18 (1.11)	6-10
3. About the intervention…		
3.1. Has it provided you with tools and taught you skills to help your daughter with the eating disorder?	9.25 (0.81)	8-10
3.2. Has it been satisfactory for you?	9.60 (0.66)	8-10
3.3. Was it what you expected?	8.77 (1.38)	5-10
3.4. Would you recommend it to another family member with a daughter with an eating problem?	9.84 (0.37)	9-10

Discussion

The main aim of the present study was to analyze the effectiveness of adding the ECHO intervention program applied online and individually to the traditional intervention (TAU) for caregivers of patients with ED by means of a RCT. In addition, the second objective was to examine the acceptability and feasibility of this new format of the program ECHO.

The results generally confirmed our first hypothesis, indicating that carers allocated to ECHO + TAU demonstrated significant improvements in expressed emotion, psychological well-being, and lower illness accommodation, and burden in comparison to carers from the control group (TAU). With regard to expressed emotion, as assessed with the FQ, it is interesting to note that only in the ECHO + TAU group was there an improvement in the factor on “critical comments,” albeit with a small effect size. With regard to the factor “emotional over involvement,” a significant effect was observed in the interaction, indicating that although changes were observed in the TAU group after treatment, the changes were greater when the ECHO component was added. Previous RCT studies have found no differences in expressed emotion factors (Hodsoll et al., 2017), so one possible explanation could be that the application format (individual and online) has improved the results.

In terms of the impact of ED on caregivers, assessed with the EDSIS, both interventions showed changes, with small to moderate effect sizes, similar to, but smaller than that found in the Adamson et al. (2019) study. No interaction effect was found for any factor.

Regarding emotional well-being (DASS-21), although statistically significant differences were found for all three factors in both groups, the effect sizes were slightly larger in the group with the addition of ECHO. Effect sizes were larger than in the Adamson et al. (2019) study. In addition, for the depression factor, an interaction effect was observed, indicating that the ECHO program is more effective in reducing depressive symptomatology in caregivers than using the TAU program alone.

Results on the effect of treatment on caregivers' accommodation to the disease (AESED) showed differences on all factors with slightly larger effect sizes in the ECHO component compared to the TAU group. With the TAU program, significant differences were found in four factors, but not in "turning a blind eye." It is interesting to note that the interaction effect is observed in the factor "avoidance," and only in the ECHO + TAU group was a medium effect size reached. Effect sizes were larger than in the Adamson et al. (2019) study.

Finally, the greatest differences in the effectiveness of the ECHO program were found in the acquisition of caregiver skills (CASK). In accordance with our second hypothesis, while in the ECHO + TAU group differences were found in all factors, in the TAU group, differences were only found in the factors "self-care" and "insight acceptance." It is precisely these two factors in which an interaction effect is observed, showing that the improvement was significantly greater in the ECHO + TAU group. It is also interesting to note that for factors "Bigger picture," "emotional intelligence" and "frustration tolerance," although with very small effect sizes, differences appeared only at the one-year follow-up. It could indicate that those are aspects that take some time to assimilate. Effect sizes in case of self-care and insight acceptance were close to 0.40 similar to those found in previous study (Adamson et al., 2019; Hodsoll et al., 2017).

Our third hypothesis was that the efficacy of the combined intervention (ECHO + TAU) would remain stable at the 3-, 6-, and 12-month follow-ups. The results confirm this hypothesis for factors that showed improvement. Moreover, it is interesting to note that in most of these factors there is a tendency showing increasing differences from baseline, with significant improvement even between follow-ups (T0 > T1; T1 > T2; T2 > T3; T3 > T4).

In the present study, 81.48% of caregivers completed the ECHO program, showing a higher adherence rate than previous studies (Hodsoll et al., 2017). This may be due precisely to the fact that in this format the flexibility and ease of attending the sessions was greater, as in this case the sessions were individual and online. However, in the previous studies the formats did not allow for this flexibility as they were group-based and/or through self-help materials (books, DVDs, web-based materials, self-guides) and showed a low adherence of caregivers to the program (Adamson et al., 2019; Hibbs et al., 2015a; Hibbs et al., 2015b; Hodsoll et al., 2017). Regarding the 12-month follow-up, 66.66% of the participants completed the evaluation. In previous studies, only the 68% of caregivers completed the program in 75% of the sessions, with a 41% data loss 12 months after the end of the program (Hibbs et al., 2015a; Hibbs et al., 2015b). The study by Adamson et al. (2019) increases the percentage of caregivers who did not complete their follow-up assessment 3 months after the end of ECHO to 48%.

In terms of homework, in the present study, although they indicated that they read the book most of the time (>75%), they only completed 43.97% of the homework assignments. Although they are low rates, those percentages were higher than in previous studies. Hodsoll et al. (2017) highlight that lack of engagement with the intervention may be due to high rates of caregiver distress in the initial phase of adaptation, which, coupled with a lack of time to read the ECHO materials, may explain why only 36% of caregivers in their study reported having read half of the book. In order to improve compliance with these tasks, it would be appropriate to review the content and difficulty of them to ensure that the low compliance rate is not due to the tasks being difficult to understand or perform. In addition, and in order to encourage them to carry out these tasks it might be appropriate to send a "reminder note" to parents to further encourage on the completion of them.

When caregivers were asked about their satisfaction with the program, in 10 of the 12 items the scores were higher than 9 out of 10, and the remaining two were close to 9 (8.77 and 8.80). They rated the program as very satisfactory for improving their experience as caregivers, for developing skills and tools to improve communication with their daughters (more compassionate and less critical), and for dealing with conflictive situations and difficult management of the disorder. Previous research with ECHO (Adamson et al., 2019; Hibbs et al., 2015a; Hibbs et al., 2015b) has indicated, through qualitative assessments, that caregivers would like more direct guidance in skills training and have reported that the intervention was helpful. In this sense, our study provides a high level of satisfaction with the program and its contents, along with a quantitative assessment of caregivers' satisfaction.

Among the limitations of this study, we can highlight the self-administration of the assessment instruments, the reliability of a scale of the EDSIS was below the adequate, and the lack of control over the TAU programs that were being applied in the different hospital units. Another limitation of our study is that we only included female patients with an ED. This prevents us from obtaining relevant data about men. Therefore, in future researches, men should be included in order to know the feasibility and effectiveness of this program in them. In addition, future studies should examine whether the effectiveness of ECHO + TAU on caregivers has implications for patients' improvement in terms of emotional well-being, the quality of the relationship with their caregivers and on the symptoms of the disorder itself.

Among the strengths of this study, we highlight that it is a multicenter, randomized, controlled clinical trial, with a longitudinal design comparing two parallel groups, with a relevant size sample. It is the first study that provides evidence on the effectiveness and feasibility of the ECHO program in family members of adolescent patients with an ED. Furthermore, this study shows the effectiveness of a different way of applying this intervention program in the relatives of these patients, since it has been used in individual and online sessions, allowing for individualization and taking into account in some way the personal circumstances of each family.

The ECHO program for caregivers of patients with EDs was designed to be affordable, scalable, and have a broad reach (Cardi et al., 2017). As it has been pointed out in the introduction section, the original ECHO program has worked through formats such as workshops and self-guides, offering caregivers access to program content through platforms (Treasure et al., 2015). It is important to note the novelty in our trial, where program sessions were individually delivered online to each caregiver. This approach facilitates the immediate and guided transfer of caregiving skills, as previous studies have indicated (Adamson et al., 2019; Ruiz et al., 2023), promoting caregiver program adherence as the schedules of the program sessions were adjusted according to the needs of each caregiver.

The results of this RCT show that after ECHO + TAU and after TAU significant changes in many factors are achieved. However, with the addition of the ECHO program, improvements were achieved in all the factors evaluated and for the remaining factors where changes were also obtained in the TAU group, the improvement was greater in the case of ECHO + TAU, showing larger interaction effects and/or effect sizes in almost all subscales. Undoubtedly, it is of great importance that family caregivers receive specialized attention adapted to their needs, given that involving the family in the treatment of EDs is a key strategy for their recovery (Treasure & Nazar, 2016). The application of a specific program for caregivers in addition to the TAU achieves positive results in caregivers, which leads to better care for patients with an ED.

In conclusion, this study offers relevant clinical contributions for ED treatment. Results have highlighted that by adding ECHO to TAU, caregivers' skills increase and their emotional state improves. In addition, it has also been shown to be effective in reducing some of the negative effects suffered by ED caregivers, such as symptom accommodation, the impact of the disease, expressed emotion, and they feel more competent and able to cope with the care of their loved one. At the clinical level, this study offers an effective, feasible, successful, and protocolized program for working with these relatives.

7.4. Article 4

Efficacy of the ECHOMANTRA individual online intervention to support recovery from eating disorders in adolescent patients: a randomized controlled trial. European Journal of Eating Disorders.

Introductory Note

The following article presents the main findings and final analyses derived from the intervention study conducted as part of this thesis. This work constitutes the core of the research, offering a comprehensive evaluation of the program's effectiveness based on the complete dataset. The results provide critical evidence regarding the outcomes of the ECHOMANTRA program and its impact on the variables of interest.

Method

Participants

To be eligible for this study, patients had to meet the inclusion criteria outlined in Article 1. Patients were also required to nominate a primary carer to participate in the trial.

A total of 108 patient–carer dyads were recruited from seven specialist ED units across Spain, including inpatient, day-patient, and outpatient settings.

To be eligible for the study, patients had to meet the inclusion criteria detailed In Article 1. The mean age of participating patients was 14.94 years (SD = 1.56). 80% (n = 77) met criteria for AN, 5% (n = 5) for BN, and 15% (n = 16) for OSFED. In order to take part in the study, patients were required to nominate a primary carer who would also participate in the trial.

Carers had a mean age of 48.39 years (SD = 5.23). To be eligible, carers needed to meet the inclusion criteria described in Article 1. Carers were excluded if they were experiencing a severe medical or psychiatric condition, or if the associated patient declined participation. Both parents were invited to participate when possible, and in cases where the dyad was allocated to the intervention condition, both were allowed to attend ECHO program sessions. However, only the data of one caregiver per dyad was considered, typically the one who attended the sessions most consistently.

All participants provided informed consent and the study received ethical approval from the corresponding institutional review boards (Appendix).

Instruments

Further details on instruments used are available in Table 2.

Patients

Ad-hoc sociodemographic data questionnaire collected age, gender, and education details.

Ad-hoc clinical data questionnaire covering DSM-5 diagnosis, illness duration, BMI, level of care. It was completed by the healthcare providers at the unit.

Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Berglin, 1997; Peláez-Fernández et al., 2013). In the present sample, reliability estimates were α ≥ 0.73 to α ≥ 0.92 for the subscales and α ≥ 0.94 for the total score.

Depression and Anxiety Stress Scales (DASS-21) (Bados et al., 2005; Lovibond & Lovibond, 1995). In the present sample, reliability estimates were α ≥ 0.79 to α ≥ 0.93 for the subscales and α ≥ 0.94 for the total score.

Clinical Impairment Assessment (CIA 3.0) (Bohn & Fairburn, 2008; Martín et al., 2015). In the present sample, reliability estimates were α ≥ 0.83 to α ≥ 0.86 for the subscales and α ≥ 0.92 for the total score.

Health Survey (SF-12) (Ware et al. 1996; Vilagut et al., 2008). In the present sample, reliability estimates were α ≥ 0.65 and α ≥ 0.73, respectively.

Eating Disorders Quality of Life (EDQoL) (Engel et al., 2006; Quiles et al., 2023). In the present sample, reliability estimates were α ≥ 0.78 to α ≥ 0.91 for the subscales and α ≥ 0.91 for the total score.

Motivation to Change Rule (Miller & Rollnick, 1999)

Health Survey (SF-12). (Ware et al., 1996; Vilagut et al., 2008)

Child and Adolescent Perfectionism Scale (CAPS) (Flett et al., 1997; Castro et al., 2004). In the present sample, reliability estimates were α ≥ 0.93 for the Self-Oriented Perfectionism subscale, α ≥ 0.90 for the Socially Prescribed Perfectionism subscale, and α ≥ 0.92 for the total score.

Obsessive-Compulsive Inventory Revised (OCIR) (Foa et al., 2002; Fullana et al., 2005). In the present sample, reliability estimates were α ≥ 0.67 to α ≥ 0.86 for the subscales and α ≥ 0.88 for the total score.

Acceptability and Feasibility of ECHOMANTRA. Patients in the ECHOMANTRA group completed a “Participant Feedback Form” at the end of the intervention. Additionally, the therapist recorded attendance, completion of tasks between sessions, and engagement with reading materials for each session.

Carers

Ad-hoc sociodemographic data questionnaire collected age, gender, marital status, relation with the patient, education, and employment status.

Depression and Anxiety Stress Scales (DASS-21) (Bados et al., 2005; Lovibond & Lovibond, 1995). In the present sample, reliability estimates ranged from α ≥ 0.79 to α ≥ 0.87 for the subscales and α ≥ 0.92 for the global score.

Family Questionnaire (FQ) (Wiedemann et al., 2002; Sepúlveda et al., 2014). In the current sample, reliability estimates were α ≥ 0.71 for the Critical Comments subscale, α ≥ 0.83 for Emotional Over-Involvement, and α ≥ 0.86 for the total score.

The Eating Disorders Symptom Impact Scale (EDSIS-S) (Sepúlveda et al., 2008a; Sepúlveda et al., 2008b; Carral-Fernández et al., 2013).). In the present sample, reliability estimates ranged from α ≥ 0.65 to α ≥ 0.85 for the subscales and α ≥ 0.85 for the global score.

The Accommodation to Illness Symptoms Scale (AESED) (Sepúlveda et al., 2009; Quiles et al., 2016). In the present sample, reliability estimates ranged from α ≥ 0.71 to α ≥ 0.85 for the subscales and α ≥ 0.91 for the total score.

The Caregiver Skills Scale (CASK) (Hibbs et al., 2015a; Hibbs et al., 2015b; Vintró-Alcaraz et al., 2018). In the present sample, reliability estimates ranged from α ≥ 0.60 to α ≥ 0.72 for the subscales and α ≥ 0.87 for the total score.

Acceptability and Feasibility of ECHOMANTRA. Carers in the ECHOMANTRA group completed a custom "Participant Feedback Form" at the end of the intervention. The therapist also recorded attendance, completion of tasks between sessions, and engagement with reading materials for each session.

Procedure

Design

This study is a multi-center, randomized, controlled, double-masked design comparing two parallel groups, following CONSORT guidelines. Further information about the study design is provided in Article 1.

Recruitment ran from September 2021 to September 2023 across seven different specialist inpatient/day-patient/outpatient ED units spread throughout Spain.

After screening and baseline assessment, 54 dyads were included in the ECHOMANTRA+TAU group and 54 in the TAU group. For patients, questionnaire completion rates were as follows: for MANTRA, 87.04% at T1, 74.07% at T2, 64.81% at T3, and 55.56% at T4; and for TAU-only, 92.59% at T1, 87.04% at T2, 74.07% at T3, and 64.81% at T4. Regarding carers, completion rates were: for ECHO, 81.48% at T1, 74.07% at T2, 62.96% at T3, and 57.41% at T4; and for TAU-only, 94.44% at T1, 85.19% at T2, 83.33% at T3, and 68.52% at T4. For more details see the CONSORT diagram flow chart (Figure 8).

Interventions

For further details on the interventions in both groups, refer to Article 1.

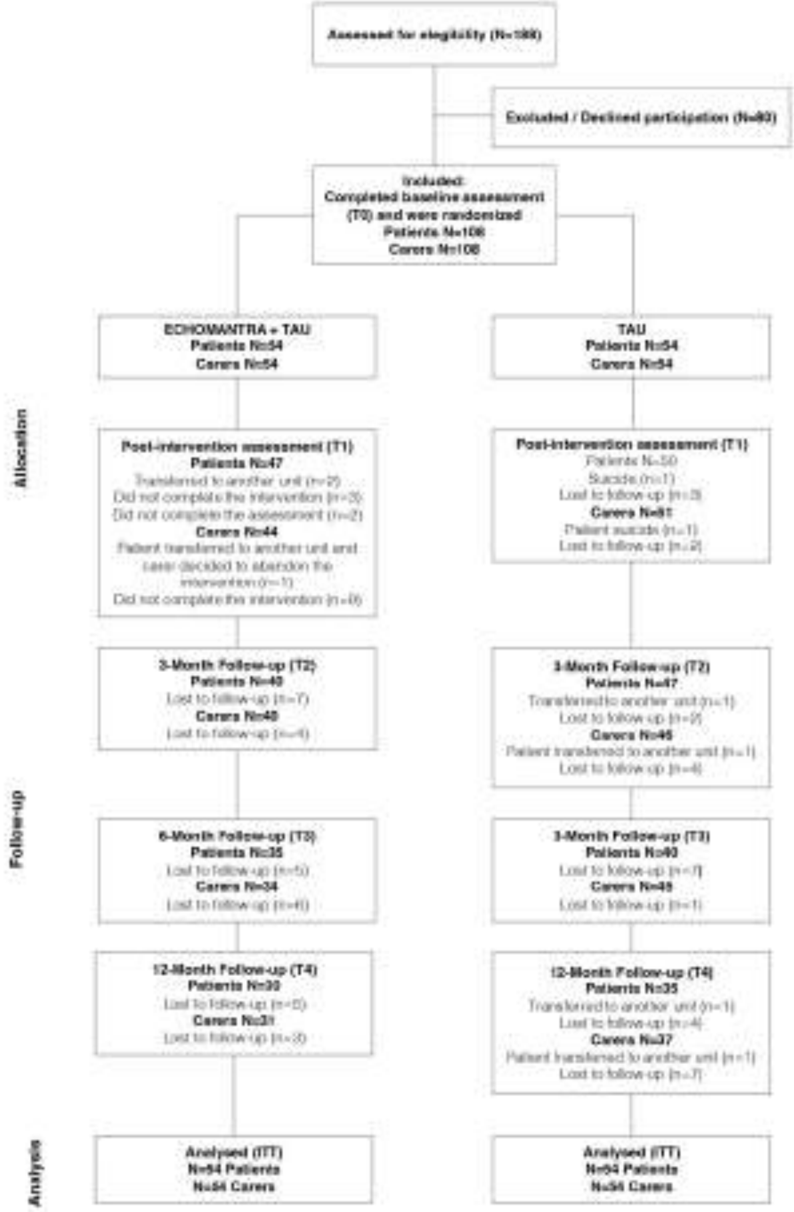
Statistical analysis

Independent research assessors, blinded to the treatment allocations, conducted evaluations to randomization (baseline: T0), at 2 months (T1; end of treatment for the ECHOMANTRA group), at 6 months (T2), at 9 months (T3), and at 12 months (T4).

Jamovi (version 2.3.28) was used for data analysis. Baseline characteristics were compared between groups using t-tests and chi-square tests.

All analyses followed an intent-to-treat approach. Missing data was imputed using multiple imputation based on fully conditional Markov chain Monte Carlo (Schafer, 1997), confirmed as MCAR indicated by the non-significant result from the Roderick Little test. Consequently, final analyses were based on the pooled results from five separate imputations.

Figure 8 | CONSORT diagram describing the flow of participation in the study.



General linear models, using the GAMLj module, assessed outcome changes across all time points for both groups (time × ECHOMANTRA vs. TAU). Significant time × group interaction effects indicated differences in change between groups. Pairwise comparisons and effect sizes (omega squared, ω^2) were calculated. Effect sizes were interpreted as small ($\omega^2 = 0.01$), medium ($\omega^2 = 0.06$), or large ($\omega^2 = 0.14$), based on benchmarks proposed by Cohen (2013).

A separate model analyzed outcome changes within the MANTRA + TAU group based on diagnosis and care level, with time as the within-subject factor and diagnosis/care level as between-subject factors. Significant interactions would suggest different changes across diagnostic groups or care levels. Statistical significance was set at 0.05, with Bonferroni-adjusted pairwise comparisons and effect sizes calculated where appropriate.

Results

Sample characteristics

After screening and baseline assessment, 54 dyads were included to each group.

Baseline sociodemographic and clinical characteristics are presented in Table 7. No significant differences were found between groups in sociodemographic at baseline. A total of 104 patients were aged 17 or younger, while a small proportion of the sample was older than 18 (N = 4). Most had attained post-primary school-level education.

18.51% (n = 20) received hospital level ED treatment, 53.70% (n = 58) attended a day center, and 27.77% (n = 30) were outpatients. Diagnoses were: 80% (n = 77) AN, 5% (n = 5) BN, and 15% (n = 16) OSFED. Mean BMI was 17.09 kg/m^2 (SD = 3.41)), and mean disorder age of onset was 13.40 (SD = 1.67).

Common comorbidities included affective disorders (N = 25, 23.1%), dysfunctional personality traits (N = 22, 20.4%), and anxiety disorders (N = 16, 14.8%). Less common conditions included obsessive-compulsive disorder (N = 5, 4.63%), substance abuse (N = 3, 2.8%), post-traumatic stress disorder (N = 2, 1.8%), and autism (N = 1, 1.85%).

Most caregivers were mothers, female, and married. The majority were the parents of the patient. No baseline score differences were found between groups (p>.05).

Comparisons between ECHOMANTRA and TAU

The results of the general linear mixed model analysis, including effect sizes, are shown in Tables 8 and 9 for BMI and other outcomes.

For patients, a significant main effect of time was found in all outcome variables, indicating improvements in both groups, except for the Importance of change, and the Financial subscale of the EDQoL in the MANTRA+TAU group, and the Neutralising subscale of the OCIR in the TAU group (p > .05). Large effect sizes were found for the EDEQ, DASS-21, EDQoL, SF-12, CIA 3.0 and OCIR in both groups, and CAPS only in the MANTRA+TAU group. Effect sizes were generally higher in the MANTRA+TAU group, except for the Anxiety subscale of the DASS-21, Physical Health subscale of the SF-12, and Ordering subscale of the OCIR. Statistically significant time × group interaction effects were observed for the EDEQ and all of its subscales, the DASS-21 and all of its subscales, the Confidence in the ability to change, the CAPS and its Socially prescribed perfectionism subscale, and the Neutralising subscale of the OCIR, showing greater improvements in the MANTRA+TAU group.

For carers, significant main effect of time was found for all outcome variables, except for the Critical comments subscale of the FQ, the Anxiety and Depression subscales of the DASS-21, the Turning a blind eye subscale of the AESED, and the CASK in the TAU condition (p>.05). Effect sizes were higher in the ECHO+TAU group. Significant time x group interactions showed greater improvements in the MANTRA+TAU group for the FQ and its Emotional over-involvement subscale, the Guilt subscale of the EDSIS, the Depression subscale of the DASS-21, the Avoidance and Family control subscales of the AESED, and the CASK and all of its subscales.

In Figure 8 and Figure 9 we present respectively the profile plots (interaction plots) of the patients and carers for these relationships.

Table 7 | Demographic, psychosocial, and clinical variables at baseline.

PATIENTS

	MANTRA+TAU (N=54)	TAU (N=54)	Total (N=108)	
Age	M=15.02 (SD=1.69)	M=14.85 (SD=1.43)	M=14.94 (SD=1.56)	t=-0.55; p=.58
Educational level				
First level	n=1 (1,85%)	n=1 (1,85%)	n=2 (2%)	χ^2= 3.97; p=.55
Second level	n=36 (66,67%)	n=39 (72,22%)	n=75 (69%)	
Third level	n=10 (18,52%)	n=12 (22,22%)	n=22 (20%)	
Vocational training	n=4 (7,41%)	n=2 (3,70%)	n=6 (6%)	
University studies	n=2 (3,70%)	n=0 (0%)	n=2 (2%)	
Other	n=1 (1,85)	n=0 (0%)	n=1 (1%)	
Diagnosis				
AN-R	n=37 (68,52%)	n=39 (72,22%)	n=76 (70%)	χ^2= 0.59; p=.90
AN-P	n=5 (9,26%)	n=6 (11,11%)	n=11 (10%)	
BN	n=3 (5,56%)	n=2 (3,70%)	n=5 (5%)	
OSFED	n=9 (16,67)	n=7 (12,96)	n=16 (15%)	
Age of onset	M=13.46 (SD=1.60)	M=13.35 (SD=1.75)	M=13.40 (SD=1,67)	t=.36; p=.72
Duration of illness (months)	M=23.45 (SD=24.27)	M=17.28 (DT=10.30)	M=20.37 (DT=18.81)	t=-1.70; p=.09
BMI	M=17.34 (SD=3,94)	M=16.83 (SD=2.81)	M=17.09 (SD=3,41)	t=-.77; p=.45
Level of care				
Hospitalization	n=8 (14.81%)	n=12 (22.22%)	n=20 (18.51%)	χ^2= 1.33; p=.51
Day care	n=29 (53.70%)	n=29 (53.70%)	n=58 (53.70%)	
Outpatient	n=17 (31.48%)	n=13 (24.08%)	n=30 (27.77%)	

CARERS

	ECHO+TAU (N = 54)	TAU (N = 54)	Total (N = 108)	
Age	M = 49.19 (SD = 5.89)	M = 47.59 (SD = 4.37)	M = 48.39 (SD = 5.23)	t = -1.60; p = .11
Gender				χ^2= 0.00; p=1.00
Female	n = 46 (85.2%)	n = 46 (85.2%)	n = 92 (85%)	
Male	n = 8 (14.8 %)	n = 46 (14.8%)	n = 16 (15%)	
Marital status				
Married / Living together	n = 42 (77.77%)	n = 40 (74.1%)	n = 82 (76%)	χ^2= 1.45; p=.69
Separated / Divorced	n = 9 (16.66%)	n = 11 (20.1%)	n = 20 (19%)	
Single	n = 3 (5.55%)	n = 2 (3.7%)	n = 5 (5%)	
Widowed	n = 0 (0%)	n = 0 (0%)	n = 0 (0%)	
Other	n = 0 (0%)	n = 1 (1.9%)	n = 1 (1%)	
Educational level				χ^2= 9.02; p=.11
First level	n = 8 (14.81%)	n = 3 (5.56%)	n = 11 (10%)	
Second level	n = 4 (7.41%)	n = 4 (7.41%)	n = 8 (7%)	
Third level	n = 3 (5.56%)	n = 1 (1.85%)	n = 4 (4%)	
Vocational training	n = 6 (11.11%)	n = 17 (31.48%)	n = 23 (21%)	
University studies	n = 31 (57.41%)	n = 28 (51.85%)	n = 59 (55%)	
Other	n = 2 (3.70%)	n = 1 (1.85%)	n = 3 (3%)	
Employment status				χ^2= 4.11; p=.25
Employed	n = 36 (66.66%)	n = 43 (79.63%)	n = 79 (73%)	
Unemployed	n = 11 (20.37%)	n = 7 (12.96%)	n = 18 (17%)	
Job training	n = 0 (0%)	n = 1 (1.85%)	n = 1 (1%)	
Other	n = 7 (12.96%)	n = 3 (5.55%)	n = 10 (9%)	
Relationship with the sufferer				χ^2= 3.11; p=.21
Mother	n = 44 (81.48%)	n = 46 (85.19%)	n = 90 (83%)	
Father	n = 7 (12.96%)	n = 8 (14.81%)	n = 15 (14%)	
Other	n = 3 (5.55%)	n = 0 (0%)	n = 3 (3%)	

Abbreviations: AN-R: Anorexia Nervosa Restrictive, AN-P: Anorexia Nervosa Purging, BN: Bulimia Nervosa; OSFED: Other Specified Feeding or Eating Disorder, BMI: Body Mass Index

MANTRA+TAU: Intra-group comparation analyses

Comparisons by diagnosis

No significant differences were found in baseline scores among diagnostic groups (p > .05), except for the Weight Concern subscale of the EDEQ (F(2, 6.16) = 5.56; p = .04; ω^2 = .56), where OSFED had higher scores than AN. No differences were observed between AN and BN or BN and OSFED.

A significant main effect of time was found for most outcome variables, showing improvements across all diagnostic groups, except for the Importance of Change and Financial subscale of the EDQoL ($p > .05$). Patients with BN showed less improvement compared to the other groups. Howecer, no significant time × group interactions were found, except for the Neutralising subscale of the OCIR ($F(8) = 2.35$, $p = .02$), where only patients with AN showed a significant improvement over time ($F(4) = 5.66$, $p < .001$).

Details of the general linear mixed model analysis with effect sizes across diagnostic categories are available in the Table 10.

Comparisons by level of care

No significant differences were found in baseline scores among levels of care ($p > .05$), except for the Confidence in the ability to change ($F(2, 21.23)=3.67$; $p=.04$; $\omega^2=.19$), where a potential difference between Hospitalization and the other groups was observed, but not strong enough to be considered significant.

A statistically main effect of time was found for most outcomes, showing improvements across all levels of care, except for Importance of change, the Financial subscale of the EDQoL, and the Socially prescribed perfectionism, where improvement was observed ($p > .05$). Specifically, patients in Hospitalization showed no improvements in the Confidence in the ability to change, Checking and Neutralizing subscales of the OCIR; patients in Outpatient care showed no improvements in the Washing and Ordering subscales of the OCIR ($p > .05$). However, no significant time × group interactions were found, except for the Restraint subscale of the EDEQ ($F(8) = 1.93$, $p = .06$), where Day care patients showed better improvements.when comparing effect sizes.

Details of the general linear mixed model analysis with effect sizes across level of care are available in the Table 11.

Table 8 | Results of general linear models analyzing BMI in the MANTRA and TAU groups.

	Baseline (T0)	5M (T2)	12M (T4)				
	M (SD)	M (SD)	M (SD)	Time	Bonferroni	ω^2	Time x group
MANTRA+TAU	17.34 (3.94)	20.64 (3.75)	21.29 (4.55)	F(2)=42,34; p<.001	T0<T2***; T0<T4***; T2<T4**	.55	F(2)=.21; p=81
TAU	16.83 (2.81)	19.98 (2.88)	20.99 (3.23)	F(4)=63.15; p<.001	T0<T2***; T0<T4***; T2<T4***	.63	

Table 9 | Results of general linear models analyzing outcomes in the ECHOMANTRA and TAU groups.

PATIENTS

	T0	T1	T2	T3	T4				
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	Time	Bonferroni	ω^2	Time x group
EDEQ									
MANTRA+TAU	3.98 (1.26)	2.66 (1.32)	2.10 (1.26)	2.00 (1.35)	1.81 (1.23)	F(4)=61,25; p<..001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***	,52	F(4)=3.86; p=.04
TAU	3.96 (1.40)	3.36 (1.36)	2.87 (1.64)	2.45 (1.53)	1.95 (1.42)	F(4)=33,54; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4***; T3>T4**	,37	
Restraint									
MANTRA+TAU	3.43 (1.62)	1.75 (1.40)	1.42 (1.16)	1.37 (1.18)	1.20 (1.02)	F(4)= 49,31; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4*	.47	F(4)=2.92; p=.02
TAU	3.55 (1.81)	2.74 (1.65)	2.24 (1.68)	2.00 (1.50)	1.55 (1.43)	F(4) = 23.23; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**; T1>T4***; T2>T4*; T3>T4*	.29	
Eating concern									
MANTRA+TAU	3.38 (1.23)	2.18 (1.26)	1.53 (1.17)	1.52 (1.29)	1.46 (1.19)	F(4)=53.60; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3**	.49	F(4)=4.60; p<.001
TAU	3.32 (1.41)	2.80 (1.36)	2.33 (1.49)	1.83 (1.30)	1.50 (1.30)	F(4)=31.48; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4**	.35	
Shape concern									
MANTRA+TAU	4.93 (1.29)	3.80 (1.52)	3.03 (1.54)	2.86 (1.57)	2.61 (1.50)	F(4)=51.66; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***	.48	F(4)=2.92; p=.02
TAU	4.73 (1.46)	4.34 (1.47)	3.65 (1.91)	3.23 (1.76)	2.70 (1.66)	F(4)=30.30; p<..001	T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4**; T3>T4**	.35	
Weight Concern									
MANTRA+TAU	4.18 (1.56)	3.07 (1.65)	2.45 (1.55)	2.31 (1.63)	2.05 (1.53)	F(4)=37.18; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3**; T1>T4***	.40	F(4)=2.59; p=.04
TAU	4.23 (1.55)	3.66 (1.55)	3.23 (1.85)	2.68 (1.75)	2.04 (1.53)	F(4)=29.65; p<.001	T0>T1*; T0>T2**; T0>T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4***; T3>T4**	.34	

Table 9 (continuation)

	T0	T1	T2	T3	T4				
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	Time	Bonferroni	ω²	Time x group
DASS-21									
MANTRA+TAU	34.04 (12.64)	23.03 (11.81)	18.16 (11.61)	18,55 (11.86)	14.49 (8.54)	F(4)=44.81; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T4***	.45	F(4)=3.08; p=.02
TAU	33.70 (15.79)	29.17 (14.68)	23.39 (15.32)	19.50 (12.62)	15.19 (11.11)	F(4)=35.98; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4***; T3>T4***	.39	
Depression									
MANTRA+TAU	13.85 (5.54)	9.23 (5.22)	6.96 (5.20)	6.68 (4.72)	5.26 (4.00)	F(4)=41,96; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3**; T1>T4***	.43	F(4)=2,49; p=.04
TAU	12.44 (6.71)	10.60 (6.32)	8.52 (6.75)	7.00 (5.33)	5.63 (4.52)	F(4)=25.87; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4**	.31	
Anxiety									
MANTRA+TAU	8.30 (4.74)	5.61 (3.81)	4.51 (3.75)	4.63 (3.75)	3.67 (2.63)	F(4)=20.92; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T4**	.27	F(4)=2,57; p=.04
TAU	9.17 (5.12)	8.29 (4.98)	6.34 (4.61)	5.44 (3.85)	4.22 (3.66)	F(4)=26.81; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4**; T3>T4**	.32	
Stress									
MANTRA+TAU	11.89 (4.47)	8.10 (4.23)	6.60 (3.85)	6.84 (4.21)	5.81 (3.00)	F(4)=34,15; p<,001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4***	.38	F(4)=3,53; p=.01
TAU	12.09 (5.50)	10.33 (4.74)	8.55 (5.18)	7.08 (4.41)	5.46 (3.84)	F(4)=32,42; p<..001	T0>T2***; T0>T3***; T0>T4***; T1>T3***; T1>T4***; T2>T4**; T3>T4**	.36	
MOTIVATION FOR CHANGE RULER									
Importance of change									
MANTRA+TAU	8.24 (1.79)	8.64 (1.60)	8.43 (1.37)	8.57 (1.46)	8.11 (1.63)	F(4)=1,55; p=0.19	-	.01	F(4)=0,47; p=.76
TAU	7.50 (2.52)	7.49 (2.48)	7.36 (2.64)	7.20 (2.43)	7.11 (2.72)	F(4)=0.38; p=0.82	-	.00	
Confidence in the ability to change									
MANTRA+TAU	5.68 (2.42)	6.74 (2.12)	7.05 (2.14)	7.12 (1.95)	7.17 (2.09)	F(4)=9.19; p<.001	T0<T1*; T0<T2***; T0<T3***; T0<T4***	.13	F(4)=3,03; p=.02
TAU	5.17 (2.96)	4.85 (2.70)	6.10 (2.68)	6.25 (2.33)	6.80 (2.47)	F(4)=8.78; p<..001	T0<T4*; T1<T2**; T1<T3**; T1<T4***	.12	

Table 9 (continuation)

	T0	T1	T2	T3	T4				
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	Time	Bonferroni	ω²	Time x group
EDQoL									
MANTRA+TAU	2.69	2.31	1.94	1.74	1.66	F(4)=60,38;	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***;	.52	F(4)=1.80;
	(0.61)	(0.65)	(0.60)	(0.57)	(0.49)	p<..001	T1>T4***; T2>T3**		p=.13
TAU	2.65	2.34	2.14	1.78	1.58	F(4)=50,33;	T0>T1**; T0>T2***; T0>T3***, T0>T4***; T1>T2*; T1>T3***;	.48	
	(0.80)	(0.66)	(0.74)	(0.60)	(0.52)	p<.001	T1>T4***; T2>T3***; T2>T4***; T3>T4*		
Psychological									
MANTRA+TAU	3.49	2.88	2.43	2.24	2.16	F(4)=44,92;	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***;	.45	F(4)=1.49;
	(0.84)	(0.92)	(0.81)	(0.83)	(0.76)	p<.001	T1>T4***		p=.20
TAU	3.54	3.21	2.80	2.36	2.17	F(4)=28.84;	T0>T2**; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***;	.34	
	(1.29)	(1.01)	(1.08)	(0.93)	(0.94)	p<..001	T2>T3***; T2<T4***		
Physical / Cognitive									
MANTRA+TAU	3.18	2.59	2.05	1.93	1.90	F(4)=34.27;	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***,	.38	F(4)=1.48;
	(0.97)	(1.11)	(0.90)	(0.78)	(0.73)	p<.001	T1>T4***		p=.21
TAU	3.08	2.59	2.29	1.98	1.72	F(4)=32.40;	T0>T1**; T0>T2***; T0>T3***; T1>T2**; T1>T3***; T1>T4***;	.37	
	(1.04)	(1.01)	(1.01)	(0.97)	(0.74)	p<.001	T2>T4***		
Financial									
MANTRA+TAU	1.25	1.28	1.25	1.17	1.20	F(4)=0.96;	-	.09	F(4)=0.58;
	(0.44)	(0.47)	(0.47)	(0.38)	(0.27)	p=0.43			p=.68
TAU	1.20	1.31	1.27	1.12	1.12	F(4)=3.69;	T1>T3*; T1>T4*	.05	
	(0.47)	(0.47)	(0.60)	(0.17)	(0.18)	p=.006			
Work / School									
MANTRA+TAU	2.54	2.58	1.97	1.56	1.62	F(4)=27.2;	T0>T2**; T0>T3***; T0>T4***, T1>T2**; T1>T3***; T1>T4***;	.32	F(4)=1.84;
	(1.04)	(0.98)	(0.90)	(0.66)	(0.62)	p<..001	T2>T3*; T2>T4*		p=.12
TAU	2.30	2.51	2.11	1.74	1.46	F(4)=20.45;	T0>T3***; T0>T4***; T1>T3***; T1>T4***; T2>T4***; T3>T4*	.26	
	(1.06)	(1.12)	(1.06)	(0.72)	(0.61)	p<.001			
SF-12									
Physical Health									
MANTRA+TAU	13.20	14.76	16.00	16.49	16.82	F(4)=32.42;	T0<T1**; T1<T2***; T1<T3***; T1<T4***; T1<T2**; T1<T3***;	.37	F(4)=1.22;
	(3.13)	(2.63)	(2.29)	(1.92)	(1.60)	p<.001	T1<T4***		p=.30
TAU	12.69	14.54	15.63	16.61	17.35	F(4)=44.23;	T0<T1**; T0<T2***; T0<T3***; T0<T4***; T1<T2*; T1<T3***;	.44	
	(2.95)	(2.98)	(2.46)	(2.07)	(1.96)	p<.001	T1<T4***; T2<T3**; T2<T4***; T3<T4*		

Table 9 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Mental Health									
MANTRA+TAU	13.44 (3.62)	16.04 (3.39)	17.34 (3.92)	17.59 (3.66)	18.30 (2.89)	F(4)=27,33; p<.001	T0<T1***; T0<T2***; T0<T3***; T0<T4***; T1<T4***	.33	F(4)=2.21; p=.07
TAU	14.46 (4.14)	15.30 (3.85)	16.62 (4.32)	17.61 (3.95)	18.98 (3.41)	F(4)=20.96; p<..001	T0<T2*; T0<T3***; T0<T4***, T1<T3***; T1<T4***; T2<T4**; T3<T4*	.27	
CIA 3.0									
MANTRA+TAU	28.48 (10.01)	22.95 (10.61)	15.94 (10.02)	14.34 (10.23)	11.95 (7.65)	F(4)=58.12; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4*	.51	F(4)=1.65; p=.16
TAU	28.44 (13.23)	25.71 (12.21)	20.60 (12.77)	16.40 (11.08)	12.59 (10.65)	F(4)=33.58; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4***; T3>T4**	.38	
Personal									
MANTRA+TAU	12.57 (4.52)	10.47 (4.37)	7.72 (4.23)	7.44 (4.63)	6.05 (3.78)	F(4)=42,39; p<..001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4*	.43	F(4)=1.69; p=.15
TAU	12.44 (5.27)	11.74 (5.13)	9.73 (5.50)	7.82 (5.19)	6.76 (4.91)	F(4)=24.97; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T3*; T2>T4**	.31	
Social									
MANTRA+TAU	8.61 (3.98)	6.44 (3.90)	4.01 (3.24)	3.74 (3.35)	2.93 (2.43)	F(4)=40.66; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***, T1>T4***	.42	F(4)=1.93; p=.10
TAU	8.69 (4.69)	7.76 (4.23)	5.91 (4.54)	4.36 (3.50)	3.27 (3.26)	F(4)=32.82; p<.001	T0<T2**; T0<T3***; T0<T4***; T1<T2**; T1<T3***; T1<T4***; T2<T3*; T2<T4***; T3<T4**	.36	
Cognitive									
MANTRA+TAU	7.30 (3.31)	6.08 (3.68)	4.51 (3.61)	3.36 (3.06)	3.07 (2.34)	F(4)=34.05; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4**	.38	F(4) 0.51; p=.63
TAU	7.31 (4.46)	6.12 (4.18)	4.89 (3.87)	4.08 (3.22)	2.89 (2.95)	F(4)=20.10; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4***; T3>T4*	.26	
CAPS									
MANTRA+TAU	74.06 (15.46)	69.21 (13.21)	65.56 (14.59)	65.22 (14.43)	65.12 (13.50)	F(4)=10.82; p<.001	T0>T2***; T0>T3***; T0>T4***	.15	F(4)=3.65; p=.01
TAU	76.39 (19.26)	79.04 (14.52)	76.35 (17.66)	72.59 (16.91)	69.91 (14.63)	F(4)=6.50; p<.001	T1>T3*; T1>T4***; T2>T4*	.09	
Self-oriented Perfectionism									
MANTRA+TAU	47.26 (10.56)	44.70 (8.37)	41.49 (9.72)	41.23 (9.80)	41.77 (8.90)	F(4)=11.34; p<.001	T0>T2**; T0>T3***; T0>T4**; T1>T2*; T1>T3**; T1>T4*	.16	F(4)=1.97; p=.10
TAU	48.56 (11.10)	49.13 (8.71)	46.17 (10.89)	44.87 (10.42)	43.23 (9.41)	F(4)=8.48; p<.001	T0>T4***; T1>T3*; T1>T4***	.12	

Table 9 (continuation)

	T0	T1	T2	T3	T4				
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	Time	Bonferroni	ω²	Time x group
Socially Prescribed Perfectionism									
MANTRA+TAU	26.80 (8.80)	24.50 (8.48)	23.98 (7.47)	23.88 (7.08)	23.33 (6.48)	F(4)=3.92; p=.004	T0>T2*; T0>T4*	.05	F(4)=3.33; p=.01
TAU	27.83 (10.81)	29.86 (9.26)	30.21 (8.99)	27.67 (8.72)	26.89 (7.05)	F(4)=3.05; p=.02	T2>T4*	.04	
OCIR									
MANTRA+TAU	26.48 (13.15)	21.94 (11.93)	15.06 (8.63)	15.30 (10.31)	13.09 (9.19)	F(4)=35.74; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***	.39	F(4)=1.35; p=.25
TAU	29.85 (15.64)	24.71 (12.77)	22.33 (13.22)	18.97 (14.38)	16.79 (14.19)	F(4)=17.92; p<.001	T0>T1*; T0>T2**; T0>T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4**	.23	
Washing									
MANTRA+TAU	2.67 (3.02)	1.64 (1.86)	0.91 (1.30)	1.47 (1.95)	1.19 (1.82)	F(4)=9.09; p<.001	T0>T2***; T0>T4*; T1>T4*	.13	F(4)=2.38; p=.05
TAU	3.07 (3.19)	2.48 (2.82)	2.64 (2.80)	2.14 (2.49)	1.68 (2.24)	F(4)=3.98; p=.004	-	.05	
Obsessing									
MANTRA+TAU	6.72 (3.99)	5.39 (3.28)	3.68 (2.91)	3.79 (2.54)	3.35 (2.87)	F(4)=22.21; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3**; T1>T4***	.28	F(4)=1.80; p=.13
TAU	7.44 (3.85)	5.98 (3.40)	5.74 (3.69)	4.56 (3.33)	4.33 (3.42)	F(4)=14.99; p<.001	T0>T1*; T0>T2*; T0>T3***; T0>T4***; T1>T3*; T1>T4**; T2>T3*; T2>T4*	.20	
Hoarding									
MANTRA+TAU	5.35 (3.47)	4.32 (3.12)	2.88 (2.22)	2.86 (2.40)	2.43 (2.53)	F(4)=20.79; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**; T1>T4***	.26	F(4)=1.22; p=.30
TAU	5.26 (3.56)	4.33 (3.28)	3.88 (3.24)	3.29 (2.97)	3.04 (2.44)	F(4)=8.65; p<.001	T0>T3***; T0<T4***	.12	
Ordering									
MANTRA+TAU	5.96 (3.80)	4.97 (2.98)	4.09 (2.74)	3.84 (2.73)	3.76 (2.54)	F(4)=9.97; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T3*; T1>T4*	.14	F(4)=1.79; p.13
TAU						F(4)=19.53; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T3*; T1>T4***; T2>T4**; T3>T4*	.25	
Checking									
MANTRA+TAU	3.17 (2.68)	2.75 (2.43)	1.64 (1.82)	1.72 (1.80)	1.29 (1.48)	F(4)=16.98; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**; T1>T4***	.27	F(4)=0.94; p=.44
TAU	4.20 (3.19)	3.31 (2.67)	2.82 (2.36)	2.20 (2.68)	1.90 (2.35)	F(4)=12.88; p<.001	T0>T2*; T0>T3***; T0>T4***; T1>T3*; T1<T4***	.17	

Table 9 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Neutralising									
MANTRA+TAU	2.61 (3.07)	2.82 (3.04)	1.83 (2.09)	1.84 (2.14)	1.26 (1.41)	8.33; p<.001	T0>T4*; T1>T2*; T1>T3*; T1>T4**	.12	F(4)=8,48; p=.03
TAU	3.11 (3.54)	2.76 (2.84)	2.63 (2.94)	2.73 (2.95)	2.72 (3.20)	F(4)=.50; p=.74	-	.00	
CARERS									
FQ									
ECHO+TAU	28.43 (8.31)	24.57 (6.75)	21.22 (6.53)	21.29 (6.53)	18.87 (5.87)	F(4)=29.28; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4*; T3>T4**	.34	F(4)=2.85; p=.02
TAU	29.24 (7.85)	28.57 (8.08)	25.91 (7.88)	24.78 (9.01)	24.30 (5.76)	F(4)=8.06; p<.001	T0>T2*; T0>T3*; T0>T4**; T1>T3*; T1>T4**	.12	
Critical comments									
ECHO+TAU	10.70 (5.16)	9.80 (4.00)	8.22 (3.51)	8.71 (3.63)	7.82 (3.29)	F(4)=8.29; p<.001	T0>T2*; T0>T4**; T1>T2*; T1>T4**	.12	F(4)=1.52; p=.19
TAU	11.15 (4.42)	10.77 (5.02)	10.09 (4.88)	10.35 (5.33)	10.14 (3.50)	F(4)=1.07; p=.37	-	.00	
Emotional over-involvement									
ECHO+TAU	17.72 (4.33)	15.01 (4.05)	12.91 (3.91)	12.48 (4.00)	10.80 (3.44)	F(4)=49.91; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4***; T3>T4***	.47	F(4)=3.88; p=.004
TAU	18.11 (4.95)	17.82 (4.89)	15.72 (4.49)	14.50 (4.47)	14.10 (3.42)	F(4)=17.40; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***	.23	
EDSIS									
ECHO+TAU	35.52 (13.78)	25.62 (12.92)	19.46 (11.04)	17.41 (10.30)	14.52 (7.86)	F(4)=48.30; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4*	.47	F(4)=2.03; p=.08
TAU	38.03 (11.37)	33.54 (14.09)	27.99 (12.61)	25.46 (11.51)	20.76 (8.87)	F(4)=29.31; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4**	.34	
Nutrition impact									
ECHO+TAU	11.87 (5.16)	7.18 (4.36)	5.49 (3.71)	4.55 (3.06)	3.59 (2.94)	F(4)=56.90; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4*	.50	F(4)=0.90; p=.47
TAU	13.30 (4.12)	10.31 (5.12)	7.76 (4.72)	7.06 (4.16)	6.07 (3.27)	F(4)=36.65; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***	.40	

Table 9 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Guilt									
ECHO+TAU	9.94 (5.03)	7.63 (4.00)	5.18 (3.55)	5.10 (3.49)	4.63 (2.92)	F(4)=29.84; p<.001	T0>T1*; T0>T2***; T0>T3***, T0>T4***; T1>T2***; T1>T3***; T1>T4***	.35	F(4)=2.63; p=.03
TAU	10.21 (4.99)	9.48 (4.74)	7.85 (3.99)	7.23 (3.88)	6.15 (3.32)	F(4)=19.85; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4*	.26	
Dysregulated behavior									
ECHO+TAU	5.37 (4.87)	4.62 (4.21)	3.30 (3.57)	3.44 (3.54)	2.61 (2.10)	F(4)=9.57; p<.001	T0>T2***; T0>T3*; T0>T4**; T1>T2*; T1>T4*	.14	F(4)=1.27; p=.28
TAU	5.21 (3.17)	4.99 (3.80)	4.51 (3.86)	4.40 (3.16)	3.65 (2.71)	F(4)=2.94; p=.02	-	.03	
Social Isolation									
ECHO+TAU	8.33 (4.26)	6.30 (3.73)	5.27 (3.67)	4.40 (2.57)	3.66 (2.81)	F(4)=25.24; p=<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T3***; T1>T4***; T2>T4**	.31	F(4)=1.65; p=.16
TAU	9.30 (4.21)	8.89 (4.52)	7.66 (3.91)	6.53 (3.89)	4.97 (2.62)	F(4)=18.50; p<.001	T0<T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4***	.24	
DASS-21									
ECHO+TAU	17.67 (10.88)	10.67 (8.88)	7.66 (6.54)	7.05 (6.77)	7.35 (6.20)	F(4)=27.17; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3*	.32	F(4)=2.26; p=.06
TAU	18.17 (11.06)	16.12 (11.61)	13.13 (11.27)	12.04 (11.11)	12.37 (9.26)	F(4)=5.63; p<.001	T0>T2**; T0>T3**; T0>T4*	.08	
Depression									
ECHO+TAU	6.24 (4.69)	3.48 (3.66)	2.56 (2.68)	2.38 (2.61)	2.59 (2.49)	F(4)=21.12; p<.001	T0<T1**; T0>T2***; T0>T3***; T0<T4***; T1>T2*; T1>T3**	.27	F(4)=3.15; p=.01
TAU	5.94 (4.30)	5.51 (4.27)	4.53 (4.51)	4.52 (4.23)	4.15 (3.45)	F(4)=3.12; p=.02	-	.04	
Anxiety									
ECHO+TAU	3.55 (3.70)	2.15 (2.76)	1.29 (1.78)	1.41 (2.22)	1.47 (1.76)	F(4)=11.36; p<.001	T0>T2***, T0>T3**; T0>T4**; T1>T2*	.16	F(4)=0.85; p=.50
TAU	3.95 (3.66)	3.61 (3.85)	2.71 (3.30)	2.44 (3.29)	2.67 (3.50)	F(4)=3.15; p=.02	-	.04	
Stress									
ECHO+TAU	7.90 (3.92)	5.07 (3.17)	3.79 (2.81)	3.27 (2.73)	3.14 (2.58)	F(4)=35.33; p<.001	T0<T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3**; T1>T4**	.39	F(4)=1.93; p=.11
TAU	8.25 (4.34)	7.03 (4.42)	5.76 (4.05)	5.10 (4.27)	5.40 (3.30)	F(4)=9.36; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T3*	.13	

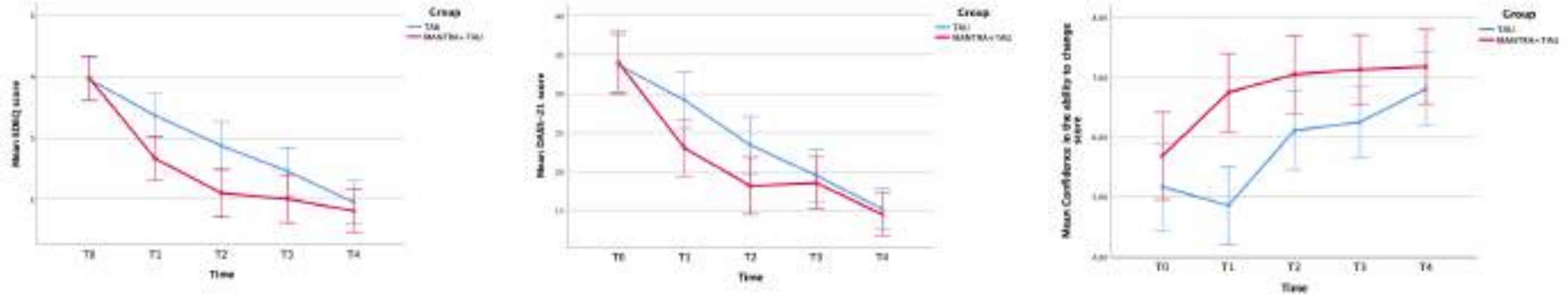
Table 9 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
AESED									
ECHO+TAU	46.54 (20.22)	34.83 (15.14)	26.56 (14.28)	21.76 (13.00)	18.74 (11.82)	F(4)=44.97; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***	.45	F(4)=1.48; p=.21
TAU	49.46 (20.99)	42.64 (20.72)	36.37 (17.87)	32.56 (16.63)	27.33 (12.06)	F(4)=21.11; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T3**; T1>T4***; T2>T4**	.27	
Avoidance									
ECHO+TAU	17.46 (7.02)	11.94 (5.53)	8.56 (5.07)	6.89 (4.53)	6.01 (4.51)	F(4)=53.38; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2***; T1>T3***; T1>T4***; T2>T4**	.52	F(4)=3.57: p=.01
TAU	18.41 (6.99)	16.11 (7.24)	14.17 (7.28)	11.29 (6.74)	8.46 (4.78)	F(4)=27.90; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T3***; T1>T4***; T2>T4***	.33	
Reassurance seeking									
ECHO+TAU	10.69 (7.37)	7.74 (4.98)	5.68 (4.00)	5.04 (4.23)	4.58 (4.06)	F(4)=20.70; p<.001	T0<T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3**; T1>T4***	.27	F(4)=0.12; p=.97
TAU	11.80 (7.01)	9.05 (7.29)	7.28 (5.95)	6.89 (5.10)	5.97 (3.74)	F(4)=15.68; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T4**	.22	
Meal ritual									
ECHO+TAU	3.48 (4.02)	3.06 (3.34)	2.56 (3.33)	1.60 (2.16)	1.49 (1.67)	F(4)=6.53; p<.001	T0>T3*; T0>T4*; T1>T3*; T1>T4*	.09	F(4)=0.45; p=.77
TAU	4.37 (5.51)	3.90 (4.87)	2.69 (3.00)	2.71 (3.78)	2.06 (1.97)	F(4)=4.84; p<.001	T0>T4*; T1>T4*	.06	
Family control									
ECHO+TAU	12.69 (6.40)	10.28 (4.82)	8.20 (4.17)	6.63 (3.74)	5.59 (3.55)	F(4)=31.24; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1>T4***; T2>T4***	.36	F(4)=2.86; p=.02
TAU	13.08 (5.52)	11.64 (5.53)	10.33 (4.45)	9.75 (4.45)	9.01 (4.03)	F(4)=9.16; p<.001	T0>T2*; T0>T3**; T0>T4***; T1>T4**	.13	
Turning a bilnd eye									
ECHO+TAU	2.22 (2.91)	1.64 (2.25)	1.51 (2.31)	1.48 (1.63)	1.01 (1.08)	F(4)=4.09; p=.003	T0>T4*	.05	F(4)=1.29; p=.27
TAU	1.97 (2.84)	1.73 (1.68)	1.80 (2.34)	1.97 (2.12)	1.68 (1.56)	F(4)=0.35; p=.85	-	.00	

Table 9 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
CASK									
ECHO+TAU	71.31 (11.75)	78.53 (9.21)	80.64 (8.24)	81.22 (9.97)	84.65 (7.35)	F(4)=22.77; p<.001	T0<T1***; T0<T2***; T0<T3***; T0<T4***; T1<T4***; T2<T4*	.29	F(4)=6.93; p<.001
TAU	71.58 (10.44)	70.12 (11.18)	74.59 (10.79)	73.56 (12.93)	74.41 (9.50)	F(4)=2.97; p=.02	T0<T4*	.04	
Bigger picture									
ECHO+TAU	76.64 (13.25)	80.28 (10.53)	82.01 (9.17)	83.10 (11.74)	86.21 (8.29)	F(4)=8.55; p<.001	T0<T2*; T0<T4***; T1<T4**	.12	F(4)=5.60; p<.001
TAU	76.65 (12.67)	75.67 (11.78)	78.73 (12.41)	76.85 (13.56)	75.03 (12.18)	F(4)=1.26; p=.29	-	.00	
Self care									
ECHO+TAU	59.40 (18.81)	74.23 (12.47)	77.55 (11.40)	80.22 (12.75)	81.31 (11.60)	F(4)=30.52; p<.001	T0<T1***; T0<T2***; T0<T3***; T0<T4***; T1<T4*	.35	F(4)=5.00; p<.001
TAU	58.62 (18.17)	59.04 (19.21)	66.81 (16.55)	68.20 (14.79)	72.21 (13.66)	F(4)=11.06; p<.001	T0<T2*; T0>T3**; T0<T4***; T1<T3*; T1<T4***	.16	
Biting your tongue									
ECHO+TAU	70.86 (17.03)	73.57 (14.60)	77.71 (15.19)	74.21 (18.89)	84.13 (11.97)	F(4)=9.75; p<.001	T0<T2*; T0<T4***; T1<T4***; T3<T4***	.14	F(4)=3.63; p=.006
TAU	69.32 (16.22)	67.45 (17.10)	70.56 (14.86)	71.58 (15.57)	70.76 (13.45)	F(4)=.79; p=.53	-	.01	
Insight and acceptance									
ECHO+TAU	61.39 (19.78)	17.23 (14.22)	79.45 (10.98)	77.26 (13.54)	81.31 (11.75)	F(4)=24.46; p<.001	T0<T1***; T0<T2***; T0<T3***; T0<T4***; T1<T4***	.30	F(4)=9.89; p<.001
TAU	68.10 (18.52)	63.76 (18.23)	68.86 (17.77)	68.96 (17.24)	71.12 (15.00)	F(4)=2.36; p=.05	-	.02	
Emotional intelligence									
ECHO+TAU	74.48 (16.02)	79.70 (12.70)	80.87 (11.82)	83.39 (11.60)	84.30 (8.72)	F(4)=7.75; p<.001	T0<T3**; T0<T4***	.11	F(4)=2.64; p=.03
TAU	73.31 (14.66)	71.74 (14.79)	76.64 (12.11)	73.99 (15.81)	76.19 (11.34)	F(4)=1.71; p=.15	-	.01	
Frustration tolerance									
ECHO+TAU	76.30 (13.08)	83.53 (9.09)	84.64 (9.64)	83.61 (8.56)	87.42 (7.57)	F(4)=13.15; p<.001	T0<T1**; T0<T2**; T0<T3**; T0<T4***	.18	F(4)=5.58; p<.001
TAU	76.51 (13.08)	74.87 (12.46)	77.00 (15.03)	78.90 (11.91)	76.95 (9.57)	F(4)=1.12; p=.35	-	.00	

Figure 9 | Profile plots: Changes in patients regarding the mean (a) EDEQ total score, (b) DASS-21 total score, (c) Confidence in the ability to change, (d) CAPS total score, (e) Socially prescribed perfectionism subscale, (f) Neutralising subscale.



(a) EDEQ total score

(b) DASS-21 total score

(c) Confidence in the ability to change

(d) CAPS total score

(e) Socially Prescribed Perfectionism subscale

(f) Neutralising subscale

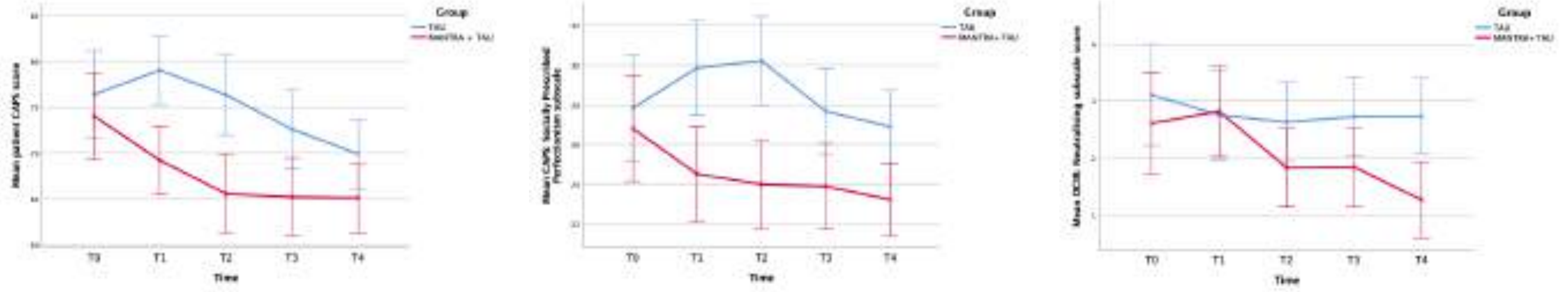
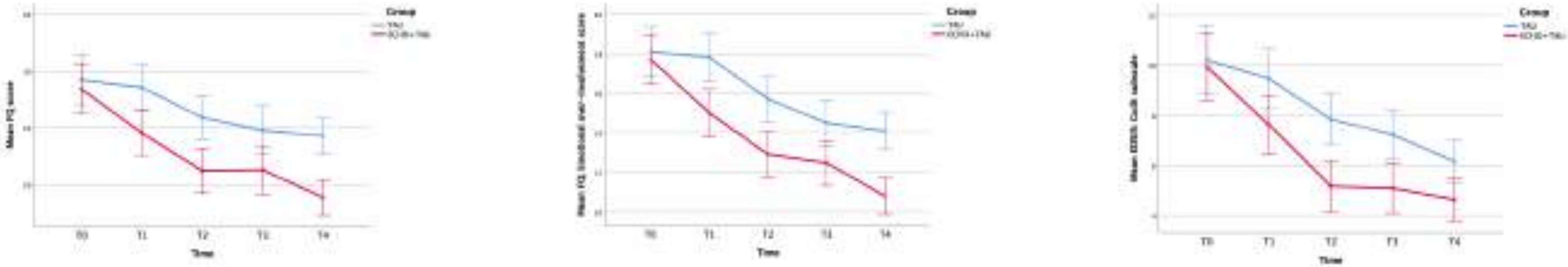
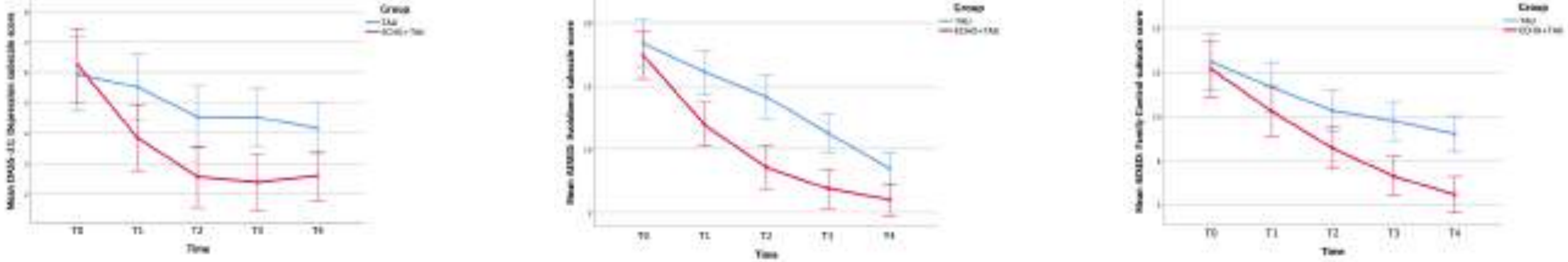


Figure 10 | Profile plots: Changes in carers regarding the mean (a) FQ total score, (b) Emotional over-involvement subscale, (c) Guilt subscale, (d) Depression subscale, (e) Avoidance subscale, (f) Family control subscale, (g) CASK total score.


(a) FQ total score (b) Emotional over-involvement subscale (c) Guilt subscale


(d) Depression subscale (e) Avoidance subscale (f) Family control subscale

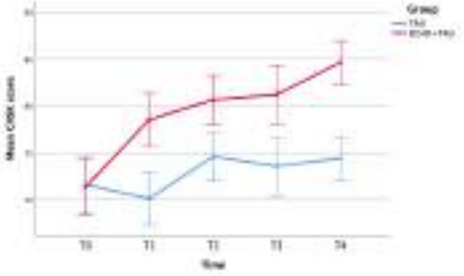

(g) CASK total score

Table 10 | Results of general linear models analyzing outcomes in the MANTRA group based on diagnosis.

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
EDEQ									
AN (N=42)	3.79	2.49	1.99	1.97	1.73	F(4)=42.95;	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3*;	.50	F(8)=.89;
	(1.32)	(1.32)	(1.22)	(1.33)	(1.21)	p<.001	T1>T4***		p=.52
BN (N=3)	4.55	3.49	2.00	1.56	1.95	F(4)=4.81; p=.03	-	.53	
	(0.41)	(1.78)	(1.45)	(1.88)	(2.09)				
OSFED (N=9)	4.66	3.18	2.65	2.27	2.11	F(4)=13.91;	T0>T1*; T0>T3*; T0>T4**	.58	
	(0.81)	(1.01)	(1.40)	(1.40)	(1.14)	p<.001			
Restraint									
AN	3.29	1.63	1.35	1.37	1.23	F(4)=32.55;	T0>T1***; T0>T2***; T0>T3***, T0>T4***	.43	F(8)=.90;
	(1.68)	(1.43)	(1.15)	(1.20)	(1.07)	p<.001			p=.52
BN	3.88	2.40	0.91	1.39	1.11	F(4)=7.45; p=.008	T0>T2*	.66	
	(0.44)	(1.80)	(0.70)	(1.40)	(1.10)				
OSFED	3.96	2.08	1.95	1.38	1.07	F(4)=13.68;	T0>T3*; T0>T4**; T1>T4**	.58	
	(1.53)	(1.15)	(1.25)	(1.19)	(0.88)	p<.001			
Eating concern									
AN	3.20	2.04	1.42	1.47	1.42	F(4)=34.87;	T0>T1***; T0>T2***, T0>T3***; T0>T4***; T1>T2***; T1>T3*;	.44	F(8)=.87;
	(1.28)	(1.25)	(1.08)	(1.30)	(1.15)	p<.001	T1>T4*		p=.54
BN	4.27	3.00	1.99	1.30	2.13	F(4)=4.56; p=.03	-	.52	
	(0.58)	(1.93)	(1.40)	(1.65)	(2.20)				
OSFED	3.93	2.54	1.91	1.79	1.42	F(4)=18.16;	T0>T1**; T0>T2*; T0>T3*; T0>T4***	.65	
	(0.87)	(1.05)	(1.50)	(1.27)	(1.07)	p<.001			
Shape concern									
AN	4.77	3.66	2.89	2.76	2.55	F(4)=35.63;	T0>T1***; T0>T2***; T0>T3***, T0>T4***, T1>T2**; T1>T3**;	.45	F(8)=.64;
	(1.39)	(1.56)	(1.51)	(1.56)	(1.46)	p<.001	T1>T4***		p=.74
BN	5.33	4.38	2.43	2.47	2.62	F(4)=4.22; p=.04	-	.50	
	(0.63)	(1.96)	(2.06)	(2.31)	(2.66)				
OSFED	5.58	4.26	3.87	3.46	2.90	F(4)=13.13;	T0>T3*; T0>T4**; T1>T4**	.57	
	(0.53)	(1.15)	(1.38)	(1.45)	(1.45)	p<.001			
Weight concern									
AN	3.92	2.83	2.26	2.14	1.93	F(4)=23.82;	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T3*; T1>T4**	.35	F(8)=.72;
	(1.64)	(1.66)	(1.52)	(1.61)	(1.53)	p<.001			p=.68
BN	4.73	4.20	2.13	2.35	2.33	F(4)=3.19; p=.08	-	.40	
	(0.83)	(1.56)	(1.55)	(1.95)	(2.32)				
OSFED	5.18	3.82	3.47	3.10	2.49	F(4)=15.15;	T0>T3*; T0>T4**; T1>T4*; T2>T4*	.60	
	(0.76)	(1.38)	(1.42)	(1.57)	(1.34)	p<.001			

Table 10 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
DASS-21									
AN	33.17 (12.39)	22.16 (11.43)	18.49 (12.36)	18.86 (12.62)	14.21 (8.71)	F(4)=29.60; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4***	.40	F(8)=0.68; p=.71
BN	30.00 (14.93)	26.33 (24.34)	14.15 (8.37)	14.22 (8.19)	11.35 (9.30)	F(4)=2.92; p=.09	-	.37	
OSFED	39.44 (13.16)	25.99 (9.44)	17.94 (9.25)	18.58 (9.55)	16.85 (7.89)	F(4)=15.49; <.001	T0>T2*; T0>T3*; T0>T4*; T1>T3*; T1>T4**	.61	
Depression									
AN	13.36 (5.54)	8.82 (4.93)	6.90 (5.36)	6.72 (4.81)	5.16 (4.26)	F(4)=27.72; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4***	.39	F(8)=.54; p=.83
BN	13.00 (7.55)	11.33 (9.87)	6.31 (1.53)	6.30 (2.25)	4.96 (4.33)	F(4)=2.22; p=.16	-	.27	
OSFED	16.44 (4.75)	10.47 (5.19)	7.43 (5.59)	6.62 (5.27)	5.84 (2.80)	F(4)=13.56; p<.001	T0>T3*; T0>T4**; T1>T3*; T1>T4*	.58	
Anxiety									
AN	7.64 (4.66)	5.34 (3.97)	4.75 (4.08)	4.51 (4.00)	3.53 (2.59)	F(4)=11.61; p<.001	T0>T1*; T0>T2**; T0>T3**; T0>T4***; T1>T4**	.20	F(8)=1.50; p=,16
BN	7.67 (3.06)	6.67 (6.11)	2.42 (2.18)	3.39 (3.51)	3.41 (3.08)	F(4)=2.09; p=.17	-	.25	
OSFED	11.56 (4.61)	6.53 (2.09)	4.12 (2.15)	5.59 (2.55)	4.41 (2.91)	F(4)=13.75; p<.001	T0>T2**; T0>T3*; T0>T4*	.58	
Stress									
AN	12.17 (4.24)	8.03 (3.97)	6.67 (4.06)	7.14 (4.43)	5.80 (3.01)	F(4)=26.73; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4*	.37	F(8)=.46; p=.89
BN	9.33 (5.86)	8.33 (9.07)	3.59 (3.14)	4.12 (3.76)	4.02 (2.67)	F(4)=1.99; p=.19	-	.23	
OSFED	11.44 (5.39)	8.36 (4.14)	6.85 (2.82)	6.35 (3.13)	6.45 (3.13)	F(4)=5.58; p=.002	-	.33	
MOTIVATION FOR CHANGE RULER									
Importance of change									
AN	8.34 (1.76)	8.68 (1.57)	8.48 (1.34)	8.60 (1.54)	8.06 (1.79)	F(4)=1.37; p=.25	-	.01	F(8)=0.43; p=.90
BN	8.00 (1.00)	7.33 (2.08)	8.12 (0.83)	8.35 (0.56)	8.16 (0.77)	F(4)=0.69; p=.69	-	.00	
OSFED	7.89 (2.20)	8.87 (1.62)	8.29 (1.72)	8.49 (1.32)	8.32 (0.97)	F(4)=0.79; p=.54	-	.00	

Table 10 (continuation)

	T0	T1	T2	T3	T4				
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	Time	Bonferroni	ω^2	Time x group
Confidence in the ability to change									
AN	5.87 (2.54)	7.01 (2.01)	7.12 (2.20)	7.24 (1.93)	7.13 (2.16)	F(4)=5.21; p<.001	T0<T2*; T0<T3**; T0<T4*	.09	F(8)=0.88; p=.53
BN	5.00 (2.65)	6.67 (3.21)	8.13 (1.80)	8.17 (0.75)	7.91 (1.13)	F(4)=3.75; p=.05	-	.46	
OSFED	5.00 (1.73)	5.54 (2.11)	6.32 (1.93)	6.25 (2.15)	7.15 (2.10)	F(4)=5.75; p=.001	T0<T4*	.34	
EDQoL									
AN	2.67 (.67)	2.28 (.64)	1.95 (.61)	1.74 (.58)	1.65 (.48)	F(4)=41.31; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3***; T1<T4***; T2>T4**	.49	F(8)=1.69; p=.10
BN	2.77 (.41)	2.44 (1.03)	1.59 (.53)	1.65 (.57)	1.62 (.65)	F(4)=0.14; p=.01	-	.63	
OSFED	2.76 (.38)	2.44 (.61)	1.97 (.57)	1.80 (.56)	1.74 (.44)	F(4)=14.29; p<.001	T0>T2*; T0>T3*; T0>T4**; T1>T3*; T1>T4*	.59	
Psychological									
AN	3.42 (0.89)	2.82 (0.89)	2.42 (0.82)	2.22 (0.85)	2.14 (0.77)	F(4)=29.36; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**; T1>T4***	.40	F(8)=.29; p=.97
BN	3.74 (0.63)	3.11 (1.54)	2.22 (1.06)	2.08 (1.01)	2.06 (1.06)	F(4)=5.77; p=.02	-	.60	
OSFED	3.77 (0.64)	3.06 (0.96)	2.57 (0.78)	2.39 (0.73)	2.26 (0.66)	F(4)=11.14; p<.001	T0>T3*; T0>T4**	.52	
Physical / Cognitive									
AN	3.12 (1.00)	2.59 (1.09)	2.07 (0.91)	1.97 (0.80)	1.90 (0.77)	F(4)=21.97; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**; T1>T4**	.33	F(8)=.45; p=.89
BN	3.39 (1.11)	2.67 (1.67)	1.63 (0.82)	1.47 (0.46)	1.53 (0.54)	F(4)=7.77; p=.01	-	.68	
OSFED	3.39 (0.90)	2.54 (1.18)	2.10 (0.93)	1.90 (0.77)	2.02 (0.59)	F(4)=8.40; p<.001	T0>T2*; T0>T3**; T0>T4*	.45	
Financial									
AN	1.25 (0.47)	1.32 (0.52)	1.26 (0.52)	1.18 (0.41)	1.22 (0.29)	F(4)=.92; p=.46	-	.00	F(8)=.19; p=.99
BN	1.20 (0.35)	1.13 (0.23)	1.16 (0.27)	1.10 (0.18)	1.13 (0.23)	F(4)=1.00; p=.46	-	.40	
OSFED	1.25 (0.32)	1.15 (0.21)	1.23 (0.31)	1.16 (0.25)	1.14 (0.18)	F(4)=.45; p=.77	-	.00	

Table 10 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Work / School									
AN	2.60 (0.99)	2.48 (1.04)	1.91 (0.90)	1.52 (0.51)	1.56 (0.64)	F(4)=21.56; p<.001	T0>T2**; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4*	.33	F(8)=.67; p=.72
BN	2.75 (0.53)	2.87 (0.95)	1.87 (0.90)	2.20 (1.31)	1.95 (0.90)	F(4)=2.71; p=.11	-	.35	
OSFED	2.44 (1.11)	2.68 (1.16)	2.27 (0.93)	1.87 (0.74)	1.47 (0.69)	F(4)=4.62; p=.005	-	.28	
SF-12									
Physical Health									
AN	13.19 (3.20)	14.80 (2.40)	16.11 (2.13)	16.46 (1.79)	16.88 (1.55)	F(4)=26,06; p<.001	T0<T1*; T0<T2***; T0<T3***; T0<T4***; T1<T2**; T1<T3**, T1<T4***	.37	F(8)=.30; p=.96
BN	13.33 (5.03)	15.00 (5.00)	17.14 (2.42)	16.42 (.52)	16.99 (1.74)	F(4)=1.41; p=.313	-	.11	
OSFED	13.22 (2.44)	14.50 (3.14)	15.13 (2.92)	16.69 (2.79)	16.49 (1.92)	F(4)=4,66; p=.004	T0>T4*	.28	
Mental Health									
AN	13.48 (3.85)	16.11 (3.31)	17.29 (4.19)	17.51 (3.84)	18.32 (2.98)	F(4)=18.93; p<.001	T0<T1**; T0<T2***; T0<T3***; T1<T4**	.30	F(8)=0.15; p=.99
BN	13.67 (4.04)	15.67 (7.37)	18.05 (.08)	16.85 (2.78)	18.47 (3.50)	F(4)=.76; p=.58	-	.00	
OSFED	13.22 (2.59)	15.82 (2.52)	17.34 (3.36)	18.19 (3.24)	18.25 (2.62)	F(4)=11.26; p<.001	T0<T2*; T0<T3**; T0<T4**	.53	
CIA 3.0									
AN	27.52 (10.55)	22.52 (10.33)	15.80 (9.96)	14.43 (10.72)	11.94 (7.67)	F(4)=35.87; p<.001	T0<T1**; T0>T2***; T0<T3***; T0<T4***; T1>T2***; T1>T3***; T1>T4***	.45	F(8)=0.95; p=.47
BN	33.33 (10.26)	26.67 (21.22)	11.04 (9.90)	10.54 (9.67)	13.72 (13.06)	F(4)=7.32; p=.01	T0>T2**	.66	
OSFED	31.33 (6.71)	23.68 (8.93)	18.24 (10.82)	15.21 (8.63)	11.43 (6.48)	F(4)=30.42; p<.001	T0>T1*; T0>T2**; T0>T3***; T0>T4***; T1>T3*; T1>T4**	.76	
Personal									
AN	11.95 (4.77)	10.19 (4.26)	7.64 (4.21)	7.41 (4.78)	5.99 (3.77)	F(4)=25.67; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**; T1>T4***	.36	F(8)=0.89; p=.52
BN	14.00 (3.00)	11.67 (7.57)	6.11 (5.60)	5.79 (5.03)	6.51 (6.50)	F(4)=6.11; p=.02		.61	
OSFED	15.00 (2.69)	11.36 (4.18)	8.66 (4.18)	8.15 (4.14)	6.18 (3.36)	F(4)=16.36; p<.001	T0>T2*; T0>T1**; T0>T4***	.62	

Table 10 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Social									
AN	8.40 (4.01)	6.38 (4.00)	3.90 (3.18)	3.81 (3.51)	3.02 (2.51)	F(4)=27.33; p<.001	T0>T1*; T0>T2***; T0’>T3***; T0>T4***, T1>T2**; T1>T3**; T1>T4***	.38	F(8)=0.65; p=.73
BN	8.67 (4.04)	7.33 (6.43)	1.53 (2.65)	2.93 (2.61)	2.97 (3.62)	F(4)=4.17; p=.04	-	.49	
OSFED	9.11 (4.26)	6.40 (2.90)	5.35 (3.43)	3.64 (2.04)	2.51 (1.88)	F(4)=13.03; p<.001	T0>T2*; T0>T3*; T0>T4*; T1>T4*	.57	
Cognitive									
AN	7.07 (3.38)	6.08 (3.46)	4.52 (3.66)	3.30 (3.28)	3.05 (2.44)	F(4)=23.40; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***	.35	F(8)=1.42; p=.19
BN	10.67 (3.51)	7.67 (7.51)	2.65 (2.50)	2.86 (2.58)	3.01 (3.00)	F(4)=5.53; p=.02	-	.58	
OSFED	7.22 (2.54)	5.53 (3.57)	5.08 (3.84)	3.80 (2.21)	3.16 (1.93)	F(4)=8.82; p<.001	T0>T3**; T0>T4**	.46	
CAPS									
AN	73.60 (15.08)	70.25 (11.95)	65.42 (14.07)	64.76 (13.64)	65,43 (13.77)	F(4)=7.44; p<.001	T0>T2**; T0>T3**; T0>T4*	.15	F(8)=.80; p=.60; η_p^2 =,04
BN	60.67 (22.19)	52.67 (22.37)	44.81 (18.04)	48.62 (17.97)	49.57 (13.91)	F(4)=3.05; p=.08	-	.39	
OSFED	80.67 (13.30)	69.84 (13.83)	73.10 (9.48)	72.92 (13.21)	68.86 (8.99)	F(4)=5.13; p=.003	T0<T1*	.31	
Self-oriented Perfectionism									
AN	47.19 (10.69)	45.22 (7.73)	41.36 (9.51)	40.85 (9.37)	41.72 (9.12)	F(4)=8.69; p<.001	T0>T2*; T0>T3**; T0>T4*; T1>T2*; T1>T3**; T1>T4**	.13	F(8)=0.64; p=.75
BN	36.67 (12.34)	31.33 (11.02)	27.63 (10.72)	28.29 (11.18)	33.11 (10.71)	F(4)=1.77; p=.23	-	.19	
OSFED	51.11 (7.49)	46.74 (7.39)	46.71 (5.59)	47.30 (7.05)	44.89 (5.50)	F(4)=3.41; p=.02	-	.21	
Socially Prescribed Perfectionism									
AN	26.40 (8.67)	25.05 (8.46)	23.91 (7.68)	23.83 (7.05)	23.59 (6.73)	F(4)=2.01; p=.09	-	.02	F(8)=0.85; p=.56
BN	24.00 (13.45)	21.33 (11.93)	19.48 (5.73)	19.48 (5.73)	17.53 (6.11)	F(4)=1.70; p=.24	-	.18	
OSFED	29.56 (8.38)	22.99 (8.14)	25.58 (7.67)	25.58 (7.67)	23.37 (4.85)	F(4)=15.15; p=.007	T0>T1**	.26	

Table 10 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
OCIR									
AN	27.00 (13.20)	21.99 (11.93)	15.17 (9.13)	15.74 (11.22)	13.52 (9.85)	F(4)=27.18; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***, T1>T2***; T1>T3**; T1>T4***	.38	F(4)=1.43; p=.18
BN	32.67 (26.08)	28.99 (22.11)	10.18 (9.11)	13.18 (11.19)	8.42 (6.43)	F(4)=4.21; p=.04	-	.50	
OSFED	22.00 (6.63)	19.69 (8.45)	16.20 (5.95)	13.91 (4.83)	12.62 (6.43)	F(4)=5.38; p=.002	T0>T4*	.32	
Washing									
AN	2.67 (3.21)	1.62 (1.80)	0.94 (1.33)	1.53 (2.10)	1.30 (2.01)	F(4)=5.86; p<.001	T0>T2**; T1>T2*	.10	F(8)=0.27; p=.98
BN	2.67 (4.62)	2.33 (4.04)	0.30 (0.51)	1.95 (1.69)	1.03 (1.05)	F(4)=0.65; p=.64	-	.00	
OSFED	2.67 (1.50)	1.49 (1.45)	1.01 (1.35)	1.06 (1.25)	0.74 (0.69)	F(4)=5.24; p=.002	T0>T4*	.31	
Obsessing									
AN	6.74 (3.95)	5.24 (3.25)	3.70 (3.10)	3.75 (2.70)	3.45 (3.06)	F(4)=16.96; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**, T1>T4*	.27	F(8)=0.79; p=.61
BN	6.00 (5.57)	7.33 (6.43)	1.67 (1.53)	2.63 (2.28)	2.36 (1.18)	F(4)=3.05; p=.08	-	.39	
OSFED	6.89 (4.17)	5.43 (2.32)	4.26 (2.07)	4.35 (1.82)	3.21 (2.39)	F(4)=3.12; p=.03	-	.19	
Hoarding									
AN	5.45 (3.49)	4.41 (3.25)	2.88 (2.44)	2.97 (2.65)	2.57 (2.72)	F(4)=15.94; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3*; T1>T4**	.26	F(8)=0.59; p=.79
BN	6.33 (6.03)	4.67 (4.04)	2.04 (1.77)	2.74 (1.62)	0.88 (0.83)	F(4)=2.86; p=.10	-	.36	
OSFED	4.56 (2.65)	3.80 (2.38)	3.19 (0.97)	2.42 (1.20)	2.29 (1.80)	F(4)=2.25; p=.09	-	.12	
Ordering									
AN	6.24 (3.96)	5.07 (3.00)	3.97 (2.65)	3.93 (2.83)	3.87 (2.64)	F(4)=9.21; p<.001	T0>T2**; T0>T3**; T0>T4**; T1>T4*	.16	F(8)=1.30; p=.24
BN	6.67 (3.79)	4.00 (4.36)	2.30 (2.04)	2.75 (3.03)	2.09 (1.81)	F(4)=2.79; p=.10	-	.36	
OSFED	4.44 (2.96)	4.86 (2.76)	5.29 (3.14)	3.78 (2.35)	3.84 (2.24)	F(4)=0.97; p=.44	-	.00	
Checking									
AN	3.29 (2.77)	2.71 (2.39)	1.54 (1.96)	1.81 (1.97)	1.43 (1.62)	F(4)=13.49; p<.001	T0>T2***; T0>T3**; T0>T4***; T1>T2**; T1>T4**	.23	F(8)=1.64; p=.12
BN	4.67 (4.16)	4.00 (4.00)	1.47 (1.29)	1.15 (1.03)	0.71 (0.62)	F(4)=2.98; p=.09	-	.38	
OSFED	2.11 (1.36)	2.55 (2.22)	2.20 (1.22)	1.50 (1.01)	0.84 (0.72)	F(4)=2.76; p=.05	T2>T4*	.16	

Table 10 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Neutralising									
AN	2.62 (2.97)	2.86 (3.11)	2.06 (2.27)	2.03 (2.29)	1.31 (1.53)	F(4)=5.66; p<.001	T1>T4*	.10	F(8)=2.35; p=.02
BN	6.33 (5.69)	5.67 (4.93)	1.46 (1.50)	2.20 (2.55)	1.42 (1.51)	F(4)=3.00; p=.09	-	.38	
OSFED	1.33 (1.50)	1.69 (1.06)	0.86 (0.79)	0.85 (0.73)	1.00 (0.67)	F(4)=1.72; p=.17	-	.08	

Table 11 | Results of general linear models analyzing outcomes in the MANTRA group based on level of care.

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
EDEQ									
Hospitalization	3.84 (1.65)	2.46 (1.22)	1.65 (.74)	1.61 (.90)	1.88 (.90)	F(4)=11.36; p<.001	T0>T2*; T0>T4*	.56	F(8)=1.93; p=.06
Day care	4.18 (1.08)	2.61 (1.27)	2.08 (1.21)	1.86 (1.34)	1.55 (1.16)	F(4)=40.36; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T3*; T1>T4***	.57	
Outpatient	3.71 (1.36)	2.86 (1.49)	2.35 (1.52)	2.43 (1.49)	2.21 (1.42)	F(4)=12.92; p<.001	T0>T1**; T0>T2**; T0>T3**; T0>T4**	.41	
Restraint									
Hospitalization	3.67 (2.02)	2.08 (1.12)	1.13 (0.51)	1.13 (0.46)	1.42 (0.60)	F(4)=10.37; p<.001	-	.53	F(8)=3.11; p=.002
Day care	3.80 (1.35)	1.59 (1.33)	1.35 (1.11)	1.28 (1.23)	1.03 (0.90)	F(4)=42.76; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***	.59	
Outpatient	2.69 (1.69)	1.86 (1.66)	1.68 (1.44)	1.65 (1.32)	1.38 (1.33)	F(4)=5.28; p<.001	T0>T4*	.20	
Eating concern									
Hospitalization	2.98 (1.68)	2.19 (1.11)	1.20 (0.54)	1.24 (0.70)	1.48 (0.94)	F(4)=8.94; p<.001	-	.49	F(8)=0.96; p=.47
Day care	3.52 (1.15)	2.07 (1.25)	1.48 (1.15)	1.36 (1.27)	1.27 (1.13)	F(4)=30.78; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T4*	.50	
Outpatient	3.33 (1.16)	2.34 (1.40)	1.77 (1.41)	1.91 (1.49)	1.76 (1.38)	F(4)=15,38; p<.001	T0>T1**; T0>T2**; T0>T3**; T0>T4**	.45	
Shape concern									
Hospitalization	4.77 (1.40)	3.24 (1.25)	2.54 (0.94)	2.64 (1.10)	2.22 (0.93)	F(4)=16.99; p<.001	T0>T2*; T0>T3**; T0>T4***	.66	F(8)=1.27; p=.26
Day care	5.14 (1.09)	3.95 (1.44)	3.07 (1.60)	2.70 (1.58)	2.47 (1.49)	F(4)=32.70; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***	.52	
Outpatient	4.67 (1.55)	3.81 (1.75)	3.18 (1.67)	3.23 (1.75)	3.03 (1.70)	F(4)=8.80; p<.001	T0>T1*; T0>T2**; T0>T3*; T0>T4*	.31	
Weight concern									
Hospitalization	3.92 (1.82)	2.89 (1.51)	2.02 (1.07)	1.72 (0.94)	1.77 (1.17)	F(4)=11.63; p<.001	T0>T3*; T1>T3*	.44	F(8)=0.69; p=.70
Day care	4.28 (1.39)	2.92 (1.69)	2.33 (1.47)	2.17 (1.57)	1.85 (1.41)	F(4)=20.81; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4**	.40	
Outpatient	4.13 (1.77)	3.41 (1.68)	2.88 (1.83)	2.83 (1.88)	2.51 (1.82)	F(4)=7,75; p<.001	T0>T2*; T0>T3*; T0>T4*	.28	

Table 11 (continuation)

	T0	T1	T2	T3	T4				
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	Time	Bonferroni	ω^2	Time x group
DASS-21									
Hospitalization	35.75 (16.94)	21.77 (4.05)	16.70 (4.19)	18.04 (4.58)	14.18 (4.52)	F(4)=9.12; p<.001	T0>T4**	.49	F(8)=0.32; p=.06
Day care	32.28 (10.63)	22.43 (13.65)	18.41 (13.36)	17.10 (12.70)	13.56 (8.72)	F(4)=21.01; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4*	.40	
Outpatient	36.24 (13.93)	24.65 (11.17)	18.41 (11.19)	21.27 (12.75)	16.24 (9.72)	F(4)=14.46; p<.001	T0<.T1**; T0<T2**; T0>T3*; T0>T4***; T1>T4*	.13	
Depression									
Hospitalization	14.75 (5.63)	9.11 (3.57)	6.54 (0.95)	6.76 (1.96)	5.95 (3.30)	F(4)=9.28; p<.001	T0>T2*	.50	F(8)=0.55; p=.82
Day care	13.83 (4.98)	9.09 (5.84)	7.72 (5.97)	6.53 (5.46)	4.75 (3.61)	F(4)=21.09; p<.001	T0>T1***; T0>T2***; T0>T3***; T0>T4***; T1>T4**	.41	
Outpatient	13.47 (6.62)	9.53 (4.99)	5.85 (4.95)	6.91 (4.46)	5.80 (4.93)	F(4)=12.98; p<.001	T0>T2**; T0>T3*; T0>T4**; T1>T2*; T1>T4*	.41	
Anxiety									
Hospitalization	8.75 (7.36)	3.98 (2.50)	3.52 (1.75)	4.04 (2.52)	2.68 (1.43)	F(4)=4.28; p=.008	-	.28	F(8)=0.79; p=.62
Day care	7.17 (3.62)	5.66 (4.49)	4.18 (4.19)	4.05 (3.86)	3.44 (2.65)	F(4)=9.47; p<.001	T0>T2**; T0>T3***; T0>T4***	.22	
Outpatient	10.00 (4.74)	6.29 (2,87)	5.54 (3.56)	5.89 (3.91)	4.51 (2.89)	F(4)=7.67; p<.001	T0>T4**	.32	
Stress									
Hospitalization	12.25 (5.44)	8.22 (1.16)	5.83 (1.90)	6.08 (1.92)	6.00 (2.54)	F(4)=7.93; p<.001	-	.46	F(8)=0.55; p=.82
Day care	11.28 (4.42)	7.64 (4.51)	6.45 (4.44)	6.12 (4.16)	5.75 (3.24)	F(4)=15.18; p<.001	T0>T1***; T1>T2***; T1>T3***; T1>T4***	.33	
Outpatient	12.76 (4.19)	8.82 (4.72)	7.21 (3.51)	8.44 (4.78)	5.84 (2.94)	F(4)=9.29; p<.001	T0>T1**; T0>T2***; T0>T4***; T1>T4*	.40	
MOTIVATION FOR CHANGE RULER									
Importance of change									
Hospitalization	8.20 (1.99)	8.41 (1.48)	8.40 (0.41)	8.43 (0.76)	8.39 (1.07)	F(4)=0.06; p=.99	-	.00	F(4)=0.27; p=.97
Day care	8.22 (1.80)	8.63 (1.63)	8.44 (1.56)	8.73 (1.22)	8.19 (1.41)	F(4)=1.04; p=.39	-	.00	
Outpatient	8.29 (1.79)	8.76 (1.68)	8.43 (1.38)	8.36 (2.02)	7.84 (2.17)	F(4)=0.82; p=.52	-	.00	

Table 11 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Confidence in the ability to change									
Hospitalization	7.34 (1.72)	7.18 (2.23)	7.04 (1.11)	6.95 (0.82)	7.26 (1.54)	F(4)=.12; p=.98	-	.02	F(8)=1.28; p=.25; η_p^2 =,05
Day care	5.45 (2.28)	6.92 (1.71)	7.20 (2.34)	7.39 (1.98)	7.23 (2.24)	F(4)=9.14; p<.001	T0<T1**; T0<T2**; T0<T3***; T0<T4***	.25	
Outpatient	5.29 (2.71)	6.24 (2.68)	6.78 (2.21)	6.76 (2.28)	7.04 (2.15)	F(4)=2.81; p=.03	-	.15	
EDQoL									
Hospitalization	2.81 (.70)	2.11 (.39)	1.82 (.50)	1.87 (.48)	1.57 (.25)	F(4)=13.79; p<.001	T1<T2*; T1<T3*; T1<T4**	.61	F(8)=1.69; p=.10
Day care	2.77 (.57)	2.38 (.70)	2.02 (.65)	1.67 (.60)	1.64 (.49)	F(4)=38.53; p<.001	T0<T1**; T0<T3***; T0<T4***; T1<T2**; T1<T3***; T1<T4***; T2<T3**; T2<T4*	.56	
Outpatient	2.50 (.64)	2.30 (.67)	1.85 (.54)	1.82 (.56)	1.73 (.54)	F(4)=13.11; p<.001	T0<T2**; T0<T3***; T0<T4**; T1<T2*; T1<T3*; T1<T4*	.42	
Psychological									
Hospitalization	3.42 (1.09)	2.68 (0.47)	2.23 (0.66)	2.25 (0.60)	2.23 (0.59)	F(4)=5.57; p=.002	-	.36	F(8)=0.88; p=.54
Day care	3.59 (0.74)	2.95 (0.94)	2.50 (0.83)	2.15 (0.83)	2.05 (0.82)	F(4)=31.45; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***: T1>T2*; T1>T3***; T1>T4***	.51	
Outpatient	3.37 (0.91)	2.84 (1.08)	2.42 (0.87)	2.40 (0.93)	2.30 (0.73)	F(4)=9.35; p<.001	T0>T2***; T0>T3*; T0>T4***	.33	
Physical / cognitive									
Hospitalization	3.46 (0.90)	2.25 (0.52)	1.78 (0.55)	1.85 (0.43)	1.61 (0.51)	F(4)=19.68; p<.001	T0>T2**; T0>T3*; T0>T4**; T1>T4**	.69	F(8)=0.96; p=.47
Day care	3.17 (0.91)	2.58 (1.13)	1.99 (0.98)	1.80 (0.71)	1.86 (0.72)	F(4)=20.79; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2**; T1>T3**; T1>T4*	.40	
Outpatient	3.08 (1.14)	2.75 (1.28)	2.28 (0.87)	2.18 (0.97)	2.10 (0.81)	F(4)=5.04; p=.001	T0>T2*; T0>T3*; T0>T4**	.19	
Financial									
Hospitalization	1.53 (0.91)	1.28 (0.27)	1.21 (0.21)	1.28 (0.20)	1.26 (0.21)	F(4)=0.67; p=.62	-	.00	F(8)=0.90; p=.52
Day care	1.21 (0.26)	1.30 (0.56)	1.30 (0.60)	1.18 (0.48)	1.16 (0.22)	F(4)=1.24; p=.30	-	.00	
Outpatient	1.20 (0.31)	1.26 (0.40)	1.18 (0.30)	1.12 (0.21)	1.25 (0.37)	F(4)=0.59; p=.67	-	.00	

Table 11 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Work / social									
Hospitalization	2.60 (1.20)	2.41 (1.05)	1.79 (0.58)	1.67 (0.60)	1.50 (0.37)	F(4)=3.16; p=.03	-	.21	F(8)=0.68; p=.71
Day care	2.72 (0.89)	2.68 (1.08)	2.17 (1.03)	1.56 (0.75)	1.63 (0.71)	F(4)=18.04; p<.001	T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***; T2>T4*	.37	
Outpatient	2.33 (1.02)	2.35 (0.99)	1.70 (0.72)	1.53 (0.52)	1.65 (0.57)	F(4)=6.59; p<.001	T0>T3*; T1>T3**	.24	
SF-12									
Physical Health									
Hospitalization	11.75 (1.98)	15.71 (1.44)	16.16 (.93)	16.56 (1.05)	17.00 (.73)	F(4)=34.60; p<.001	T0<T1**; T0<T2**; T0<T3***; T0<T4***	.80	F(8)=1.00; p=.43
Day care	13.14 (3.38)	14.37 (2.96)	15.64 (2.78)	16.17 (2.04)	16.53 (1.90)	F(4)=12.62; p<.001	T0<T2*; T0<T3**; T0<T4***; T1<T3*; T1<T4***	.28	
Outpatient	14.00 (3.00)	15.00 (2.42)	16.54 (1.70)	17.02 (1.98)	17.24 (1.23)	F(4)=10.02; p<.001	T0<T3*; T0<T4**; T1<T2*	.34	
Mental Health									
Hospitalization	13.38 (3.85)	16.84 (2.55)	17.25 (2.05)	17.52 (2.09)	18.22 (2.45)	F(4)=8.55; p<.001	T0<T2*	.47	F(8)=0.65; p=.73
Day care	13.10 (3.73)	16.02 (3.78)	17.29 (4.25)	17.70 (3.58)	18.32 (2.73)	F(4)=15.14; p<.001	T0<T1**; T0<T2***; T0<T3***; T0<T4***; T1<T4**	.33	
Outpatient	14.53 (3.26)	15.71 (3.12)	17.45 (4.16)	17.43 (4.47)	18.28 (3.46)	F(4)=5.84; p<.001	T0<T3**; T0<T4***	.22	
CIA 3.0									
Hospitalization	28.13 (11.05)	20.28 (6.54)	12.59 (4.47)	12.03 (4.39)	10.76 (3.50)	F(4)=22.12; p<.001	T0>T2*; T0>T3*; T0>T4*; T1>T2**; T1>T3**; T1>T4**	.76	F(8)=1.19; p=.31
Day care	30.03 (9.72)	23.53 (11.21)	16.61 (10.83)	13.45 (9.95)	11.37 (8.74)	F(4)=33.32; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3***; T1>T4***;	.52	
Outpatient	26.00 (10.13)	23.24 (11.40)	16.38 (10.58)	16.95 (12.38)	13.50 (7.12)	F(4)=12.12; p<.001	T0>T2***; T0>T3**; T0>T4***;T1>T2*; T1>T4**	.72	
Personal									
Hospitalization	12.25 (5.63)	10.08 (2.94)	6.49 (2.32)	6.46 (2.14)	4.96 (1.69)	F(4)=14,08; p<.001	T0>T4*; T1>T2***; T1>T4**	.61	F(8)=0.49; p=.86
Day care	13.00 (4.00)	10.33 (4.29)	8.07 (4.79)	7.25 (5.04)	6.01 (4.42)	F(4)=24.03; p<.001	T0>T1**; T0>T2***; T0>T3***; T0>T4***; T1>T3**; T1>T4***	.44	
Outpatient	12.00 (5.01)	10.88 (5.19)	7.72 (3.96)	8.24 (4.85)	6.63 (3.30)	F(4)=8.55; p<.001	T0>T2**; T0>T4**; T1>T4*	.30	

Table 11 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Social									
Hospitalization	9.38 (4.57)	6.21 (3.43)	3.36 (1.35)	3.52 (1.66)	2.42 (0.93)	F(4)=11.56; p<.001	T0>T4*	.56	F(8)=0.83; p=.58
Day care	8.90 (3.76)	6.69 (4.12)	3.95 (3.39)	3.46 (3.34)	2.65 (2.80)	F(4)=21.92; p<.001	T0>T1*; T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3*; T1>T4***	.42	
Outpatient	7.76 (4.18)	6.12 (3.92)	4.42 (3.68)	4.31 (4.00)	3.64 (2.17)	F(4)=9.07; p<.001	T0>T2**; T0>T3*; T0>T4**; T1>T4*	.32	
Cognitive									
Hospitalization	6.50 (2.78)	4.85 (1.49)	3.75 (1.83)	2.82 (1.86)	3.20 (1.52)	F(4)=8.86; p<.001	T0>T3*	.48	F(8)=1.74; p=.09
Day care	8.14 (3.63)	6.32 (4.00)	4.76 (3.92)	2.97 (2.51)	2.87 (2.12)	F(4)=27.09; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T3***; T1>T4***	.47	
Outpatient	6.24 (2.66)	6.24 (3.87)	4.43 (3.81)	4.28 (4.15)	3.34 (3.03)	F(4)=5.00; p=.001	T0>T4**; T1>T4*	.19	
CAPS									
Hospitalization	78.25 (15.14)	74.08 (7.52)	67.08 (5.23)	67.27 (3.64)	66.49 (7.84)	F(4)=3.19; p=.03	-	.21	F(8)=.25; p=.98
Day care	71.03 (17.46)	66.71 (15.16)	63.18 (16.70)	63.54 (17.21)	63.46 (13.51)	F(4)=4.10; p=.004	-	.10	
Outpatient	77.24 (11.04)	71.18 (11.15)	68.90 (13.50)	67.13 (12.45)	67.32 (15.69)	F(4)=4.00; p=.01	-	.15	
Self-oriented perfectionism									
Hospitalization	48.13 (12.53)	46.39 (6.86)	41.39 (1.60)	40.99 (2.48)	41.35 (3.96)	F(4)=2.27; p=.09	-	.14	F(8)=0.16; p=.99
Day care	46.00 (11.37)	43.61 (9.20)	40.18 (11.68)	40.13 (11.70)	40.94 (9.18)	F(4)=5.34; p<.001	-	.13	
Outpatient	49.00 (8.24)	45.76 (7.66)	43.78 (8.04)	43.20 (8.33)	43.38 (10.19)	F(4)=4.63; p=.01	T0>T3*	.13	
Socially prescribed perfectionism									
Hospitalization	30.13 (4.76)	27.83 (3.92)	26.45 (5.77)	26.13 (4.43)	24.94 (5.77)	F(4)=2.44; p=.07	-	.15	F(8)=0.32; p=.96
Day care	25.03 (10.33)	23.06 (9.18)	22.56 (8.05)	23.33 (7.96)	22.36 (6.94)	F(4)=1.19; p=.32	-	.02	
Outpatient	28.24 (6.82)	25.41 (8.59)	25.26 (6.97)	23.76 (6.59)	23.87 (6.08)	F(4)=1.74; p=.15	-	.04	

Table 11 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
OCIR									
Hospitalization	26.63 (15.15)	24.31 (10.68)	13.56 (3.02)	12.89 (4.57)	11.15 (4.80)	F(4)=8.36; p<.001	T1<T4*	.47	F(8)=.64; p=.74
Day care	26.93 (12.06)	25.65 (14.73)	16.19 (9.58)	15.04 (11.51)	13.65 (10.20)	F(4)=19.24; p<.001	T0<T1**; T0<T2***; T0<T3***; T0<T4***; T1<T2*; T1<T3**; T1<T4**	.38	
Outpatient	25.65 (14.73)	21.59 (13.46)	13.84 (8.78)	16.87 (10.28)	13.04 (9.22)	F(4)=9.07; p<.001	T0>T2**; T0>T3*; T0>T4**; T1>T2*	.32	
Washing									
Hospitalization	3.75 (3.96)	1.89 (1.24)	0.85 (0.47)	1.51 (0.92)	1.02 (0.43)	F(4)=3.33; p=.02	-	.22	F(8)=0.59; p=.79
Day care	2.79 (3.24)	1.78 (2.08)	0.96 (1.51)	1.65 (2.47)	1.42 (2.34)	F(4)=4.11; p=.004	T0>T2**	.09	
Outpatient	1.94 (1.92)	1.29 (1.76)	0.87 (1.21)	1.14 (1.16)	0.88 (1.01)	F(4)=2.13; p=.09	-	.06	
Obsessing									
Hospitalization	5.50 (4.72)	5.35 (3.04)	2.84 (0.91)	3.15 (1.13)	2.32 (1.34)	F(4)=3.50; p=.02	-	.23	F(8)=0.95; p=.48
Day care	7.31 (3.85)	5.77 (3.47)	4.05 (3.22)	3.59 (2.49)	3.40 (3.17)	F(4)=15.41; p<.001	T0>T2***; T0>T3***; T0>T4***; T1>T2*; T1>T3**; T1>T4*	.33	
Outpatient	6.29 (3.93)	4.76 (3.13)	3.44 (2.99)	4.43 (3.05)	3.73 (2.86)	F(4)=4,74; p=.002	T0>T2**	.18	
Hoarding									
Hospitalization	6.50 (3.42)	6.20 (3.08)	3.55 (0.99)	2.38 (1.19)	2.23 (1.08)	F(4)=8.43; p<.001	-	.47	F(8)=1.75; p=.09
Day care	4.76 (3.68)	3.44 (3.02)	2.64 (2.47)	2.76 (2.77)	2.52 (2.82)	F(4)=7.06; p<.001	T0>T2*; T0>T3**; T0>T4*	.17	
Outpatient	5.82 (3.09)	4.94 (2.90)	2.98 (2.21)	3.27 (2.20)	2.36 (2.59)	F(4)=8.59; p<.001	T0>T2**; T0>T3*; T0>T4**; T1>T2*	.30	
Ordering									
Hospitalization	6.75 (5.04)	5.18 (3.39)	3.53 (1.40)	3.43 (1.68)	3.64 (1.86)	F(4)=3.09; p=.03	-	.20	F(8)=0.73; p=.66
Day care	6.14 (3.50)	5.18 (2.78)	4.59 (2.99)	3.70 (2.86)	3.94 (2.50)	F(4)=6.24; p<.001	T0>T3*; T0>T4*; T1>T3*	.15	
Outpatient	5.29 (3.80)	4.53 (3.26)	3.52 (2.74)	4.27 (2.95)	3.52 (2.96)	F(4)=1.88; p=.12	-	.05	

Table 11 (continuation)

	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω²	Time x group
Checking									
Hospitalization	2.50 (2.56)	2.20 (1.14)	1.44 (1.04)	1.41 (1.06)	1.15 (0.76)	F(4)=1.87; p=.14	-	.10	F(8)=0.29; p=.97
Day care	3.45 (2.92)	2.83 (2.73)	1.90 (2.27)	1.88 (2.20)	1.52 (1.80)	F(4)=9.16; p<.001	T0>T2**; T0>T3*; T0>T4**	.22	
Outpatient	3.00 (2.37)	2.88 (2.39)	1.30 (1.11)	1.60 (1.27)	0.97 (1.04)	F(4)=5.82; p<.001	-	.22	
Neutralising									
Hospitalization	1.63 (2.33)	2.85 (2.53)	1.63 (1.21)	1.65 (0.86)	0.99 (0.75)	F(4)=1.97; p=.13	-	.11	F(8)=0.35; p=0.95
Day care	2.48 (2.85)	2.61 (2.74)	1.76 (2.09)	1.72 (1.98)	1.19 (1.32)	F(4)=3.88; p=.005	-	.09	
Outpatient	3.29 (3.70)	3.18 (3.80)	2.05 (2.49)	2.14 (2.81)	1.53 (1.77)	F(4)=3.11; p=.02	-	.11	

Acceptability and feasibility of the intervention

Most patients (87.04%, n = 47) completed the MANTRA intervention, accomplishing 72.87% of the tasks between sessions and reading the contents of the workbook on 69.95% of occasions. Seven patients did not complete the intervention: two were transferred for more intensive treatment, and five opted out.

Patients reported high level of satisfaction with MANTRA, feedback on the intervention is presented in Table 12.

Acceptability and feasibility of the ECHO is available in Article 3.

Table 12 | Patient feedback on the MANTRA intervention

	M (SD)	Rng
1. Do you think the sessions have been useful in helping you understand and better address aspects of your eating disorder and related elements?	8.55 (1.41)	4-10
2. Do you think the sessions have helped you to…		
2.1. Better understand the consequences/effects of your eating disorder on your body and brain?	8.66 (1.39)	5-10
2.2. Improve your motivation for recovery?	7.98 (1.64)	2-10
2.3. Gain a better understanding of how your eating disorder developed and why it persists?	8.13 (2.12)	1-10
2.4. Develop a more compassionate attitude towards yourself, take better care of yourself, and be less self-critical?	7.51 (1.74)	1-10
2.5. Understand how different thinking styles affect the way we relate to others and ourselves?	8.49 (1.28)	5-10
2.6. Recognize and manage your emotions better?	7.34 (1.95)	1-10
2.7. Improve your relationships with those around you?	7.47 (1.68)	2-10
2.8. Plan your “transition” from the service that is treating you to home?	8.06 (1.39)	5-10
2.9. Enhance your problem-solving skills for challenges you may face in your recovery process?	8.09 (1.46)	4-10
2.10. Set goals for your recovery?	8.29 (1.75)	2-10
2.11. Gain more skills and tools to cope with your eating disorder?	8.60 (1.25)	5-10
3.To what extent has this program:		
3.1. Been useful in helping you address your eating disorder?	7.81 (1.75)	2-10
3.2. Been satisfactory for you?	8.26 (1.88)	2-10
3.3. Met your expectations?	5.85 (3.06)	1-10
3.4. Would you recommend it to a friend who is experiencing the same problem?	9.06 (1.67)	3-10

Discussion

This study is the first to evaluate the efficacy of integrating the online, individually delivered ECHOMANTRA intervention into standard treatment (TAU) for adolescent ED patients and their carers through an RCT.

Results showed greater improvements in ED symptoms, emotional state, confidence in change, and socially prescribed perfectionism in the ECHOMANTRA+TAU group compared to TAU-only. Both groups improved in BMI, psychosocial impairment, QoL, and obsessiveness. MANTRA+TAU demonstrated larger effect sizes across these outcomes, but no interaction effects were found. These improvements remained stable in the short and medium term.

These findings do not fully support our first hypothesis, which predicted significantly greater improvements across all health outcomes in the experimental group. However, they do confirm our second hypothesis, as the effectiveness of the combined intervention (ECHOMANTRA+ TAU) remained stable in the short and long term.

Our findings differ from previous studies on the ECHOMANTRA intervention in adults with AN. In the original study, Cardi et al. (2024) found no significant differences between ECHOMANTRA+TAU and TAU-alone in the primary outcome (DASS-21 at 12 months) and reported small, non-significant effects in secondary outcomes (BMI, ED psychopathology, Work and social adjustment, Importance and ability to change, and QoL). Similarly, Adamson et al. (2019) observed a large reduction in ED symptoms and depression, but no significant differences compared to a cohort control group. A possible explanation for these discrepancies is the delivery format: both studies, used a self-help program, and patient or patient-carer joint group sessions (Cardi et al., 2024) or as a structured intervention that included self-help sessions and guided practice meals (Adamson et al., 2019). This may have contributed to the low adherence rates reported (20% in Cardi et al., 2024; 16% at discharge in Adamson et al., 2019). In contrast, our study implemented a personality approach, with individual online sessions, likely improving engagement and adherence. Additionally, while our study included adolescents with various EDs, previous studies focused on adults with AN, a population typically associated with greater illness severity and chronicity. This could explain the limited effects seen in those studies compared to our significant improvements.

This study also aimed to assess the efficacy of MANTRA+TAU across different diagnostic groups and levels of care. Our findings indicate that while all groups showed improvements, the magnitude of change varied depending on the diagnosis and care setting.

Regarding comparisons by diagnosis, results showed that MANTRA+TAU led to improvements across most outcome measures, with patients diagnosed with BN showing less pronounced improvements compared to AN and OSFED. This may be due to the small BN sample size and, maybe, specific clinical characteristics of BN, such as increased impulsivity or emotional dysregulation due to lower cognitive control, which could impact treatment response, as stated in previous studies (Testa et al., 2022). The only significant time × group interaction was in the Neutralizing subscale of the OCIR, where only AN patients showed significant improvement. MANTRA specifically targets cognitive factors that contribute to the maintenance of the disorder, emphasizing thinking styles and incorporating behavioral exercises to enhance set-shifting abilities, which have been identified as a core feature of AN (Schmidt et al., 2023). Therefore, this result aligns with findings from the scientific literature and may suggest that specific cognitive and behavioral components of AN, such as rigid thinking, overcontrol, and compulsive behaviors, are particularly responsive to the intervention (Krug et al., 2024). Nonetheless, these findings should be interpreted cautiously due to small sample sizes in some subgroups, which may limit the reliability and generalizability of the results.

Regarding the level of care, MANTRA + TAU led to improvements across most variables, though patterns differed by care setting. Hospitalized patients did not improve in Confidence in the Ability to Change or in certain obsessive-compulsive behaviors (Checking and Neutralizing), whereas outpatients did not improve in Washing and Ordering behaviors. Day care patients showed the greatest improvement in the Restraint subscale of the EDEQ, likely due to their less severe conditions and the structured yet flexible care environment. Overall, the efficacy of MANTRA+TAU varied by diagnosis and treatment setting, indicating the need for tailored support.

Carers in the ECHOMANTRA group showed greater improvements in expressed emotion, psychological well-being, and reduced illness accommodation and burden, compared to the TAU group. The ECHO+TAU group also demonstrated improvements in caregiving skills (CASK), whereas the TAU group only improved in the Self-care factor, with a greater effect size observed in the ECHO+TAU group. For the remaining factors, significant improvements were found exclusively in the ECHO+TAU group. Notably, for the Bigger Picture and Emotional Intelligence factors, medium to large effect sizes emerged after six months of follow-up, suggesting that these changes occurred once carers had fully integrated the program's content. Overall, these findings align with ECHO's goals of reducing dysfunctional emotional responses and improving caregiving (Treasure et al., 2020). These results confirm our third and fourth hypotheses, in which we expected carers in the experimental group to show a better emotional state, lower symptom accommodation, reduced expressed emotion and symptom impact, and greater caregiving skills compared to family members in the control group.

Compared to previous studies on the implementation of the ECHOMANTRA program in carers of adult patients with AN, our findings show greater improvements in carers. The study by Cardi et al. (2024) found no differences between groups, and Adamson et al. (2019) reported moderate improvements in caregiver burden and a slight increase in skills. As said before, these discrepancies may be attributed to methodological differences in intervention delivery. This may suggest that the individual and online format of ECHO used in this study, unlike the self-help and group-based applications previously reported in the scientific literature, contributed to these improvements in carers too. Additionally, the shorter illness duration in adolescent patients may have contributed to lower caregiver burden compared to carers of adults with AN. Over time, long-term caregiving can lead to greater emotional exhaustion and reduced responsiveness to interventions, which may partly explain the differences in outcomes between our study and those involving adult patients.

Regarding adherence to the program, 87.04% of patients and 81.48% of carers completed all eight sessions. Patients completed 72.87% of tasks and read workbook materials 69.95% of the time, while carers read the book over >75% of the time but completed only 43.97% of homework. These completion rates suggest that ECHOMANTRA is both viable and feasible for adolescents with EDs and their carers, with higher adherence compared to previous studies, where Cardi et al. (2024) found only 20% attendance, and Adamson et al. (2019) reported a 16% dropout rate, with 42% of patients and 48% of carers failing to complete their three-month follow-up assessment.

A key difference between these studies and ours lies in the format of intervention delivery. In both previous studies, sessions were conducted in a group format and centered on self-help materials. In contrast, our study implemented individually delivered online sessions, with each participant receiving a printed workbook, likely improving engagement and adherence

When comparing adherence rates, the original study authors noted that "it was not possible to access data on the usage of other components of the intervention (i.e., written psychoeducational materials and video clips), although qualitative findings suggested they were widely used" (Clark Bryan et al., 2024). The differences in adherence between the two studies may be attributed to the delivery format.

The original study found that patients with AN often found online group settings overwhelming and emotionally exhausting, Some also reported experiencing a sense of competition among participants. The study further emphasized the need for a more personalized approach (Clark Bryan et al., 2024). Our study addressed this by incorporating these recommendations, improving adherence while maintaining the content and protocol of both MANTRA and ECHO.

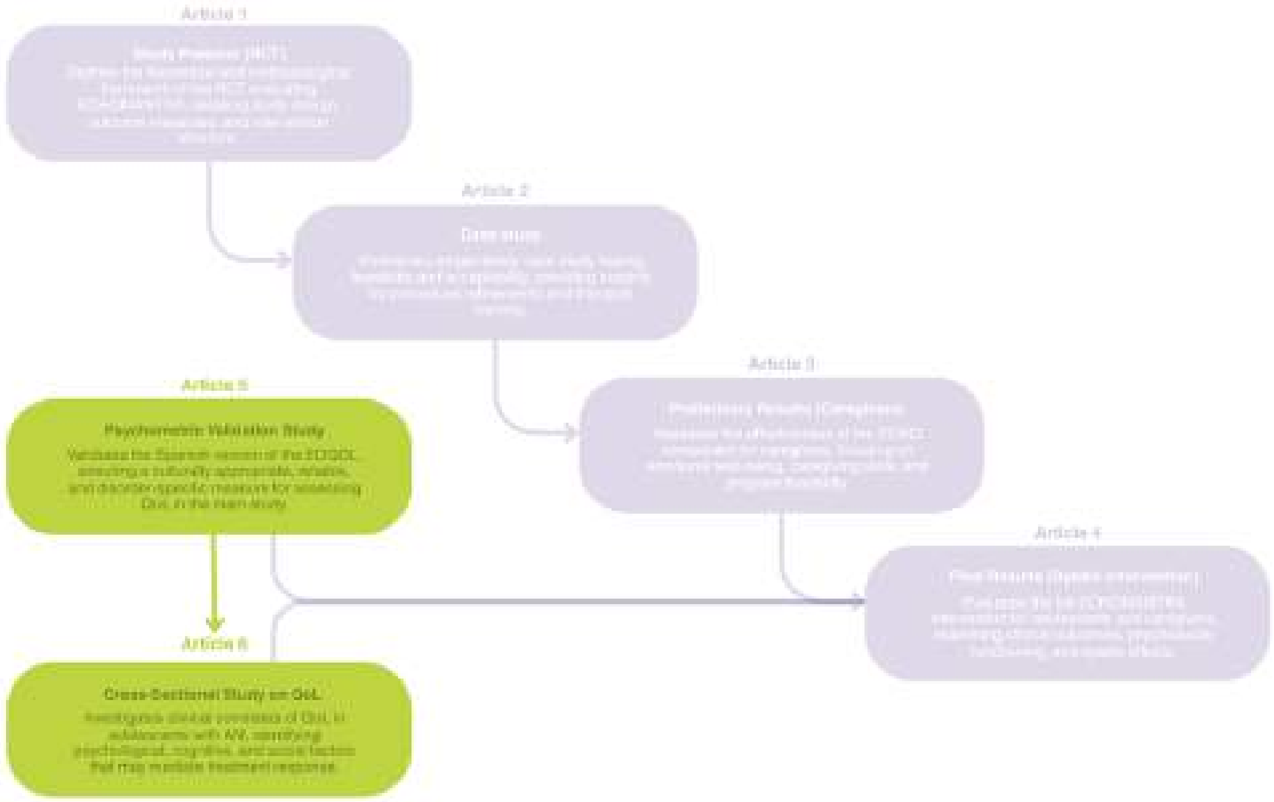
These findings highlight the effectiveness of the ECHOMANTRA program in enhancing treatment outcomes for adolescents with EDs. The significant improvements observed in ED symptoms, emotional well-being, confidence in change, and socially prescribed perfectionism suggest that ECHOMANTRA provides valuable therapeutic benefits beyond standard treatment. Furthermore, the program has proven effective across all ED diagnoses and in various treatment settings, demonstrating its versatility. Integrating it into routine care could enhance the overall effectiveness of interventions for these patients by offering a structured and supportive approach that fosters recovery. Given these promising results, incorporating ECHOMANTRA alongside TAU may be a useful strategy to optimize treatment outcomes, equipping adolescents with additional tools to manage their symptoms and sustain long-term improvements. Regarding carers, the results suggest that adding ECHO not only improves expressed emotion, psychological well-being, and reduces illness accommodation and burden, but also enhances outcomes by reducing guilt, depressive symptoms, avoidance, and family control, while equipping carers with the skills necessary to support their loved one's recovery. In conclusion, ECHOMANTRA, when added to TAU, is an adaptable, scalable, patient-centered approach that increases the reach of personalized care in ED treatment, fostering long-term recovery. Integrating online individual sessions increases the reach of this intervention and facilitates the integration of personalized models of care across service pathways (Reay et al., 2022).

The strengths of this study lie in its use of a randomized controlled trial design and the implementation of a protocolized therapist guidance system, ensuring intervention fidelity. The online format increased accessibility, promoting patient and carer engagement in daily therapeutic practices, thereby promoting greater engagement in treatment.

This study has some limitations. At the 12-mont follow-up, the dropout rate was 55.5% for the patient sample. Unfortunately, this is a prevalent issue in treatment studies involving ED (Giel et al., 2021). These findings largely align with those from the original TRIANGLE trial (Cardi et al., 2024), and emphasize the importance of considering strategies to strengthen uptake, adherence, and retention in ED treatment trials. Additionally, requiring a carer may have excluded some participants, and the predominance of mothers in the sample could bias family feedback. The dyadic nature of the intervention also adds complexity to adherence and retention rates, as participation depends on both the patient and the caregiver consistently attending sessions. Generalizability is limited, as findings may not fully apply to patients who lack a caregiver or whose carers are unable to participate actively in treatment. Moreover, it should be noted that the sample consisted exclusively of female patients. Therefore, it would be of interest for future studies to include the male population. Another limitation is that most outcomes were assessed using self-reported questionnaires. Furthermore, the representativeness of the sample is limited, since most patients had a diagnosis of AN and 53% were receiving treatment in a day-care setting.

Future research should refine the intervention to improve adherence and effectiveness across diverse clinical settings. Strategies to enhance retention, like digital reminders or motivational interventions, could reduce drop-out rates and improve long-term follow-up. Additionally, studying variables such as cost-effectiveness, readmission, and admission time would be valuable.

Foundational articles



Introductory Note

In addition to the main clinical trial, this thesis includes two foundational studies designed to broaden and strengthen the research framework. Both studies drew on participants from the main clinical sample, allowing for a more comprehensive interpretation of the results and a deeper understanding of the impact of EDs in adolescence. One study focused on the psychometric validation of a quality-of-life instrument (EDQOL) in a Spanish-speaking population, ensuring a culturally adapted, disorder-specific patient-reported outcome measure for the RCT. The other examined clinical factors associated with QoL in adolescents with AN, an essential yet underexplored dimension in the literature, thereby informing both the interpretation of intervention effects and the selection of mechanisms to target, such as cognitive and psychosocial functioning.

8.1. Article 5

Validation of the Spanish version of the Eating Disorders Quality of Life instrument (EDQOL).

Method

Participants

The sample consisted of 141 female participants from a clinical sample. The mean age was 18.06 (SD = 6.31, range 12–47). 56% (n = 79) of them met diagnostic criteria for AN-R, 7.1% (n = 10) for AN-P, 11.3% (n = 16) for BN, 5% (n = 7) for BED and 20.6% (n = 29) for OSFED. The mean age of onset was 14.65 (SD = 2.93) and mean time of evolution was 44.42 (SD = 69.83) months. Their mean BMI was 19.73 (SD = 5.28). Regarding level of treatment, 36.9% (n = 52) of them received treatment in an ED specialized outpatient setting, 53.2% (n = 75) on a hospital-day and 9.9% (n = 14) in an inpatient unit. Regarding the level of education, 1.4% (n = 2) of them completed primary education, 72.4% (n = 102) secondary education, 11.3% (n = 16) superior education cycle and 14.9% (n = 21) university degrees.

Procedure

The sample was collected in five different Spanish centers specialized in the treatment of ED. Once their informed consent was given, the participants completed the self-administered paper-and-pencil questionnaire. Afterwards, the therapists who attended the case provided the corresponding clinical data. No compensation of any kind was offered. To evaluate the sensivity to change of this questionnaire, we re-administered this scale another two months later following the completion of the skills-based intervention.

Part of the data was collected as part of the baseline assessment of research that evaluated a skills-based intervention for patients with an ED (Trial Identifier: ISRCTN43554732). The Ethics and Research Integrity Committee of the university, as well as the hospitals where ED specialized units participated approved the conduct of this study.

Adaptation and cultural validation

The questionnaire's translation and adaptation procedure took place using the guidelines for instrument translation across countries proposed by López-Roig & Pastor (2016): 1. Translation. Two bilingual people (residents in Spain whose native language was English) were first instructed about the study's conceptual framework, and then they translated two versions into Spanish independently. This created the first Spanish version. 2. Back translation. The resulting version was translated back to English by two separate bilingual individuals who had not previously been informed about the objectives of the construct to be measured. The outcome was a version which is practically equal to the original. 3. Expert review. A team composed by members of the investigative group (two experts in EDs and one statistician) reviewed all versions and evaluated comprehension, as well as the semantic, linguistic, and conceptual equivalency. So after modifying and adjusting the instructions, and some items, a consensus was reached. 4. Pilot program. In order to evaluate the comprehension, reliability, and acceptance of both the items and the response scale, the questionnaire was administered to a pilot sample of 10 patients. The pilot sample was also interviewed, and opinions concerning different aspects related to understanding the instructions, the wording of the items, and so on were given. This resulted in some modifications being made to the Spanish version of the instrument.

Instruments

Sociodemographic and clinical items. Age and educational level are reported by the patients. Clinical variables were completed by the therapist attending the case: diagnosis (according to the diagnostic criteria of the DSM-5), age of onset, time of evolution of the ED, treatment and BMI.

Eating disorders quality of life (EDQOL) (Engel et al., 2006).

Eating disorder examination questionnaire (EDEQ) (Fairburn et al., 1994; Peláez-Fernández et al., 2021).

Depression, anxiety and stress scales (DASS-21) (Lovibond et al., 1995; Badós et al., 2005)

Clinical impairment assessment (CIA 3.0) (Bohn et al. 2008; Martín et al., 2015)

Health survey (SF-12) (Ware et al., 1996; Vilagut et al., 2008)

For further details about the instruments, refer to Table 2.

Data analysis

The statistical computing R environment 4.2.1 was used for the data analyses. The lavaan package (Rosseel et al., 2012) was used to conduct a Confirmatory Factor Analysis (CFA). The method of parameter estimation was MLR (maximum likelihood estimation with robust standard errors). According to Rhemtulla, Brosseau-Liard, and Savalei (Rhemtulla et al., 2012) the maximum likelihood method is suitable for variables with 5 or more categories and the sample size is small. The indices used for testing the model fit were the chi-square test, the comparative fit index (CFI > 0.90 indicates acceptable fit, > 0.95, good fit), the Tucker- Lewis index (TLI > 0.90 indicates acceptable fit, > 0.95, good fit), the root mean square error of approximation (RMSEA < 0.06), and the standardized root mean-square residual (SRMR < 0.08), following Hu & Bentler (1999) criteria. These criteria, however, should be used with caution as the sample size is lower than N = 250, and maximum likelihood estimations tend to yield lower results in the CFI and TLI (Hu et al., 1999). Particular attention was paid to the SRMR as it is a robust indicator regardless of the method of estimation (Shi & Maydeu-Olivares, 2020). In addition, the Akaike Information Criterion (AIC) was used to compare the fit of the models.

The psych package for R (Revelle, 2020) was used to obtain the descriptive analyses, internal consistency (Cronbach's α and McDonald's ω coefficients), Pearson's correlations, and Student's t-test for paired samples.

Results

Factor structure

The CFA was carried out through the MLR estimation. Replicating the original study, a four-factor solution was tested, and 9 items were assigned to the psychological factor, 6 to physical/cognitive, 5 to economic, and 5 to work/school. Part of the results showed an acceptable fit of the model, according to the cutoff values proposed by Hu et al., (1999) [$\chi 2(269) = 440.09$, $p < 0.001$; RMSEA = 0.07 (90% CI 0.06 ~ 0.08); SRMR = 0.07; CFI = 0.90]. One of the indices did not show an adequate fit (TLI = 0.88). The factors were correlated with each other.

An additional one-factor model was tested in order to compare the fit between the original and the single-factor model. In this case, the results showed that the fit of the one-factor model was not adequate ($\chi 2(275) = 889.00$, $p < 0.001$; RMSEA = 0.13 (90% CI 0.12 ~ 0.14); SRMR = 0.12; CFI = 0.61; TLI = 0.58). When AIC indexes were compared, the four-factor model was a more parsimonious solution (AIC = 9390.03) than the one-factor model (AIC = 10,140.48). Therefore, the original model was deemed the most appropriate. Parameter estimates of the four-factor model are presented in Table 13.

Table 13 | Descriptive statistics of the Items, item-factor correlations, CFA parameter estimates, and internal consistency

	M (SD)	Item-factor r	CFA parameter estimators	α	ω
Psychological				0.91	0.91
I1	3.64 (1.11)	0.66	0.69		
I2	4.04 (1.02)	0.70	0.73		
I3	3.17 (1.19)	0.72	0.76		
I4	3.55 (1.17)	0.66	0.70		
I5	3.31 (1.34)	0.71	0.76		
I6	3.56 (1.23)	0.73	0.78		
I7	3.60 (1.23)	0.63	0.67		
I8	3.29 (1.22)	0.73	0.76		
I9	3.13 (1.39)	0.60	0.64		
Physical/Congnitive				0.85	0.86
I10	3.38 (1.41)	0.51	0.44		
I11	2.89 (1.32)	0.59	0.60		
I12	3.27 (1.27)	0.63	0.63		
I13	3.43 (1.21)	0.73	0.90		
I14	2.63 (1.35)	0.67	0.75		
I15	3.29 (1.25)	0.69	0.86		
Financial				0.79	0.83
I16	1.65 (1.12)	0.44	0.49		
I17	1.29 (0.82)	0.62	0.69		
I18	1.12 (0.51)	0.60	0.67		
I19	1.44 (0.96)	0.66	0.80		
I20	1.28 (0.77)	0.69	0.82		
Work/Academic				0.78	0.80
I21	2.53 (1.57)	0.59	0.62		
I22	2.19 (1.25)	0.55	0.69		
I23	2.12 (1.44)	0.53	0.59		
I24	1.86 (1.47)	0.54	0.56		
I25	2.66 (1.34)	0.68	0.83		

Reliability

Reliability coefficients for each of the factors are shown in Table 13. The global scale showed adequate internal consistency (α = 0.91; ω = 0.91).

Construct validity

Eating pathology, emotional distress, psychosocial impairment, and QoL measures were selected to examine its relations with ED related QoL. The descriptive analyses of the selected variables, as well as the Pearson's correlations with the EDQOL factors are shown in Table 14. Psychological and physical/cognitive factors correlated with all the variables. The financial factor correlated with all the variables except for the restraint scale of the EDEQ and the social impairment scale of the CIA 3.0. The work/academic factor correlated with all the variables except for the anxiety scale of the DASS-21.

Table 14 | Descriptive analysis and correlations between EDQOL and other variables

	M (DT)	Range	Psychological	Physical/Cognitive	Financial	Work/Academy
EDQOL	2.56 (0.67)	1–5	0.79**	0.83**	0.56**	0.73**
Psychological	3.48 (0.92)	1–5		0.65**	0.28**	0.34**
Physical/cognitive	3.15 (0.99)	1–5	0.65**		0.31**	0.41**
Financial	1.36 (0.63)	1–5	0.28**	0.30**		0.28**
Work/academic	2.27 (1.05)	1–5	0.34**	0.41**	0.28**	
EDEQ	3.91 (1.36)	0–24	0.69**	0.57**	0.15	0.33**
Restraint	3.46 (1.79)	0–6	0.52**	0.52**	0.06	0.23**
Eating concern	3.31 (1.33)	0–6	0.64**	0.54**	0.17	0.35**
Shape concern	4.72 (1.41)	0–6	0.67**	0.49**	0.17*	0.31**
Weight concern	4.17 (1.52)	0–6	0.67**	0.49**	0.19*	0.29**
DASS-21	33.31 (14.08)	0–63	0.64**	0.54**	0.25**	0.26**
Depression	12.55 (6.14)	0–21	0.63**	0.48**	0.20*	0.30**
Anxiety	8.59 (5.10)	0–21	0.53**	0.49**	0.23**	0.14
Stress	12.16 (4.83)	0–21	0.52**	0.46**	0.23**	0.22**
CIA3.0	28.29 (11.40)	0–48	0.75**	0.67**	0.25**	0.47**
Personal impairment	12.96 (4.63)	0–18	0.73**	0.52**	0.28**	0.28**
Social impairment	8.13 (4.50)	0–15	0.64**	0.60**	0.14	0.44**
Cognitive impairment	7.19 (3.86)	0–15	0.58**	0.65**	0.24**	0.55**
SF12—Physical health	13.27 (3.19)	6–20	− 0.40**	− 0.43**	− 0.21*	− 0.39**
SF12— Mental health	13.92 (3.94)	6–27	− 0.64**	− 0.51**	− 0.22*	− 0.31**

Responsiveness to change

Fifty-four cases participated in a specialized ED intervention for two months and were assessed twice over time. Analyses of group means at Time 1 (T1) and Time 2 (T2) and responsiveness to change are shown in Table 15. The psychological and physical/cognitive scales and the EDQOL global scale were responsive to change. Their mean values were significantly reduced at T2 and showed a moderate responsiveness ranging from − 0.39 to − 0.59.

Table 15 | EDQOL responsiveness of group means to change.

	T1 (N=47) M (SD)	T2 (N=47) M (SD)	t	p	d
EDQOL Global score	2.49 (0.62)	2.28 (0.66)	2.93	0.01	-0.39
Psychological	3.41 (1.00)	3.04 (1.03)	3.53	<0.01	-0.46
Physical/cognitive	2.96 (0.97)	2.46 (1.00)	4.47	<0.01	-0.59
Financial	1.24 (0.55)	1.27 (0.36)	-0.31	0.76	0.04
Work/academic	2.32 (0.90)	2.35 (1.12)	-0.20	0.84	0.03

EDQOL Eating Disorders Quality of Life, SRM Standardized response means

Discussion

The main aim of the present study was to analyze the psychometric properties of the Spanish version of the EDQOL in a sample of ED patients. Results obtained with the CFA analysis with the original four-factor model showed acceptable indices (except for the TLI), and superior to the one-factor model. Therefore, it was decided to keep the original four factors with all the items, as the saturations in all cases were adequate. Moreover, results at the level of internal consistency and construct validity were also satisfactory. As expected, the Spanish version of the EDQOL showed relationships with almost all the measures of eating pathology, emotional distress and psychosocial deterioration in the sense that the greater the eating symptoms, emotional distress and psychosocial deterioration, the worse the QoL. This result has been found in previous studies using other versions of EDQOL (Engel et al., 2006; Meneguzzo et al., 2021; Tagay et al., 2011; Yoneda et al., 2020). Specifically, our results posit that the psychological and physical/cognitive factors of the EDQOL scale were associated with all the variables. The financial EDQOL factor was related to all the ED symptomatology variables, apart from the EDEQ restriction scale and the CIA 3.0 social deterioration scale. Finally, the work/academic factor showed relationships with all the measured variables, except with the DASS-21 anxiety scale. The fact that the financial factor has a lower association when compared with the other measures could be due to the fact that the patients have an average age of 18 years old and are not able to have their own financial resources as they are not working. Furthermore, most of these patients were treated for ED in specialized public health centers.

Validation of the instrument in a Japanese sample has shown how the EDQOL subscales and the global QoL score of patients with EDs correlate with most of the EAT-26 and EDI-2 subscales while they have not been found significant correlations between body dissatisfaction and the "physical/cognitive" and "work/school" subscales of the EDQOL (Yoneda et al., 2020). The study by Mitchison et al. (2013) found that all the EDQOL subscales, with the exception of financial, were significantly correlated with the symptomatology of the disorder assessed with the EDE. However, in our study, the economic factor is only related to two of the EDEQ symptom factors, specifically shape concern and weight concern. On the other hand, the trend of the EDQOL correlations with the SF-12 questionnaire carried out with a Spanish sample are similar to those found with a German sample and with the Italian version. Thus, the mental health factor of the SF-12 finds its highest degree of relationship with the psychological subscale of the EDQOL, followed by the physical subscale. As expected, in our study, the correlations with the greatest associations of the EDQOL with eating symptoms occurred with the psychological factor followed by the physical-cognitive factor. These results are also observed in similar studies that have evaluated eating symptoms with other instruments such as the EAT-26 and EDI (Tagay et al., 2011; Yoneda et al., 2020), which have found significant relationships among all factors (Meneguzzo et al., 2021).

On the other hand, the means obtained in our study show a medium level of QoL(2.56 out of 5 in the overall score), with the psychological area presenting the worst level, followed by physical/cognitive and with the financial area as the best QoL. This trend is also observed in other studies (Engel et al. 2006) and in the German and Japanese versions of the EDQOL (Meneguzzo et al., 2021; Tagay et al., 2011). Regarding the responsiveness to change of the EDQOL, the results showed that the psychological, physical/cognitive scales, and the global EDQOL scales were sensitive to change when a second measurement was made after a skill-based intervention. This data would mean that these dimensions, precisely those in which there has been the greatest interference, would be useful as measures to assess the state of patients during treatment. However, other studies have found that the work/academic factor worked as a predictor at 6 and 12 months of follow-up after treatment, so this scale should be taken into account for possible changes (Mitchison et al., 2013).

QOL is a very relevant concept in the treatment of chronic diseases and its evaluation requires specific health-related questionnaires. This validation fills an important gap in the field of ED in Spain. This questionnaire may be preferred by clinicians and researchers interested in ED-specific HRQoL impairment and as an additional indicator of ED severity (Mitchison et al., 2013). Therefore, it could be a useful instrument that allows patients to benefit from interventions directed at the areas most affected by ED.

Regarding its limitations, we must point out several relevant issues of this validation. First of all, we must highlight that, although the sample size is adequate, a limitation of this study is the small sample used to carry out a CFA of 33 items. Although the sample includes diagnoses of AN-P, AN-R, BED, and OSFED, at least half of the sample corresponds to patients with a diagnosis of AN-R, which must be taken into account when interpreting the results. Therefore, more research is needed with the Spanish version in a larger sample and including a similar percentage of ED diagnoses.

Another limitation is regarding generalization to males. Although the prevalence of ED in females is higher than in males, it is important to include men in validation samples instruments in order to detect possible differences. Therefore, generalization of items to males should be used with caution. Something similar occurs with age, as the mean age of the patients was in their late teens. As the literature shows, it is to be expected that the impact on QoL may vary with age and with the number of years of disease progression. This will have to be taken into account when applying this instrument to the adult population.

In relation to future psychometric analyses, it would be convenient to study temporal stability and measurement invariance (e.g., gender and diagnostic). Longitudinal studies should also be carried out in order to explore patient and treatment factors that may affect QoL. This will allow for the development of specific interventions that target on these factors.

Finally, the information concerning a clinical sample of Spanish girls may not be generalizable to other Hispanic clinical samples, and further research is required to validate the factor structure in more diverse Hispanic groups. However, to our knowledge, this is the first study to assess the latent structure of the EDQOL among ED patients in a Hispanic population. Most research on ED has been conducted in populations from Western English- speaking countries (Smink et al.. 2012). Therefore, this study contributes to the development of cross-cultural research among Hispanics, in order to increase the understanding of ED among patients from understudied populations.

Conclusions

The Spanish version of the EDQOL is an inexpensive, valid, and reliable instrument that assesses health-related QoL specific to patients with EDs and is recommended for use both in research and clinical settings. Our study provides a useful tool to assess QOL among Spanish ED patients. Our Spanish version of the scale adds to the multitude of translated versions of this scale, allowing for cross-cultural comparisons of QOL among these patients.

8.2. Article 6

Quality of Life and Clinical Impairment in Spanish Adolescent Anorexia Nervosa Patients.

Method

Participants

86 female adolescents diagnosed with AN were recruited between March 2021 and May 2023 from six different specialist outpatient, daycare, and inpatient ED settings in Comunidad Valenciana and Murcia (Spain). The research assistant at each center conducted a semi-structured interview to evaluate participants and confirm fulfillment of the following inclusion criteria: (1) aged between 11 and 19; (2) AN diagnosis according to the DSM-5 criteria (American Psychiatric Association, 2013); (3) no psychiatric comorbidity; and (4) receiving treatment for AN at a specialist outpatient/day-patient/inpatient ED unit.

Instruments

An ad hoc sociodemographic questionnaire was used to assess age and educational level.

An ad hoc clinical variables questionnaire was submitted by the health care providers at the unit of reference. It assessed diagnosis (according to DSM-5 criteria), weight, BMI, and AN time-course.

The Eating Disorder Examination Questionnaire (EDEQ) (Fairburn, 1994; Peláez-Fernández et al., 2012).

Clinical Impairment Assessment (CIA 3.0) (Bohn et al., 2008; Martin et al., 2015). Despite being originally designed for adult populations, CIA has been previously administered in adolescent and young adult populations (Calugi et al., 2018; He et al., 2022; Reas et al., 2010). In this study, it was shown to have satisfactory internal consistency with the subscales ($\alpha = 0.93$, $\alpha = 0.88$, and $\alpha = 0.83$, respectively) as well as with the overall scale ($\alpha = 0.94$).

Eating Disorders Quality of Life (EDQOL) (Engel et al., 2006; Quiles et al., 2023).

Health Survey (SF-12) (Ware et al., 1996; Vilagut et al., 3008).

For further details about the instruments, refer to Table 2.

Procedure

The data were gathered during the initial evaluation phase of a research study that examined the effectiveness of a skills-based intervention for patients diagnosed with an ED. The study received approval from both the Ethics and Research Integrity Committee of the University Miguel Hernández of Elche and the participating ED specialized units (Trial Identifier: ISRCTN43554732).

After confirmation for eligibility to participate, the research assistant at each center obtained participants' and carers' informed consent. Subsequently, patients filled out a self-administered paper-and-pencil questionnaire; the healthcare providers responsible for each case submitted the patients' clinical data.

Data analyses

Descriptive analyses (means, standard deviations, and percentages) were used to explore the data. In addition, normality assumptions were assessed. This revealed that the sample was not normally distributed; therefore, non-parametric tests were used to analyze differences and correlations. Wilcoxon and Kruskal–Wallis tests analyzed the differences between AN subtypes, time-course, and QoL. Spearman's bivariate correlation coefficient was employed to analyze the associations between the study variables. Regression analyses were performed to assess QoL predictors, using the EDEQ and CIA dimensions as independent variables and the EDQOL and SF-12 scores as dependent variables. The SPSS (Statistical Package for the Social Sciences, Version 28) was used for statistical analysis.

Results

The sample consisted of 86 female adolescents diagnosed with AN (75 restrictive and 11 purgative). Sociodemographic and clinical descriptive data of the participants are shown in Table 16.

Table 16 | Sociodemographic and clinical descriptive data.

	M	DE	Range	N	%
Age	14.86	1–60	11–19		
Pre-adolescents (11-12 y.o.)				5	5.9
Early adolescents (13-15 y.o.)				52	60.5
Mid adolescents (16-17 y.o.)				26	30.2
Late adolescents (18-19 y.o.)				3	3.5
Education					
Primary school				2	2.3
Secondary school				60	69.8
High school				16	18.6
University				5	5.8
Vocational training				2	2.3
Others				1	1.2
Weight (kg)	41.03	6.92	27–62.4		
BMI	15.93	2.11	11.8–22.30		
AN time-course	20.93	20.83	4–144		
Level of care					
Outpatient setting				24	27.9
Day-patient setting				44	51.2
Inpatient setting				18	20.9

Table 17 presents a comprehensive description of the variables investigated, with their mean values, standard deviations, and the range of minimum and maximum scores observed. First, the studied time period was grouped into the following ranges: less than one year; between 1 and 2 years; between 3 and 4 years; and more than 4 years. A Kruskal–Wallis test was performed, showing no significant differences in any of the variables after the data were divided into the previously mentioned timeframes.

A non-parametric Wilcoxon test was carried out to assess differences between AN subtypes and QoL. Two significant differences were found between the variables: adolescents with purgative AN had worse mental health (W = 219.50, p = 0.021) and scored higher in the psychological EDQOL dimension (W = 214.50, p = 0.021) than adolescents with restrictive AN.

Table 17 | Descriptive data of variables

Variables	M	SD	Min.-Max.
EDEQ Restriction	3.44	1.77	0-6
EDEQ Eating concern	3.26	1.36	0-6
EDEQ Shape concern	4.79	1.36	0-6
EDEQ Weight concern	4.11	1.50	0-6
CIA-Personal	12.13	5.01	1-18
CIA-Social	8.60	4.44	0-15
CIA-Cognitive	6.98	3.89	0-15
EDQOL Psychological	3.48	1.15	1-8.5
EDQOL Physical/cognitive	3.10	1.03	1-5
EDQOL Financial	1.14	0.37	1-3.6
EDQOL Work/school	2.46	0.96	1-4.8
SF-12 Physical	12.92	3.10	5-19
SF-12 Mental	14.20	4.11	6-26

Notes: M = Mean; SD = standard deviation; Min = minimum; Max = maximum; EDEQ (Eating Disorders Examination Questionnaire); CIA (Clinical Impairment Assessment); EDQOL (Eating Disorder-Specific Health-Related Quality of Life instrument); SF-12 (Short Form-12 Item Health Survey)

Spearman's correlation analyses were conducted to study the relationship between all the variables (Table 18). Timeframe, age, weight, and BMI did not show significant correlations with any study variables. All dimensions of the EDEQ and CIA showed significant relationships with the QoL variables, all scoring above 0.40 except for the EDQOL Work/School and the SF-12 Physical Health dimensions, which were below 0.40. The Psychological dimension of the EDQOL showed the highest correlations with the EDEQ Eating ($r = 0.75$, $p < 0.01$) and Shape ($r = 0.75$, $p < 0.01$) Concern dimensions, and with the CIA Personal Impairment dimension ($r = 0.79$, $p < 0.01$).

To clarify the factors influencing QoL, we conducted a regression analysis, as shown in Table 19. This analysis utilized independent variables from two sources. The Eating Disorders Exploration Questionnaire (EDEQ) covered the following four dimensions: restraint; eating behaviors; weight concern; and body shape concern. The Clinical Assessment of Impairment (CIA) evaluated the following three dimensions: personal; social; and cognitive impairments. The dependent variables were selected from the Eating Disorders Quality of Life (EDQOL) instrument, which comprises the following four dimensions: psychological; physical/cognitive; economic; and work/school. Two dimensions of the SF- 12 health survey, physical and mental health, were also included. No problems of multicollinearity, characterized by high intercorrelations among variables, were identified within any of the regression models.

Concerning the four EDQOL dimensions, higher scores on EDEQ Eating Concern and the CIA Personal Impairment dimensions were related to worse scores on the EDQOL Psychological dimension, explaining 61% of its variance. Two CIA dimensions (Cognitive and Social Impairment) were entered into the model for the EDQOL Physical/Cognitive dimension. These dimensions were found to be predictors of a lower EDQOL Physical/ Cognitive score, accounting for 71% of the variance observed in this measure. The EDEQ Eating Concern and the CIA Cognitive and Personal Impairment dimensions explained 32% of the EDQOL Work/School dimension's variance: higher Cognitive Impairment scores were related to worse Work/School dimension scores. Eating Concern and Personal Impairment were also negatively related to this EDQOL dimension. No predictors were observed for the EDQOL Financial dimension.

Regarding the SF-12 QoL questionnaire, higher scores on the EDEQOL Restraint and the CIA Cognitive Impairment dimensions were related to worse SF-12 Physical Health scores, explaining 31% of its variance. Concerning the SF-12 Mental Health dimension, two CIA dimensions (Social and Cognitive Impairment) were found to have a negative correlation, which explained 61% of the variance in the SF-12 Mental Health dimension.

Table 19 | Determinants of Health-Related Quality of Life.

Variables Dependientes / Predictores	R^2ajust	F	β
EDQOL Psychological	0.611	19.846 ***	
EDEQ Eating concern			0.276 *
CIA Personal			0.412 **
EDQOL Physical/Cognitive	0.707	30.290 ***	
CIA Social			0.290 **
CIA Cognitive			0.547 ***
EDQOL Work/school	0.317	6.648 ***	
EDEQ Eating concern			–0.439 **
CIA Cognitive			0.532 ***
CIA Personal			–0.394 *
SF-12 Physical	0.314	6.545 ***	
EDEQ Restriction			–0.385 **
CIA Cognitive			–0.466 ***
SF-12 Mental	0.613	20.254 ***	
CIA social			–0.299 *
CIA cognitive			–0.295 **

Notes: *p < 0.05; **p < 0.01; ***p < 0.001. EDE-Q (Eating Disorders Examination Questionnaire); CIA (Clinical Impairment Assessment); (EDQOL (Eating-Disorder Specific Health-Related Quality of Life instrument); SF-12 (Short Form-12 Item Health Survey).

Table 18 | Spearman's correlations between EDs attitudes, clinical impairment, and health-related quality of life.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. EDEQ Restriction	1												
2. EDEQ Eating concern	0.67**	1											
3. EDEQ Shape concern	0.67**	0.78**	1										
4. EDEQ Weight concern	0.63**	0.74**	0.85**	1									
5. CIA-Personal	0.59**	0.66**	0.80**	0.71**	1								
6. CIA-Social	0.62**	0.62**	0.65**	0.63**	0.75**	1							
7. CIA-Cognitive	0.45**	0.61**	0.61**	0.54**	0.67**	0.67**	1						
8. EDQOL Psychological	0.59**	0.59**	0.75**	0.68**	0.79**	0.71**	0.69**	1					
9. EDQOL Physical/cognitive	0.51**	0.62**	0.63**	0.55**	0.63**	0.71**	0.82**	0.71**	1				
10. EDQOL Financial	−0.11	−0.06	0.10	0.04	0.09	−0.01	0.04**	0.10	0.10	1			
11. EDQOL Work/school	0.29**	0.29**	0.29**	0.40**	0.29**	0.45**	0.53**	0.41**	0.43**	−0.09	1		
12. SF-12 Physical	−0.48**	−0.37**	−0.39**	−0.32**	−0.39**	−0.42**	−0.49**	−0.49**	−0.51**	0.19	−0.34**	1	
13. SF-12 Mental	−0.51**	−0.56**	−0.62**	−0.62**	−0.68**	−0.72**	−0.68**	−0.65**	−0.63**	0.01	−0.46**	0.51**	1

Notes: ** p < 0.01. EDEQ (Eating Disorders Examination Questionnaire); CIA (Clinical Impairment Assessment); EDQOL (Eating Disorder-Specific Health-Related Quality of Life instrument); SF-12 (Short Form-12 Item Health Survey)

Discussion

The study thoroughly examines various factors influencing the QoL among adolescents with AN. Through a comprehensive analysis, the research explores the impact of different variables, including ED psychopathology, various demographic factors, and the dimensions related to ED and impairment. The findings provide valuable insights into the complexities of AN and its repercussions on the QoL of affected individuals.

The results of our study are consistent with previous research demonstrating strong association between ED and deteriorated QoL in adolescent patients (Jenkins et al., 2014; Herpertz-Dahlmann et al., 2018; Wu et al., 2019). Despite the high prevalence and clinical relevance of these disorders in this age group, previous studies have highlighted the limited number of studies specifically adressing the relationship between QoL and EDs in adolescents (Urzúa et al., 2018).. Therefore, it is essential to better understand and identify the specific differences in patients' QoL in different diagnostic groups (Ágh et al. 2016).

The present study focused on adolescent patients suffering specifically from AN, which allowed us to delve deeper into the impact of AN on their QoL. Previous findings have shown that patients with AN have a lower psychological and physical/cognitive QoL compared to patients with a BN or an OSFED (Bamford & Sly, 2010). Studies have found that patients with AN-P had the poorest perception of QoL in all areas assessed (González et al., 2001).

Differences were also detected between the AN subtype and the relationship with adolescents' QoL, showing that adolescents suffering from purgative AN have worse mental health. Likewise, similar studies showed that patients with restrictive AN had a significantly better QoL than those with purgative AN (Mond et al., 2005), and that patients with purgative AN had greater psychosocial impairment than patients with restrictive AN (Martín et al., 2016).

One notable finding is the lack of significant differences for all variables studied based on the different timeframes. This suggests that the duration of the disorder does not necessarily correlate with variations in the measured variables, challenging the assumption that longer durations inherently lead to more severe outcomes, in line with previous studies in the literature (Le Grange et al., 2014). Additionally, no significant correlations were found between timeframe, age, weight, BMI, and the variables under consideration, indicating that these factors may not be reliable indicators of the severity or impact of AN in this population. These results contradict other studies that have found BMI to be the strongest predictor of disease recovery (Castellini et al., 2011). Therefore, further investigation of the impact of these demographic and clinical factors on the QoL of AN patients should be carried out.

Concerning the objective of analyzing the relationships between ED-related psychopathology factors and AN patients' QoL, the results yielded significant and high associations between all dimensions of the EDEQ and CIA with QoL variables, except for the EDQOL Work/School and SF-12 Physical Health dimensions, which were low.

In addition, the psychological dimension of the EDQOL questionnaire showed the highest correlations with the EDEQ dimensions of Eating and Shape Concern and also with the Personal Impairment dimension. These findings highlight the intricate interplay between psychological well-being and the severity of eating and shape concerns, suggesting that addressing these aspects is crucial for improving overall QoL in adolescents with AN. Studies indicate that, in AN patients, comorbidity and symptomatology are related to greater QoL impairment, and that these patients are more likely to report bodily pain, depression, self-harming behaviors, and suicidal ideation (Sy et al. 2013). Recently, studies have also revealed strong relationships between QoL and depressive symptoms in patients with AN (Kenny et al., 2023). Therefore, therapeutically, it would be interesting to adjust the specific goals of the intervention based on the patient's level of physical impairment. This should also be considered when designing intervention programs, adjusting them to the patients' needs to improve their QoL in different areas, as this is a key factor in their recovery (Mitchison et al., 2016).

The strong relationships between attitudes towards EDs, clinical impairment, and mental health-related QoL of adolescent girls were analyzed in this study. Thus, attitudes towards EDs, clinical impairment, and mental health-related QoL in adolescent girls indicated strong negative relationships between the mental health component of the SF-12 with all dimensions of the EDEQ, EDQOL and CIA. Previous studies in the literature have already highlighted how patients with an ED have more impaired mental health than physical health (Martin et al., 2017), as well as lower QoL than the general population (Baiano et al., 2014). Weight concerns and their relationship with clinical deterioration translate into lower QoL, even in pre-adolescents (Urzúa et al., 2010). Therefore, mental health interventions for adolescent patients with ED should also address the psychosocial areas impacted (López & Treasure, 2002), and in areas such as academic studies. In addition, our results have shown strong relationships between social and cognitive impairment and the impact of the ED on labor or academic performance in adolescent girls assessed with the EDQOL. Additionally, studies conducted with adult AN patients have also suggested that patients spend more time at home or alone due to their impaired QoL; this impacts their work or studies and may cause more binge eating leading to a worse QoL (Mason et al., 2018). Other authors have highlighted work/study impairment as the strongest predictor of overall QoL impairment in EDs (Engel et al., 2006). Our work has found that all EDQOL subscales, with the exception of the Financial dimension, had significant correlations with the EDE scales, which is identical to the results obtained by Mitchison et al. (2013). However, in our study, the two components of the SF-12, physical and mental, obtained correlations with the EDE dimension. In other studies, there has only been a relationship between the EDE and the mental components of the SF-12 (Mitchison et al., 2013).

Regarding the second objective, which was to evaluate the different relationships of these variables with the QoL measured from a generic measure (SF-12) and with another specific scale of ED QoL (EDQOL), the results showed that 70% of the variance in physical and cognitive QoL evaluated with the EDQOL scale was explained by the CIA social and cognitive dimensions. A comparison with the mental QoL assessment obtained with a general QoL scale (SF-12), indicated that the results were similar, such that the CIA personaland cognitive dimensions explained 61% of the variance, excluding eating symptomatology variables from the explanatory model. Patients with greater ED psychopathology experienced more significant impairment secondary to ED, as previously reported in other studies using clinical samples (Martin et al., 2017; Fairburn, 1994; Castellini et al., 2011; Kenny et al., 2023). These results are in line with previous studies showing that the QoL of patients with AN is greatly affected by eating symptoms, and that this deterioration increases as the symptoms become more intense (Mitchison et al., 2016). These findings underscore the importance of considering the impact beyond clinical symptoms. Individuals with EDs not only face challenges related to eating and weight but also experience a significant burden in their psychosocial functioning, resulting in a lower QoL. This finding underscores the need to address well-being in all areas of life for adolescents with ED. Therefore, the use of specific instruments and adapted measures for this type of patient, in order to assess their functioning in different areas and in their psychosocial impairment as it relates to QoL, should be a future aim (Calugi et al., 2018).

Moreover, as expected, the EDEQ Eating Concern and CIA Personal Impairment dimensions explained a high percentage of variance (61%) in the psychological dimension of the EDQOL. The AN core symptom, eating concern, is related to higher eating pathology, emotional distress, and psychosocial deterioration in the sense that the more intense the eating symptoms, emotional distress, and psychosocial deterioration, the worse the QoL. This result has been found in previous studies (Vaz et al., 2020; Pike & Olmsted, 2016).

Personal and cognitive impairment are also included as explanatory variables in the case of school and work QoL, together with eating concern. In this case, the explained variance was lower (32%), again highlighting the impairment caused by the core symptoms in patients with AN. On the other hand, the psychological dimension of QoL was explained (61%) by restriction concern and personal impairment. In this case, a core symptom of ED (eating concern) is related to mood and self-perception. Studies with a larger sample should be conducted to assess how this deterioration is associated with the AN time-course, as well as to assess possible differences with other types of ED.

It is remarkable that the cognitive dimension of psychosocial impairment exhibits a noteworthy impact on the physical, school, and mental dimensions of QoL. This confirms that cognitive challenges, such as fixation on body image and self-esteem, exert a profound influence on the lives of adolescents with EDs (Bardone-Cone et al., 2010). These outcomes strongly advocate for implementing interventions specifically designed to address these nuanced aspects within the framework of ED treatment.

Finally, we highlight the fact that neither impairment nor deterioration explained the financial dimension of QoL. This could be because economic concerns are not a central aspect of ED, especially in adolescent girls, and that psychosocial impairment manifests more intensely in other domains of patients' lives. We think that, due to the age of the patients, who are minors and financially dependent on their families, they do not perceive an impairment in this dimension of their EDQOL. However, this aspect can be significantly altered in their families or in adult patients, for whom the illness can involve a high economic cost and a significant loss of QoL for those affected (Herpertz-Dahlmann et al., 2018).

Based on the results obtained, we can confirm that the specific QoL instrument (EDQOL) is able to explain a higher percentage of AN in psychological and physical dimensions, while the general questionnaire, SF-32, explains a high percentage of variance in the mental domain but not in the physical domain. Previous studies have highlighted this limitation of the generic tool, SF-32, by pointing out that the increased physical activity associated with improved QoL in the SF-36 may be a sign of severity in AN rather than of improvement (Badia et al., 2001). However, in a more recent paper, Panea-Pizarro et al. (2021) concluded that the SF-36 could be useful for monitoring the impairment of health in adults ED patients. Therefore, it is necessary to develop studies with a larger number of participants and with a longer follow-up to be able to evaluate the usefulness of these scales for collecting changes throughout treatment.

The present study has some limitations. First, its cross-sectional nature implies that we cannot conclude causality between variables. Further research is needed using a longitudinal design. The typical limitations and advantages of using a self-administered questionnaire must also be considered (Meneguzzo et al., 2021). As this study was carried out with Spanish participants, its generalizability may be limited due to specific characteristics of the sample, such as demographics, cultural backgrounds, and geographic locations. Results may not be representative of the broader population of adolescents with AN. Another limitation concerns generalization to males. Although the prevalence of ED in females is higher than in males, it is essential to include males to detect possible differences (Peláez-Fernández et al., 2012). Future studies should analyze the relationship between QoL and the time progression of ED, and whether the results of this investigation can be transferred to patients with BN or OSFED. Likewise, given that EDs affect not only the patient but also their entire family and social environment, the impact of support systems on treatment outcomes and QoL should be investigated, and interventions involving and enhancing support from family and friends should be developed. In this report, the CIA 3.0 has been administered in adolescent and young adult populations, as previous studies have done (Calugi et al., 2018; He et al., 2022; Reas et al., 2010). Despite showing good reliability scores in this sample, it is worth noting that the CIA is a psychometric tool designed for adult populations. Moreover, the sample size was small because the target population is specific and limited, restricting the availability of subjects for the study. Finally, longitudinal studies should be conducted to explore AN trajectories and how various factors evolve over time. This approach would provide a more dynamic understanding of the disorder, treatment effects, and their implications for QoL.

Among the strengths of this work, we highlight that, to our knowledge, there are few studies to assess the determinants of QoL in adolescent patients with AN. A strength of this study includes the sample we used, which comprises participants with AN from six different ED services. Therefore, it is safe to state that the sample is representative of patients seen in daily clinical practice, and that these results may be generalizable to other populations with ED. Another strength of this study includes the use of a large sample of adolescents with a diagnosis of AN. This is also the first study to examine the QoL of AN patients with a specific QoL questionnaire for adolescent Spanish patients. In addition, there are very limited previous studies that have examined QoL in adolescents with AN; therefore, the current study adds meaningful data to the current literature on the topic.

The results of this study have several practical implications for clinicians, healthcare providers, and researchers working with adolescents with AN. Results provide relevant implications for clinical practice, as they can guide the design of more effective and personalized interventions for patients with AN. By understanding the QoL of these patients, we can address not only the physical symptoms, but also the psychological and social aspects that affect their lives. Previous research revealed that patients receiving treatment can improve their QoL (Wu et al., 2019). However, even in the case of remission, patients' QoL has been found to remain lower than that of the general population (Zasada et al., 2018). The present study showed that AN symptoms were associated with the physical, psychological, and social dimensions of QoL. Cognitive impairment was shown to have a positive and significant relationship with the psychological and social QoL of patients, and a negative relationship with the mental subscale of SF-36. These results make cognitive impairment a relevant target in the treatment of ED. Along the same lines, personal impairment should be the target of intensive therapeutic interventions, as it has been shown to be a psychological and academic determinant. Finally, social impairment was shown to have a significant influence on physical, cognitive, and mental dimensions of QoL. The literature states that core symptoms, such as worries about eating or restriction, are essential targets in the treatment of AN. To our knowledge, these results suggest that clinicians should consider the dimensions of QoL as therapeutic goals. In addition, including these measures in assessment protocols can provide viability for the treatment of AN. Further implications of the study are as follows: (a) The early detection and timely intervention may help prevent the exacerbation of symptoms and contribute to better long-term outcomes; (b) Given the strong correlations between psychological well-being, eating, and shape concerns with QoL, interventions should specifically address these aspects. Cognitive-behavioral therapy or interventions targeting body image and self-esteem may be beneficial to improve well-being; and (c) Clinicians should conduct comprehensive assessments that consider multiple dimensions, including eating concerns, personal impairment, and cognitive and social impairment. This holistic approach can guide treatment planning in addressing the various facets influencing QoL (Yoneda et al., 2020).

Conclusions

This study showed a deteriorated QoL in adolescent patients suffering from AN. Results showed that patients with a purgative AN diagnosis had worse mental health. Other variables, such as BMI, weight, and timeframe, were not significant. Additionally, the results showed that, although a generic mean QoL is useful for evaluating these patients, it is necessary to develop specific measures, such as EDQOL, that allow for a better understanding of the variability and specificity of these disorders. In summary, this study is one of the only studies to evaluate the QoL of adolescents suffering from ED. Future studies should focus on longitudinal data that allow researchers to observe the changes in QoL in relation to eating symptoms.

9. Summary and Conceptual Integration of the Studies

This section provides a summary of the six empirical studies and their relationships to the overarching research objectives, highlighting their contributions to a coherent, cumulative program aimed at evaluating and refining the ECHOMANTRA intervention for adolescents with EDs and their caregivers.

Articles 1–4 constitute the core intervention research:

> Article 1 (Study Protocol) establishes the theoretical and methodological framework for the RCT, setting the stage for testing all key hypotheses.
>
> Article 2 (Single-Case Study) provides formative evidence on the feasibility and acceptability of the intervention, and informed procedural refinements to ensure optimal delivery, which is essential for achieving clinical and caregiver outcomes.
>
> Article 3 (Preliminary Results – Caregivers) specifically addresses caregiver-related hypotheses, showing improvements in emotional well-being, reductions in illness accommodation, expressed emotion, and burden, as well as enhanced ED-specific caregiving skills.
>
> Article 4 (Final Results – Main Intervention Study) evaluates the combined effects of TAU + ECHOMANTRA on adolescent outcomes and caregiver effects, directly testing hypotheses related to clinical symptom improvements and psychosocial functioning, and the maintenance of these effects over 6- and 12-month follow-ups.

Complementing this core program, Articles 5 and 6 strengthened the methodological and interpretive foundations of the trial.

> Article 5 (Spanish EDQOL Validation) ensures that changes in quality of life, a key patient-reported outcome, can be measured reliably and culturally appropriately, supporting interpretation of intervention effects on psychosocial functioning.
>
> Article 6 (Cross-Sectional Study on QoL in AN) identifies clinical correlates of QoL in adolescents, highlighting cognitive, emotional, and social dimensions that may mediate or moderate intervention effects, thus informing both the conceptual rationale and interpretation of observed outcomes in the trial.

Together, these studies create a cumulative program, integrating intervention development, feasibility testing, outcome evaluation, and measurement validation, thereby providing empirical support for the central hypotheses regarding both adolescent clinical outcomes and caregiver skills and well-being.

Building on the integration of findings from the six empirical studies, the following General Discussion examines the theoretical, clinical, and practical implications of the research.

10. General Discussion

EDs are serious mental health conditions and represent one of the most challenging clinical issues due to their high rates of chronicity, relapse, hospitalization, medical comorbidities, and mortality (Castellini et al., 2022). These factors make EDs a significant public health concern, particularly among adolescents and young women (Silén & Keski-Rahkonen, 2022). Given their complexity, these disorders require targeted interventions that can support and enhance the effectiveness of standard treatment.

In this context, the present doctoral thesis evaluated the effectiveness of the ECHOMANTRA intervention for adolescents with EDs and their caregivers (Articles 1 to 4). ECHOMANTRA was implemented as a complementary approach designed to enhance and strengthen the outcomes of TAU.

The adaptation and implementation of ECHOMANTRA for Spanish-speaking populations, particularly adolescents, represents a significant and novel contribution. The original MANTRA intervention had previously been tested in adolescents, showing promising results (Wittek et al., 2023). ECHO, on the other hand, had already been adapted and applied in a Spanish context with caregivers of adult patients, also yielding positive outcomes (Quiles et al., 2018). However, all existing studies on ECHOMANTRA had primarily focused on adult populations with AN. This is the first adaptation and implementation of ECHOMANTRA for a Spanish adolescent population with a broader range of ED diagnoses. Therefore, by tailoring the ECHOMANTRA model to this demographic, the study not only expands its applicability but also enhances its cultural relevance and accessibility (Articles 1 and 2).

Findings from the clinical trial highlight the intervention's potential to improve core clinical outcomes in patients, including ED symptoms, emotional wellbeing, confidence in the ability to change, and socially prescribed perfectionism, with changes sustained over the short and medium term (Article 4). Although BMI was initially one of the targeted outcomes, no significant differences were observed between the ECHOMANTRA and TAU groups in this regard. These findings are consistent with the fact that BMI stabilization and improvement is among the primary aims of TAU, which is specifically designed to support patients' nutritional recovery. Moreover, it is important to note that not all patients included in the study required weight restoration. Since the sample comprised individuals with various ED diagnoses, not exclusively AN, BMI values and requirements varied. Therefore, BMI improvement should not be considered a primary outcome for the ECHOMANTRA intervention (Article 4).

In addition, the results underscore the critical role of caregiver involvement in treatment, highlighting the value of family-based skills-oriented psychoeducational interventions within multidisciplinary ED care (Articles 3 and 4). Caregivers who received the ECHOMANTRA intervention showed greater improvements in expressed emotion, psychological wellbeing, and reductions in illness accommodation and caregiver burden. They were also the only group to show significant gains in caregiving skills. These changes were sustained over the short and medium term (Articles 3 and 4). Together, these findings support the relevance of a dyadic intervention model: empowering carers with targeted strategies not only improves their own health outcomes but could also indirectly support patient recovery. This aligns with Treasure's model, which emphasizes that healthier, better-supported caregivers are more prepared and capable of caring for their loved ones with EDs (Treasure et al., 2011). Nevertheless, further research is needed to better understand how improvements in caregiver wellbeing and skills are related to improvements in patient outcomes.

Moreover, this study marks the first time the ECHOMANTRA program has been adapted to an individual, online format. In previous implementations, the intervention was delivered through guided self-help materials, telephone-based support, and/or group sessions involving family members, patients, or joint family–patient meetings (Cardi et al., 2024; Adamson et al., 2019). In contrast, the current study delivered ECHOMANTRA through one-to-one online sessions, with the same therapist consistently assigned to each participant, one for the patient and another for the caregiver, throughout the intervention. This model ensured fidelity to the treatment protocol across all cases and stands out as a key strength of the study (Articles 1 to 4). Furthermore, the use of individual online sessions enhances the intervention's accessibility and supports the integration of personalized care models across different treatment settings (Reay et al., 2022).

Additionally, the intervention proved to be both feasible and acceptable for patients and caregivers (Articles 2 to 4). Integrating ECHOMANTRA into routine care could improve the overall effectiveness of treatment by providing a structured and supportive framework that fosters recovery. When delivered alongside TAU, ECHOMANTRA may serve as a valuable strategy to optimize outcomes by equipping adolescents and their caregivers with additional tools to manage symptoms and maintain long-term improvements (Articles 3 and 4).

This thesis also reflects on the current gaps in ED treatment, especially in adolescent populations (Articles 4 and 6). Despite the availability of evidence-based approaches such as CBT-ED and family-based therapies, dropout rates remain high and sustained recovery is difficult to achieve. By incorporating motivational, emotional, and interpersonal components, ECHOMANTRA addresses several limitations of traditional approaches. It aligns with emerging trends that emphasize transdiagnostic and broader systemic perspectives in mental health treatment, considering not only the individual, but also the family, peer and treatment environments involved in the recovery process (Articles 4 to 6).

Another particularly important aspect of this thesis is its focus on QOL. This dimension was addressed through two studies: the validation of the Spanish version of the EDQOL (Article 5) and a cross-sectional study evaluating QoL in patients with AN (Article 6).

QOL is a particularly relevant concept in the context of EDs, and its proper assessment requires the use of disorder-specific instruments. By validating the Spanish version of the EDQOL scale and incorporating it as an outcome measure, this study addresses an important need in the ED field in Spain. Moreover, this Spanish adaptation contributes to the growing number of translated versions of the EDQOL, facilitating cross-cultural comparisons of QoL among individuals with EDs. Importantly, the validation of this instrument provides the empirical foundation for interpreting patient-reported outcomes in the ECHOMANTRA trial, ensuring that observed changes in QoL reflect true improvements in functioning and well-being. .As such, the instrument can be a valuable tool for assessing ED-specific HRQoL and the severity of the disorder's impact, both in clinical practice and research contexts. The Spanish version of the EDQOL is an inexpensive, valid, and reliable tool recommended for use in both settings (Article 5).

The cross-sectional study evaluating QoL in patients with AN addresses a recognized gap in the scientific literature (Article 6). Existing studies have highlighted the need for further research into the relationship between QoL and ED, particularly within adolescent populations, and the necessity of exploring the impact of AN on QoL in greater depth (U rzúa et al., 2018). The findings support the notion that QoL in adolescents with AN is closely related to both physical and psychological variables. These results call into question the prevailing view of ED severity based primarily on BMI criteria (Castellini et al., 2011), suggesting that BMI may not be the most appropriate standalone indicator of severity. Instead, these results emphasize the multidimensional nature of AN and the importance of assessing treatment outcomes beyond weight restoration or symptom remission.

From a theoretical standpoint, the results can be interpreted within the Cognitive-Interpersonal Maintenance Model (Schmidt & Treasure, 2006; Treasure & Schmidt, 2014), which underpins the ECHOMANTRA intervention. The observed associations between cognitive, social, and psychological impairment and lower QoL align with the model's premise that rigid thinking patterns, emotional avoidance, and interpersonal difficulties act as maintaining mechanisms of AN. The finding that personal, cognitive and social impairment significantly influence multiple QoL domains highlights these areas as potential mediators of treatment response, precisely the mechanisms targeted by ECHOMANTRA through the enhancement of emotional processing, flexible thinking, and improved communication within the caregiving dyad.

Thus, further investigation into the influence of clinical factors on QoLacross the full spectrum of ED is needed. Incorporating disorder-specific QoL measures in both clinical and research settings may provide a more comprehensive understanding of treatment outcomes and better reflect the complex, multifaceted nature of the disorder.

However, these findings could align with transdiagnostic perspectives on EDs, which conceptualize shared maintaining mechanisms—such as perfectionism, emotional dysregulation, and interpersonal sensitivity—across diagnostic boundaries (Fairburn et al., 2003; 2008). From this broader perspective, impairments in QoL may reflect these common cognitive and affective processes rather than being solely attributable to specific symptom profiles or diagnostic categories (Curzio et al., 2018). Integrating this transdiagnostic framework reinforces the value of interventions such as ECHOMANTRA, which target underlying psychological mechanisms that transcend individual ED subtypes, thereby enhancing both generalizability and long-term recovery potential.

Limitations and Future Directions

This thesis has several limitations that should be acknowledged. Firstly, the use of self-reported instruments across all articles derived from the main study may introduce relevant bias to outcomes. Furthermore, the CIA 3.0 has been applied to adolescent and young adult populations, consistent with the methodology of prior studies (Calugi et al., 2018; He et al., 2022; Reas et al., 2010). While these studies have demonstrated strong reliability, it is important to emphasize that the CIA3.0. was originally developed as a psychometric tool for adult populations. This may have limited its sensitivity to developmental differences in younger participants.

Additionally, at the 12-month follow-up, dropout rates were notably high for both patients and their caregivers, potentially affecting the robustness and reliability of long-term outcomes. The dyadic nature of the ECHOMANTRA intervention added further complexity to retention, as continued participation relied on the consistent involvement of both patients and carers, which may have reduced adherence to sessions and assessments.

The generalizability of the findings is also limited. The results may not apply to patients who lack a caregiver or whose caregivers are unable to actively participate in treatment. Moreover, the sample consisted exclusively of female participants, most of whom had a diagnosis of AN and were receiving treatment in a day hospital setting. This homogeneity limits the representativeness of the sample and restricts the applicability of the findings to male patients. Although the validation study was conducted with an adequate sample, it was relatively small, and the demographic characteristics of the participants further constrain the generalizability of the results. While EDs are more prevalent among young women, it remains crucial to validate these instruments in male populations to explore potential gender-based differences in treatment experiences and outcomes. The same limitation applies to the cross-sectional study, whose findings are also limited to female adolescents diagnosed with AN.

Despite these limitations, the current thesis provides a valuable foundation for future research and clinical innovation. Moving forward, subsequent studies could strategically build on these findings in several ways:

1. Scaling and diversification of samples: Future research should aim to include more diverse samples in terms of age, gender, and diagnostic profiles, and eventually extend research across different cultural contexts. This would strengthen external validity and allow exploration of potential moderators of treatment response, including sociocultural variables and family dynamics.

2. Adaptive and stepped-care formats. Building on the online, individualized delivery model developed, future work could test adaptive versions of ECHOMANTRA, where treatment intensity is adjusted based on patient needs, progress, or risk factors. Such models would promote more efficient use of clinical resources and enhance accessibility.

3. Integration of technological innovations: Advances in digital health could be introduced to enhance engagement and personalization. Future adaptations of ECHOMANTRA might incorporate interactive digital tools, mobile applications, and AI-assisted tailoring of content, enabling real-time feedback and individualized monitoring of symptoms and recovery trajectories.

4. Longitudinal and process-oriented research: Further investigation is needed to clarify how improvements in caregiver wellbeing and skills influence patient outcomes. Examining the mediating mechanisms underlying these effects—such as emotional regulation, communication patterns, and caregiver modeling—would deepen understanding of the intervention's change processes and inform future refinements.

5. Exploration of caregivers' QoL: Future research should also investigate the impact of EDs on the QoL of caregivers, an important but underexplored area. Understanding how caregiving burden, emotional strain, and relational dynamics affect caregiver QoL could guide the development of targeted interventions that support both members of the dyad more effectively.

6. Translational application of QoL findings: Insights from the QoL studies (Articles 5–6) could inform more personalized and recovery-oriented treatment approaches. Integrating disorder-specific QoL assessment into clinical decision-making could guide tailored interventions, ensuring that treatment success reflects both symptom reduction and meaningful improvements in daily functioning.

Taken together, these directions a clear framework for the continued development of the ECHOMANTRA program. By integrating adaptive design, digital innovation, and personalized care principles, and by expanding research to include the wellbeing of caregivers, future studies can extend the translational impact, sustainability, and scalability of this intervention

In conclusion, this study represents a significant advancement in the treatment of ED by adapting and implementing, for the first time, the ECHOMANTRA intervention in an individual online format for Spanish-speaking adolescents with diverse ED diagnoses and their caregivers. Key strengths of the study include its randomized-controlled trial design, the individual delivery format, the dyadic and skills-based approach that emphasizes caregiver involvement, and the integration of a specific QoL measure for ED as a central outcome, offering a more comprehensive understanding of recovery. By providing a culturally adapted, accessible, and evidence-based complementary intervention to TAU, this work enhances the current treatment landscape for adolescent EDs, bridging several key gaps in the literature, introduces a culturally adapted model of care, and advocates for a broader definition of recovery that incorporates QoL. Building on these findings, our team is currently applying an adapted version of the ECHOMANTRA program with adult women diagnosed with AN and their caregivers, aiming to further explore its effectiveness across different age groups and clinical profiles (Quiles et al., 2025).

11. Conclusions

This doctoral thesis comprises a RCT evaluating the ECHOMANTRA program, the validation of the Eating Disorders Quality of Life (EDQOL) psychometric instrument, and a cross-sectional study assessing QoL in patients with anorexia nervosa (AN). The findings obtained throughout this work allow for several relevant conclusions in both clinical and research domains.

Firstly, the ECHOMANTRA intervention, culturally and linguistically adapted for the Spanish context, has been shown to be effective as a complement to TAU for adolescents with EDs and their caregivers. This dyadic approach, combining a patient-focused intervention with a caregiver-focused program, produced significant benefits in ED symptomatology, emotional wellbeing, confidence in the ability to change, and socially prescribed perfectionism. Caregivers also acquired specific caregiving skills and showed improved emotional stability, reduced illness accommodation, and decreased expressed emotion, all factors recognized as maintaining mechanisms of the disorder within the family environment. Furthermore, these effects were maintained over short- and medium-term follow-ups, suggesting that the changes promoted by the intervention were sustainable beyond the active treatment period.

A key methodological contribution of this study was the intervention format: individualized online sessions tailored to the characteristics of each patient-caregiver dyad. This modality demonstrated high acceptability among participants, improving treatment adherence and overcoming common limitations of group-based formats, such as social comparison or lack of personalization. Additionally, assigning the same therapists to patients and caregivers throughout the intervention ensured fidelity to the original protocol and consistency in the therapeutic process.

Another contribution of this thesis is the incorporation of QoL as a central variable in treatment evaluation. Within this framework, the Spanish version of the EDQoL was validated for the first time, providing a disorder-specific psychometric instrument that allows for a more precise assessment of the impact of EDs on patients' daily lives. Including this measure in the trial enabled a more accurate evaluation of the recovery process and the intervention's impact.

The cross-sectional study further highlighted the influence of clinical factors—such as eating psychopathology, emotional distress, and functional impairment—on perceived QoL in patients with AN. Specifically, patients with the AN-P showed greater psychosocial deterioration and poorer mental health compared to those with AN-R. These findings guided the interpretation of the main trial results by identifying cognitive, social, and psychological domains as key targets for intervention, directly informing the mechanisms addressed by ECHOMANTRA.

Several methodological limitations should be considered when interpreting these findings. Although the sample included patients with varying levels of care (inpatient, day hospital, and outpatient) and diverse diagnoses, it was predominantly composed of females with AN, mainly treated in a day hospital setting. This homogeneity limits the generalizability of the findings to other populations, such as male patients, individuals with other types of EDs, or patients in different care settings. Moreover, the study was conducted exclusively in Spain, which may restrict the applicability of the findings to other healthcare systems or cultural contexts. While a 12-month follow-up was included, response rates were low, compromising the robustness of longitudinal data from the RCT. Future studies should develop strategies to improve follow-up adherence and consider longer-term assessments to examine the stability of treatment effects.

In summary, this thesis provides robust empirical evidence on the effectiveness of ECHOMANTRA as a complementary intervention for adolescents with EDs and their caregivers.

It also introduces a relevant psychometric instrument for assessing QoL in ED patients, a variable increasingly recognized as a key clinical outcome, and provides valuable data on QoL in individuals with AN. The findings highlight the importance of actively involving families in the therapeutic process, incorporating disorder-specific QoL measures, and employing flexible, accessible, and personalized intervention formats. This work not only expands the therapeutic and evaluative tools available for this vulnerable population but also opens new avenues for research and clinical application.

Currently, the research team is implementing the ECHOMANTRA program with adult women diagnosed with AN and their caregivers, as part of a project funded by the Knowledge Generation Projects Call of the Spanish Ministry of Science, Innovation, and Universities (Convocatoria de Proyectos de Generación de Conocimiento del Ministerio de Ciencia, Innovación y Universidades). This initiative will allow the evaluation of its effectiveness in a different population and will further advance the development of effective interventions in the field of EDs (Quiles et al., 2025).

12. Conclusiones

Esta tesis doctoral se compone de un Ensayo Clínico Aleatorizado (RCT) que evalúa la aplicación del Programa ECHOMANTRA, la validación del instrumento psicométrico Eating Disorders Quality of Life (EDQOL) y un estudio transversal que evalúa la calidad de vida en pacientes con anorexia nerviosa. Los hallazgos obtenidos a lo largo de este trabajo permiten extraer varias conclusiones relevantes tanto en el ámbito clínico como en el de la investigación.

En primer lugar, el Programa ECHOMANTRA, adaptado cultural y lingüísticamente al contexto español, ha demostrado ser eficaz como complemento al tratamiento habitual (TAU) para adolescentes con TCA y sus cuidadores. Este enfoque diádico, que combina una intervención centrada en el paciente con un programa dirigido al cuidador, produjo beneficios significativos en la sintomatología del TCA, el bienestar emocional, la confianza en la capacidad de cambio y el perfeccionismo socialmente prescrito. Los cuidadores también adquirieron habilidades específicas de cuidado y mostraron una mayor estabilidad emocional, una reducción en la acomodación a la enfermedad y una disminución en la emoción expresada, todos ellos factores reconocidos como mecanismos de mantenimiento del trastorno en el entorno familiar. Además, estos efectos se mantuvieron en los seguimientos a corto y medio plazo, lo que sugiere que los cambios promovidos por la intervención fueron sostenidos más allá del periodo de tratamiento activo.

Una contribución metodológica clave de este estudio fue el formato de intervención: sesiones online individuales adaptadas a las características de cada díada paciente-cuidador. Esta modalidad mostró una alta aceptabilidad entre los participantes, mejorando la adherencia y mitigando algunas de las limitaciones comunes de los formatos grupales como la comparación social o la falta de personalización. Asimismo, asignar los mismos terapeutas a todas las pacientes y cuidadoras durante toda la intervención aseguró la fidelidad al protocolo original y la coherencia en el proceso terapéutico.

Otra contribución de esta tesis es la incorporación del concepto de calidad de vida como variable central en la evaluación del tratamiento. En este marco, se validó por primera vez la versión en español del EDQoL, un instrumento psicométrico específico para TCA que permite valorar con mayor precisión el impacto del trastorno en la vida cotidiana de las pacientes. La inclusión de este instrumento en el ensayo permitió una evaluación más precisa del proceso de recuperación y del impacto de la intervención.

El estudio transversal destacó además la influencia de factores clínicos, como la psicopatología alimentaria, el malestar emocional y el deterioro funcional, en la calidad de vida percibida por las pacientes con AN. En concreto, las pacientes con AN-P mostraron un mayor deterioro psicosocial y peor salud mental en comparación con aquellas con AN-R. Estos hallazgos orientaron la interpretación de los resultados del ensayo principal al identificar los dominios cognitivo, social y psicológico como objetivos clave de intervención, aportando información directa sobre los mecanismos trabajados por el Programa ECHOMANTRA.

Deben considerarse varias limitaciones metodológicas al interpretar estos resultados. Aunque la muestra incluyó pacientes con distintos niveles de atención (hospitalización completa, hospital de día y tratamiento ambulatorio) y diagnósticos diversos, estaba compuesta predominantemente por mujeres adolescentes con AN tratadas principalmente en un hospital de día. Esta homogeneidad limita la generalización de los hallazgos a otras poblaciones, como pacientes varones, personas con otros tipos de TCA o pacientes en diferentes entornos asistenciales. Además, el estudio se realizó exclusivamente en España, lo que puede restringir la aplicabilidad de los resultados a otros sistemas sanitarios o contextos culturales. Aunque se incluyó un seguimiento de 12 meses, las tasas de respuesta fueron bajas, lo que compromete la solidez de los datos longitudinales del ensayo. Futuros estudios deberían desarrollar estrategias para mejorar la adherencia al seguimiento y considerar evaluaciones a más largo plazo para examinar la estabilidad de los efectos del tratamiento.

En resumen, esta tesis aporta evidencia empírica sólida sobre la eficacia del Programa ECHOMANTRA como complemento al tratamiento para adolescentes con TCA y sus cuidadores. Asimismo, presenta y valida un instrumento psicométrico relevante para evaluar la calidad de vida en pacientes con TCA, una variable cada vez más reconocida como resultado clínico clave, y proporciona datos sobre la calidad de vida en personas con AN. Los hallazgos destacan la importancia de involucrar activamente a las familias en el proceso terapéutico, incorporar medidas específicas de calidad de vida relacionadas con el trastorno y emplear formatos de intervención flexibles, accesibles y personalizados. Este trabajo no solo amplía las herramientas terapéuticas y de evaluación disponibles para esta población vulnerable, sino que también abre nuevas vías para la investigación y la aplicación clínica.

Actualmente, el equipo de investigación se encuentra implementando el Programa ECHOMANTRA con mujeres adultas diagnosticadas de AN y sus cuidadores, como parte de un proyecto financiado por la Convocatoria de Proyectos de Generación de Conocimiento del Ministerio de Ciencia, Innovación y Universidades de España. Esta iniciativa permitirá evaluar su eficacia en una población diferente y avanzar en el desarrollo de intervenciones efectivas en el ámbito de los TCA (Quiles et al., 2025).

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Appendix

List of hospitals that participated in the study and the code number of the approvals by the hospitals' ethics committees:

- Eating disorders Unit. Hospital Universitario de San Juan de Alicante. 20/043 Tut.
- Eating disorders Unit. Hospital Universitario de la Fe de Valencia.2021-614-1
- Eating disorders Unit. Hospital Universitario Reina Sofia de Murcia.2021-30
- Eating disorders Unit. Hospital Universitario de La Ribera. 2023-24
- Eating disorders Unit. Hospital Universitario de Castellón 2024-59
- Day hospital of the CREA (Centro de Recuperación Emocional y Alimentaria) center.2020/49555
- Day hospital of the ADANER (Asociación en Defensa de la Anorexia nerviosa y Bulimia) center.2020/49555

Annexes

Article 1

Adaptation and Implementation of an Intervention Programme on Spanish Carers and Adolescent Patients With an Eating Disorder: Study Protocol of a Randomized Controlled Trial

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Adaptation and Implementation of an Intervention Programme on Spanish Carers and Adolescent Patients With an Eating Disorder: Study Protocol of a Randomized Controlled Trial

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Introduction: One of the major problems with inpatient treatment of adolescent girls with an eating disorder (ED) is that the strategies learned during their hospital stay are not easily applied or maintained in their daily lives, and this has been related to high rates of relapse and readmission. The ECHOMANTRA programme was developed to optimize outcomes during and following inpatient or day-patient treatment. ECHOMANTRA is based on interventions for carers (Experienced Carers Helping Others, ECHO) and patients (Maudsley Model of Anorexia Nervosa Treatment for Adults, MANTRA) and is developed from the cognitive interpersonal model of anorexia (Schmidt and Treasure, 2006; Treasure and Schmidt, 2013). This study aims to describe the study protocol of a randomized controlled trial (RCT) for evaluating the efficacy of an adaptation of a novel intervention for patients and carers (ECHOMANTRA) to be implemented as an add-on to treatment-as-usual (TAU).

Method: In a multi–center pilot RCT, 80 female adolescent patients with a DSM-5 diagnosis of an ED and their carers will be invited to participate in the study. They will then be randomized to receive either the ECHOMANTRA intervention as an add-on to TAU or TAU alone. A repeated measures design will be conducted across four time points. Primary outcomes will be patient psychological well-being and eating disorder symptoms, and secondary outcomes will include body mass index, obsessive-compulsive symptoms, perfectionism, motivation to change and psychosocial adjustment. For carers, outcome variables will include psychological well-being, expressed emotion, accommodation and enabling behaviors, burden, and care skills.

Discussion: The results from this trial will establish the effectiveness of ECHOMANTRA and may reveal whether and to what extent this novel intervention can optimize outcomes during and following inpatient treatment. This study will also provide the adaptation of the ECHOMANTRA in the Spanish context for inpatient/day-care treatment.

Keywords: eating disorders, adolescents, skills sharing, carer skills, randomized controlled trial

INTRODUCTION

Eating disorders (ED) are extremely complex multi-causal mental health illnesses, which have serious medical complications and especially affect adolescents and young women (López and Treasure, 2011). The most frequent diagnosis in adolescents is Other Specified Feeding and Eating Disorder (OSFED) followed by Anorexia Nervosa (AN) and finally Bulimia Nervosa (BN) (Swanson et al., 2011). These disorders are characterized by serious symptoms as well as a high degree of comorbidity and mortality (Nordbo et al., 2012; Saldaña et al., 2014; Fichter and Quadflieg, 2016); consequently, patients need to be hospitalized on many occasions. One of the major problems with hospital treatment is that although these patients learn strategies during their hospital stay, they have difficulty in being able to apply and maintain them in their daily lives. As a result, there is a high rate of relapses and readmissions, which have been related to resistance to treatment, low motivation to change, severe pretreatment caloric restriction, low body mass index and higher occupational and social stress (Fairburn, 2008; Kaplan et al., 2009; Grilo et al., 2012; Hoang et al., 2014; Morris et al., 2015; Vall and Wade, 2015). A recent meta-analysis study found that the risk of relapse is especially high during the first year after the end of treatment (Berends et al., 2018; Khalsa et al., 2017). High relapse rates reveal the need to optimize patient treatments after hospital admissions by supporting inpatient/day care and community transition through promising targeted psychological interventions (Bryan et al., 2021).

In response to this, Dr. Janet Treasure's team developed the ECHOMANTRA intervention programme, as a means of facilitating the transition from inpatient hospital treatment to daily life and to the community (Treasure and Schmidt, 2013; Treasure et al., 2015; Cardi et al., 2017). This programme is based on scientific evidence that demonstrates that interventions directed at these patients as well as their carers improve the outcomes in these patients' health. Involving the family in the treatment of ED is a key strategy in their recovery and it also strengthens patients' social networks and eliminates their isolation and loneliness, which contribute to maintaining the disorder (Levine, 2012; Treasure and Nazar, 2016; Sepúlveda et al., 2020). A study was recently published with the preliminary results of ECHOMANTRA intervention with AN inpatients and their carers in the United Kingdom (Adamson et al., 2019). A case series study was employed using a mixed-methods approach to measure the feasibility and efficacy of augmenting intensive hospital treatment with ECHOMANTRA. Results showed that patients' symptomatology improved after the ECHOMANTRA intervention and was maintained in the follow-up. In addition, there was a reduction in carer burden and an improvement in skills, so it was concluded that the efficiency of hospital attention for ED can be increased by preparing both patients and their carers for the transition after hospitalization.

ECHOMANTRA consists of an intervention programme for ED carers (ECHO; Experienced Carers Helping Others; Treasure et al., 2015) and another programme for patients (MANTRA, Schmidt et al., 2014). MANTRA is recommended for the treatment of adults outpatients with AN (National Institute for Health and Care Excellence [NICE], 2017). It is based on the Cognitive Interpersonal Maintenance model of AN (Schmidt et al., 2014), which was developed as a proposed theoretical framework that would synthesize the most important internal and interpersonal maintaining factors of this disorder. MANTRA intervenes in the emotional regulation and eating behavior of these patients, putting a special emphasis on behavior change strategies. This programme focuses on the steps that will help patients thrive in their transition from inpatient care to daily life as well as generating cognitive and behavior changes and strengthening relationships with their family and social groups. It is a flexible treatment programme which directly involves patients in the therapeutic process. To date, it has not been applied to adolescents with an ED; however, some of its characteristics might be especially beneficial to them. In fact, it has been published the study protocol of a recent research that analyses the feasibility, acceptability and efficacy of the MANTRA treatment programme for adolescents patients (Wittek et al., 2021). MANTRA includes content that is prevalent and important to address across the spectrum of ED and in adolescent patients.

The ECHO part of the intervention focuses on carers. Based on the Model of Carer Coping (Treasure et al., 2003), this part of the programme reveals the different aspects that influence coping which can be problematic for carers as they represent sources of psychological distress. The programme provides assistance, support and training for carers to enable them to cope with their role. It teaches them how to reduce and manage their expressed emotion and symptom accommodation, and to deal with difficult and problematic situations that arise. In addition, ECHO teaches skills for positive communication and behavior change so carers will be able to support their loved ones in their recovery. Different studies using the ECHO have shown that the intervention in both the adult and adolescent groups led to a moderate reduction in time spent caring and also in bed use. Moreover, through this programme there was a small to moderate improvement in the wellbeing of both carers and patients in the intervention group (Hibbs et al., 2015a; Magill et al., 2016; Hodsoll et al., 2017). Our research group applied an intervention programme based on the ECHO to carers of ED patients in Spain. The results obtained showed that carers who participated in the programme improved their levels of well-being, reducing carer burden, psychological distress, and expressed emotion. In addition, only patients whose carers participated in the programme reduced their levels of anxiety, depression, and psychological distress while no change occurred in patients whose carers participated in the control group (Pérez-Pareja et al., 2014; Quiles Marcos et al., 2018). A recent review study analyzing the effectiveness of treatments for carers of ED patients concluded that ECHO also provides an intervention that can reduce service costs (Treasure et al., 2021).

The aim of this paper is to describe the study protocol of a randomized control trial (RCT) aimed at evaluating the efficacy of a novel intervention for patients and carers, called ECHOMANTRA, adapted to be used as an add-on to treatment-as-usual (TAU; inpatient treatment or intensive day-care treatment) compared to TAU alone.

Hypotheses

- Patients from the experimental group (TAU + ECHOMANTRA) will show significantly greater improvements in health outcomes (body mass index, ED symptoms, psychological well-being, psychosocial adjustment, perfectionism, obsessive-compulsive symptoms, motivation to change), and other efficacy indicators as readmission, in comparison to patients from the control group.
- The efficacy of the combined intervention (TAU + ECHOMANTRA) will be stable in the short (6 months) and middle term (9 months).
- Carers from the experimental group will present a better psychological well-being and lower illness accommodation, expressed emotion and burden in comparison to carers from the control group.
- Carers from the experimental group will have more ED carer skills in comparison to carers from the control group.

METHODS AND ANALYSES

This study has been registered on the ISRCTN registry (Trial Identifier: ISRCTN43554732). CONSORT 2010 for parallel group randomized trials (Schulz et al., 2010) is specifically observed in reporting this trial.

Study Design and Procedure

This is a multi-center, pilot, randomized, controlled, blind, superiority study with two parallels groups. Assignment to the control or experimental group will carry out using a computer-generated randomized sequence, with1:1 treatment allocation. The research assistant at each center will conduct a semi-structured interview to evaluate participants and confirm fulfillment of the inclusion/exclusion criteria. Patients who are receiving ED treatment (either as inpatients or day-patients) and fulfill the inclusion criteria, will be invited to participate in the study together with a carer. By "carer" we refer to someone who usually takes care of the patient outside the hospital/day-center and lives with her. Patients and carers will receive detailed information on the study and will be asked for a written informed consent to be able to participate. After submitting the consent form, participants will be invited to complete the baseline questionnaires and will then be randomly assigned to either (1) ECHOMANTRA in addition to TAU or (2) TAU only (see **Figure 1**). The ECHOMANTRA-guided skills-sharing intervention will include materials and eight online sessions (one per week) for carers and patients, while treatment duration will be 8 weeks.

Participants

Patients

Patients will be recruited from three different specialist inpatient/day-patient eating disorder units (Eating Disorders Inpatient Unit at the San Juan Hospital; CREA, Centre for emotional and nutritional recovery, Eating Disorders Day Centre; ADANER, Association for the defense of AN and BN care, Eating Disorders Day Centre). This study will involve adolescent girls who have received an eating disorder diagnosis according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria (American Psychiatric Association, 2013), including diagnoses of AN, BN, and OSFED. The inclusion criteria will be as follows: (1) aged between 12 and 19, (2) no psychiatric comorbidity, (3) receiving treatment for ED in a specialist inpatient/day-patient ED unit, (4) a family member willing to participate in the study and (5) ability to manage an electronic device (e.g., mobile phone, computer, laptop or tablet) and the Internet in order to access the online sessions, (6) a native Spanish speaker or understands native level Spanish. Patients will be asked to nominate a carer to whom the researcher will invite to participate in the trial. One carer per patient will be permitted, and this should be a primary carer, somebody who usually takes care of the patient outside the hospital/day-center and lives with her.

Carers

For carers/family members the inclusion criteria will be as follows: (1) living with the patient and (2) not suffering from a serious medical or psychiatric condition (this information will be assessed through a self-report) and (3) ability to access an electronic device (e.g., mobile phone, computer, laptop or tablet) and the Internet in order to access the online sessions and (4) a native Spanish speaker or understands native level Spanish.

Randomization

After screening and consent, patients and their carers will be randomized as a dyad using a randomized computer-generated sequence. A full randomization procedure macro will be applied saving the "seed" (SEED = 13012021) to reproduce the exact selection. Randomization will be facilitated by S. L., a colleague from the Behavioral Sciences and Health Department, who will be not involved in this study. Once the allocation has been assigned, no changes can be made. Those randomized to the intervention arm (ECHOMANTRA plus TAU) will have access to the intervention materials.

Sample Size

An intention-to-treat method will be used to calculate sample size, considering the hypotheses for the primary outcome variables. Power calculations will be based on power determination for longitudinal designs with attrition (Hedeker et al., 1999), an alpha of 0.05, four assessment points (with baseline serving as a covariate), dropout rate of 40% and a fixed autoregressive coefficient of 0.40. A group size of 40 patients per group would provide 80% power with a bilateral $p < 0.05$ to detect a clinically significant change in eating pathology (overall Eating Disorder Examination Questionnaire, EDE-Q, of 0.45 points), assuming a standard deviation of one for the overall EDE-Q change scores (Hedeker et al., 1999), and also to detect a difference in mean weight gain of one Body Mass Index (BMI) point, which, based on previous research, would be clinically important to detect (Agras et al., 2000; Byrne et al., 2017). Therefore, if a sample loss of approximately 40% is taken into account, the participation of at least 70 participants per group will be required.

Interventions/Treatment Arms

Treatment as Usual

We have chosen not to use a standardized comparison treatment as this would require practical changes in different settings and resource management (including training, supervision and quality control), which will not be feasible. We have therefore chosen to allow centers to follow their own procedures for TAU. We will stratify our analyses by center, which will be adjusted accordingly for any bias.

For TAU inpatient care, the Eating Disorder Unit at the San Juan Hospital will provide a programme using a multidisciplinary team approach (dietician, psychologist, physician and nurse). It will include monitoring of physical risks, nutritional rehabilitation, education on healthy eating and nutrition patterns. Besides it will try to modify/improve thoughts, attitudes, behaviors and feelings that maintain the illness through psychological therapy. Once a patient has stabilized and reached a healthy body mass index, she is discharged. She is then either followed up to assess her progress and to facilitate transition to home or she is referred to a day care center.

Treatment-as-usual in the day care centers (ADANER and CREA) will involve multidisciplinary treatment including dietetic support, psychological interventions, school education, and when appropriate, sessions with psychiatrists. Patients will receive the following psychological interventions: weekly individual cognitive behavioral therapy for eating disorders (CBT-ED); and psychoeducational group therapy on nutrition, emotion management, body image, social skills and problem-solving strategies. Usually, patients attend every day of the week (from Monday to Friday) for an average of 6 h. They receive psychological intervention sessions and they also make the different meals of the day. Parents/carers can also access a fortnightly parent support group.

The TAU-only (control condition) group will have no access to the intervention materials or the ECHOMANTRA intervention sessions. At the end of the study, individuals randomized to the TAU-only condition will be offered the self-help components of the intervention.

Treatment-as-Usual Plus Patient and Carer Skills-Sharing Intervention (ECHOMANTRA)

In the experimental group, the adaptation of the ECHOMANTRA programme will be implemented. The contents of the intervention will be translated into the Spanish language and adapted to a Spanish-speaking cultural context.

Patients

Based on the interpersonal model of AN, the "MANTRA" part of the ECHOMANTRA intervention addresses patients' modifiable characteristics, such as difficulties in emotional regulation, interpersonal relationships and eating. The intervention includes a workbook with an emphasis on specific behavioral change strategies. The workbook is organized into eight chapters that correspond to the contents of the eight sessions of the programme.

MANTRA will involved eight, weekly, individual online sessions lasting 60 min, which will be delivered by assistant psychologists trained by the first and principal authors of the study (YQ and MJQ). During the sessions, the trained psychologist will encourage patients to reflect on the information and exercises proposed in the workbook. They will also carry out a series of activities taken from the MANTRA programme to further develop the contents included in the corresponding chapter of the workbook.

Each session will be themed following the structure of the patient workbook. Specifically, the focus of each session will be as follows: the first and second sessions will be on psychoeducation and motivation to change; the third session will be on skills to develop acceptance and self-compassion; the fourth and fifth sessions will be on skills to improve social functioning and to explore thinking styles; the sixth session will be on emotion management; and the seventh and eighth sessions will be on planning for the transition through goal setting, use of social support and implementation intentions.

For a more detailed description of the exercises, see Schmidt et al. (2014).

Carers

Carers allocated to the intervention group will receive a carer workbook.

ECHO will involve eight, weekly, individual online sessions, lasting 60 min, which will be delivered by assistant psychologists trained by the first and principal authors of the study (YM and MJS). During the sessions, the trained psychologist will encourage discussion about the information and exercises proposed in the workbook. In addition, for a deeper understanding of the contents of each session presented in the workbook, carers will read and do activities from the book "Skills based caring for a loved one with an eating disorder: The

New Maudsley Method" (Treasure et al., 2011). (Spanish version: Los trastornos de la alimentación: guía práctica para cuidar de un ser querido Treasure et al., 2011). These sessions will also include some of the video-clips from the Digital Versatile Disc (DVD) for carers "How to Care for Someone with an Eating Disorder"[1]. This DVD includes practical strategies and techniques to help carers develop skills and knowledge to help their loved one move toward recovery and to look after their own wellbeing by following the "New Maudsley Approach."

This book and the DVD are designed to help carers develop self-reflective skills in order to develop confidence, compassion and the courage to take risks. Both resources will show them how to experiment with changes in their caring behavior so they can be more helpful to a loved one suffering from an eating disorder.

The workbook and online sessions will provide a skills training programme that includes training in stress management, communication (based on motivational interviewing techniques), strategies to reduce accommodation and expressed emotion and to increase extinction training and new habits at home *via* effective social support.

Outcomes

Patients

This study will consider primary and secondary outcomes measured at the four evaluation points: baseline (T0), post-intervention (T1), 3-month follow-up (T2) and 6-month follow-up (T3).

The following will be assessed as primary measures: ED symptomatology and psychological well-being. Secondary outcomes will include the following: body mass index (BMI), psychosocial adjustment, perfectionism, obsessive-compulsive symptomatology, motivation to change and hospital readmission. All outcomes and the instruments to be used are shown in **Table 1**.

Clinical Assessment

The health care providers at the day care center or the 24-h hospital unit will submit the following information on the patient: BMI from monthly clinical measurement and up to 9 months post-randomization, diagnosis, age at onset of disorder, evolution of illness over time (duration), admissions prior to current one, comorbidity and readmission after being discharged.

Carers

For carers the following outcome measures will be considered: emotional state, expressed emotion, impact from and accommodation to eating symptoms, coping skills, and parents' perceived efficacy in dealing with the ED (see **Table 1**).

Patients and carers in the ECHOMANTRA-plus- TAU (treatment) arm will complete a "Participant Feedback Form." It is a self-report measure created *ad hoc* for completion at the end of the intervention. It will assess participants' experiences and satisfaction with the study. They will be asked to provide their views regarding: what they found beneficial and/or challenging, what they enjoyed and/or did not like, the transferability of

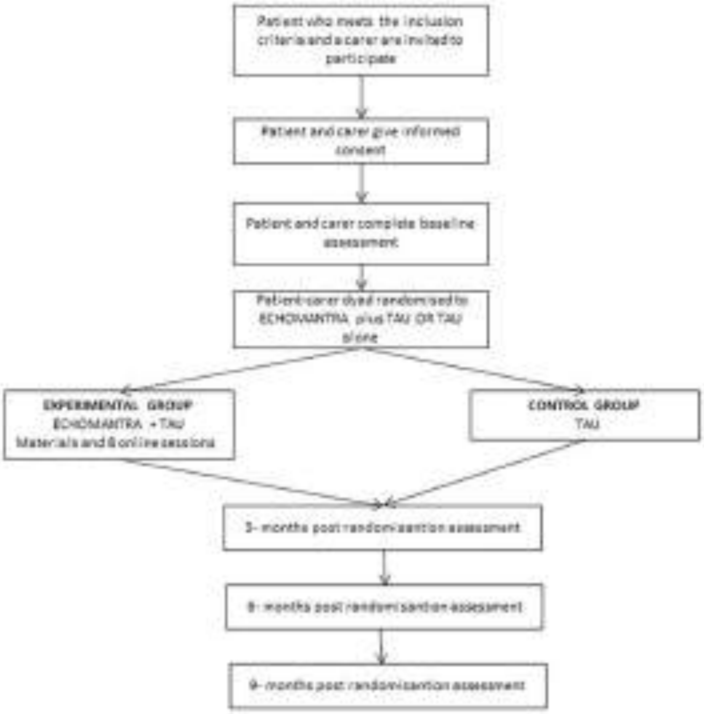

FIGURE 1 | Study design flow diagram.

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[1] http://www.succeedfoundation.org/work/pre_order_dvd

TABLE 1 | Outcomes and measures/instruments.

	Outcome	Measure/instrument	References
PATIENTS			
1	Body mass index		
2	ED Symptomatology	Eating Disorder Examination (EDE-Q)	Fairburn and Beglin, 1994; Spanish Validation (SV): Peláez-Fernández et al., 2012
3	Eating pattern	Daily food self-reporting	
4	Psychological well-being	Depression Anxiety and Stress Scales (DASS-21)	Lovibond and Lovibond, 1995; SV: Bados et al., 2005
5	Psychosocial adjustment	Eating Disorders Quality of Life (EDQL)	Engel et al., 2006
6	Perfectionism	Child and Adolescent Perfectionism Scale (CAPS)	Flett et al., 1997[1]; SV: Castro et al., 2004
7	Obsessive-compulsive symptoms	Obsessive Compulsive Inventory-Revised (OCI-R)	Foa et al., 2002; SV: González et al., 2011
8	Adherence to treatment	Drop-out rate, number of sessions completed and task completion between sessions.	
9	Motivation to change	Visual analogue scale that assesses confidence and importance in changing symptoms of ED (*ad hoc*)	
10	Admission	Number of readmissions to hospital during the intervention and follow-up periods. Record medical history	
11	Patient feedback form	Patients' satisfaction and experiences in the study.	
CARERS			
1	Psychological well-being	Depression Anxiety and Stress Scales (DASS-21)	Lovibond and Lovibond, 1995; SV: Bados et al., 2005
2	Expressed emotion	Family Questionnaire	Wiedemann et al., 2002; SV: Sepúlveda et al., 2014
3	Burden	Eating Disorders Symptom Impact Scale (EDSIS-S).	Sepúlveda et al., 2008; SV: Carral-Fernández et al., 2013
4	Accommodation to illness	Accommodation to Illness Symptoms Scale (AESED).	Sepúlveda et al., 2009; Quiles Marcos et al., 2016
5	Care skills	Caregiver skills scale.	Hibbs et al., 2015b; SV: Vintró-Alcaraz et al., 2018
6	Parents' perception of efficacy	Parents vs anorexia.	Rhodes et al., 2005
7	Carer feedback form	Carers' satisfaction and experiences in the study.	

[1] Flett, G. L., Hewitt, P. L., Boucher, D. J., Davidson, L. A. and Munro, Y. (1997). The child-adolescent perfectionism scale: development, validation, and association with adjustment. Unpublished manuscript.

ECHOMANTRA skills to their routine, and their suggestions for further improvements to the intervention.

Blinding

Given the nature of the study design, all participants and therapists will be aware of the treatment condition.

The person responsible for creating the sequence of randomization will not belong to the research team and will not have other role in this research project. The researcher responsible for making the analyses will be a specialist in statistical methodology and only will participate in this aspect of the study. The research assistant who administers the assessment at each time period will not deliver the intervention. The statistician will be blinded to the condition allocated to the patient and their carer.

Statistical Analysis

Firstly, a covariance analysis (ANCOVA) will be carried out using the pre-test scores as a covariate to analyze the impact of the combined intervention. Secondly, a repeated measures analysis of variance will be used to analyze the short and medium-term efficacy of the combined intervention in comparison to the usual intervention between and within groups at different time points, and effect size values will also be considered. Stratification will be performed in the analyses by the admission center and "diagnosis" variable will be controlled. IBM SPSS Statistics 24.0 will be used for all the analyses (IBM Corp, 2016).

DISCUSSION

The treatment of eating disorders should include patients and carers in order to improve patients' outcomes and adherence (Treasure and Nazar, 2016). In this sense, ECHOMANTRA is an intervention that can improve outcomes during and following intensive care for adolescents with AN (Cardi et al., 2017; Adamson et al., 2019). ECHOMANTRA should reduce patients' distress and eating disorder symptoms. For carers, outcomes have been related to a reduction in distress and an improvement in their skills.

ECHOMANTRA is protocolized in eight sessions, so it can be replicated in different contexts, such as a day hospital or inpatient unit. It was designed to be affordable, scalable, and to potentially have a wide reach (Cardi et al., 2017). Treatment sessions will be developed online, which will allow both patients and family members to adapt their learning and improvement in therapeutic skills to their daily routine in order to increase engagement. This design will make it possible to overcome some of the obstacles that make it difficult for participants to adhere, especially carers.

This is a multi-center trial, which will take place in two different types of services (day hospital and inpatient unit). It will allow us to evaluate intervention effectiveness according to the therapeutic context and its impact on the generalizability of the data. Also, MANTRA was originally developed for adult AN patients. This study will examine the usefulness of the MANTRA treatment programme for adolescents with other EDs and not just AN, thereby enhancing current knowledge about potential treatments for these patients.

This trial has some limitations. Firstly, two questionnaires that will be used in this RCT, the EDQL and the “Parents vs Anorexia Questionnaire” are not validated in the Spanish population. As a result, our team will validate them. Another limitation is that not only AN patients will receive the MANTRA protocol, but it will also be received by BN and those with OSFED. Another limitation is the fact that we have translated all the original protocols into Spanish, and we will use them without a previous pilot study. Another limitation is the possible difficulties for both members of the dyad (patient and carer) to be involved in the intervention during all sessions. To facilitate the adherence of both, the schedule for each of the sessions will be agreed on individually with each of the participants. Finally, special attention will be paid to possible difficulties in maintaining adherence in the control group. To this end, they will be offered the self-help components of the intervention at the end of the study.

The strengths of this study will be the randomized control study design and protocolized therapist guidance during the intervention. Moreover, individualized interventions for patients and carers reinforce trial soundness.

Clinical implications will be related to improving psychological treatment for ED disorders. In our opinion, findings from the ECHOMANTRA trial will be able to optimize inpatient/day-patient treatment and improve our knowledge about the factors that maintain the illness for those with a severe and enduring ED. An additional benefit could be found in the assessment of MANTRA’s effectiveness for BN and OSFED and not only for AN.

Finally, this paper outlines the protocol for a study that should improve treatment in ED patients. We have outlined the components of the ECHOMANTRA intervention and have clearly stated the research methodology as recommended in CONSORT 2010 guidelines (Schulz et al., 2010).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of University Hospital of San Juan of Alicante, and Ethics Committee of University Miguel Hernández of Elche. Written informed consent to participate in this study was provided by the participants’ legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

YQ spearheaded the design of the trial protocol and development of intervention materials in collaboration with MQ, EL, MR, ÁR, ME, CR, and VE. All authors contributed to the article and approved the submitted version.

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Article 2

Efectividad de la aplicación del programa Echomantra en una adolescente con anorexia nerviosa y su familiar: Un estudio de caso.

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Efectividad de la aplicación del programa Echomantra en una adolescente con anorexia nerviosa y su familiar: Un estudio de caso.

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Resumen

El programa ECHOMANTRA tiene como finalidad facilitar la transición de las pacientes con un trastorno de la conducta alimentaria desde el ingreso hospitalario a su vida cotidiana. Consta de una intervención para los/las familiares (ECHO; Treasure et al., 2015) y otra para las pacientes (MANTRA, Schmidt, et al, 2014). El objetivo de este estudio fue evaluar la efectividad del programa ECHOMANTRA, aplicado junto al tratamiento usual, en una adolescente de 15 años con anorexia nerviosa (AN) y su madre. Se utilizó un diseño de caso único y medidas pre-post, con seguimiento a los 3 y 6 meses. En la paciente se evaluó: patología alimentaria (EDE-Q), estado emocional (DASS-21), ajuste psicosocial (EQ-5D-5L y el CIA 3.0) y motivación al cambio; y en la madre: emoción expresada (FQ), impacto de los síntomas (EDSIS), acomodación a la enfermedad (EAISA), estado emocional (DASS-21) y habilidades de cuidadora (CSS). Ambos programas constaban de 8 sesiones online individuales y semanales. Los resultados mostraron una reducción en la sintomatología de AN, aumento del IMC, mejora del estado emocional, motivación al cambio y ajuste psicosocial; y en la madre, mejoró el estado emocional y las habilidades de cuidado, y disminuyó la acomodación a la enfermedad, la emoción expresada y el impacto de los síntomas. Estos cambios se mantuvieron en el seguimiento. Ambas valoraron el programa como satisfactorio. La aceptabilidad y la eficiencia del tratamiento de la AN puede mejorarse utilizando el ECHOMANTRA para preparar la transición de la atención hospitalaria, apoyando a las pacientes y familiares.

Palabras clave: ECHOMANTRA; anorexia; adolescente; familiar; estudio de caso único.

Abstract

Effectiveness of the application of the Echomantra in an adolescent girl with anorexia nervosa and her caregiver: A case study. The aim of the ECHOMANTRA program is to facilitate the transition from hospital back into the community. ECHOMANTRA is based on interventions for carers (Experienced Carers Helping Others, ECHO; Treasure et al. 2016) and patients (Maudsley Model of Anorexia Nervosa Treatment for Adults, MANTRA; Schmidt, et al., 2014). The aim of this study was to evaluate the effectiveness of the ECHOMANTRA program, applied together with the usual treatment, in a 15-yearold adolescent girl with anorexia nervosa (AN) and her mother. A single case design and pre-post measures were used, as well as follow-up at 3 and 6 months. The patient was assessed for: eating pathology (EDE-Q), emotional state (DASS-21), psychosocial adjustment (EQ-5D-5L and CIA 3.0) and motivation to change. In the mother: expressed emotion (FQ), symptom impact (EDSIS), accommodation to illness (EAISA), emotional state (DASS-21) and her caregiver skills (CSS) were assessed. Both programs consisted of 8 on-line sessions, which were conducted individually and on a weekly basis. The results showed a reduction in AN symptomatology, increased BMI, improved emotional state, motivation to change and psychosocial adjustment; and in the mother, improved emotional state and caregiving skills, and reduced accommodation to illness, expressed emotion and the impact of symptoms. These changes were maintained at follow-up. Both patient and family valued the program as satisfactory. Both the acceptability and efficiency of treatment for AN may be improved by using ECHOMANATRA to prepare for transition from inpatient care, by giving support to both patients and their carers.

Keywords: ECHOMANTRA; anorexia; adolescent; relative/caregiver; case study.

En la actualidad, la anorexia nerviosa (AN) es la enfermedad psiquiátrica más frecuente en mujeres jóvenes, presentando una prevalencia de entre 0,3-0,9% en adolescentes (Herpertz-Dahlmann, 2015; Martínez-González et al., 2020). Sin el tratamiento adecuado, el trastorno puede adquirir un curso crónico e incapacitante. Éste persigue normalizar el peso, tratar las complicaciones físicas, conductuales, cognitivas y emocionales, proporcionar educación nutricional y tratar los trastornos asociados (Arrufat, 2009). Es multidisciplinar y se efectúa en distintos niveles asistenciales: el tratamiento ambulatorio es la intervención de primera línea, pero se requiere hospitalización cuando hay alto riesgo de presentar complicaciones biológicas y psicológicas graves, no hay respuesta al tratamiento ambulatorio y/o se dispone de limitados recursos psicosociales (NICE, 2017). La principal limitación del ingreso hospitalario es la dificultad que presentan las pacientes para generalizar las pautas al ámbito cotidiano, que se manifiesta en la cronificación del trastorno en el 20-30% de los casos, con unos índices de recuperación completa inferiores al 50-60%, unas altas tasas de recaídas tras el alta médica, además de una mortalidad de 10-12 veces y un índice de suicidio 200 veces superior que en población general (Gómez-Candela, 2018; Grave et al., 2014; Legenbauer y Meule, 2015; Schmidt et al. 2014). Por tanto, es necesario que las intervenciones terapéuticas de los TCA optimicen sus resultados durante y después del tratamiento.

Con este propósito y con el objetivo de facilitar la transición desde el ingreso hospitalario a la vida cotidiana, el equipo de la Dra. Janet Treasure desarrolló el programa de intervención ECHOMANTRA, compuesto por un programa para los/las familiares/cuidadores/as (ECHO; Experienced Carers Helping Others; Treasure et al., 2015) y otro para las pacientes (MANTRA; Maudsley Anorexia Nervosa Treatment for Adults; Schmidt et al., 2014).

La parte ECHO, basada en el Modelo de Afrontamiento y Estrés del Cuidador/a en los TCA (Treasure et al., 2003), proporciona asistencia y entrena a los familiares/cuidadores para lidiar con dicho rol. Aplicaciones previas evidencian una reducción en los costes asociados a los servicios y unos resultados positivos y estables en la reducción de la carga de cuidado, la emoción expresada y el malestar psicológico tras la intervención (Hibbs et al, 2015; Hodsoll et al., 2017; Magill et al., 2016; Pérez-Pareja et al. 2014; Quiles et al., 2018; Treasure et al., 2021).

El MANTRA se basa en el Modelo de Mantenimiento Cognitivo de la AN (Schmidt et al, 2014) e interviene en la regulación emocional de las pacientes y en su comportamiento alimentario, poniendo énfasis en las estrategias de cambio conductual y centrándose en los pasos para prosperar en la transición desde el ingreso hospitalario a la vida cotidiana.

Estudios sobre su eficacia en pacientes adultas muestran mejoras estables en la psicopatología de los TCA y el IMC, alta aceptabilidad y bajas tasas de abandono (Schmidt et al., 2015; 2016). De hecho, ha sido recomendado como intervención psicológica de primera línea en pacientes adultas con AN (NICE, 2017). Debido a la escasez de investigación sobre intervenciones de AN juvenil y las altas tasas de abandono y recaídas en los abordajes ya establecidos, es necesario el desarrollo de nuevos enfoques terapéuticos en población adolescente con AN. Por tanto, aunque el MANTRA haya sido aplicado únicamente en población adulta, algunas de sus características podrían ser especialmente beneficiosas en adolescentes (Schmidt, 2009; Wittek et al., 2021).

Por tanto, el objetivo del presente estudio de caso es examinar la efectividad del programa ECHOMANTRA, como complemento al tratamiento usual (TAU), en una adolescente con AN ingresada en un centro de día. Éste tiene el propósito de mejorar la transición de la paciente desde el ingreso hospitalario a la comunidad (vida cotidiana) y su bienestar. Tras la intervención se espera en la paciente una reducción de la sintomatología conductual y cognitiva de AN, un incremento del IMC y una mejora del ajuste psicosocial; y en su familiar una mejora en las habilidades de cuidado y estado emocional y una menor acomodación al síntoma, emoción expresada e impacto de los síntomas.

Descripción del caso

Identificación de la paciente

C. es una adolescente de 15 años de nacionalidad española. Cursa cuarto de Educación Secundaria Obligatoria. Pertenece a una familia de nivel socioeconómico medio-alto. Vive con sus padres, ambos tienen 45 años y son profesores, y con su hermana mayor de 17 años.

Esta paciente presenta un diagnóstico de anorexia nerviosa restrictiva (AN-R) y es atendida en un centro especializado en el tratamiento de los TCA en régimen de centro de día, éste es uno de los perfiles más frecuentes y representativos en la práctica clínica, y que justifica su selección para este estudio.

Para la realización de este estudio, se contó con el visto bueno y valoración positiva del comité ético de la Universidad Miguel Hernández y se obtuvo un consentimiento informado de la paciente y su familiar aceptando participar en la investigación.

Motivo de consulta

C. ingresó en el centro de día derivada desde la Unidad de Salud Mental Infantil y Adolescente (USMIA) con diagnóstico de AN-R, acorde a los criterios del DSM-V. Debido al estadío de la enfermedad y la predisposición de su madre a colaborar en el tratamiento, se consideró que C. podía beneficiarse de la aplicación del Programa ECHOMANTRA.

Historia del problema

Desde pequeña, C. practicaba la natación de competición. Según refiere, ésta actuaba como punto de unión en la relación paternofilial, al ser él su entrenador, y como rasgo identitario en la familia: su hermana era “la estudiosa” y ella “la nadadora”. Sin embargo, se lesionó la rodilla y tuvo que abandonarla, perjudicando la relación paternofilial, y afrontando una rehabilitación que se prolongaría cinco meses.

Durante esta temporada, coincidente con el confinamiento por la COVID-19, C. expone que comenzó a sentirse mal con su cuerpo y presentaba miedo a engordar como resultado de la inactividad física. Inició una dieta vegetariana, redujo progresivamente la ingesta y aumentó el ejercicio físico para "cambiar su físico como ella quería". Como desencadenante de la enfermedad, C. identifica la delgadez ocasionada por la atrofia muscular en la pierna lesionada. Según refiere, su madre presentaba un estilo parental permisivo y su padre autoritario, destacando en el hogar una comunicación hostil predominantemente pasivo-agresiva. Durante las discusiones conyugales C. se percibía como canal de comunicación entre sus padres y como nexo de unión en su familia, al ser la única que mantenía buena relación con ambas partes. Expresa que al mostrar explícitamente sintomatología del trastorno los conflictos familiares disminuían verbalizando "desde que estoy enferma no discuten tanto". Estos factores resultaron en una pérdida de peso de 10kg, aparición de miedo a ganar peso, un aumento del ejercicio físico extenuante, un estado de ánimo deprimido y malestar en sus relaciones sociales.

Posteriormente, acudió a una nutricionista quien, según afirman sus padres, reforzaba la restricción alimentaria; y recibió tratamiento con una psicóloga privada donde abordaría la sintomatología depresiva, expresión de la ira tras la lesión, gestión de las dificultades maritales de sus padres y habilidades interpersonales.

Más adelante acudió a un psiquiatra privado quien, debido a su bajo IMC (13.9 kg/m2), pautó un ingreso domiciliario y reposo absoluto iniciando los estudios desde casa. Además, derivó el caso de C. a la USMIA donde la diagnosticaron con AN restrictiva y se recomendó su hospitalización en la Unidad de Hospitalización de Trastornos Alimentarios del Hospital provincial de referencia. Sus padres rechazaron dicha medida y se propuso el centro especializado en TCA donde ingresó semanas después en régimen de centro de día, lugar donde se aplicó la intervención de estudio.

En la información aportada por su madre, expresa la incertidumbre ante el problema de su hija, culpabilidad, sobreimplicación emocional, comprobación en su comportamiento, búsqueda de seguridad en la terapeuta y verbaliza la necesidad de mayor conocimiento en cuanto al TCA.

Estrategias de evaluación

Se emplearon los siguientes instrumentos:

Con la paciente:

- *Cuestionario de variables sociodemográficas y clínicas elaborado ad-hoc*. Las variables clínicas fueron cumplimentadas por la psicóloga que la atendía en el centro de día: diagnóstico, duración del TCA, tratamientos e ingresos previos, tratamiento farmacológico e índice de masa corporal (IMC).
- *Eating Disorder Examination Questionnaire (EDE-Q)* (Fairburn y Berglin, 1997). Evalúa comportamientos, actitudes y sentimientos con respecto a la alimentación y la imagen corporal en los TCA. Compuesto por cuatro factores: restricción alimentaria, preocupación por el peso, la figura y por comer. Puntuaciones elevadas indican mayor sintomatología. La validación española presenta una consistencia interna de entre α=,74 y α=,93 en las dimensiones y en la escala total (Peláez-Fernández, Labrador y Raich, 2013).

- *Escalas de Depresión, Ansiedad y Estrés (DASS-21)* (Lovibond y Lovibond, 1995). Compuesto por tres subescalas: depresión, ansiedad y estrés. La validación española presenta consistencia interna entre α=,70 y α=,84 (Badós, Solanas y Andrés, 2005).
- *The Child and Adolescent Perfectionism Scale (CAPS)* (Flett et al., 1997). Consta dos dimensiones: Perfeccionismo Autoorientado, evalúa autoimposiciones poco realistas; y Perfeccionismo Prescrito Socialmente, evalúa la presión ejercida por otros para alcanzar metas poco realistas. La validación española presenta una consistencia interna de α=,87 (Castro et al., 2004).
- *EQ-5D-5L.* Desarrollada por el Grupo EuroQuol (2009) y validada en población española por Hernández et al. (2018). Evalúa dificultades en cinco dimensiones respondidas: movilidad, autocuidado, actividades cotidianas, dolor/malestar y ansiedad/depresión. Incluye una Escala Visual Analógica (EVA) para determinar el estado de salud autopercibido del 0 al 100.
- *Clinical Impairment Assessment (CIA 3.0)* (Bohn et al., 2008). Compuesta por tres subescalas de deterioro: personal, social y cognitivo. Puntuaciones elevadas indican un mayor deterioro psicosocial. La validación española presenta consistencia interna de α= ,90 (Martín et al., 2015).
- *Regla de motivación al cambio.* Basada en la Entrevista Motivacional de Miller y Rollnick (1999), consta de dos ítems: "¿En qué medida es importante para ti cambiar?" y "¿Cuánta confianza tienes en tu capacidad para cambiar?" con una escala de respuesta del 1 al 10. Puntuaciones elevadas indican mayor motivación al cambio.

Con su familiar:

- *Cuestionario Familiar (FQ)* (Wiedemann et al., 2002). Consta de dos dimensiones: comentarios críticos y sobreprotección. Puntuaciones elevadas indican mayor emoción expresada. La validación española presenta una consistencia interna de α= ,83 y α=,72, respectivamente (Sepúlveda et al., 2014).
- *Eating Disorders Sypmtom Impact Scale (EDSIS)* (Sepúlveda et al., 2008). Compuesta por cuatro dimensiones: dificultades nutricionales, culpa, conductas disfuncionales y aislamiento social. Puntuaciones elevadas indican mayor carga de cuidado percibida. La validación española presenta una consistencia interna entre α=,74 y α=,88 en la escala total y las dimensiones (Carral-Fernández et al., 2013).
- *Escalas de Depresión, Ansiedad y Estrés (DASS-21).*

- *Escala de Acomodación a los Síntomas de la Enfermedad (EAISA)* (Sepúlveda, Kyriacou y Treasure, 2009). Compuesta por cinco subescalas: evitación y modificación de la conducta, rituales en torno a la comida, control de la familia y "hacer la vista gorda". Mayores puntuaciones indican mayor acomodación a la enfermedad. La validación española presenta una consistencia interna entre α=,74 y α=,89 (Quiles et al., 2016).
- *The Caregiver Skills Scale (CASK)* (Hibbs et al., 2015). Compuesta por seis factores: "no quedarse en el detalle", autocuidado, morderse la lengua, comprensión y aceptación, inteligencia emocional y tolerancia a la frustración. La validación española presenta una consistencia interna entre α=,70 y α=,75 (Vintró-Alcaraz et al., 2018).

Análisis topográfico y funcional

Mediante la información obtenida a través de la entrevista inicial, su historia clínica y los instrumentos psicométricos, se ha establecido la relación funcional entre las variables antecedentes y mantenedoras del TCA de C.

Como factores de vulnerabilidad (O), dentro de la historia de aprendizaje, se encuentran: la lesión y el proceso de rehabilitación, vivido como una pérdida de reforzadores por la quiebra de identidad y de la relación paternofilial; los conflictos conyugales, un estilo de comunicación predominantemente pasivo-agresivo y hostil en el hogar y la percepción de un estilo parental permisivo en su madre y autoritario en su padre; y un estilo de pensamiento perfeccionista autoorientado y autoexigente. En cuanto a las variables biológicas, hay evidencias de antecedentes de AN en la familia extensa.

Como factores desencadenantes (E) remotos externos se encuentra la dismorfia corporal real ocasionada por la atrofia muscular fisiológica en la pierna lesionada, el confinamiento por la crisis del COVID-19, que incrementó el aislamiento social, la inactividad física y los conflictos familiares, así como las dietas restrictivas pautadas por la nutricionista a la que acudió. Los internos serían el estado de ánimo deprimido, pensamientos sobre delgadez, la insatisfacción corporal y la pérdida de identidad. Como factores desencadenantes inmediatos externos, las cinco comidas diarias pautadas y el reposo; e internos, la preocupación sobre la alimentación, el peso y la forma corporal y las emociones negativas.

Como respuestas (R) motoras destaca la restricción alimentaria y el ejercicio físico excesivo. A nivel fisiológico, presenta ansiedad grave y estrés moderado. A nivel cognitivo, pensamientos rumiativos sobre la comida, forma y peso corporal y miedo a ganar peso.

Como consecuencias (C) externas, la mayor atención y cuidado de sus padres, la emoción expresada (sobreimplicación emocional y comprobación de su comportamiento) y el cese de los conflictos conyugales actuarían como reforzadores del comportamiento de enfermedad. También cesan las relaciones con sus iguales y su hermana, quien se aleja de C. a raíz del trastorno. En cuanto a las consecuencias internas, la sensación de control y satisfacción ante la pérdida de peso y la evitación del malestar al adherirse a las normas alimentarias autoimpuestas refuerzan el problema.

Diseño del estudio

Se trata de un experimento de caso único (N=1), se emplea el modelo básico A-B (Montero y León, 2007). El caso es el propio control y se mide el efecto de la intervención en base a los objetivos terapéuticos establecidos. Se realizaron medidas pre-post, con seguimiento a los 3 y 6 meses.

Intervención

Objetivos

Como objetivo central se planteó mejorar la transición de la paciente desde el ingreso en centro de día a la comunidad (vida cotidiana) y su bienestar.

Como objetivos específicos se propusieron:

Paciente

1. Reducir la sintomatología de AN

2. Incrementar el IMC
3. Mejorar el estado emocional
4. Aumentar la motivación al cambio
5. Aumentar el ajuste psicosocial
6. Disminuir el perfeccionismo

Familiar

1. Mejorar el estado emocional
2. Mejorar las habilidades de cuidado
3. Reducir la acomodación al síntoma
4. Reducir la emoción expresada
5. Reducir el impacto de los síntomas

Aplicación del tratamiento

La paciente recibía simultáneamente el tratamiento protocolizado del centro de ingreso (TAU) y la intervención de estudio.

Tratamiento usual (TAU)

Incluía rehabilitación nutricional e intervención psiquiátrica y psicológica, donde recibía: terapia cognitivo-conductual semanal y asistía a grupos terapéuticos psicoeducacionales de nutrición, gestión de emociones, imagen corporal, habilidades sociales y resolución de problemas. Acudía al centro de ingreso de lunes a viernes seis horas diarias y realizaba dos ingestas.

Programa ECHOMANTRA

El programa ECHOMANTRA fue traducido y adaptado al español.

Paciente

Se realizaron ocho sesiones telemáticas semanales con una duración de 60 minutos, cuyos contenidos fueron extraídos del programa MANTRA; y complementadas por un “Cuaderno del paciente”. Éstas incluyeron: psicoeducación, motivación al cambio, entrenamiento en autocompasión, estilos de pensamiento y habilidades para el funcionamiento social, gestión emocional y el establecimiento de objetivos y el uso del apoyo social para planificar la transición. Todas las sesiones seguían la misma estructura, en la que se revisaban las tareas propuestas y la lectura del Cuaderno, se presentaban los contenidos correspondientes a la sesión según el protocolo y se enviaban tareas y ejercicios para la semana. A lo largo del programa, se fomentaba la reflexión sobre los contenidos y ejercicios implementados durante las sesiones.

Para una descripción más detallada de los ejercicios, ver Schmidt et al. (2014).

Familiar

Se realizaron ocho sesiones telemáticas semanales con una duración de 60 minutos complementadas por un “Cuaderno del cuidador”. Éstas seguían la misma estructura descrita anteriormente en las sesiones con la paciente y se fomentaba la discusión sobre la información y ejercicios propuestos en el cuaderno. Estas sesiones incluyeron el entrenamiento en manejo del estrés, comunicación (basada en las técnicas de la Entrevista Motivacional), estrategias para reducir la acomodación al síntoma, la emoción expresada y desarrollar nuevos hábitos en el hogar para lograr un apoyo social efectivo. Además, se propuso la lectura del libro “Los trastornos de la alimentación: guía práctica para cuidar de un ser querido” (Treasure et al., 2011) y se presentaron clips de vídeo del DVD “How to Care for Someone with an Eating Disorder” con estrategias y técnicas aplicadas para desarrollar habilidades para ayudar a su ser querido durante la recuperación y cuidar de su propio bienestar siguiendo el “The New Maudsley Approach”.

Para implementar la intervención, se reclutó a dos psicólogas generales sanitarias, con experiencia en el campo de los TCA y con formación en la aplicación del programa ECHOMANTRA.

Para valorar la adherencia al programa, las terapeutas emplearon un registro escrito sobre los temas y módulos del workbook tratados durante la sesión, el cumplimiento de tareas y la asistencia a las sesiones. Se consiguió una buena adherencia, en ambos casos el cumplimiento y asistencia fue del 100%. Además, las terapeutas afirmaron conseguir un buen vínculo con la paciente y su familiar, respectivamente.

Resultados

Análisis cualitativo

Paciente

Al finalizar la intervención, la paciente valoró las sesiones como muy satisfactorias y útiles para afrontar el problema alimentario, le habían servido para entender el problema alimentario y los factores de origen y mantenimiento, mejorar su motivación hacia la recuperación y sus relaciones sociales, tener una actitud más autocompasiva, comprender los estilos de pensamiento y gestionar sus emociones. Destacó su utilidad para planificar la transición desde el centro de día, establecer metas y mejorar la resolución de problemas durante el proceso de recuperación.

Familiar

Su madre también valoró la intervención de manera satisfactoria, considerando las sesiones útiles para entender el trastorno alimentario, mejorar su experiencia como cuidadora, desarrollar herramientas para afrontar situaciones conflictivas y mejorar su comunicación con su hija (más compasiva y menos crítica).

Análisis cuantitativo

Paciente

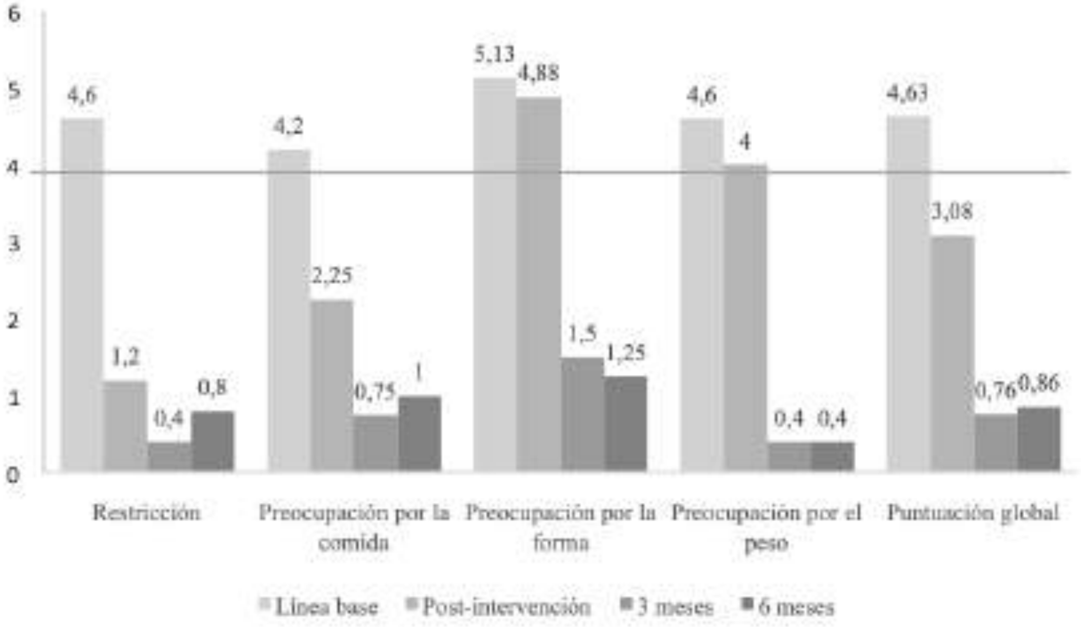
Patología alimentaria (Eating Disorders Questionnaire, EDE-Q): inicialmente las puntuaciones de la paciente superaron el punto de corte (≥4) en todas las subescalas. Atendiendo a las puntuaciones tras la intervención y al Índice de cambio fiable (ICF) y seguimientos, se produjo una reducción significativa en todas ellas por debajo del punto de corte. (Tabla 1, Figura 1).

Tabla 1 | Índice de cambio fiable (ICF) para las puntuaciones del EDE-Q

	T0-T1	T0-T2	T0-T3
Restricción (R)	-4,493*	-5,551*	-5,022*
Preocupación por la comida (EC)	-1,483	-2,623*	-2,433
Preocupación por la forma (SC)	-0,361	-5,244*	-5,605*
Preocupación por el peso (WC)	-0,473	-0,309*	-3.309*
Puntuación total (GS)	-1,604	-4,005*	-3,902*

** Reducción significativa (p<0,05)*

Figura 1 | Puntuaciones en la patología alimentaria, obtenidas a través del EDE-Q



En los ítems conductuales las “Conductas regulares de dieta” se redujeron de 23-27 días en el último mes a ningún día. Los “Episodios regulares de ejercicio excesivo” disminuyeron de 2-3 días a la semana a 1.

Índice de Masa Corporal (IMC): la paciente presentaba un IMC de 14,50 kg/m2, que incrementó a 16,90 kg/m2 tras la intervención y 18,90 kg/m2 en los seguimientos.

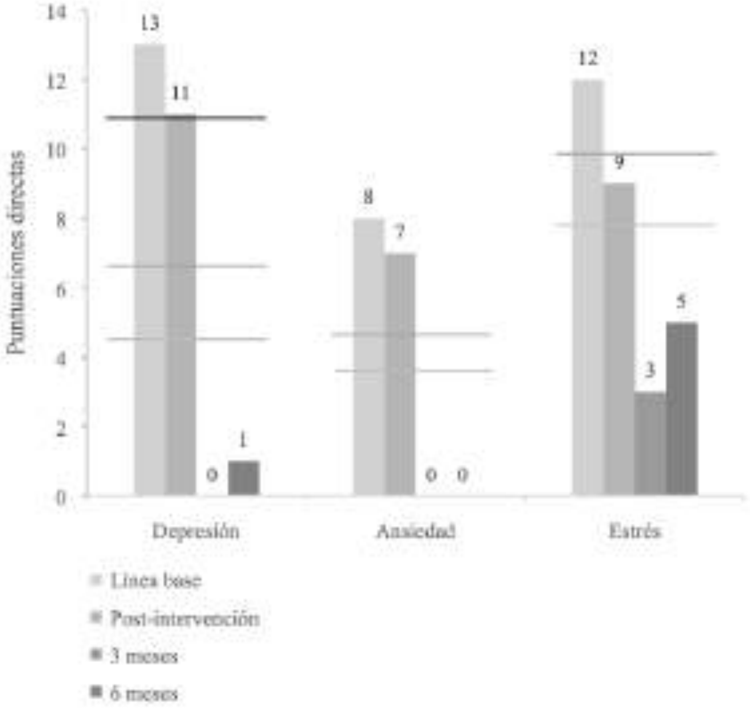
Estado emocional (DASS-21): en la evaluación inicial la paciente obtuvo una puntuación directa de 33, equivalentes a depresión y ansiedad graves y estrés moderado. En el último seguimiento se redujo a 6, situándose por debajo de los puntos de corte y obteniendo unos porcentajes de mejora entre 58,33-100% para las dimensiones y la puntuación total (Figura 2).

Motivación al cambio: inicialmente la paciente otorgó un 8 a la importancia del cambio y un 6 a su confianza para cambiar que incrementaron respectivamente a 10 y 9 tras la intervención.

Ajuste psicosocial: en el EQ-5D-5L, inicialmente la paciente mostró problemas leves para realizar las actividades cotidianas, dolor/malestar leve y estar moderadamente ansiosa/deprimida. A los 6 meses únicamente manifestó estar levemente ansiosa/deprimida. En la EVA, inicialmente evaluó su estado de salud con un 75 y al finalizar los seguimientos con un 89.

En la *Clinical Impairment Assessment (CIA 3.0)* en la evaluación inicial la paciente obtuvo una puntuación directa de 33, reducida a 8 en el último seguimiento. Del mismo modo ocurrió en las puntuaciones de las dimensiones, obteniendo unos porcentajes de mejora entre 50-90,91%.

Figura 2 | Puntuaciones en el estado emocional, obtenidas a través del DASS-21



En la *Clinical Impairment Assessment (CIA 3.0)* en la evaluación inicial la paciente obtuvo una puntuación directa de 33, reducida a 8 en el último seguimiento. Del mismo modo ocurrió en las puntuaciones de las dimensiones, obteniendo unos porcentajes de mejora entre 50-90,91%.

Perfeccionismo (The Child and Adolescent Perfectionism Scale, CAPS): inicialmente la paciente mostró una puntuación directa de 35 en perfeccionismo autoorientado, 20 en perfeccionismo prescrito socialmente y 55 en la escala total durante la evaluación inicial y tras la intervención. A los tres meses se redujeron las puntuaciones a 19, 14 y 33, obteniendo unos porcentajes de mejora entre 30-45,71%. Sin embargo, estos cambios no se mantuvieron en el seguimiento posterior, las puntuaciones superaron los valores originales: 35, 25 y 60, respectivamente.

Familiar

Emoción expresada (Cuestionario familiar, FQ): inicialmente la madre presentó unas puntuaciones directas de 31 en la escala total, 10 en comentarios críticos y 21 en sobreprotección, no superando el punto de corte. En el último seguimiento se redujeron, obteniendo unos porcentajes de mejora entre 30-61,29%.

Impacto de los síntomas (Escala del Impacto de Síntomas de los Trastornos Alimentarios, EDSIS): inicialmente la madre mostró unas puntuaciones directas de 9 en aislamiento, 15 en culpa, 16 en nutrición, 6 en conductas desreguladas y 46 en la escala total.

Tras los seguimientos estas puntuaciones disminuyeron, obteniendo unos porcentajes de mejora entre 50-86,67%.

Acomodación a la enfermedad (Escala de Acomodación a los Síntomas de Enfermedad, EAISA): inicialmente la madre mostró unas puntuaciones directas de 26 en evitación y modificación de conducta, 7 en búsqueda de seguridad, 2 en rituales de comida, 16 en control de la familia y 51 en total. En el último seguimiento las puntuaciones disminuyeron, obteniendo porcentajes de mejora significativos entre 68,75-88,46%. La puntuación de la subescala de hacer la vista gorda se mantuvo en 0 durante todas las evaluaciones.

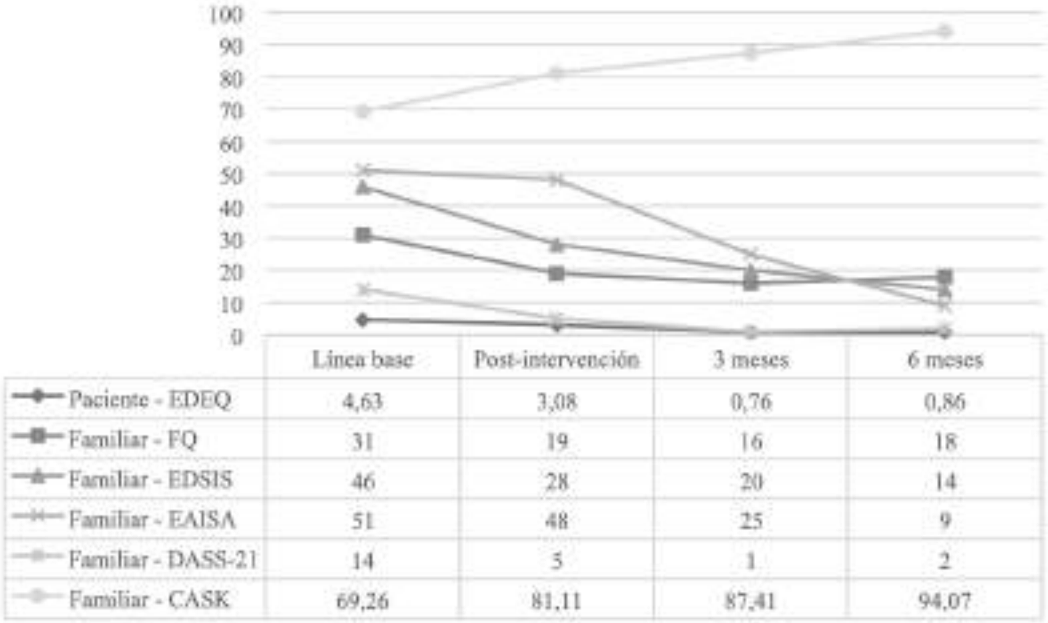
Estado emocional (DASS-21): inicialmente la madre obtuvo una puntuación directa de 14, mostrando puntuaciones equivalentes a depresión moderada. Tras los seguimientos se redujo a 2, obteniendo unos porcentajes de mejora entre 66,67-100%.

Habilidades de cuidadora (The Caregiver Skills Scale, CASK): inicialmente la madre mostró una puntuación media total de 69,26, que se incrementó a 94,07 tras los seguimientos. Las puntuaciones en cada subescala incrementaron, obteniendo porcentajes de mejora entre 34,29-85,71%.

Evolución temporal

En la Figura 3 se muestra la evolución temporal de las puntuaciones de la paciente en la patología alimentaria (EDEQ) y las de su madre en la emoción expresada (FQ), impacto de los síntomas (EDSIS), acomodación a la enfermedad (EAISA), estado emocional (DASS-21) y habilidades de cuidadora (CASK).

Figura 3 | Evolución temporal de puntuaciones directas en las escalas



	Línea base	Post-intervención	3 meses	6 meses
Paciente - EDEQ	4,63	3,08	0,76	0,86
Familiar - FQ	31	19	16	18
Familiar - EDSIS	46	28	20	14
Familiar - EAISA	51	48	25	9
Familiar - DASS-21	14	5	1	2
Familiar - CASK	69,26	81,11	87,41	94,07

Discusión

El objetivo principal de este estudio fue examinar la efectividad del programa ECHOMANTRA, como complemento al TAU, en una adolescente con AN ingresada en un centro de día para mejorar la transición desde el ingreso a la comunidad. Tras la intervención se observaron mejoras en los objetivos terapéuticos propuestos para ella: reducir la sintomatología de AN, incrementar el IMC, mejorar el estado emocional, la motivación al cambio y el ajuste psicosocial; y su familiar: mejorar el estado emocional y las habilidades de cuidado y reducir la acomodación a la enfermedad, la emoción expresada y el impacto de los síntomas. Estos cambios se mantuvieron e incluso algunos aumentaron a lo largo del seguimiento. Además, ambas partes realizaron una valoración subjetiva satisfactoria del programa, lo que se reflejó en una adecuada adherencia a la intervención.

Debido a la naturaleza observacional de este estudio no se pueden extraer relaciones directas entre las variables. No obstante, atendiendo a los resultados obtenidos se observa una disminución de la sintomatología de AN en la paciente simultánea al aumento de habilidades de cuidadora y reducción de la emoción expresada y acomodación al síntoma en su familiar. Estos resultados enfatizan, tal y como se propone en la literatura científica existente, la asociación de estas variables familiares con la optimización de los resultados terapéuticos y, con ello, la importancia de incluir a las familias como agentes activos en el proceso de cambio (Salerno et al., 2016; Philip et al., 2021).

A pesar de la mejora observada en la sintomatología de AN y el resto de variables, no se observaron cambios en el perfeccionismo de la paciente. Tal y como se hipotetiza en la literatura científica, el perfeccionismo tiende a mantenerse estable durante y tras la recuperación parcial de un TCA, definida esta como el cese de la sintomatología alimentaria y recuperación de peso (e.g. Bardone-Cone et al., 2007; Nilsson et al. 2008, Serrano et al., 2018). Esto apoyaría la hipótesis de que el perfeccionismo no es un estado asociado a la fase activa de la enfermedad, siendo una entidad unidimensional y cognitiva, sino que se trata de un constructo de personalidad multidimensional con tendencia temporal estable (Hewitt y Flett, 1991). Sin embargo, otros estudios plantean que, cuando la recuperación total se define más estrictamente, los niveles de perfeccionismo en muestras recuperadas no distan de los presentados en controles sanos (Bardone-Cone et al., 2010).

Tras la intervención, la paciente continúa recibiendo la TAU en régimen ambulatorio tal y como recogen las guías clínicas (Arrufat, 2009).

Este estudio tiene importantes implicaciones clínicas, ya que muestra evidencia de la efectividad de un programa que aplicado junto al TAU consigue resultados positivos en el abordaje de la AN-R en adolescentes. Además, el ECHOMANTRA está protocolizado en ocho sesiones, por lo que se puede replicar fácilmente en diferentes contextos, como un hospital de día o una unidad de hospitalización. Este programa, se diseñó para que fuera asequible, escalable y tuviera un amplio alcance (Cardi et al., 2016). Las sesiones de tratamiento se han realizado de manera telemática, lo que permite tanto a las pacientes como a los familiares adaptar el aprendizaje y la mejora de las habilidades terapéuticas a su rutina diaria, y permite aumentar el compromiso con la intervención. Este tipo de diseño permite superar algunos de los obstáculos que dificultan la adhesión de los participantes, especialmente la de los familiares.

Entre las limitaciones de este estudio cabe mencionar que, al tratarse de un diseño de caso único, los resultados no se pueden generalizar; la buena predisposición de la familia y de la paciente a recibir la intervención, puede haber afectado a la respuesta y resultados presentados. Además, las herramientas de evaluación fueron autoadministradas, lo que pudo interferir en la validez de los resultados obtenidos. Tampoco se puede concluir si los cambios observados en la paciente se deben a la intervención del programa ECHOMANTRA o al TAU. Por tanto, y en lo que respecta a la investigación, se requiere de futuros ensayos clínicos aleatorizados, como los que están realizando actualmente Cardi et al., (2016) y Quiles et al., (2021) con el fin de poder conocer la efectividad de este programa.

A pesar de estas limitaciones, podemos concluir que el programa ECHOMANTRA como complemento a la TAU ha sido efectivo en el abordaje de la transición desde la unidad hospitalaria a la vida cotidiana en un caso de una paciente adolescente con AN. Por tanto, este programa se presenta como una intervención con efectos beneficiosos en la mejora de la sintomatología de AN y el bienestar y habilidades del familiar, así como en el mantenimiento del cambio terapéutico tras el ingreso, constituyendo una adecuada herramienta para el abordaje de este proceso no solo en población adulta, sino también adolescente.

Conflicto de Interés

Los autores no presentan ningún conflicto de interés.

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Assessing the effectiveness and feasibility of the Experienced Carers Helping Others program in relatives of adolescents with eating disorders using an online application format with individual sessions.

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FAMILY PROCESS

ORIGINAL ARTICLE

Assessing the effectiveness and feasibility of the Experienced Carers Helping Others program in relatives of adolescents with eating disorders using an online application format with individual sessions

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Abstract

Eating disorders (ED) usually involve hospital admission and a high relapse rate, with the return home being a critical moment for patients and their families. After their return home, they often have trouble incorporating the guidelines they have learned into their daily context. ECHOMANTRA intervention program aims to facilitate this transition by offering psychological strategies that involve both patients and their families and carers. Specifically, the ECHO program is aimed at the relatives of these patients. The present study aimed to analyze the efficacy of adding the ECHO program to the usual treatment (TAU) of relatives through a novel format based on individual intervention and with an online format and to examine the acceptability and feasibility of this new format. The study design was multi-center, randomized, controlled, with a longitudinal design and comparing two parallel groups. A total of 108 family members participated. Results indicated that relatives from both groups, TAU and ECHO + TAU, showed improvements in expressed emotion, accommodation, impact of the ED, emotional well-being, and caregiver skills. However, effect sizes in the ECHO + TAU group were slightly larger than the TAU group. In addition, the changes were greater in depression and caregiver skills when the ECHO component was added. Most caregivers (81.48%) completed the ECHO and indicated a high level of satisfaction with the program. These results suggest the efficacy and the feasibility of adding the ECHO intervention program to the usual treatment in an individual online format.

KEYWORDS
carers, eating disorders, ECHO, Experienced Carers Helping Others, RCT

Eating disorders (ED) are severe mental illnesses, typically developing in adolescence, characterized by the severity of their symptoms and their high mortality and comorbidity (Arcelus et al., 2011; Fitcher & Quadflieg, 2016). In recent years, there has been a significant increase in the number of cases, as well as in their severity, with a 104% increase in children and adolescents with EDs requiring hospital admissions (Santomauro et al., 2021). When patients require intensive treatment, they are addressed through hospital admissions or specialized day centers. However, there is a high rate of relapses and readmissions, especially after treatment has ended (Berends et al., 2018), highlighting the need for support in the transition to the community through specialized psychological interventions (Bryan et al., 2021). In this regard, interventions that promote social support during recovery are considered particularly beneficial, given that difficulties in interpersonal relationships may contribute to increased ED symptoms (Treasure et al., 2020).

In response to this, Dr. Janet Treasure's team developed the ECHOMANTRA intervention program, which aims to facilitate the transition from inpatient treatment to daily life in one's community (Adamson et al., 2019; Cardi et al., 2017). This program is based on scientific evidence that family involvement in the treatment of EDs is a key strategy for recovery (Levine, 2012; Sepúlveda et al., 2020; Treasure & Nazar, 2016). ECHOMANTRA is composed of the ECHO program for caregivers (*ECHO*; *Experienced Carers Helping Others*; Treasure et al., 2015) and MANTRA for patients (MANTRA; Schmidt et al., 2014). The MANTRA program is based on the Cognitive Maintenance Model of Anorexia Nervosa (Schmidt et al., 2014) which synthesizes the main internal and external maintenance factors of the disorder, emphasizing behavioral change strategies and focusing on steps for successful transition from hospital admission to daily life.

The ECHO program, aimed at family members, builds on the importance of interpersonal relationships in the maintenance of ED (Treasure et al., 2021) and provides assistance and training to caregivers in handling this role. Recovery from ED can involve many years of treatment (National Institute for Health and Care Excellence, 2017), during which time the patient may require a significant degree of family (Adamson et al., 2019) and healthcare support (Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015). During the recovery process, families may experience high levels of emotional, familial, and/or financial strain (Fernández-Aranda et al., 2021). Two systematic reviews have shown that the problems associated with this illness negatively impact the quality of life for all family members leading to burden, distress, accommodating and enabling behaviors and expressed emotion (Anastasiadou et al., 2014; Zabala et al., 2009). Family members often request information and help with the caregiver role (Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015). For this reason, including family in treatment is a recommendation from main clinical guides (Couturier et al., 2020; National Institute for Health and Care Excellence, 2017). Involving the family during in-patient care for adults as well as children can have benefits for both the patient and the caregiver (Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015).

Studies have shown that the ECHO program improves caregivers' levels of well-being and reduces psychological distress and expressed emotion (Hodsoll et al., 2017; Magill et al., 2016). Furthermore, patients whose caregivers participated in these groups also reduced their anxiety, depression, and psychological distress scores (Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015; Pépin & King, 2013; Sepúlveda et al., 2009; Sepúlveda, Lopez et al., 2008; Sepúlveda, Whitney et al., 2008; Treasure & Nazar, 2016). This program, adapted to a Spanish population by the authors, led to improved levels of anxiety, depression, and psychological distress among *carers*. There was also a reduction in symptom accommodation behaviors and an increase in the perception of control over how ED affected their lives. Furthermore, patients whose family members participated in these groups experienced decreased levels of anxiety, depression, and psychological distress (Pérez-Pareja et al., 2015; Quiles et al., 2018). Another study, in which ECHO was implemented as a novel transition support intervention in an adult ED service, reported a moderate reduction in carer burden, a small/moderate increase in carers skills, and an increase in efficacy at reducing anorexia nervosa behaviors. However, levels of distress were mostly unchanged and there was little impact on reducing accommodating and enabling behaviors (Adamson et al., 2019). A recent review study concluded that ECHO can also reduce service costs by reducing relapse and readmission rates in specialized centers (Treasure et al., 2020).

The ECHO program has been designed to be affordable, scalable, and have a potentially wide reach (Cardi et al., 2015), making its application increasingly accessible. Previous research showed interest in using digital approaches to improve treatments for transition programs (Cardi et al., 2017; Fichter et al., 2012). A recent meta-analysis recommends, given the clinical and economic success of the ECHO program, adapting it to digital/ online features that allow it to be applied remotely (Hanna et al., 2022). Another novel contribution of the present work is its application to carers of adolescent patients. Until now, studies have primarily focused on adult patients. Therefore, the aim of this paper was to evaluate the efficacy of adding the ECHO program to the usual treatment (TAU) of relatives through a novel format based on individual intervention and with an online format. Additionally, we aimed to evaluate the acceptability and feasibility of this new approach. This trial investigated the following hypothesis: The primary hypothesis (a) was that carers allocated to ECHO + TAU would present improved psychological well-being and lower levels of illness accommodation, expressed emotion, and burden in comparison to carers from the control group (TA). The second hypothesis (b) was that carers from the experimental group would have more ED carer skills in comparison to carers from the control group. Finally, the third hypothesis (c) was that the efficacy of the combined intervention (ECHO + TAU) would remain stable in the 3-, 6- and 12-month follow-up.

METHOD

The protocol paper provides further details and information about methodology (Quiles et al., 2021). This study has been registered on the ISRCTN registry (Trial Identifier: ISRCTN43554732).

Participants

Family participants ($N = 108$) comprised 92 women (85.2%) and 16 men (14.8%); age range: 30–64; $M = 48.43$; $SD = 5.26$ were recruited from seven different specialist inpatient/day-patient/outpatient eating disorder units spread throughout Spain. To be eligible for this study the carers had to be currently living with the patient and had to be a primary carer (somebody who usually takes care of the patient outside the hospital/day center and lives with them), be able to access and manage an electronic device (e.g., mobile phone, computer, laptop or tablet) and the Internet in order to access online sessions, and to be a native Spanish speaker or understand Spanish at a native level. Carers were excluded from the study if they were suffering from a serious medical or psychiatric condition and if their daughter declined to participate in the study. Both parents were invited to participate in the study, and in the case that they were assigned to the experimental group, both could receive the ECHO program sessions. However, only the data from one of them were considered for the data analyses, usually the one who attended the sessions more frequently.

Respect patients, and following the same guidelines as the original ECHOMANTRA study (Cardi et al., 2017), only women with an ED participated in this study. In addition, it is important to note that the MANTRA program was designed to apply to women. Therefore, patients were included if they were women with an eating disorder diagnosis according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), were aged between 12 and 19, had no psychiatric comorbidity, were receiving treatment for ED in a specialist inpatient/day-patient/outpatient ED unit, had the ability to manage an electronic device and the Internet to access online sessions, and were native Spanish speakers or understood Spanish at a native level. This information was assessed through a self-report and provided by the psychologist and/or the psychiatrists who attended to them in their eating disorder unit. Patients were asked to nominate a carer to whom the researcher invited to participate in the study.

Instruments

Clinical and socio-demographic data

Carers completed a *sociodemographic questionnaire* ad-hoc that included age, gender, marital status, educational, and employment status. Clinical data of the patients were completed by the health care providers at the unit and included diagnosis, illness duration, and care level.

Emotional well-being

It was evaluated with *Depression and Anxiety Stress Scales* (*DASS-21*; Bados et al., 2005; Lovibond & Lovibond, 1995). The instrument consists of 21 items divided into three subscales that assess the emotional state: depression, anxiety, and stress. The scoring of each item ranges from 0 (*did not apply to me at all*) to 3 (a*pplied to me very much or most of the time*), scores are the addition of the items, and range from 0 to 63. Higher scores indicate a poorer emotional state. The instrument shows adequate internal consistency ranging from $\alpha \geq 0.70$ to $\alpha \geq 0.84$ in the Spanish validation study. Specifically, the reliability estimates for the present sample ranged from $\alpha \geq 0.79$ to $\alpha \geq 0.87$ in the subscales, and $\alpha \geq 0.92$ in the global score.

Expressed emotion

It was assessed with *Family Questionnaire* (*FQ*; Sepúlveda et al., 2014; Wiedemann et al., 2002). The instrument consists of 20 items distributed across two scales: critical comments (CC; 10 items) and emotional over-involvement (EOI; 10 items). The scoring of each item ranges from 1 (*never/rarely*) to 4 (*very often*), scores are the addition of the items and range from 20 to 80. Higher scores indicate greater expressed emotion. The instrument shows adequate psychometric properties in the Spanish validation study ($\alpha \geq 0.83$, $\alpha \geq 0.72$, respectively in each subscale). The reliability estimates for the present sample were $\alpha \geq 0.71$ and $\alpha \geq 0.83$, respectively, in each subscale and $\alpha \geq 0.86$ in the global score.

Caregiving burden

The assessment of the degree of impact of the ED on the caregiver was carried out using the *Eating Disorders Symptom Impact Scale* (*EDSIS-S*; Carral-Fernández et al., 2013; Sepúlveda, Lopez et al., 2008; Sepúlveda, Whitney et al., 2008). The instrument consists of 24 items distributed into four scales: nutrition impact, guilt, dysregulated behaviors, and social isolation. The scoring on each item ranges from 0 (*never*) to 4 (*nearly always*); scores are the addition of the items and range from 0 to 96. Higher scores indicate a greater impact of the ED upon the caregiver over the previous month. The Spanish validation of the instrument shows adequate internal consistency ranging from $\alpha \geq 0.74$ to $\alpha \geq 0.83$ in the dimensions, and $\alpha \geq 0.88$ for the total scale. The reliability estimates for the present sample ranged from $\alpha \geq 0.65$ to $\alpha \geq 0.85$, respectively, in each subscale and $\alpha \geq 0.85$ in the global score.

Illness accommodation

To assess this domain, we used the *Accommodation to Illness Symptoms Scale* (*AESED*; Quiles et al., 2016; Sepúlveda et al., 2009). The instrument consists of 33 items distributed across five subscales: avoidance and modifying routine, reassure seeking, meal ritual, control of family, and "turning a blind eye." Participants rate each item using a 5-point Likert scale, ranging from 0 (*never*) to 4 (*nearly always*); scores are the addition of the items and range from 0 to 132. Higher scores indicate a greater degree of family accommodation to the illness. The instrument shows adequate internal consistency ranging from $\alpha \geq 0.74$ to $\alpha \geq 0.89$ in the Spanish validation study. The reliability estimates for the present sample ranged from $\alpha \geq 0.71$ to $\alpha \geq 0.85$, respectively, in each subscale and $\alpha \geq 0.91$ in the global score.

Caregiver skills

These skills were measured through the *Caregiver Skills Scale* (*CASK*; Vintró-Alcaraz et al., 2018; Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015). The instrument consists of 27 items distributed into six subscales: bigger picture, self-care, biting-your-tongue, insight-acceptance, emotional intelligence, and frustration-tolerance, scored on a visual analogue scale anchored from 0 to 100. Scores are the mean of the items. Higher scores reflect increased caregiver skills that can benefit patients with eating disorders. In the Spanish validation study, the instrument shows adequate psychometric properties ranging from $\alpha \geq 0.71$ to $\alpha \geq 0.75$. The reliability estimates for the present sample ranged from $\alpha \geq 0.60$ to $\alpha \geq 0.72$, respectively, in each subscale and $\alpha \geq 0.87$ in the global score.

Acceptability and feasibility of the ECHO

Carers in the ECHO arm completed a "Participant Feedback Form," created ad hoc for completion at the end of the intervention. It consisted of 12 Likert-type items (e.g., Do you think the sessions have been useful to improve your experience as a caregiver?), ranging from 1 (*nothing at all*) to 10 (*very much*), and assessed participants' experiences and satisfaction with the study. They were asked to provide their views regarding the following: what they found beneficial and/or challenging, what they enjoyed and/or did not like, the transferability of ECHO skills to their routine, and their suggestions for further improvements to the intervention. In addition, the session facilitator documented session attendance, task compliance between sessions, and reading material completion for each session.

Procedure

Design

This study used a multi-center, randomized, controlled, double-masked design comparing two parallel groups, following CONSORT guidelines. Ethical approval was obtained from the Ethics Committee of the different hospitals to which the eating disorders units belonged (see Appendix S1) and the Ethics Committee of the University Miguel Hernández.

Prior to the conduct of this study, patients had already been diagnosed by the corresponding clinician staff in their respective units. The research assistant at each center, commonly clinical psychologists or psychiatrists from the participating units, evaluated carers and participants' fulfillment of the inclusion criteria and provided detailed information on the study. Patients and carers who were willing to participate were requested written informed consent and the completion of the baseline questionnaires by the research assistant at their unit. Once completed, participants were randomly assigned into two groups: receiving Treatment as Usual (TAU) only or receiving the ECHO MANTRA intervention complementary to TAU. A research administrator independent of the clinicians involved in the assessment and in the treatment used a computer-generated randomized sequence, with 1:1 treatment allocation.

This study employed a longitudinal RCT design and 12-month follow-ups. Carers completed self-report questionnaires provided by the research assistant at their corresponding unit just before the start of the intervention at baseline (T0). Once the study intervention concluded, the clinicians involved administered a self-report questionnaire to the carers who participated (2 months apart from the baseline; T1) and carried out follow-ups by periodically contacting at 3 months (T2), 6 months (T3), and 12 months (T4) after the completion of the intervention. As the patients also received an intervention, they had to complete the battery of questions at the same time intervals as the carers were assessed. Nonetheless, in this study we only present the data and results corresponding to family members.

One hundred and eight carers agreed to participate: 54 were allocated to the TAU-only group and 54 to the ECHO group. Questionnaire completion rates were for TAU-only: 92.45% in T1, 84.90% in T2, 79.25% in T3 and 75.47% in T4; and for ECHO + TAU: 81.48% in T1, 74.07% in T2, 68.51% in T3 and 66.67% in T4.

Figure 1 shows the CONSORT diagram for the study.

Interventions

Treatment as usual

We did not use a standardized comparison treatment as this would require practical changes in different settings which was not feasible. Each center followed their own procedures for TAU, which can be considered standard practice in Spain. It is expected that the eating disorders units, which belong to the public health services in Spain, follow the recommendations of the Clinical Practice Guidelines of the National Health System (Ministerio de Sanidad y Consumo, 2009), which indicates that it is important to get the support and involvement of the family, help them to cope with the situation and raise awareness so that they adopt positive changes in their family routine. TAU should also include information and advice. This information aims to enhance understanding of the disease, its origin, consequences, and treatments.

The 24-h hospitalization services that have participated in this study (Hospital Universitario La Fe in Valencia, Reina Sofia in Murcia, and San Juan in Alicante) offer a program with a multidisciplinary team approach (nutritionist/endocrinologist, psychologist, physician, and nurse). It includes monitoring of physical risks, nutritional rehabilitation, education on

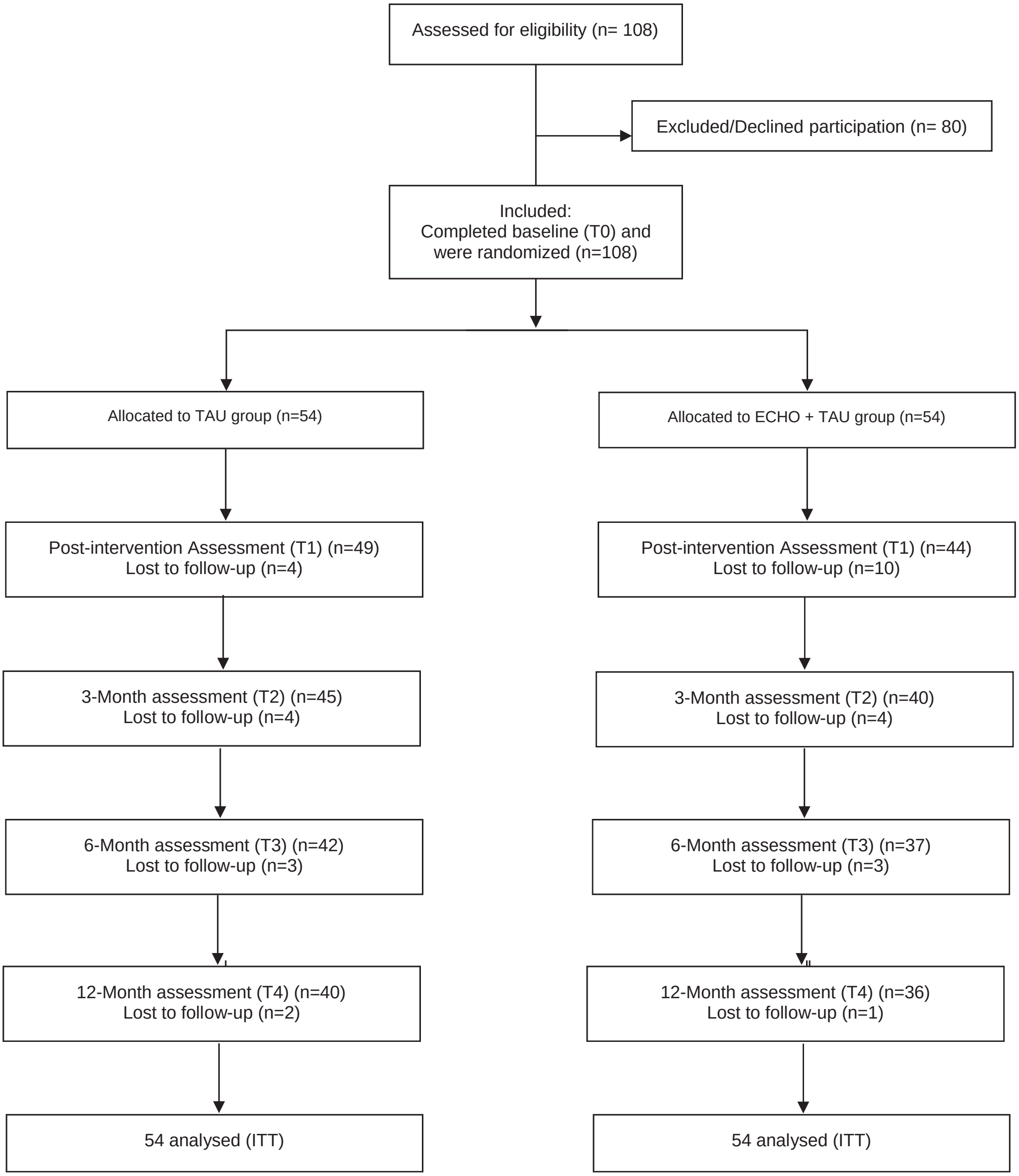


FIGURE 1 CONSORT diagram flow.

healthy eating, and nutrition guidelines. In addition, work is done to try to modify/improve the thoughts, attitudes, behaviors, and feelings that maintain the disease through psychological therapy. Once the patient has stabilized and reached a healthy body mass index, the patient is discharged. She is then followed up to assess her progress and evaluate whether she should continue her treatment in another resource (outpatient unit/day hospital).

The usual treatment in the day hospitals of CREA (Centro de Recuperación Emocional y Alimentaria), ADANER (Asociación en Defensa de la Atención a la Anorexia Nerviosa y Bulimia), and the Hospital de La Fé in Valencia enables continuous care and a progressive transition from inpatient to outpatient care. Interdisciplinary treatment is carried out including dietary support/therapeutic feeding, psychological interventions, and school support. Patients receive the following psychological interventions: weekly individual cognitive-behavioral therapy for eating disorders (CBT-ED) and psychoeducational group therapy on nutrition, emotion management, body image, social skills, and problem-solving strategies. Patients usually attend every weekday (Monday through Friday) for an average of 6 h per day. Parents can also access psycho-educational groups that are held on a twice monthly for support.

The usual treatment in the Outpatient Units of the Hospital de la Fé and the CREA center involves psychological interventions to modify/improve the thoughts, attitudes, behaviors, and feelings that maintain the disease. They offer nutritional and medical support when needed. The TAU condition did not have access to intervention materials or ECHOMANTRA intervention sessions.

Treatment as usual plus carer skill-sharing intervention (ECHO + TAU)

The original ECHO program was delivered in the form of workshops that aimed to reduce carer distress (Sepúlveda, Lopez et al., 2008; Sepúlveda, Whitney et al., 2008). As a next step, the training materials were synthesized into a self-help intervention with a book and a set of DVDs to facilitate dissemination and careers access. Research showed that it was a feasible and acceptable intervention (Goddard et al., 2011). In the present RCT, sessions are delivered individually and online, allowing it to be tailored to the personal circumstances of families, with greater adherence to the program (Quiles et al., 2021).

Carer's intervention (ECHO) consisted of a total of eight weekly, individual online sessions, lasting 60 min each, which were delivered by assistant psychologists trained in the ECHO intervention and supervised by the principal authors of the study (YQM and MJQ). Carers received a workbook, which included activities from the book “Skills based caring for a loved one with an eating disorder: The New Maudsley Method” (Treasure et al., 2011; Spanish version: “Los trastornos de la alimentación: guía práctica para cuidar de un ser querido”; Treasure et al., 2011).

During the sessions, the trained psychologist encouraged discussion about the exercises proposed in the workbook and displayed some of the video clips from the Digital Versatile Disc (DVD) for carers “How to Care for someone with an Eating Disorder.” The intervention included practical strategies and techniques to help carers develop self-reflective skills and knowledge in order to develop confidence, compassion, and the courage to take risks and help their loved one move toward recovery and to look after their own well-being by following the “New Maudsley Approach.” Both resources, workbook and online sessions, provide a skills training program that includes training in stress management, communication (based on motivational interviewing techniques), strategies to reduce accommodation and expressed emotion and to increase extinction training and new habits at home via effective social support. An outline of the content of the ECHO intervention is given in Table 1.

As shown in Table 1, the ECHO program has three main components: First, ECHO provides carers with information to strengthen coping with the caregiving role. Second, ECHO teaches carers how to reduce emotionally driven caregiving behaviors, such as high expressed emotion, accommodating and enabling the eating disorder, as well as disagreement and division within the family. Third, ECHO teaches skills of positive communication and behavioral change in order to support recovery (Cardi et al., 2017).

Patients also received a similar intervention that involved eight weekly, individual online sessions delivered by assistant psychologists trained in the Cognitive Maintenance Model of Anorexia Nervosa and the MANTRA protocol and supervised by the principal authors of the study (YQM and MJQ). During the intervention, a series of activities selected for the MANTRA program were taken out. For a more detailed description of the intervention, see Schmidt et al. (2014) and Quiles et al. (2021).

TABLE 1 Contents of the Experienced Carers Helping Others (ECHO) program.

Session 1	Program presentation and multifactorial origin of the ED: Predisposing, precipitating, and maintaining factors
Session 2	Description of the Model of Carer Coping
Session 3	Symptom accommodation Resilience as the transformative ability
Session 4	Description of the Cognitive Interpersonal Maintenance Model of Eating Disorders. Understanding patterns of relationship with the person with the problem through the animal metaphors. How to create distance and provide warmth and guidance
Session 5	Effective communication strategies based on the Motivational Interviewing approach. Listening strategies: basic skills of motivational interviewing such as asking open-ended questions, providing support, reflecting, and summarizing. Communicating with compassion
Session 6	Practice in communication skills
Session 7	Practice in problem-solving and goal-setting skills
Session 8	Review of the content covered during the intervention and practice of the given skills. Relapse prevention

Data analysis

Independent research assessors, who were unaware of the treatment allocations, conducted pre-randomization evaluations (baseline: T0), at 2 months (T1; end of the treatment in ECHO group), at 6 months (T2), at 9 months (T3), and at 12 months (T4).

We used IBM SPSS Statistics 27.0. First, baseline sample characteristics between the ECHO + TAU and TAU group were compared using *t test* for continuous variables and X^2 test for categorical variables. All formal statistical analyses were based on an intent-to-treat principle with all participants analyzed in the condition arm to which they were assigned. Missing data for both groups were imputed using multiple imputation based on fully conditional Markov chain Monte Carlo (Schafer, 1997). In both groups, it was proved that all the missing data were Missing Completely at Random (MCAR) because the Roderick Little test was not significant in any case. As a result, the final analyses were based on the pooled results of five separate imputations.

We conducted general linear models to evaluate the change in outcome variables over all five assessment time points for the ECHO + TAU and TAU group (within factor: time, between factor: ECHO vs. TAU). A significant time × group interaction effect indicates a difference in change between the two cohorts. A significance level of 0.05 was used. Pairwise comparisons were performed following a significant main effect of time (Bonferroni's test).

Effect sizes were calculated using partial eta squared. Partial eta-squared indicates the percentage of variance in the dependent variable attributable to a particular independent variable. A commonly used interpretation is to refer to effect sizes as small ($\eta = 0.2$), medium ($\eta = 0.5$), and large ($\eta = 0.8$) based on benchmarks suggested by Cohen (2013).

RESULTS

Participant characteristics

After screening and baseline assessment, 54 participants were included in the ECHO + TAU group and 54 in TAU. Baseline sociodemographic data and clinical characteristics of their daughters are shown in Table 2. We found no differences between groups in sociodemographic and clinical characteristics measured at baseline.

Comparisons between

In Table 3, we present the means, standard deviations, and results of the general linear model analysis, including effect sizes, for the outcomes measured at the five evaluation times for both conditions. The analysis revealed a statistically significant main effect of time in all outcome variables (all *p values* ≤ 0.01) indicating improvements in emotional well-being, expressed emotion, caregiving burden, accommodation to illness, and care skills in both groups, except for criticism measured with the expressed emotion measure (FQ), the subscale "turning a blind eye" of the illness accommodation scale (AESED), and in the subscales "bigger-picture," "biting your tongue," "emotional intelligence," and "frustration-tolerance" of the caregiver skills scale in the TAU group ($p > 0.05$). Statistically significant time × group interaction effects were observed regarding the Emotional Over-involvement, $F(3.27) = 2.47$, $p < 0.05$, $\eta_p^2 = 0.02$; emotional well-being (with the total score of the DASS-21), $F(3.57) = 3.19$, $p < 0.05$, $\eta_p^2 = 0.03$; depression, $F(3.40) = 3.27$, $p < 0.001$, $\eta_p^2 = 0.03$; avoidance, $F(3.62) = 3.72$, $p < 0.01$, $\eta_p^2 = 0.03$; caregiver skills (total score of the CASK), $F(3.64) = 3.78$, $p < 0.01$, $\eta_p^2 = 0.03$; as well as self-care and insight acceptance CASK subscales, indicating a greater improvement in these outcomes in ECHO + TAU group compared to TAU.

In Figure 2, we present the profile plots (interaction plots) of these relationships. No time × group interaction effects were observed for the other outcome variables (all *p values* > 0.05).

With regard to effect sizes of the change in outcome variables in the ECHO + TAU group, we found low to medium effects for the expressed emotion (total score of the FQ) and emotional over-involvement subscale. We observed low to medium effects for the caregiving burden (total score of the EDSIS) and two out of the four subscales. We identified low to medium effects for the emotional well-being (total score of the DASS-21) and the subscales depression and stress. We also noted low to medium effects for the Illness accommodation (total score of the AESED) and two out of the five subscales. Finally, we observed low to medium effects for the total score of the caregiver skills and the subscale insight-acceptance. Furthermore, medium to large effects were found in the "nutrition impact" subscale of the caregiving burden scale and in the "avoidance" subscale of the illness accommodation measure.

Within the TAU group, we observed low to medium effects for various outcome measures. These included the expressed emotion total score and its emotional over-involvement subscale, the caregiving burden total score and three of its four subscales, the "stress" subscale of the emotional well-being measure, the illness accommodation total score and three of its five subscales, as well as the "self-care" subscale of the caregiver skills scale. Notably, we did not find any medium to large effects in this group. In fact, effect sizes tended to be higher in the ECHO + TAU group compared to the TAU group.

Acceptability and feasibility of the intervention

Most of caregivers (81.48%, $n = 44$) completed the ECHO intervention, accomplishing 43.97% of the tasks between sessions and reading the contents of the workbook on 75.29% of occasions. Ten family members did not complete the program: five carers chose not to finish the intervention voluntarily, two patients required admission to a more intensive resource; thus, caregivers decided to cease their participation, two caregivers did not complete the intervention due to the patients decided not to participate, and one did not respond to contact

TABLE 2 Demographic, psychosocial, and clinical variables at baseline.

Carers	Total sample ($N=108$)	ECHO + TAU Group ($N=54$)	TAU group ($N=54$)	
Gender				
Male	$N=16$ (15.0%)	$N=8$ (14.8%)	$N=8$ (14.8%)	$\chi^2=0.01$
Female	$N=91$ (85.0%)	$N=46$ (85.2%)	$N=46$ (85.2%)	$p=0.97$
Age	$M=48.43$ (SD = 5.26)	$M=49.00$ (SD = 6.08)	$M=46.00$ (SD = 6.35)	$t=-1.59$; $p=0.11$
Employment status				
Employed	$N=78$ (72.9%)	$N=36$ (66.7%)	$N=41$ (78.8%)	
Unemployed	$N=18$ (16.8%)	$N=11$ (20.3%)	$N=7$ (13.5%)	$\chi^2=3.77$
Job training	$N=1$ (0.9%)	$N=0$ (0%)	$N=1$ (1.9%)	$p=0.29$
Other	$N=10$ (9.3%)	$N=7$ (13.0%)	$N=3$ (5.8%)	
Educational status				
First level	$N=11$ (10.3%)	$N=8$ (14.8%)	$N=3$ (5.7%)	
Second level	$N=8$ (7.5%)	$N=4$ (7.4%)	$N=4$ (7.5%)	$\chi^2=9.13$
Third Level	$N=4$ (3.7%)	$N=3$ (5.6%)	$N=1$ (1.9%)	$p=0.11$
Vocational training	$N=23$ (21.5%)	$N=6$ (11.1%)	$N=17$ (32.1%)	
University degree	$N=58$ (54.2%)	$N=31$ (57.4%)	$N=27$ (50.9%)	
Other	$N=3$ (2.8%)	$N=2$ (3.7%)	$N=1$ (1.9%)	
Marital status				
Married/Living together	$N=81$ (75.7%)	$N=40$ (74.1%)	$N=41$ (77.4%)	
Divorced/Separated	$N=20$ (18.7%)	$N=11$ (20.1%)	$N=9$ (17.1%)	$\chi^2=1.40$
Single	$N=5$ (4.7%)	$N=2$ (3.7%)	$N=3$ (5.7%)	$p=0.71$
Other	$N=1$ (0.9%)	$N=1$ (1.9%)	$N=0$ (0%)	
Relationship with the sufferer				
Mother	$N=89$ (83.2%)	$N=44$ (81.5%)	$N=45$ (84.9%)	
Father	$N=15$ (14.0%)	$N=7$ (13.0%)	$N=8$ (15.1%)	$\chi^2=3.07$
Other	$N=3$ (2.8%)	$N=3$ (5.6%)	$N=0$ (0%)	$p=0.22$
Patients				
Age	$M=14.95$ (SD = 1.58)	$M=14.00$ (SD = 1.00)	$M=15.00$ (SD = 0.58)	$t=-0.55$; $p=0.58$
Diagnosis				
Anorexia Restricting Type	$N=73$ (68.2%)	$N=37$ (68.5%)	$N=36$ (70.6%)	$\chi^2=0.47$
Anorexia Purging Type	$N=11$ (10.3%)	$N=5$ (9.3%)	$N=6$ (11.8%)	$p=0.93$
Bulimia	$N=5$ (4.6%)	$N=3$ (5.6%)	$N=2$ (3.9%)	
EDNOS	$N=16$ (15.0%)	$N=9$ (16.7%)	$N=7$ (13.7%)	
Illness duration (months)	$N=20.65$ (SD = 18.94)	$M=22.00$ (SD = 3.60)	$M=27.00$ (SD = 7.37)	$t=-1.50$; $p=0.14$
Care level				
Hospitalization	$N=20$ (18.7%)	$N=8$ (14.8%)	$N=12$ (22.6%)	
Day care	$N=57$ (53.3%)	$N=29$ (53.7%)	$N=28$ (52.8%)	$\chi^2=2.12$
Outpatient	$N=30$ (28.0%)	$N=17$ (31.5%)	$N=13$ (24.5%)	$p=0.55$

Abbreviations: ECHO, Experienced Carers Helping Others; TAU, treatment as usual.

TABLE 3 Results of general linear models analyzing outcomes in the ECHO and TAU groups.

	T0	T1	T2	T3	T4				
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	Time	Bonferroni	η_p^2	Time × group
(A)									
FQ									
ECHO + TAU	28.38 (8.15)	24.98 (6.74)	22.24 (6.37)	23.14 (6.09)	19.93 (5.14)	$F(2.72)=21.93$; $p<0.001$	T0 > T1*; T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2**; T1 > T4***; T3 > T4*	0.29	$F(3.28)=1.303$; $p=0.27$
TAU	29.23 (8.01)	28.58 (8.10)	25.72 (7.67)	25.24 (8.11)	21.70 (4.62)	$F(3.72)=15.28$; $p<0.001$	T0 > T2*; T0 > T3*; T0 > T4***; T1 > T2*;T1 > T3*; T1 > T4**;T2 > T4**; T3 > T4*	0.22	
Critical comments									
ECHO + TAU	10.64 (5.15)	9.86 (3.99)	8.61 (3.35)	10.11 (3.34)	8.56 (2.79)	$F(3.25)=4.96$; $p<0.01$	T2 < T3*; T3 > T4*	0.08	$F(3.72)=0.52$; $p=0.70$
TAU	11.20 (4.42)	10.73 (5.01)	10.12 (4.82)	10.46 (4.92)	9.43 (2.50)	$F(3.77)=2.32$; $p=0.6$	-	0.04	
Emotional over-involvement									
ECHO + TAU	17.74 (4.17)	15.08 (3.79)	13.60 (3.93)	12.91 (3.62)	11.22 (3.13)	$F(2.73)=47.20$; $p<0.001$	T0 > T1***;T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*; T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4***	0.47	$F(3.27)=2.47$; $p=0.05$
TAU	18.03 (5.08)	17.84 (5.04)	15.58 (4.31)	14.66 (4.03)	12.67 (2.96)	$F(3.48)=25.47$; $p<0.001$	T0 > T2**; T0 > T3***; T0 > T4***; T1 > T2**; T1 > T4***; T2 > T4***; T3 > T4**	0.32	
EDSIS									
ECHO + TAU	36.03 (13.48)	26.43 (12.86)	21.35 (10.86)	20.74 (9.73)	15.30 (6.01)	$F(2.92)=47.82$; $p<0.001$	T0 > T1***;T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*; T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4***	0.47	$F(3.55)=2.14$; $p=0.08$

TABLE 3 (Continued)

	T0	T1	T2	T3	T4				
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	Time	Bonferroni	η_p^2	Time × group
TAU	37.53 (11.81)	33.51 (14.21)	27.86 (12.26)	25.20 (10.79)	17.83 (7.53)	*F*(3.58) = 39.41; *p* < 0.001	T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*;T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4***	0.42	
Nutrition impact									
ECHO + TAU	12.11 (5.03)	7.46 (4.35)	6.03 (3.69)	5.45 (2.83)	3.48 (1.89)	*F*(2.81) = 63.97; *p* < 0.001	T0 > T1***;T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*;T1 > T3**; T1 > T4***; T2 > T4***; T3 > T4***	0.54	*F*(3.48) = 1.19; *p* = 0.31
TAU	13.08 (4.33)	10.20 (5.17)	7.74 (4.66)	7.13 (3.85)	4.68 (2.62)	*F*(3.67) = 46.39; *p* < 0.001	T0 > T1***;T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*; T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4***	0.46	
Guilt									
ECHO + TAU	9.90 (4.98)	7.73 (3.94)	5.78 (3.43)	5.93 (3.13)	5.41 (2.70)	*F*(2.79) = 21.77; *p* < 0.001	T0 > T1*;T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2***; T1 > T3**; T1 > T4***	0.29	*F*(3.48) = 1.70; *p* = 0.16
TAU	10.27 (5.03)	9.44 (4.79)	7.69 (3.91)	7.28 (3.47)	5.81 (2.94)	*F*(3.17) = 21.34; *p* < 0.001	T0 > T2**; T0 > T3***; T0 > T4***; T1 > T2**; T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4*	0.28	
Dysregulated behavior									
ECHO + TAU	5.51 (4.83)	4.61 (4.23)	3.54 (3.52)	4.30 (3.39)	2.85 (1.87)	*F*(2.76) = 8.17; *p* < 0.001	T0 > T2***;T0 > T4**; T3 > T4*	0.13	*F*(3.49) = 1.20; *p* = 0.31
TAU	5.04 (3.19)	5.08 (3.77)	4.59 (3.82)	4.60 (3.05)	3.35 (2.60)	*F*(3.78) = 3.96; *p* < 0.01	T0 > T4*; T1 > T4*	0.07	
Social isolation									

(Continues)

TABLE 3 (Continued)

	T0	T1	T2	T3	T4				
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	Time	Bonferroni	η_p^2	Time × group
ECHO + TAU	8.5 (4.18)	6.58 (3.73)	5.95 (3.67)	5.04 (2.36)	3.68 (2.05)	$F(2.78) = 27.13$; $p < 0.001$	T0 > T2***; T0 > T3***; T0 > T4***; T1 > T3**; T1 > T4***; T2 > T4***; T3 > T4***	0.34	$F(3.59) = 1.94$; $p = 0.11$
TAU	9.13 (4.31)	8.79 (4.56)	7.73 (3.79)	6.52 (3.49)	4.17 (1.98)	$F(4) = 25.09$; $p < 0.001$	T0 > T3***; T0 > T4***; T1 > T3**; T1 > T4***; T2 > T4***; T3 > T4*	0.32	
(B)									
DASS-21									
ECHO + TAU	18.19 (10.56)	11.25 (8.22)	8.57 (6.35)	9.03 (6.56)	8.68 (5.52)	$F(2.46) = 26.62$; $p > 0.001$	T0 > T1***: T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2**	0.33	$F(3.57) = 3.19$; $p = 0.02$
TAU	17.73 (11.37)	16.09 (12.13)	12.93 (11.16)	11.97 (10.74)	9.03 (5.87)	$F(3.70) = 10.46$; $p < 0.001$	T0 > T2**; T0 > T3**; T0 > T4***; T1 > T4***	0.16	
Depression									
ECHO + TAU	18.19 (10.56)	3.86 (3.48)	3.05 (2.64)	3.33 (2.59)	3.13 (2.35)	$F(2.24) = 16.65$; $p < 0.001$	T0 > T1*; T0 > T2**; T0 > T3**; T0 > T4**	0.24	$F(3.40) = 3.28$, $p < 0.001$
TAU	5.78 (4.30)	5.49 (4.42)	4.44 (4.47)	4.53 (4.06)	3.24 (2.40)	$F(3.61) = 60.05$; $p < 0.001$	T0 > T4*; T1 > T4**	0.10	
Anxiety									
ECHO + TAU	3.67 (3.65)	2.21 (2.60)	1.56 (1.78)	1.87 (2.15)	1.70 (1.66)	$F(2.25) = 10.09$; $p < 0.001$	T0 > T4**; T1 > T4**	0.16	$F(3.22) = 1.80$, $p = 0.14$
TAU	3.84 (3.73)	3.57 (3.98)	2.69 (3.28)	2.46 (3.16)	1.70 (1.94)	$F(3.61) = 44.67$; $p < 0.001$	T0 > T1*; T0 > T2***; T0 > T3*; T0 > T4**	0.10	
Stress									
ECHO + TAU	8.03 (3.64)	5.14 (2.90)	4.21 (2.71)	3.93 (2.58)	3.82 (2.18)	$F(3.12) = 33.98$; $p < 0.001$	T0 > T1***; T0 > T2***; T0 > T3***; T0 > T4***;T1 > T4**	0.39	$F(3.81) = 2.22$; $p = 0.07$

TABLE 3 (Continued)

	T0	T1	T2	T3	T4				
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	**Time**	**Bonferroni**	η_p^2	**Time × group**
TAU	8.15 (4.58)	7.05 (4.59)	5.81 (4.02)	5.02 (4.13)	4.20 (2.52)	$F(4) = 14.27$; $p < 0.001$	T0 > T2**; T0 > T3***; T0 > T4***; T1 > T3*; T1 > T4***	0.21	
AESED									
ECHO + TAU	46.61 (20.17)	35.27 (15.28)	28.15 (14.15)	25.72 (11.88)	18.80 (8.05)	$F(2.68) = 41.84$; $p < 0.001$	T0 > T1**; T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2**; T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4***	0.44	$F(3.17) = 0.77$; $p = 0.52$
TAU	49.28 (21.05)	42.30 (20.68)	36.22 (17.61)	32.18 (14.54)	23.30 (11.26)	$F(3.49) = 29.00$; $p < 0.001$	T0 > T2**; T0 > T3***; T0 > T4***; T1 > T3**; T1 > T4***; T2 > T4***; T3 > T4***	0.35	
Avoidance									
ECHO + TAU	17.61 (7.05)	12.09 (5.40)	9.14 (5.00)	8.31 (4.24)	6.15 (3.53)	$F(2.94) = 53.91$; $p < 0.001$	T0 > T1***; T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2***; T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4*	0.50	$F(3.63) = 3.73$; $p = 0.01$
TAU	18.30 (6.98)	16.15 (7.28)	13.92 (7.10)	11.97 (10.74)	7.30 (4.32)	$F(4) = 37.12$; $p < 0.001$	T0 > T2**: T0 > T3***; T0 > T4***; T1 > T3***; T1 > T4***; T2 > T4***; T3 > T4***	0.41	
Reassure seeking									
ECHO + TAU	10.63 (7.40)	7.93 (4.99)	5.79 (3.80)	5.61 (3.33)	4.25 (2.35)	$F(2.35) = 22.22$; $p < 0.001$	T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*; T1 > T3*; T1 > T4***; T2 > T4*; T3 > T4*	0.30	$F(2.78) = 38.32$; $p = 0.94$
TAU	11.81 (6.97)	8.95 (7.31)	7.38 (5.87)	7.28 (4.49)	5.56 (3.49)	$F(3.01) = 16.68$; $p = <0.001$	T0 > T2***; T0 > T3***; T0 > T4***; T1 > T4**; T3 > T4*	0.24	
Meal ritual									

(Continues)

TABLE 3 (Continued)

	T0	T1	T2	T3	T4				
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	Time	Bonferroni	η_p^2	Time × group
ECHO + TAU	3.50 (4.06)	3.17 (3.36)	2.73 (3.33)	2.07 (1.97)	1.37 (0.96)	$F(2.69) = 6.74$; $p < 0.001$	T0 > T4**: T1 > T4**; T2 > T4*; T3 > T4*	0.11	$F(3.42) = 0.32$; $p = 0.81$
TAU	4.38 (5.49)	3.91 (4.87)	2.85 (2.95)	2.47 (2.59)	1.81 (1.71)	$F(2.67) = 6.54$; $p < 0.01$	T0 > T4**: T1 > T4**; T2 > T4*	0.11	
(C)									
AESED									
Control of family									
ECHO + TAU	12.69 (6.47)	10.52 (4.84)	8.89 (4.13)	7.96 (3.61)	5.84 (2.66)	$F(2.75) = 25.38$; $p < 0.001$	T0 > T2**: T0 > T3***; T0 > T4***: T1 > T2*; T1 > T3**; T1 > T4***; T2 > T4***; T3 > T4**	0.32	$F(3.27) = 0.32$; $p = 0.83$
TAU	13.09 (5.43)	11.68 (5.53)	10.32 (4.42)	9.36 (3.84)	7.10 (3.32)	$F(3.60) = 17.71$; $p < 0.001$	T0 > T2*: T0 > T3**; T0 > T4***: T1 > T3*; T1 > T4***; T2 > T4***; T3 > T4**	0.25	
Turning a blind eye									
ECHO + TAU	2.19 (2.93)	1.70 (2.26)	1.61 (2.29)	1.87 (1.61)	1.15 (1.07)	$F(2.86) = 3.20$; $p = 0.03$	T3 > T4**	0.06	$F(3.27) = 0.84$; $p = 0.87$
TAU	2.03 (2.83)	1.70 (1.66)	1.78 (2.29)	1.98 (1.96)	1.40 (1.33)	$F(3.18) = 1.23$; $p = 0.30$	-	0.02	
CASK									
ECHO + TAU	70.98 (11.65)	77.32 (9.43)	79.47 (8.30)	1.87 (1.61)	82.15 (7.19)	$F(3.46) = 17.33$; $p < 0.001$	T0 < T1*; T0 < T2***; T0 < T3**; T0 < T4***; T1 < T4**	0.25	$F(3.64) = 3.79$; $p = 0.01$
TAU	71.89 (10.52)	70.69 (11.40)	74.76 (10.51)	73.82 (11.28)	23.30 (11.26)	$F(4) = 6.69$; $p < 0.001$	T0 < T4**; T1 < T4**; T3 < T4*	0.11	
Bigger-picture									
ECHO + TAU	75.98 (13.27)	79.69 (10.47)	80.75 (9.20)	80.15 (11.00)	83.51 (7.66)	$F(2.97) = 5.38$; $p < 0.01$	T0 < T4**	0.09	$F(3.28) = 1.72$; $p = 0.16$

TABLE 3 (Continued)

	T0	T1	T2	T3	T4				
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	Time	Bonferroni	η_p^2	Time × group
TAU	77.29 (12.61)	76.05 (11.95)	78.62 (12.03)	77.38 (11.77)	79.34 (9.40)	$F(3.42) = 1.22$; $p = 0.31$	-	0.02	
Self-care									
ECHO + TAU	58.89 (18.89)	72.37 (13.18)	75.12 (11.53)	77.69 (10.73)	81.09 (8.45)	$F(2.25) = 31.43$; $p < 0.001$	T0 < T1***; T0 < T2***; T0 < T3***; T0 < T4***; T1 < T4***; T2 < T4***	0.37	$F(3.40) = 4.19$; $p < 0.01$
TAU	59.24 (18.08)	60.36 (19.59)	66.86 (16.07)	69.19 (13.84)	77.25 (9.79)	$F(3.73) = 19.99$; $p < 0.001$	T0 < T2*; T0 < T3**; T0 < T4***; T1 < T3*; T1 < T4***; T2 < T4***; T3 < T4**	0.24	
Biting-your-tongue									
ECHO + TAU	70.52 (16.96)	72.44 (14.46)	77.17 (13.90)	72.89 (15.91)	80.82 (10.20)	$F(4) = 6.50$; $p < 0.001$	T0 < T4***; T1 < T4**; T3 < T4**	0.11	$F(4) = 1.30$; $p = 0.27$
TAU	69.73 (16.32)	67.78 (17.39)	70.37 (14.42)	71.62 (12.52)	74.77 (12.17)	$F(3.80) = 2.41$; $p = 0.09$	-	0.04	
Insight-acceptance									
ECHO + TAU	61.14 (19.90)	73.51 (14.05)	77.53 (11.63)	76.46 (12.00)	79.58 (8.96)	$F(2.68) = 22.28$; $p < 0.001$	T0 < T1**; T0 < T2***; T0 < T3***; T0 < T4***; T1 < T4*	0.30	$F(3.42) = 7.82$; $p < 0.001$
TAU	68.30 (18.31)	63.94 (18.48)	69.52 (17.35)	70.10 (16.07)	74.31 (12.88)	$F(3.83) = 4.24$; $p < 0.01$	T1 < T4**	0.07	
Emotional intelligence									
ECHO + TAU	73.81 (15.77)	78.36 (12.58)	79.38 (11.44)	80.75 (10.13)	81.85 (7.73)	$F(3.07) = 5.31$; $p < 0.01$	T0 < T4**	0.09	$F(3.70) = 1.92$; $p = 0.11$
TAU	74.01 (14.95)	72.59 (15.28)	77.22 (12.17)	73.92 (14.17)	78.91 (10.09)	$F(4) = 2.95$; $p = 0.02$	-	0.05	
Frustration-tolerance									

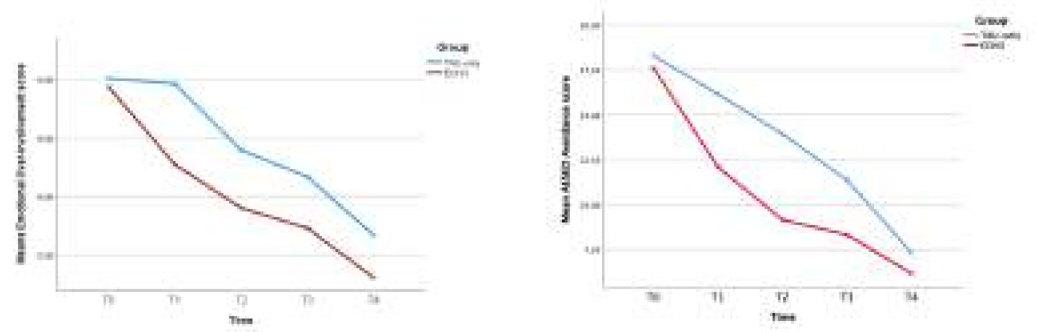
(Continues)

TABLE 3 (Continued)

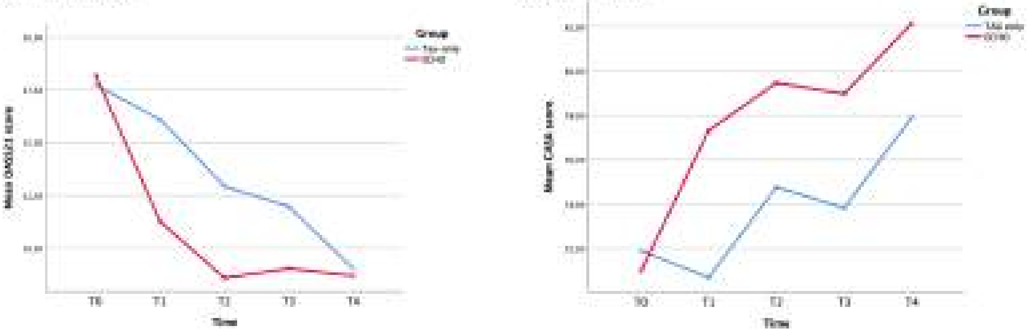
	T0	T1	T2	T3	T4				
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	Time	Bonferroni	η_p^2	Time × group
ECHO + TAU	76.89 (13.22)	82.53 (9.36)	82.47 (8.35)	81.27 (9.08)	83.27 (7.01)	$F(3.13) = 4.71$; $p < 0.01$	T0 < T4*	0.08	$F(3.63) = 1.61$; $p = 0.18$
TAU	75.93 (12.63)	75.40 (12.60)	78.91 (11.63)	76.96 (13.17)	79.61 (8.55)	$F(4) = 2.09$; $p = 0.8$	–	0.04	

Abbreviations: AESED, Accommodation to Illness Symptoms Scale; CASK, Caregiver Skills Scale; DASS-21, Depression and Anxiety Stress Scales; ECHO, Experienced Carers Helping Others; EDSIS, Eating Disorders Symptom Impact Scale; FQ, Family Questionnaire; TAU, treatment as usual.

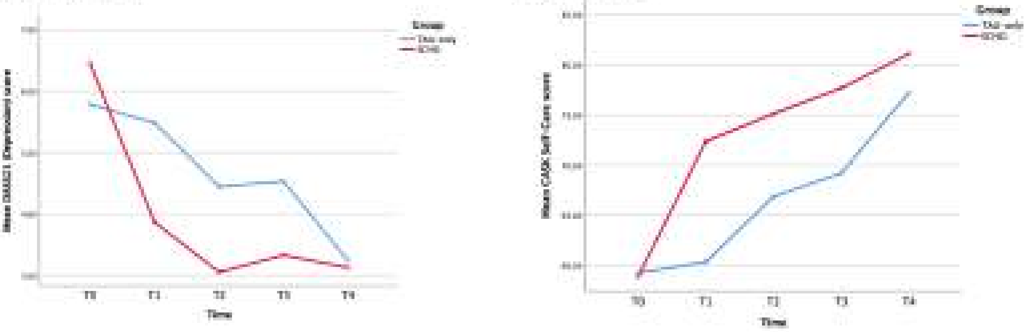
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.


(a) Emotional Overinvolvement

(d) Avoidance Subscale


(b) Total score DASS-21

(e) Total Score CASK


(c) Depression Subscale

(f) Self-care Subscale

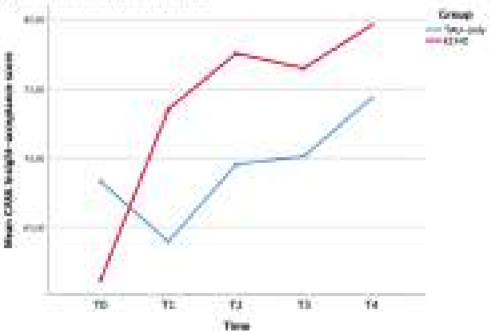

(g) Insight and Acceptance Subscale

FIGURE 2 Profile plots: Changes regarding the mean (a) emotional over-involvement, (b) total score DASS-21, (c) depression subscale, (d) avoidance subscale, (e) total score CASK, (f) self-care subscale, and (g) insight acceptance subscale.

attempts. Participant feedback on the intervention is presented in Table 4. As shown in the table, participants indicated a high level of satisfaction with the ECHO.

DISCUSSION

The main aim of the present study was to analyze the effectiveness of adding the ECHO intervention program applied online and individually to the traditional intervention (TAU) for caregivers of patients with ED by means of a RCT. In addition, the second objective was to examine the acceptability and feasibility of this new format of the program ECHO.

The results generally confirmed our first hypothesis, indicating that carers allocated to ECHO + TAU demonstrated significant improvements in expressed emotion, psychological well-being, and lower illness accommodation, and burden in comparison to carers from the control group (TAU). With regard to expressed emotion, as assessed with the FQ, it is interesting to note that only in the ECHO + TAU group was there an improvement in the factor on "critical comments," albeit with a small effect size. With regard to the factor "emotional over-involvement," a significant effect was observed in the interaction, indicating that although changes were observed in the TAU group after treatment, the changes were greater when the ECHO component was added. Previous RCT studies have found no differences in expressed emotion factors (Hodsoll et al., 2017), so one possible explanation could be that the application format (individual and online) has improved the results.

TABLE 4 Carer feedback on the ECHO intervention.

	M (SD)	Range
1. Do you believe the sessions have been helpful in improving your experience as a caregiver?	9.41 (0.88)	7–10
2. Do you believe the sessions have been helpful in…		
2.1. Better understanding what an eating disorder is?	9.30 (0.82)	7–10
2.2. Better understanding how the eating disorder developed and why it continues to persist?	8.80 (1.32)	6–10
2.3. Having more skills and tools to address your daughter's eating problem?	9.48 (0.82)	7–10
2.4. Improving your communication with your daughter?	9.25 (1.10)	5–10
2.5. Using motivational interviewing and active listening strategies in your communication with your daughter?	9.30 (0.88)	7–10
2.6. Having a more compassionate and less critical communication with your daughter regarding the eating disorder?	9.36 (0.89)	7–10
2.7. Having more strategies to handle challenging situations with your daughter, such as mealtime?	9.18 (1.11)	6–10
3. About the intervention…		
3.1. Has it provided you with tools and taught you skills to help your daughter with the eating disorder?	9.25 (0.81)	8–10
3.2. Has it been satisfactory for you?	9.60 (0.66)	8–10
3.3. Was it what you expected?	8.77 (1.38)	5–10
3.4. Would you recommend it to another family member with a daughter with an eating problem?	9.84 (0.37)	9–10

In terms of the impact of ED on caregivers, assessed with the EDSIS, both interventions showed changes, with small to moderate effect sizes, similar to, but smaller than that found in the Adamson et al. (2019) study. No interaction effect was found for any factor.

Regarding emotional well-being (DASS-21), although statistically significant differences were found for all three factors in both groups, the effect sizes were slightly larger in the group with the addition of ECHO. Effect sizes were larger than in the Adamson et al. (2019) study. In addition, for the depression factor, an interaction effect was observed, indicating that the ECHO program is more effective in reducing depressive symptomatology in caregivers than using the TAU program alone.

Results on the effect of treatment on caregivers' accommodation to the disease (AESED) showed differences on all factors with slightly larger effect sizes in the ECHO component compared to the TAU group. With the TAU program, significant differences were found in four factors, but not in "turning a blind eye." It is interesting to note that the interaction effect is observed in the factor "avoidance," and only in the ECHO + TAU group was a medium effect size reached. Effect sizes were larger than in the Adamson et al. (2019) study.

Finally, the greatest differences in the effectiveness of the ECHO program were found in the acquisition of caregiver skills (CASK). In accordance with our second hypothesis, while in the ECHO + TAU group differences were found in all factors, in the TAU group, differences were only found in the factors "self-care" and "insight acceptance." It is precisely these two factors in which an interaction effect is observed, showing that the improvement was significantly greater in the ECHO + TAU group. It is also interesting to note that for factors "Bigger picture," "emotional intelligence" and "frustration tolerance," although with very small effect sizes, differences appeared only at the one-year follow-up. It could indicate that those are aspects that take some time to assimilate. Effect sizes in case of self-care and insight acceptance were close to 0.40 similar to those found in previous study (Adamson et al., 2019; Hodsoll et al., 2017).

Our third hypothesis was that the efficacy of the combined intervention (ECHO + TAU) would remain stable at the 3-, 6-, and 12-month follow-ups. The results confirm this hypothesis for factors that showed improvement. Moreover, it is interesting to note that in most of these factors there is a tendency showing increasing differences from baseline, with significant improvement even between follow-ups (T0 > T1; T1 > T2; T2 > T3; T3 > T4).

In the present study, 81.48% of caregivers completed the ECHO program, showing a higher adherence rate than previous studies (Hodsoll et al., 2017). This may be due precisely to the fact that in this format the flexibility and ease of attending the sessions was greater, as in this case the sessions were individual and online. However, in the previous studies the formats did not allow for this flexibility as they were group-based and/or through self-help materials (books, DVDs, web-based materials, self-guides) and showed a low adherence of caregivers to the program (Adamson et al., 2019; Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015; Hodsoll et al., 2017). Regarding the 12-month follow-up, 66.66% of the participants completed the evaluation. In previous studies, only the 68% of caregivers completed the program in 75% of the sessions, with a 41% data loss 12 months after the end of the program (Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015). The study by Adamson et al. (2019) increases the percentage of caregivers who did not complete their follow-up assessment 3 months after the end of ECHO to 48%.

In terms of homework, in the present study, although they indicated that they read the book most of the time (>75%), they only completed 43.97% of the homework assignments. Although they are low rates, those percentages were higher than in previous studies. Hodsoll et al. (2017) highlight that lack of engagement with the intervention may be due to high rates of caregiver distress in the initial phase of adaptation, which, coupled with a lack of time to read the ECHO materials, may explain why only 36% of caregivers in their study reported having read half of the book. In order to improve compliance with these tasks, it would be appropriate to review the content and difficulty of them to ensure that the low compliance rate is not due to the tasks being difficult to understand or perform. In addition, and in order to encourage them to carry out these tasks it might be appropriate to send a "reminder note" to parents to further encourage on the completion of them.

When caregivers were asked about their satisfaction with the program, in 10 of the 12 items the scores were higher than 9 out of 10, and the remaining two were close to 9 (8.77 and 8.80). They rated the program as very satisfactory for improving their experience as caregivers, for developing skills and tools to improve communication with their daughters (more compassionate and less critical), and for dealing with conflictive situations and difficult management of the disorder. Previous research with ECHO (Adamson et al., 2019; Hibbs, Magill et al., 2015; Hibbs, Rhind et al., 2015) has indicated, through qualitative assessments, that caregivers would like more direct guidance in skills training and have reported that the intervention was helpful. In this sense, our study provides a high level of satisfaction with the program and its contents, along with a quantitative assessment of caregivers' satisfaction.

Among the limitations of this study, we can highlight the self-administration of the assessment instruments, the reliability of a scale of the EDSIS was below the adequate, and the lack of control over the TAU programs that were being applied in the different hospital units. Another limitation of our study is that we only included female patients with an ED. This prevents us from obtaining relevant data about men. Therefore, in future researches, men should be included in order to know the feasibility and effectiveness of this program in them. In addition, future studies should examine whether the effectiveness of ECHO + TAU on caregivers has implications for patients' improvement in terms of emotional well-being, the quality of the relationship with their caregivers and on the symptoms of the disorder itself.

Among the strengths of this study, we highlight that it is a multicenter, randomized, controlled clinical trial, with a longitudinal design comparing two parallel groups, with a relevant size sample. It is the first study that provides evidence on the effectiveness and feasibility of the ECHO program in family members of adolescent patients with an ED. Furthermore, this study shows the effectiveness of a different way of applying this intervention program in the relatives of these patients, since it has been used in individual and online sessions, allowing for individualization and taking into account in some way the personal circumstances of each family.

The ECHO program for caregivers of patients with EDs was designed to be affordable, scalable, and have a broad reach (Cardi et al., 2017). As it has been pointed out in the introduction section, the original ECHO program has worked through formats such as workshops and self-guides, offering caregivers access to program content through platforms (Treasure et al., 2015). It is important to note the novelty in our trial, where program sessions were individually delivered online to each caregiver. This approach facilitates the immediate and guided transfer of caregiving skills, as previous studies have indicated (Adamson et al., 2019; Ruiz et al., 2023), promoting caregiver program adherence as the schedules of the program sessions were adjusted according to the needs of each caregiver.

The results of this RCT show that after ECHO + TAU and after TAU significant changes in many factors are achieved. However, with the addition of the ECHO program, improvements were achieved in all the factors evaluated and for the remaining factors where changes were also obtained in the TAU group, the improvement was greater in the case of ECHO + TAU, showing larger interaction effects and/or effect sizes in almost all subscales. Undoubtedly, it is of great importance that family caregivers receive specialized attention adapted to their needs, given that involving the family in the treatment of EDs is a key strategy for their recovery (Treasure & Nazar, 2016). The application of a specific program for caregivers in addition to the TAU achieves positive results in caregivers, which leads to better care for patients with an ED.

In conclusion, this study offers relevant clinical contributions for ED treatment. Results have highlighted that by adding ECHO to TAU, caregivers' skills increase and their emotional state improves. In addition, it has also been shown to be effective in reducing some of the negative effects suffered by ED caregivers, such as symptom accommodation, the impact of the disease, expressed emotion, and they feel more competent and able to cope with the care of their loved one. At the clinical level, this study offers an effective, feasible, successful, and protocolized program for working with these relatives.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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Article 4

Efficacy of the ECHOMANTRA Individual Online Intervention to Support Recovery From Eating Disorders in Adolescent Patients: A Randomized Controlled Trial.

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European Eating Disorders Review

WILEY

RESEARCH ARTICLE

Efficacy of the ECHOMANTRA Individual Online Intervention to Support Recovery From Eating Disorders in Adolescent Patients: A Randomized Controlled Trial

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ABSTRACT

Introduction: ECHOMANTRA supports both patients and carers as an adjunct to treatment in Eating Disorders (Eds).
Objective: This study evaluates the efficacy, acceptability, and feasibility of ECHOMANTRA as an add-on to treatment-as-usual (TAU) for adolescent ED patients and their carers, using an individualised online format.
Method: A multicenter, randomized controlled trial compared two parallel groups (TAU + ECHOMANTRA vs. TAU alone) with 108 patient-carer dyads.
Results: Patients in both groups showed improvements in BMI, ED symptoms, emotional state, quality of life, confidence in change, obsessiveness, and perfectionism, with larger effects in the ECHOMANTRA + TAU group. Carers in both groups improved in expressed emotion, accommodation, perceived ED impact, and emotional well-being, with greater effects in the ECHOMANTRA + TAU group. Only carers in this group improved in caregiver skills. Completion rates were high (patients: 87.04%, carers: 81.84%), with strong satisfaction.
Conclusions: ECHOMANTRA is an effective, feasible online intervention that enhances outcomes for adolescent ED patients and carers when added to standard care.

1 | Introduction

Eating disorders (EDs) are considered severe mental illness, mainly affecting adolescents and young women, with significant physical, psychological, social, and familial repercussions (López and Treasure 2011; Nagl et al. 2016; van Eeden et al. 2021). These disorders are characterised by serious symptoms as well as a high degree of comorbidity and mortality, in fact, EDs have the highest lethality among psychiatric illnesses (Fichter and Quadflieg 2016; Nordbo et al. 2012; Van Alsten and Duncan 2020; van Eeden et al. 2021). Affected individuals often present lower quality of life and reduced social functioning compared to healthy individuals or those with other psychiatric conditions (Jenkins et al. 2011; Neipp et al. 2024;

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Highlights

- Patients in the ECHOMANTRA group experienced greater improvements in ED symptoms, emotional state, confidence in change, and socially prescribed perfectionism compared to those receiving TAU alone. These improvements remained stable in the short and medium term.
- Carers in the ECHOMANTRA group showed greater improvements in expressed emotion and psychological well-being, as well as reductions in illness accommodation and burden, compared to those in the TAU group. In terms of caregiving skills, the ECHO + TAU group showed improvements, whereas the TAU group only demonstrated changes in one factor, with a greater effect size observed in the ECHO + TAU group.
- Adherence to the treatment and satisfaction, suggested that ECHOMANTRA is both viable and feasible for adolescents with eating disorders and their carers.

Winkler et al. 2014). Severe cases often require inpatient treatment, yet relapse risk remains high within the first year post-discharge, and treatment goals remain unmet for a considerable proportion of patients (Berends et al. 2018; Herpertz-Dahlmann et al. 2014; Wales et al. 2016).

Given ED's impact in quality of life as well as the high relapse and mortality rates, effective interventions aimed at enhancing care for these patients are crucial. To this end, Professor Janet Treasure's team developed the ECHOMANTRA, in their TRIANGLE study in the United Kingdom (UK), a skill-sharing intervention for adults with Anorexia Nervosa (AN) and their carers, which aims to facilitate the transition from inpatient hospital treatment to daily life (Cardi et al. 2017). ECHOMANTRA consists of a digital, telephone-guided intervention for carers (ECHO; Experienced Carers Helping Others; Treasure, Sepulveda, et al., 2007; Treasure, Smith, and Crane 2007; Treasure et al. 2015) and a digital, guided, aftercare adaptation of the Maudsley Anorexia Nervosa Treatment for Adults (MANTRA, Schmidt et al. 2014) for patients. Both programs, the ECHO and the MANTRA are based on the Cognitive Interpersonal Maintenance Model of AN (Schmidt and Treasure 2006; Schmidt et al. 2014; Treasure and Schmidt 2013), and have shown their efficacy in the treatment of these patients and their families (Fernández and Quiles 2024; Hibbs, Magill, et al. 2015; Hodsoll et al. 2017; Keshen et al. 2020; Schmidt et al. 2012, 2016; Startup et al. 2021).

In the TRIANGLE trial, ECHOMANTRA included an online workbook and a video library with patient's recovery narratives and role-plays of carer skills (Clark Bryan et al. 2024; Cardi et al. 2017). Patients and carers accessed to the study's website with all this material. The workbook and videos covered information on the factors that contribute to and maintain the illness, while also offered tips for behaviour change. The same topics were explored within eight online group discussion forums, which included patient-only, carer-only, and joint patient-carer sessions. We have adapted this format into our research: both MANTRA and ECHO were delivered in eight sessions, following the same contents as in the original study. However, based on the UK trial findings and some recommendations (Ambwani et al. 2024; Adamson et al. 2019; Cardi et al. 2024; Clark Bryan et al. 2024), we decided to change the delivery format. In our study, ECHOMANTRA was delivered through individualised online sessions instead of group discussions, as some patients from the original study found group formats triggering or perceived a sense of competitiveness within the patient group. Also, due to low engagement with intervention materials, a more personalised approach was suggested (Cardi et al. 2024; Clark Bryan et al. 2024). Thus, our ECHOMANTRA adaptation consists of eight online psychoeducation and individually tailored sessions, incorporating workbooks and videos to enhance adherence.

Another difference in this research is that, in the original study, the participants were only adult AN inpatients or those in day care treatment, along with their carers, as the main objective was to evaluate whether this programme improved the transition of these patients from the hospital resource to their community. In our study, adolescent ED inpatients, day care treatment and outpatients were also included, since the MANTRA programme was originally designed for outpatients, and it has also been shown to be effective in adolescents and includes content that is common and important to address across the spectrum of EDs (Fernández and Quiles 2024; Wittek et al. 2023).

ECHOMANTRA was designed, not to replace the usual treatment provided in specialised eating disorder units, but to be used as an add on. So, the aim of this study is to assess the efficacy of this novel intervention for adolescent ED patients and their carers adapted to be used as an add-on to treatment-as-usual (TAU) compared to TAU alone.

1.1 | Hypotheses

- Patients from the experimental group (TAU + ECHOMANTRA) will show significantly greater improvements in health outcomes.
- The efficacy of the combined intervention (TAU + ECHOMANTRA) will be stable in the short (6 months) and middle term (12 months).
- Carers from the experimental group will present a better emotional state and lower symptom accommodation, expressed emotion and symptom impact in comparison to family members from the control group.
- Carers from the experimental group will have more ED carer skills in comparison to family members from the control group.

2 | Method

2.1 | Trial Design

This study is registered in the ISRCTN registry under Trial Identifier: ISRCTN43554732. Details of the study protocol are published in Quiles et al. (2021). However, several deviations from the original protocol were implemented during the course of the study due to methodological and practical considerations. These modifications are described in detail in Supporting Information S1: Supplementary 1.

2.2 | Participants

To be eligible for this study, patients had to (1) be aged between 12 and 19, (2) have a diagnosis of an ED according to DSM-V criteria, (3) have no severe psychiatric or medical comorbidities that would interfere with participation, (4) be receiving treatment for an eating disorder in a specialist inpatient, day-patient, or outpatient ED unit. Additionally, they needed to (5) have a family member willing to participate in the study, (6) be able to use an electronic device (e.g., mobile phone, computer, laptop, or tablet) and access the Internet to attend the online sessions, (7) be either a native Spanish speaker or have native-level Spanish comprehension, and (8) have no previous participation in groups, programs, or therapies that utilise MANTRA. Patients were also required to nominate a primary carer to participate in the trial. The nominated carer had to (1) live with the patient, (2) regularly take care of them outside the hospital or day-centre, (3) not have any serious medical or psychiatric conditions (as self-reported), (4) have access to an electronic device and the Internet to join the online sessions, and (5) be a native Spanish speaker or have native-level Spanish understanding, (6) no previous participation in groups, programs, or therapies that use ECHO.

2.3 | Instruments

Further details on instruments used are available in Supporting Information S1: Supplementary 2.

2.3.1 | Patients

Ad-hoc sociodemographic data questionnaire collected age, gender, and education details.

Ad-hoc clinical data questionnaire covering DSM-V diagnosis, illness duration, BMI, level of care. It was completed by the healthcare providers at the unit.

Eating disorder psychopathology: *Eating Disorder Examination Questionnaire (EDE-Q)* (Fairburn and Beglin 1994; Peláez-Fernández et al. 2012).

Emotional wellbeing: *Depression and Anxiety Stress Scales (DASS-21)* (Bados et al. 2005; Lovibond and Lovibond 1995).

Psychosocial impairment: *Clinical Impairment Assessment (CIA 3.0)* (Bohn and Fairburn 2008; Martín et al. 2015).

Health-related quality of life: *Health Survey (SF-12)* (Ware et al. 1996; Vilagut et al. 2008) and Eating Disorders Quality of Life (*EDQoL*) (Engel et al. 2006; Quiles et al. 2023).

Motivation to change: *Motivation to Change Rule* (Miller and Rollnick 2002).

Perfectionism: *Child and Adolescent Perfectionism Scale (CAPS)* (Flett et al. 1997; Castro et al. 2004).

Obsessive-compulsive symptoms: *Obsessive-Compulsive Inventory Revised (OCIR)* (Foa et al. 2002; Fullana et al. 2005).

Acceptability and Feasibility of ECHOMANTRA. Patients in the ECHOMANTRA group completed a Participant Feedback Form at the end of the intervention. This form included 16 Likert-scale questions (rated from 1 to 10) to assess usefulness and overall satisfaction with the study. Additionally, the therapist recorded attendance, completion of tasks between sessions, and engagement with reading materials for each session.

2.3.2 | Carers

Ad-hoc sociodemographic data questionnaire collected age, gender, marital status, relation with the patient, education, and employment status.

Emotional wellbeing: *Depression and Anxiety Stress Scales (DASS-21)* (Bados et al. 2005; Lovibond and Lovibond 1995).

Expressed emotion: *Family Questionnaire (FQ)* (Wiedemann et al. 2002; Sepúlveda et al. 2014).

Impact of the ED symptoms: *The Eating Disorders Symptom Impact Scale (EDSIS-S)* (Sepúlveda, Lopez, et al. 2008; Sepúlveda, Whitney, et al. 2008; Carral-Fernández et al. 2013).

Family accommodation to illness symptoms: *The Accommodation to Illness Symptoms Scale (AESED)* (Sepúlveda et al. 2009; Quiles et al. 2016).

Skills of caregivers in supporting patients with EDs: *The Caregiver Skills Scale (CASK)* (Hibbs, Magill, et al. 2015; Hibbs, Rhind, et al. 2015; Vintró-Alcaraz et al. 2018).

Acceptability and Feasibility of ECHOMANTRA. Carers in the ECHOMANTRA group completed a custom Participant Feedback Form at the end of the intervention. This form included 12 Likert-scale questions (rated from 1 to 10) to assess their experiences and overall satisfaction with the study. The therapist also recorded attendance, completion of tasks between sessions, and engagement with reading materials for each session.

Ad-hoc sociodemographic data questionnaire which included details such as age, gender, marital status, relation with the patient, education, and employment status.

2.4 | Procedure

2.4.1 | Design

This study is a multi-centre, randomized, controlled, double-masked design comparing two parallel groups, following

CONSORT guidelines. Ethical approval was granted by the Ethics Committees of the respective hospitals to which the eating disorder units belonged (see Supporting Information S1: Supplementary 3) and the Ethics Committee of the University Miguel Hernández.

Recruitment ran from September 2021 to September 2023 across seven different specialist inpatient/day-patient/outpatient eating disorder units spread throughout Spain.

Prior to conducting this study, patients had been diagnosed by the clinical staff in their respective units. Research assistants, typically psychologists or psychiatrists from the participating centres, assessed eligiblity, provided study details and collected informed consent.

Participants were randomly assigned (1:1) to either Treatment as Usual (TAU) alone or TAU + ECHOMANTRA, using a minimisation algorithm stratified by centre and care level. An independent administrator handled randomisation. Patients and carers were unblinded post-randomisation, while inpatient and day-unit clinicians remained blinded. The statistician was partially blinded until final analyses.

The study followed a longitudinal RCT design. Participants completed self-report questionnaires at baseline ($T0$), just before the intervention began; after the intervention ended (approximately 2 months later, $T1$). Further follow-ups were conducted at 3 months ($T2$), 6 months ($T3$), and 12 months ($T4$) post-intervention.

Each group included 54 patient-carer dyads. Completion rates for patients were: ECHOMANTRA 87.04% ($T1$) to 55.56% ($T4$); TAU 92.59% ($T1$) to 64.81% ($T4$). Carers: ECHO 81.48% ($T1$) to 57.41% ($T4$); TAU 94.44% ($T1$) to 68.52% ($T4$). See CONSORT diagram (Figure 1).

2.5 | Interventions

2.5.1 | Treatment as Usual

It was not feasible to use a standardized comparison treatment, as doing so would have required special adjustments across different settings. Thus, each participating centre adhered to its own procedures for TAU. It is expected that eating disorder units within Spain's public health care system follow the Clinical Practice Guidelines established by the National Health System (Ministerio de Sanidad y Consumo 2009).

Dyads in the control conditions (TAU alone) did not have access to the ECHOMANTRA components. However, upon completion of the study, they were offered the self-help materials from the intervention.

2.5.2 | Treatment as Usual Plus ECHOMANTRA

An adaptation of the ECHOMANTRA programme was implemented. The MANTRA and ECHO sessions were delivered by two different assistant psychologists, each consistently assigned to one of the interventions throughout the entire study. Both had a background in clinical psychology at the Master's level and were specifically trained in their respective protocols through structured workshops and guided reading of the original manuals. Bi-weekly clinical supervision was provided by the principal investigator (YQM), a licenced clinical psychologist with extensive experience in the treatment of EDs and in the implementation of the ECHOMANTRA programme.

2.5.2.1 | Patients (MANTRA). MANTRA involved eight, weekly, individual online sessions lasting 60 min each. The intervention was supported by a workbook focused on promoting specific behavioural and attitudinal changes. The workbook was structured into eight chapters, each aligned with one of the programme's sessions. During the sessions, patients were encouraged to reflect on the workbook's content, including informational texts, videos, and proposed exercises. In addition, they completed a series of activities drawn from 'The Maudsley Model' manual (Schmidt et al. 2019) to further explore and consolidate the material presented in each chapter.

See Schmidt et al. (2014) for a comprehensive understanding of the intervention entailed.

2.5.2.2 | Carers (ECHO). ECHO involved eight, weekly, individual online sessions lasting 60 min each.

If multiple caregivers wished to participate, they were welcome to join. When both caregivers attended the sessions together, only one completed the evaluation questionnaires, and their responses were used in the analyses.

The intervention was supported by a workbook, which included activities from the book 'Skills based caring for a loved one with an eating disorder: The New Maudsley Method' (Treasure et al. 2011; Spanish version: 'Los trastornos de la alimentación: guía práctica para cuidar de un ser querido'; Treasure et al. 2011). The workbook was structured into eight chapters, each aligned with one of the programme's sessions. The intervention focused on providing practical skills and techniques to enhance caregivers' self-reflective abilities and to deepen their understanding, following the principles of the New Maudsley Approach. Each session incorporated discussions based on the workbook content and video clips from the DVD How to Care for Someone with an Eating Disorder (Treasure et al. 2008).

Table 1 provides an overview of the content included in the ECHOMANTRA intervention.

2.6 | Statistical Analysis

Independent research assessors, blinded to the treatment allocations, conducted five evaluations: prior to randomisation (baseline: $T0$), at 2 months ($T1$; end of treatment for the ECHOMANTRA group), at 6 months ($T2$), at 9 months ($T3$), and at 12 months ($T4$).

Jamovi (version 2.3.28) was used for data analysis. Baseline characteristics were compared between groups using *t*-tests and

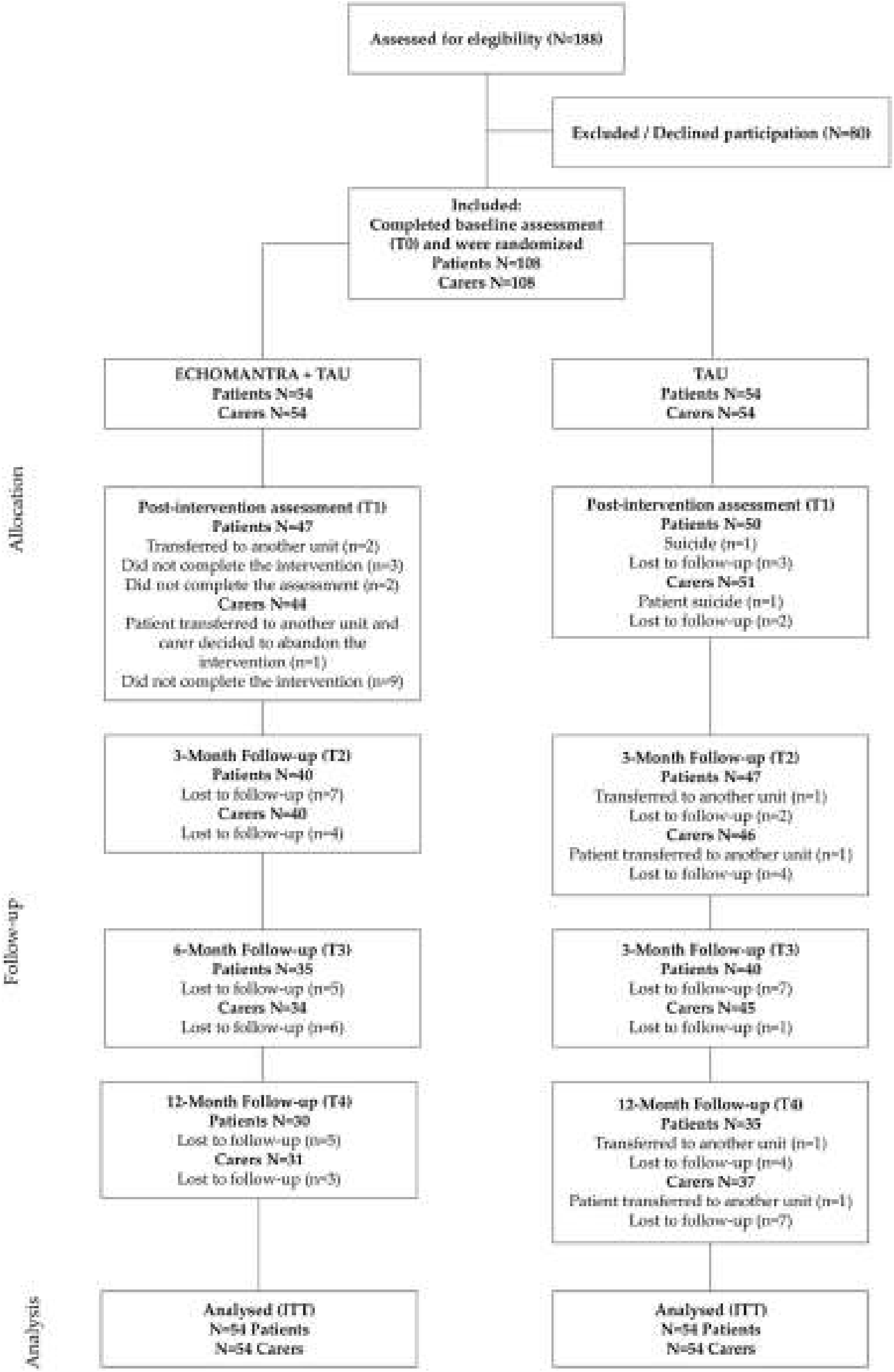


FIGURE 1 | CONSORT diagram describing the flow of participation in the study.

chi-square tests. All analyses followed an intent-to-treat approach. Missing data was imputed using multiple imputation based on fully conditional Markov chain Monte Carlo (Schafer 1997), confirmed as Missing Completely at Random (MCAR), indicated by the non-significant result from the Roderick Little test. Consequently, final analyses were based on the pooled results from five separate imputations.

General linear models, using the GAMLj module, assessed outcome changes across all time points for both groups

TABLE 1 | Contents and goals of ECHOMANTRA intervention.

Session	Goals	Content
Contents and goals of the Maudsley anorexia nervosa treatment for adults (MANTRA) adaptation		
1	To provide psychoeducation about eating disorders and increase participants' motivation to initiate change	Psychoeducation: Better understanding eating disorders. Strategies to motivate change
2	To promote understanding of the origins and maintaining factors of the eating disorder, facilitating insight and engagement in treatment	Psychoeducation: Understanding the origin and maintaining factors of eating disorders
3	To introduce self-acceptance and self-compassion as foundational attitudes for recovery	Acceptance and self-compassion training
4 and 5	To identify unhelpful thinking styles and strengthen interpersonal and social skills for improved relational functioning	Exploration of thinking styles and development of skills to improve social functioning
6	To develop emotional awareness and equip participants with strategies for effective emotion regulation	Emotion management training
7 and 8	To support treatment planning and adherence to treatment routines already in place in their units, reinforce autonomy through goal setting, and promote the use of social support and long-term recovery strategies	Planning the transition from the hospital setting to daily life, goal setting training, use of social support, and addressing the intention to implement these principles
Contents of the Experienced Carers Helping Others (ECHO) adaptation		
1	To introduce the programme, enhance understanding of the multifactorial nature of eating disorders, and validate carers' experiences	Programme presentation and psychoeducation. Understanding the multifactorial origin of the ED: Predisposing, precipitating, and maintaining factors
2	To present the model of carer coping and encourage reflection on different caregiving roles and responses	Description of the model of carer coping
3	To raise awareness of symptom accommodation behaviours and foster resilience as a transformative strength in caregiving	Symptom accommodation
4	To explore interpersonal maintenance factors using the cognitive interpersonal Model's animal metaphors, increasing awareness of relational dynamics and promoting adaptive caregiving	Resilience as the transformative ability
5	To teach effective communication strategies based on motivational interviewing, with emphasis on empathetic listening and compassionate dialogue	Description of the cognitive interpersonal maintenance model of eating disorders. Understanding patterns of relationship with the person with the problem through the animal metaphors. How to create distance and provide warmth and guidance
6	To practice and consolidate communication skills in real-life caregiving situations	Effective communication strategies based on the motivational interviewing approach. Listening strategies: Basic skills of motivational interviewing such as asking open-ended questions, providing support, reflecting, and summarising. Communicating with compassion
7	To practice and consolidate communication skills in real-life caregiving situations	Communication skills training and practice
8	To review the content and skills acquired throughout the programme, and to prepare caregivers for long-term support and relapse prevention	Problem-solving and goal-setting skills training and practice

(time × ECHOMANTRA vs. TAU). Significant time × group interaction effects indicated differences in change between groups. Pairwise comparisons and effect sizes (omega squared, ω^2) were calculated. Effect sizes were interpreted as small ($\omega^2 = 0.01$), medium ($\omega^2 = 0.06$), or large ($\omega^2 = 0.14$), based on benchmarks proposed by Cohen (2013).

A separate model analysed outcome changes within the MANTRA + TAU group based on diagnosis and care level, with time as the within-subject factor and diagnosis/care level as between-subject factors. Significant interactions would suggest different changes across diagnostic groups or care levels. Statistical significance was set at 0.05, with Bonferroni-adjusted pairwise comparisons and effect sizes calculated where appropriate.

3 | Results

3.1 | Sample Characteristics

After screening and baseline assessment, 54 dyads were included to each group.

Baseline sociodemographic data and clinical characteristics of the participants are presented in Table 2. As expected, no differences were found between the groups in sociodemographic and clinical characteristics measured at baseline.

3.2 | Comparisons Between ECHOMANTRA and TAU

The results of the general linear mixed model analysis including effect sizes are shown in Table 3 for the BMI, and in Table 4 for the rest of the outcome variables.

For patients, a significant main effect of time was found in all outcome variables indicating improvements in both groups, except for the *Importance of change* and the *Financial* subscale of the EDQoL in the MANTRA + TAU group, and the *Neutralising* subscale of the OCIR in the TAU group ($p > 0.05$). Large effect sizes were found for the EDEQ, DASS-21, EDQoL, SF-12, CIA 3.0 and OCIR in both groups, and CAPS only in the MANTRA + TAU group. Effect sizes were generally higher in the MANTRA + TAU group, except for the *Anxiety* subscale of the DASS-21, the *Physical Health* subscale of the SF-12, and the *Ordering* subscale of the OCIR. Statistically significant time × group interaction effects, were observed for the EDEQ, the DASS-21, the *Confidence in the ability to change*), the CAPS score and its *Socially prescribed perfectionism subscale* and the *Neutralising* subscale of the OCIR, indicating a greater improvement in these outcomes in the MANTRA + TAU group.

For carers, significant main effect of time was found for all outcome variables, except for the *Critical comments* subscale of the FQ, the *Anxiety* and *Depression* subscales of the DASS-21, the *Turning a blind eye* subscale of the AESED, and the CASK in the TAU condition ($p > 0.05$). Effect sizes were higher in the ECHO + TAU group. Significant time × group interaction showed greater improvements MANTRA + TAU group for the FQ and its *Emotional over-involvement subscale*, the *Guilt* subscale of the EDSIS, the *Depression* subscale of the DASS-21, the *Avoidance*, and *Family control* subscales of the AESED, and the CASK and all of its subscales.

In Figures 2 and 3 we present respectively the profile plots (interaction plots) of the patients and carers for these relationships.

3.3 | MANTRA + TAU: Intra-Group Comparation Analyses

3.3.1 | Comparisons by Diagnosis

No significant differences were observed in the baseline scores of the study variables among the different diagnostic groups ($p > 0.05$). Except for the Weight Concern subscale of the EDEQ ($F(2, 6.16) = 5.56$; $p = 0.04$; $\omega^2 = 0.56$). There was a significant difference between AN and TCANE, with TCANE showing the highest scores. There were no differences between AN and BN, nor between BN and TCANE.

A statistically significant main effect of time was observed across most outcome variables, indicating improvements in all three diagnostic groups, except for the *Importance of Change* and the *Financial* subscale of the EDQoL, where none of the categories showed significant improvement ($p > 0.05$). Patients with BN showed less significant improvement over time compared to the other groups. However, no significant interaction effects between time × group were observed for any outcome variables, with the exception of the *Neutralising* subscale of the OCIR ($F(8) = 2.35$, $p = 0.02$), where only patients with AN showed a significant improvement over time ($F(4) = 5.66$, $p < 0.001$).

The results of the general linear mixed model analysis including effect sizes across diagnostic categories are available in Supporting Information S1: Supplementary 4.

3.3.2 | Comparisons by Level of Care

No significant differences were observed in the baseline scores of the study variables among the different levels of care ($p > 0.05$), except for the *Confidence in the ability to change* ($F(2, 21.23) = 3.67$; $p = 0.04$; $\omega^2 = 0.19$). Analyses showed that there could be a significant difference between *Hospitalisation* and the other two groups, but it is not strong enough to be considered significant.

A statistically significant main effect of time was observed across most outcome variables, indicating improvements in all three levels of care patients, except for the Importance of change, the *Financial* subscale of the EDQoL, and the *Socially prescribed perfectionism*, where none of the groups showed improvement over time. Specifically, patients in Hospitalisation did not show improvements in the *Confidence in the ability to change*, the *Checking* and *Neutralising* subscales of the OCIR; patients in Outpatient care did not show improvements in the *Washing* and *Ordering* subscales of the OCIR ($p > 0.05$). However, no significant interaction effects between time × group were observed for any outcome variables, with the exception of the *Restraint* subscale of the EDEQ ($F(8) = 1.93$, $p = 0.06$), in which Day care patients showed better improvements when comparing effect sizes.

Details of the general linear mixed model analysis including effect sizes across level of care are available in Supporting Information S1: Supplementary 5.

TABLE 2 | Demographic, psychosocial, and clinical variables at baseline.

Patients	**MANTRA + TAU ($N = 54$)**	**TAU ($N = 54$)**	**Total ($N = 108$)**	
Age	M = 15.02 (SD = 1.69)	M = 14.85 (SD = 1.43)	M = 14.94 (SD = 1.56)	$t = -0.55$; $p = 0.58$
Educational level				
First level	$n = 1$ (1.85%)	$n = 1$ (1.85%)	$n = 2$ (2%)	$\chi^2 = 3.97$; $p = 0.55$
Second level	$n = 36$ (66.67%)	$n = 39$ (72.22%)	$n = 75$ (69%)	
Third level	$n = 10$ (18.52%)	$n = 12$ (22.22%)	$n = 22$ (20%)	
Vocational training	$n = 4$ (7.41%)	$n = 2$ (3.70%)	$n = 6$ (6%)	
University studies	$n = 2$ (3.70%)	$n = 0$ (0%)	$n = 2$ (2%)	
Other	$n = 1$ (1.85)	$n = 0$ (0%)	$n = 1$ (1%)	
Diagnosis				
AN-R	$n = 37$ (68.52%)	$n = 39$ (72.22%)	$n = 76$ (70%)	$\chi^2 = 0.59$; $p = 0.90$
AN-P	$n = 5$ (9.26%)	$n = 6$ (11.11%)	$n = 11$ (10%)	
BN	$n = 3$ (5.56%)	$n = 2$ (3.70%)	$n = 5$ (5%)	
OSFED	$n = 9$ (16.67)	$n = 7$ (12.96)	$n = 16$ (15%)	
Age of onset	M = 13.46 (SD = 1.60)	M = 13.35 (SD = 1.75)	M = 13.40 (SD = 1.67)	$t = 0.36$; $p = 0.72$
Duration of illness (months)	M = 23.45 (SD = 24.27)	M = 17.28 (DT = 10.30)	M = 20.37 (DT = 18.81)	$t = -1.70$; $p = 0.09$
BMI	M = 17.34 (SD = 3.94)	M = 16.83 (SD = 2.81)	M = 17.09 (SD = 3.41)	$t = -0.77$; $p = 0.45$
Level of care				
Hospitalisation	$n = 8$ (14.81%)	$n = 12$ (22.22%)	$n = 20$ (18.51%)	$\chi^2 = 1.33$; $p = 0.51$
Day care	$n = 29$ (53.70%)	$n = 29$ (53.70%)	$n = 58$ (53.70%)	
Outpatient	$n = 17$ (31.48%)	$n = 13$ (24.08%)	$n = 30$ (27.77%)	
Carers	**ECHO + TAU ($N = 54$)**	**TAU ($N = 54$)**	**Total ($N = 108$)**	
Age	M = 49.19 (SD = 5.89)	M = 47.59 (SD = 4.37)	M = 48.39 (SD = 5.23)	$t = -1.60$; $p = 0.11$
Gender				$\chi^2 = 0.00$; $p = 1.00$
Female	$n = 46$ (85.2%)	$n = 46$ (85.2%)	$n = 92$ (85%)	
Male	$n = 8$ (14.8%)	$n = 46$ (14.8%)	$n = 16$ (15%)	
Marital status				
Married/living together	$n = 42$ (77.77%)	$n = 40$ (74.1%)	$n = 82$ (76%)	$\chi^2 = 1.45$; $p = 0.69$
Separated/divorced	$n = 9$ (16.66%)	$n = 11$ (20.1%)	$n = 20$ (19%)	
Single	$n = 3$ (5.55%)	$n = 2$ (3.7%)	$n = 5$ (5%)	
Widowed	$n = 0$ (0%)	$n = 0$ (0%)	$n = 0$ (0%)	
Other	$n = 0$ (0%)	$n = 1$ (1.9%)	$n = 1$ (1%)	
Educational level				$\chi^2 = 9.02$; $p = 0.11$
First level	$n = 8$ (14.81%)	$n = 3$ (5.56%)	$n = 11$ (10%)	
Second level	$n = 4$ (7.41%)	$n = 4$ (7.41%)	$n = 8$ (7%)	
Third level	$n = 3$ (5.56%)	$n = 1$ (1.85%)	$n = 4$ (4%)	
Vocational training	$n = 6$ (11.11%)	$n = 17$ (31.48%)	$n = 23$ (21%)	
University studies	$n = 31$ (57.41%)	$n = 28$ (51.85%)	$n = 59$ (55%)	
Other	$n = 2$ (3.70%)	$n = 1$ (1.85%)	$n = 3$ (3%)	
Employment status				$\chi^2 = 4.11$; $p = 0.25$
Employed	$n = 36$ (66.66%)	$n = 43$ (79.63%)	$n = 79$ (73%)	
Unemployed	$n = 11$ (20.37%)	$n = 7$ (12.96%)	$n = 18$ (17%)	
Job training	$n = 0$ (0%)	$n = 1$ (1.85%)	$n = 1$ (1%)	
Other	$n = 7$ (12.96%)	$n = 3$ (5.55%)	$n = 10$ (9%)	

(Continues)

TABLE 2 | (Continued)

Carers	ECHO + TAU ($N = 54$)	TAU ($N = 54$)	Total ($N = 108$)	
Relationship with the sufferer				$\chi^2 = 3.11$; $p = 0.21$
Mother	$n = 44$ (81.48%)	$n = 46$ (85.19%)	$n = 90$ (83%)	
Father	$n = 7$ (12.96%)	$n = 8$ (14.81%)	$n = 15$ (14%)	
Other	$n = 3$ (5.55%)	$n = 0$ (0%)	$n = 3$ (3%)	

Abbreviations: AN-P, anorexia nervosa purging; AN-R, anorexia nervosa restrictive; BMI, body mass index; BN, bulimia nervosa; OSFED, other specified feeding or eating disorder.

TABLE 3 | Results of general linear models analysing BMI in the MANTRA and TAU groups.

	Baseline ($T0$) M (SD)	5M ($T2$) M (SD)	12M ($T4$) M (SD)	Time	Bonferroni	ω^2	Time × group
MANTRA + TAU	17.34 (3.94)	20.64 (3.75)	21.29 (4.55)	$F(2) = 42.34$; $p < 0.001$	$T0 < T2^{***}$; $T0 < T4^{***}$; $T2 < T4^{**}$	0.55	$F(2) = 0.21$; $p = 81$
TAU	16.83 (2.81)	19.98 (2.88)	20.99 (3.23)	$F(4) = 63.15$; $p < 0.001$	$T0 < T2^{***}$; $T0 < T4^{***}$; $T2 < T4^{***}$	0.63	

3.4 | Acceptability and Feasibility of the Intervention

Most patients (87.04%, $n = 47$) completed the MANTRA intervention, accomplishing 72.87% of the tasks between sessions and reading the contents of the workbook on 69.95% of occasions. Seven patients did not complete the intervention: two patients were transferred to another unit for a more intensive treatment, and five decided not to participate.

Patients reported a high level of satisfaction with the MANTRA, feedback on the intervention is presented in Table 5.

Acceptability and feasibility of the ECHO is available in Ruiz et al. (2024).

4 | Discussion

This study is the first to evaluate the efficacy of integrating the online, individually delivered ECHOMANTRA intervention into standard treatment (TAU) for adolescent ED patients and their carers through an RCT. We also assessed the programme's acceptability and feasibility.

The results showed that patients in the ECHOMANTRA group experienced greater improvements in ED symptoms, emotional state, confidence in change, and socially prescribed perfectionism compared to those receiving TAU alone. Both groups showed significant improvements in BMI, psychosocial impairment, quality of life, and obsessiveness. MANTRA + TAU demonstrated larger effect sizes, but no interaction effects were observed. These improvements remained stable in the short and medium term.

These findings do not fully support our first hypothesis, which predicted significantly greater improvements across all health outcomes in the experimental group. However, they do confirm our second hypothesis, as the effectiveness of the combined intervention (ECHOMANTRA + TAU) remained stable in the short and long term.

Our findings differ from previous studies evaluating the ECHOMANTRA intervention in adult patients with AN. Specifically, in the original study, Cardi et al. (2024) found no significant differences between ECHOMANTRA + TAU and TAU alone in the primary outcome (DASS-21 at 12 months) and reported small, non-significant effects in secondary outcomes (BMI, ED psychopathology, Work and social adjustment, Importance and ability to change, and Quality of life). Similarly, Adamson et al. (2019) observed a large reduction in ED symptoms and depression, but no significant differences when comparing the ECHOMANTRA intervention to a cohort control group. One possible explanation for these discrepancies is the format of intervention delivery. In both previous studies, ECHOMANTRA was provided as a self-help programme, and patient or patient-carer joint group sessions (Cardi et al. 2024) or as a structured intervention that included self-help sessions and guided practice meals (Adamson et al. 2019). This may have contributed to the low adherence rates reported (20% in Cardi et al. (2024); 16% at discharge in Adamson et al. (2019)). In contrast, our study implemented ECHOMANTRA in a more personalised format, with individual online sessions, which likely enhanced patient engagement and adherence to the intervention. Additionally, while our study included adolescents with various eating disorders, previous studies focused on adults with AN, a population typically associated with greater illness severity and chronicity. This could explain the limited effects seen in those studies compared to our significant improvements.

This study also aimed to evaluate the efficacy of MANTRA + TAU across different diagnostic groups and levels of care. Regarding comparisons by diagnosis, a significant main effect of time was observed across most outcome measures, supporting the overall efficacy of MANTRA + TAU. However, patients with BN showed less pronounced improvements compared to AN and TCANE, which may be attributed to the small sample size of the BN group and, maybe, specific clinical

TABLE 4 | Results of general linear models analysing outcomes in the ECHOMANTRA and TAU groups.

Patients	$T0$ M (SD)	$T1$ M (SD)	$T2$ M (SD)	$T3$ M (SD)	$T4$ M (SD)	Time	Bonferroni	ω^2	Time × group
EDEQ									
MANTRA + TAU	3.98 (1.26)	2.66 (1.32)	2.10 (1.26)	2.00 (1.35)	1.81 (1.23)	$F(4) = 61.25$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***	0.52	$F(4) = 3.86$; $p = 0.04$
TAU	3.96 (1.40)	3.36 (1.36)	2.87 (1.64)	2.45 (1.53)	1.95 (1.42)	$F(4) = 33.54$; $p < 0.001$	$T0 > T1$**; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***; $T2 > T4$***; $T3 > T4$**	0.37	
Restraint									
MANTRA + TAU	3.43 (1.62)	1.75 (1.40)	1.42 (1.16)	1.37 (1.18)	1.20 (1.02)	$F(4) = 49.31$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T4$*	0.47	$F(4) = 2.92$; $p = 0.02$
TAU	3.55 (1.81)	2.74 (1.65)	2.24 (1.68)	2.00 (1.50)	1.55 (1.43)	$F(4) = 23.23$; $p < 0.001$	$T0 > T1$*; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$**; $T1 > T4$***; $T2 > T4$*; $T3 > T4$*	0.29	
Eating concern									
MANTRA + TAU	3.38 (1.23)	2.18 (1.26)	1.53 (1.17)	1.52 (1.29)	1.46 (1.19)	$F(4) = 53.60$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$**	0.49	$F(4) = 4.60$; $p < 0.001$
TAU	3.32 (1.41)	2.80 (1.36)	2.33 (1.49)	1.83 (1.30)	1.50 (1.30)	$F(4) = 31.48$; $p < 0.001$	$T0 > T1$*; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$*; $T1 > T3$***; $T1 > T4$***; $T2 > T4$**	0.35	
Shape concern									
MANTRA + TAU	4.93 (1.29)	3.80 (1.52)	3.03 (1.54)	2.86 (1.57)	2.61 (1.50)	$F(4) = 51.66$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***	0.48	$F(4) = 2.92$; $p = 0.02$

(Continues)

TABLE 4 | (Continued)

Patients	*T0* M (SD)	*T1* M (SD)	*T2* M (SD)	*T3* M (SD)	*T4* M (SD)	Time	Bonferroni	ω^2	Time × group
TAU	4.73 (1.46)	4.34 (1.47)	3.65 (1.91)	3.23 (1.76)	2.70 (1.66)	$F(4) = 30.30$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***; $T2 > T4$**; $T3 > T4$**	0.35	
Weight concern									
MANTRA + TAU	4.18 (1.56)	3.07 (1.65)	2.45 (1.55)	2.31 (1.63)	2.05 (1.53)	$F(4) = 37.18$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$*; $T1 > T3$**; $T1 > T4$***	0.40	$F(4) = 2.59$; $p = 0.04$
TAU	4.23 (1.55)	3.66 (1.55)	3.23 (1.85)	2.68 (1.75)	2.04 (1.53)	$F(4) = 29.65$; $p < 0.001$	$T0 > T1$*; $T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T3$**; $T1 > T4$***; $T2 > T4$***; $T3 > T4$**	0.34	
DASS-21									
MANTRA + TAU	34.04 (12.64)	23.03 (11.81)	18.16 (11.61)	18.55 (11.86)	14.49 (8.54)	$F(4) = 44.81$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T4$***	0.45	$F(4) = 3.08$; $p = 0.02$
TAU	33.70 (15.79)	29.17 (14.68)	23.39 (15.32)	19.50 (12.62)	15.19 (11.11)	$F(4) = 35.98$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***; $T2 > T4$***; $T3 > T4$***	0.39	
Depression									
MANTRA + TAU	13.85 (5.54)	9.23 (5.22)	6.96 (5.20)	6.68 (4.72)	5.26 (4.00)	$F(4) = 41.96$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$*; $T1 > T3$**; $T1 > T4$***	0.43	$F(4) = 2.49$; $p = 0.04$
TAU	12.44 (6.71)	10.60 (6.32)	8.52 (6.75)	7.00 (5.33)	5.63 (4.52)	$F(4) = 25.87$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$*; $T1 > T3$***; $T1 > T4$***; $T2 > T4$**	0.31	

(Continues)

TABLE 4 | (Continued)

Patients	*T0* M (SD)	*T1* M (SD)	*T2* M (SD)	*T3* M (SD)	*T4* M (SD)	Time	Bonferroni	ω^2	Time × group
Anxiety									
MANTRA + TAU	8.30 (4.74)	5.61 (3.81)	4.51 (3.75)	4.63 (3.75)	3.67 (2.63)	$F(4) = 20.92$; $p < 0.001$	$T0 > T1^{**}$; $T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T4^{**}$	0.27	$F(4) = 2.57$; $p = 0.04$
TAU	9.17 (5.12)	8.29 (4.98)	6.34 (4.61)	5.44 (3.85)	4.22 (3.66)	$F(4) = 26.81$; $p < 0.001$	$T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T2^{**}$; $T1 > T3^{***}$; $T1 > T4^{***}$; $T2 > T4^{**}$; $T3 > T4^{**}$	0.32	
Stress									
MANTRA + TAU	11.89 (4.47)	8.10 (4.23)	6.60 (3.85)	6.84 (4.21)	5.81 (3.00)	$F(4) = 34.15$; $p < 0.001$	$T0 > T1^{***}$; $T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T4^{***}$	0.38	$F(4) = 3.53$; $p = 0.01$
TAU	12.09 (5.50)	10.33 (4.74)	8.55 (5.18)	7.08 (4.41)	5.46 (3.84)	$F(4) = 32.42$; $p < 0.001$	$T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T3^{***}$; $T1 > T4^{***}$; $T2 > T4^{**}$; $T3 > T4^{**}$	0.36	
Motivation for change ruler									
Importance of change									
MANTRA + TAU	8.24 (1.79)	8.64 (1.60)	8.43 (1.37)	8.57 (1.46)	8.11 (1.63)	$F(4) = 1.55$; $p = 0.19$	—	0.01	$F(4) = 0.47$; $p = 0.76$
TAU	7.50 (2.52)	7.49 (2.48)	7.36 (2.64)	7.20 (2.43)	7.11 (2.72)	$F(4) = 0.38$; $p = 0.82$	—	0.00	
Confidence in the ability to change									
MANTRA + TAU	5.68 (2.42)	6.74 (2.12)	7.05 (2.14)	7.12 (1.95)	7.17 (2.09)	$F(4) = 9.19$; $p < 0.001$	$T0 < T1^{*}$; $T0 < T2^{***}$; $T0 < T3^{***}$; $T0 < T4^{***}$	0.13	$F(4) = 3.03$; $p = 0.02$
TAU	5.17 (2.96)	4.85 (2.70)	6.10 (2.68)	6.25 (2.33)	6.80 (2.47)	$F(4) = 8.78$; $p < 0.001$	$T0 < T4^{*}$; $T1 < T2^{**}$; $T1 < T3^{**}$; $T1 < T4^{***}$	0.12	
EDQoL									
MANTRA + TAU	2.69 (0.61)	2.31 (0.65)	1.94 (0.60)	1.74 (0.57)	1.66 (0.49)	$F(4) = 60.38$; $p < 0.001$	$T0 > T1^{***}$; $T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T2^{***}$; $T1 > T3^{***}$; $T1 > T4^{***}$; $T2 > T3^{**}$	0.52	$F(4) = 1.80$; $p = 0.13$

(Continues)

TABLE 4 | (Continued)

Patients	*T0* M (SD)	*T1* M (SD)	*T2* M (SD)	*T3* M (SD)	*T4* M (SD)	Time	Bonferroni	ω^2	Time × group
TAU	2.65 (0.80)	2.34 (0.66)	2.14 (0.74)	1.78 (0.60)	1.58 (0.52)	$F(4) = 50.33$; $p < 0.001$	$T0 > T1^{**}$; $T0 > T2^{***}$; $T0 > T3^{***}$, $T0 > T4^{***}$; $T1 > T2^{*}$; $T1 > T3^{***}$; $T1 > T4^{***}$; $T2 > T3^{***}$; $T2 > T4^{***}$; $T3 > T4^{*}$	0.48	
Psychological									
MANTRA + TAU	3.49 (0.84)	2.88 (0.92)	2.43 (0.81)	2.24 (0.83)	2.16 (0.76)	$F(4) = 44.92$; $p < 0.001$	$T0 > T1^{***}$; $T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T2^{***}$; $T1 > T3^{***}$; $T1 > T4^{***}$	0.45	$F(4) = 1.49$; $p = 0.20$
TAU	3.54 (1.29)	3.21 (1.01)	2.80 (1.08)	2.36 (0.93)	2.17 (0.94)	$F(4) = 28.84$; $p < 0.001$	$T0 > T2^{**}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T2^{**}$; $T1 > T3^{***}$; $T1 > T4^{***}$; $T2 > T3^{***}$; $T2 < T4^{***}$	0.34	
Physical/cognitive									
MANTRA + TAU	3.18 (0.97)	2.59 (1.11)	2.05 (0.90)	1.93 (0.78)	1.90 (0.73)	$F(4) = 34.27$; $p < 0.001$	$T0 > T1^{***}$; $T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T2^{***}$; $T1 > T3^{***}$, $T1 > T4^{***}$	0.38	$F(4) = 1.48$; $p = 0.21$
TAU	3.08 (1.04)	2.59 (1.01)	2.29 (1.01)	1.98 (0.97)	1.72 (0.74)	$F(4) = 32.40$; $p < 0.001$	$T0 > T1^{**}$; $T0 > T2^{***}$; $T0 > T3^{***}$; $T1 > T2^{**}$; $T1 > T3^{***}$; $T1 > T4^{***}$; $T2 > T4^{***}$	0.37	
Financial									
MANTRA + TAU	1.25 (0.44)	1.28 (0.47)	1.25 (0.47)	1.17 (0.38)	1.20 (0.27)	$F(4) = 0.96$; $p = 0.43$	—	0.09	$F(4) = 0.58$; $p = 0.68$
TAU	1.20 (0.47)	1.31 (0.47)	1.27 (0.60)	1.12 (0.17)	1.12 (0.18)	$F(4) = 3.69$; $p = 0.006$	$T1 > T3^{*}$; $T1 > T4^{*}$	0.05	
Work/School									
MANTRA + TAU	2.54 (1.04)	2.58 (0.98)	1.97 (0.90)	1.56 (0.66)	1.62 (0.62)	$F(4) = 27.2$; $p < 0.001$	$T0 > T2^{**}$; $T0 > T3^{***}$; $T0 > T4^{***}$, $T1 > T2^{**}$; $T1 > T3^{***}$;	0.32	$F(4) = 1.84$; $p = 0.12$

(Continues)

TABLE 4 | (Continued)

Patients	*T0* M (SD)	*T1* M (SD)	*T2* M (SD)	*T3* M (SD)	*T4* M (SD)	Time	Bonferroni	ω^2	Time × group
							T1 > *T4****; *T2* > *T3**; *T2* > *T4**		
TAU	2.30 (1.06)	2.51 (1.12)	2.11 (1.06)	1.74 (0.72)	1.46 (0.61)	*F*(4) = 20.45; *p* < 0.001	*T0* > *T3****; *T0* > *T4****; *T1* > *T3****; *T1* > *T4****; *T2* > *T4****; *T3* > *T4**	0.26	
SF-12									
Physical Health									
MANTRA + TAU	13.20 (3.13)	14.76 (2.63)	16.00 (2.29)	16.49 (1.92)	16.82 (1.60)	*F*(4) = 32.42; *p* < 0.001	*T0* < *T1***; *T1* < *T2****; *T1* < *T3****; *T1* < *T4****; *T1* < *T2***; *T1* < *T3****; *T1* < *T4****	0.37	*F*(4) = 1.22; *p* = 0.30
TAU	12.69 (2.95)	14.54 (2.98)	15.63 (2.46)	16.61 (2.07)	17.35 (1.96)	*F*(4) = 44.23; *p* < 0.001	*T0* < *T1***; *T0* < *T2****; *T0* < *T3****; *T0* < *T4****; *T1* < *T2**; *T1* < *T3****; *T1* < *T4****; *T2* < *T3***; *T2* < *T4****; *T3* < *T4**	0.44	
Mental Health									
MANTRA + TAU	13.44 (3.62)	16.04 (3.39)	17.34 (3.92)	17.59 (3.66)	18.30 (2.89)	*F*(4) = 27.33; *p* < 0.001	*T0* < *T1****; *T0* < *T2****; *T0* < *T3****; *T0* < *T4****; *T1* < *T4****	0.33	*F*(4) = 2.21; *p* = 0.07
TAU	14.46 (4.14)	15.30 (3.85)	16.62 (4.32)	17.61 (3.95)	18.98 (3.41)	*F*(4) = 20.96; *p* < 0.001	*T0* < *T2**; *T0* < *T3****; *T0* < *T4****, *T1* < *T3****; *T1* < *T4****; *T2* < *T4***; *T3* < *T4**	0.27	
CIA 3.0									
MANTRA + TAU	28.48 (10.01)	22.95 (10.61)	15.94 (10.02)	14.34 (10.23)	11.95 (7.65)	*F*(4) = 58.12; *p* < 0.001	*T0* > *T1****; *T0* > *T2****; *T0* > *T3****; *T0* > *T4****; *T1* > *T2****; *T1* > *T3****; *T1* > *T4****; *T2* > *T4**	0.51	*F*(4) = 1.65; *p* = 0.16
TAU	28.44 (13.23)	25.71 (12.21)	20.60 (12.77)	16.40 (11.08)	12.59 (10.65)	*F*(4) = 33.58; *p* < 0.001	*T0* > *T2****; *T0* > *T3****; *T0* > *T4****; *T1* > *T2***;	0.38	

(Continues)

TABLE 4 | (Continued)

Patients	*T0* M (SD)	*T1* M (SD)	*T2* M (SD)	*T3* M (SD)	*T4* M (SD)	Time	Bonferroni	ω^2	Time × group
							$T1 > T3$***; $T1 > T4$***; $T2 > T4$***; $T3 > T4$**		
Personal									
MANTRA + TAU	12.57 (4.52)	10.47 (4.37)	7.72 (4.23)	7.44 (4.63)	6.05 (3.78)	$F(4) = 42.39$; $p < 0.001$	$T0 > T1$**; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***; $T2 > T4$*	0.43	$F(4) = 1.69$; $p = 0.15$
TAU	12.44 (5.27)	11.74 (5.13)	9.73 (5.50)	7.82 (5.19)	6.76 (4.91)	$F(4) = 24.97$; $p < 0.001$	$T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T2$*; $T1 > T3$***; $T1 > T4$***; $T2 > T3$*; $T2 > T4$**	0.31	
Social									
MANTRA + TAU	8.61 (3.98)	6.44 (3.90)	4.01 (3.24)	3.74 (3.35)	2.93 (2.43)	$F(4) = 40.66$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***, $T1 > T4$***	0.42	$F(4) = 1.93$; $p = 0.10$
TAU	8.69 (4.69)	7.76 (4.23)	5.91 (4.54)	4.36 (3.50)	3.27 (3.26)	$F(4) = 32.82$; $p < 0.001$	$T0 < T2$**; $T0 < T3$***; $T0 < T4$***; $T1 < T2$**; $T1 < T3$***; $T1 < T4$***; $T2 < T3$*; $T2 < T4$***; $T3 < T4$**	0.36	
Cognitive									
MANTRA + TAU	7.30 (3.31)	6.08 (3.68)	4.51 (3.61)	3.36 (3.06)	3.07 (2.34)	$F(4) = 34.05$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***; $T2 > T4$**	0.38	$F(4)$ 0.51; $p = 0.63$
TAU	7.31 (4.46)	6.12 (4.18)	4.89 (3.87)	4.08 (3.22)	2.89 (2.95)	$F(4) = 20.10$; $p < 0.001$	$T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T3$**; $T1 > T4$***; $T2 > T4$***; $T3 > T4$*	0.26	

(Continues)

TABLE 4 | (Continued)

Patients	*T0* M (SD)	*T1* M (SD)	*T2* M (SD)	*T3* M (SD)	*T4* M (SD)	Time	Bonferroni	ω^2	Time × group
CAPS									
MANTRA + TAU	74.06 (15.46)	69.21 (13.21)	65.56 (14.59)	65.22 (14.43)	65.12 (13.50)	$F(4) = 10.82$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***	0.15	$F(4) = 3.65$; $p = 0.01$
TAU	76.39 (19.26)	79.04 (14.52)	76.35 (17.66)	72.59 (16.91)	69.91 (14.63)	$F(4) = 6.50$; $p < 0.001$	$T1 > T3$*; $T1 > T4$***; $T2 > T4$*	0.09	
Self-oriented perfectionism									
MANTRA + TAU	47.26 (10.56)	44.70 (8.37)	41.49 (9.72)	41.23 (9.80)	41.77 (8.90)	$F(4) = 11.34$; $p < 0.001$	$T0 > T2$**; $T0 > T3$***; $T0 > T4$**; $T1 > T2$*; $T1 > T3$**; $T1 > T4$*	0.16	$F(4) = 1.97$; $p = 0.10$
TAU	48.56 (11.10)	49.13 (8.71)	46.17 (10.89)	44.87 (10.42)	43.23 (9.41)	$F(4) = 8.48$; $p < 0.001$	$T0 > T4$***; $T1 > T3$*; $T1 > T4$***	0.12	
Socially prescribed perfectionism									
MANTRA + TAU	26.80 (8.80)	24.50 (8.48)	23.98 (7.47)	23.88 (7.08)	23.33 (6.48)	$F(4) = 3.92$; $p = 0.004$	$T0 > T2$*; $T0 > T4$*	0.05	$F(4) = 3.33$; $p = 0.01$
TAU	27.83 (10.81)	29.86 (9.26)	30.21 (8.99)	27.67 (8.72)	26.89 (7.05)	$F(4) = 3.05$; $p = 0.02$	$T2 > T4$*	0.04	
OCIR									
MANTRA + TAU	26.48 (13.15)	21.94 (11.93)	15.06 (8.63)	15.30 (10.31)	13.09 (9.19)	$F(4) = 35.74$; $p < 0.001$	$T0 > T1$*; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***	0.39	$F(4) = 1.35$; $p = 0.25$
TAU	29.85 (15.64)	24.71 (12.77)	22.33 (13.22)	18.97 (14.38)	16.79 (14.19)	$F(4) = 17.92$; $p < 0.001$	$T0 > T1$*; $T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T3$**; $T1 > T4$***; $T2 > T4$**	0.23	
Washing									
MANTRA + TAU	2.67 (3.02)	1.64 (1.86)	0.91 (1.30)	1.47 (1.95)	1.19 (1.82)	$F(4) = 9.09$; $p < 0.001$	$T0 > T2$***; $T0 > T4$*; $T1 > T4$*	0.13	$F(4) = 2.38$; $p = 0.05$
TAU	3.07 (3.19)	2.48 (2.82)	2.64 (2.80)	2.14 (2.49)	1.68 (2.24)	$F(4) = 3.98$; $p = 0.004$	—	0.05	
Obsessing									
MANTRA + TAU	6.72 (3.99)	5.39 (3.28)	3.68 (2.91)	3.79 (2.54)	3.35 (2.87)	$F(4) = 22.21$; $p < 0.001$	$T0 > T1$*; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$**; $T1 > T4$***	0.28	$F(4) = 1.80$; $p = 0.13$

(Continues)

TABLE 4 | (Continued)

Patients	*T*0 M (SD)	*T*1 M (SD)	*T*2 M (SD)	*T*3 M (SD)	*T*4 M (SD)	Time	Bonferroni	ω^2	Time × group
TAU	7.44 (3.85)	5.98 (3.40)	5.74 (3.69)	4.56 (3.33)	4.33 (3.42)	$F(4) = 14.99$; $p < 0.001$	$T0 > T1$*; $T0 > T2$*; $T0 > T3$***; $T0 > T4$***; $T1 > T3$*; $T1 > T4$**; $T2 > T3$*; $T2 > T4$*	0.20	
Hoarding									
MANTRA + TAU	5.35 (3.47)	4.32 (3.12)	2.88 (2.22)	2.86 (2.40)	2.43 (2.53)	$F(4) = 20.79$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$**; $T1 > T4$***	0.26	$F(4) = 1.22$; $p = 0.30$
TAU	5.26 (3.56)	4.33 (3.28)	3.88 (3.24)	3.29 (2.97)	3.04 (2.44)	$F(4) = 8.65$; $p < 0.001$	$T0 > T3$***; $T0 < T4$***	0.12	
Ordering									
MANTRA + TAU	5.96 (3.80)	4.97 (2.98)	4.09 (2.74)	3.84 (2.73)	3.76 (2.54)	$F(4) = 9.97$; $p < 0.001$	$T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T3$*; $T1 > T4$*	0.14	*F* (4) = 1.79; p.13
TAU						$F(4) = 19.53$; $p < 0.001$	$T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T3$*; $T1 > T4$***; $T2 > T4$**; $T3 > T4$*	0.25	
Checking									
MANTRA + TAU	3.17 (2.68)	2.75 (2.43)	1.64 (1.82)	1.72 (1.80)	1.29 (1.48)	$F(4) = 16.98$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$**; $T1 > T4$***	0.27	$F(4) = 0.94$; $p = 0.44$
TAU	4.20 (3.19)	3.31 (2.67)	2.82 (2.36)	2.20 (2.68)	1.90 (2.35)	$F(4) = 12.88$; $p < 0.001$	$T0 > T2$*; $T0 > T3$***; $T0 > T4$***; $T1 > T3$*; $T1 < T4$***	0.17	
Neutralising									
MANTRA + TAU	2.61 (3.07)	2.82 (3.04)	1.83 (2.09)	1.84 (2.14)	1.26 (1.41)	8.33; $p < 0.001$	$T0 > T4$*; $T1 > T2$*; $T1 > T3$*; $T1 > T4$**	0.12	$F(4) = 8.48$; $p = 0.03$
TAU	3.11 (3.54)	2.76 (2.84)	2.63 (2.94)	2.73 (2.95)	2.72 (3.20)	$F(4) = 0.50$; $p = 0.74$	—	0.00	

Carers	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω^2	Time × group
FQ									
ECHO + TAU	28.43 (8.31)	24.57 (6.75)	21.22 (6.53)	21.29 (6.53)	18.87 (5.87)	$F(4) = 29.28$; $p < 0.001$	$T0 > T1$**; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***; $T2 > T4$*; $T3 > T4$**	0.34	$F(4) = 2.85$; $p = 0.02$

(Continues)

TABLE 4 | (Continued)

Carers	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω^2	Time × group
TAU	29.24 (7.85)	28.57 (8.08)	25.91 (7.88)	24.78 (9.01)	24.30 (5.76)	$F(4) = 8.06$; $p < 0.001$	$T0 > T2$*; $T0 > T3$*; $T0 > T4$**; $T1 > T3$*; $T1 > T4$**	0.12	
Critical comments									
ECHO + TAU	10.70 (5.16)	9.80 (4.00)	8.22 (3.51)	8.71 (3.63)	7.82 (3.29)	$F(4) = 8.29$; $p < 0.001$	$T0 > T2$*; $T0 > T4$**; $T1 > T2$*; $T1 > T4$**	0.12	$F(4) = 1.52$; $p = 0.19$
TAU	11.15 (4.42)	10.77 (5.02)	10.09 (4.88)	10.35 (5.33)	10.14 (3.50)	$F(4) = 1.07$; $p = 0.37$	—	0.00	
Emotional over-involvement									
ECHO + TAU	17.72 (4.33)	15.01 (4.05)	12.91 (3.91)	12.48 (4.00)	10.80 (3.44)	$F(4) = 49.91$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***; $T2 > T4$***; $T3 > T4$***	0.47	$F(4) = 3.88$; $p = 0.004$
TAU	18.11 (4.95)	17.82 (4.89)	15.72 (4.49)	14.50 (4.47)	14.10 (3.42)	$F(4) = 17.40$; $p < 0.001$	$T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***	0.23	
EDSIS									
ECHO + TAU	35.52 (13.78)	25.62 (12.92)	19.46 (11.04)	17.41 (10.30)	14.52 (7.86)	$F(4) = 48.30$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***; $T2 > T4$*	0.47	$F(4) = 2.03$; $p = 0.08$
TAU	38.03 (11.37)	33.54 (14.09)	27.99 (12.61)	25.46 (11.51)	20.76 (8.87)	$F(4) = 29.31$; $p < 0.001$	$T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$*; $T1 > T3$***; $T1 > T4$***; $T2 > T4$**	0.34	
Nutrition impact									
ECHO + TAU	11.87 (5.16)	7.18 (4.36)	5.49 (3.71)	4.55 (3.06)	3.59 (2.94)	$F(4) = 56.90$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***; $T2 > T4$*	0.50	$F(4) = 0.90$; $p = 0.47$
TAU	13.30 (4.12)	10.31 (5.12)	7.76 (4.72)	7.06 (4.16)	6.07 (3.27)	$F(4) = 36.65$; $p < 0.001$	$T0 > T1$***; $T0 > T2$***; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***	0.40	
Guilt									
ECHO + TAU	9.94 (5.03)	7.63 (4.00)	5.18 (3.55)	5.10 (3.49)	4.63 (2.92)	$F(4) = 29.84$; $p < 0.001$	$T0 > T1$*; $T0 > T2$***; $T0 > T3$***, $T0 > T4$***; $T1 > T2$***; $T1 > T3$***; $T1 > T4$***	0.35	$F(4) = 2.63$; $p = 0.03$
TAU	10.21 (4.99)	9.48 (4.74)	7.85 (3.99)	7.23 (3.88)	6.15 (3.32)	$F(4) = 19.85$; $p < 0.001$	$T0 > T2$**; $T0 > T3$***; $T0 > T4$***; $T1 > T2$**; $T1 > T3$***; $T1 > T4$***; $T2 > T4$*	0.26	
Dysregulated behaviour									
ECHO + TAU	5.37 (4.87)	4.62 (4.21)	3.30 (3.57)	3.44 (3.54)	2.61 (2.10)	$F(4) = 9.57$; $p < 0.001$	$T0 > T2$***; $T0 > T3$*; $T0 > T4$**; $T1 > T2$*; $T1 > T4$*	0.14	$F(4) = 1.27$; $p = 0.28$
TAU	5.21 (3.17)	4.99 (3.80)	4.51 (3.86)	4.40 (3.16)	3.65 (2.71)	$F(4) = 2.94$; $p = 0.02$	—	0.03	

(Continues)

TABLE 4 | (Continued)

Carers	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω^2	Time × group
Social isolation									
ECHO + TAU	8.33 (4.26)	6.30 (3.73)	5.27 (3.67)	4.40 (2.57)	3.66 (2.81)	F(4) = 25.24; p = < 0.001	T0 > T1*; T0 > T2***; T0 > T3***; T0 > T4***; T1 > T3***; T1 > T4***; T2 > T4**	0.31	F(4) = 1.65; p = 0.16
TAU	9.30 (4.21)	8.89 (4.52)	7.66 (3.91)	6.53 (3.89)	4.97 (2.62)	F(4) = 18.50; p < 0.001	T0 < T3***; T0 > T4***; T1 > T3**; T1 > T4***; T2 > T4***	0.24	
DASS-21									
ECHO + TAU	17.67 (10.88)	10.67 (8.88)	7.66 (6.54)	7.05 (6.77)	7.35 (6.20)	F(4) = 27.17; p < 0.001	T0 > T1***; T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*; T1 > T3*	0.32	F(4) = 2.26; p = 0.06
TAU	18.17 (11.06)	16.12 (11.61)	13.13 (11.27)	12.04 (11.11)	12.37 (9.26)	F(4) = 5.63; p < 0.001	T0 > T2**; T0 > T3**; T0 > T4*	0.08	
Depression									
ECHO + TAU	6.24 (4.69)	3.48 (3.66)	2.56 (2.68)	2.38 (2.61)	2.59 (2.49)	F(4) = 21.12; p < 0.001	T0 < T1**; T0 > T2***; T0 > T3***; T0 < T4***; T1 > T2*; T1 > T3**	0.27	F(4) = 3.15; p = 0.01
TAU	5.94 (4.30)	5.51 (4.27)	4.53 (4.51)	4.52 (4.23)	4.15 (3.45)	F(4) = 3.12; p = 0.02	—	0.04	
Anxiety									
ECHO + TAU	3.55 (3.70)	2.15 (2.76)	1.29 (1.78)	1.41 (2.22)	1.47 (1.76)	F(4) = 11.36; p < 0.001	T0 > T2***, T0 > T3**; T0 > T4**; T1 > T2*	0.16	F(4) = 0.85; p = 0.50
TAU	3.95 (3.66)	3.61 (3.85)	2.71 (3.30)	2.44 (3.29)	2.67 (3.50)	F(4) = 3.15; p = 0.02	—	0.04	
Stress									
ECHO + TAU	7.90 (3.92)	5.07 (3.17)	3.79 (2.81)	3.27 (2.73)	3.14 (2.58)	F(4) = 35.33; p < 0.001	T0 < T1***; T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2*; T1 > T3**; T1 > T4**	0.39	F(4) = 1.93; p = 0.11
TAU	8.25 (4.34)	7.03 (4.42)	5.76 (4.05)	5.10 (4.27)	5.40 (3.30)	F(4) = 9.36; p < 0.001	T0 > T2***; T0 > T3***; T0 > T4***; T1 > T3*	0.13	
AESED									
ECHO + TAU	46.54 (20.22)	34.83 (15.14)	26.56 (14.28)	21.76 (13.00)	18.74 (11.82)	F(4) = 44.97; p < 0.001	T0 > T1***; T0 > T2***; T0 > T3***; T0 > T4***	0.45	F(4) = 1.48; p = 0.21
TAU	49.46 (20.99)	42.64 (20.72)	36.37 (17.87)	32.56 (16.63)	27.33 (12.06)	F(4) = 21.11; p < 0.001	T0 > T2***; T0 > T3***; T0 > T4***; T1 > T3**; T1 > T4***; T2 > T4**	0.27	
Avoidance									
ECHO + TAU	17.46 (7.02)	11.94 (5.53)	8.56 (5.07)	6.89 (4.53)	6.01 (4.51)	F(4) = 53.38; p < 0.001	T0 > T1***; T0 > T2***; T0 > T3***; T0 > T4***; T1 > T2***; T1 > T3***; T1 > T4***; T2 > T4**	0.52	F(4) = 3.57: p = 0.01
TAU	18.41 (6.99)	16.11 (7.24)	14.17 (7.28)	11.29 (6.74)	8.46 (4.78)	F(4) = 27.90; p < 0.001	T0 > T2**; T0 > T3***; T0 > T4***; T1 > T3***; T1 > T4***; T2 > T4***	0.33	
Reassurance seeking									
ECHO + TAU	10.69 (7.37)	7.74 (4.98)	5.68 (4.00)	5.04 (4.23)	4.58 (4.06)	F(4) = 20.70; p < 0.001	T0 < T1*; T0 > T2***; T0 > T3***; T0 > T4***;	0.27	F(4) = 0.12; p = 0.97

(Continues)

TABLE 4 | (Continued)

Carers	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω^2	Time × group
							$T1 > T2^{*}$; $T1 > T3^{**}$; $T1 > T4^{***}$		
TAU	11.80 (7.01)	9.05 (7.29)	7.28 (5.95)	6.89 (5.10)	5.97 (3.74)	$F(4) = 15.68$; $p < 0.001$	$T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T4^{**}$	0.22	
Meal ritual									
ECHO + TAU	3.48 (4.02)	3.06 (3.34)	2.56 (3.33)	1.60 (2.16)	1.49 (1.67)	$F(4) = 6.53$; $p < 0.001$	$T0 > T3^{*}$; $T0 > T4^{*}$; $T1 > T3^{*}$; $T1 > T4^{*}$	0.09	$F(4) = 0.45$; $p = 0.77$
TAU	4.37 (5.51)	3.90 (4.87)	2.69 (3.00)	2.71 (3.78)	2.06 (1.97)	$F(4) = 4.84$; $p < 0.001$	$T0 > T4^{*}$; $T1 > T4^{*}$	0.06	
Family control									
ECHO + TAU	12.69 (6.40)	10.28 (4.82)	8.20 (4.17)	6.63 (3.74)	5.59 (3.55)	$F(4) = 31.24$; $p < 0.001$	$T0 > T1^{*}$; $T0 > T2^{***}$; $T0 > T3^{***}$; $T0 > T4^{***}$; $T1 > T2^{**}$; $T1 > T3^{***}$; $T1 > T4^{***}$; $T2 > T4^{***}$	0.36	$F(4) = 2.86$; $p = 0.02$
TAU	13.08 (5.52)	11.64 (5.53)	10.33 (4.45)	9.75 (4.45)	9.01 (4.03)	$F(4) = 9.16$; $p < 0.001$	$T0 > T2^{*}$; $T0 > T3^{**}$; $T0 > T4^{***}$; $T1 > T4^{**}$	0.13	
Turning a blind eye									
ECHO + TAU	2.22 (2.91)	1.64 (2.25)	1.51 (2.31)	1.48 (1.63)	1.01 (1.08)	$F(4) = 4.09$; $p = 0.003$	$T0 > T4^{*}$	0.05	$F(4) = 1.29$; $p = 0.27$
TAU	1.97 (2.84)	1.73 (1.68)	1.80 (2.34)	1.97 (2.12)	1.68 (1.56)	$F(4) = 0.35$; $p = 0.85$	—	0.00	
CASK									
ECHO + TAU	71.31 (11.75)	78.53 (9.21)	80.64 (8.24)	81.22 (9.97)	84.65 (7.35)	$F(4) = 22.77$; $p < 0.001$	$T0 < T1^{***}$; $T0 < T2^{***}$; $T0 < T3^{***}$; $T0 < T4^{***}$; $T1 < T4^{***}$; $T2 < T4^{*}$	0.29	$F(4) = 6.93$; $p < 0.001$
TAU	71.58 (10.44)	70.12 (11.18)	74.59 (10.79)	73.56 (12.93)	74.41 (9.50)	$F(4) = 2.97$; $p = 0.02$	$T0 < T4^{*}$	0.04	
Bigger picture									
ECHO + TAU	76.64 (13.25)	80.28 (10.53)	82.01 (9.17)	83.10 (11.74)	86.21 (8.29)	$F(4) = 8.55$; $p < 0.001$	$T0 < T2^{*}$; $T0 < T4^{***}$; $T1 < T4^{**}$	0.12	$F(4) = 5.60$; $p < 0.001$
TAU	76.65 (12.67)	75.67 (11.78)	78.73 (12.41)	76.85 (13.56)	75.03 (12.18)	$F(4) = 1.26$; $p = 0.29$	—	0.00	
Self care									
ECHO + TAU	59.40 (18.81)	74.23 (12.47)	77.55 (11.40)	80.22 (12.75)	81.31 (11.60)	$F(4) = 30.52$; $p < 0.001$	$T0 < T1^{***}$; $T0 < T2^{***}$; $T0 < T3^{***}$; $T0 < T4^{***}$; $T1 < T4^{*}$	0.35	$F(4) = 5.00$; $p < 0.001$
TAU	58.62 (18.17)	59.04 (19.21)	66.81 (16.55)	68.20 (14.79)	72.21 (13.66)	$F(4) = 11.06$; $p < 0.001$	$T0 < T2^{*}$; $T0 > T3^{**}$; $T0 < T4^{***}$; $T1 < T3^{*}$; $T1 < T4^{***}$	0.16	
Biting your tongue									
ECHO + TAU	70.86 (17.03)	73.57 (14.60)	77.71 (15.19)	74.21 (18.89)	84.13 (11.97)	$F(4) = 9.75$; $p < 0.001$	$T0 < T2^{*}$; $T0 < T4^{***}$; $T1 < T4^{***}$; $T3 < T4^{***}$	0.14	$F(4) = 3.63$; $p = 0.006$
TAU	69.32 (16.22)	67.45 (17.10)	70.56 (14.86)	71.58 (15.57)	70.76 (13.45)	$F(4) = 0.79$; $p = 0.53$	—	0.01	
Insight and acceptance									
ECHO + TAU	61.39 (19.78)	17.23 (14.22)	79.45 (10.98)	77.26 (13.54)	81.31 (11.75)	$F(4) = 24.46$; $p < 0.001$	$T0 < T1^{***}$; $T0 < T2^{***}$; $T0 < T3^{***}$; $T0 < T4^{***}$; $T1 < T4^{***}$	0.30	$F(4) = 9.89$; $p < 0.001$

(Continues)

TABLE 4 | (Continued)

Carers	T0 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	Time	Bonferroni	ω^2	Time × group
TAU	68.10 (18.52)	63.76 (18.23)	68.86 (17.77)	68.96 (17.24)	71.12 (15.00)	$F(4) = 2.36$; $p = 0.05$	—	0.02	
Emotional intelligence									
ECHO + TAU	74.48 (16.02)	79.70 (12.70)	80.87 (11.82)	83.39 (11.60)	84.30 (8.72)	$F(4) = 7.75$; $p < 0.001$	$T0 < T3$**; $T0 < T4$***	0.11	$F(4) = 2.64$; $p = 0.03$
TAU	73.31 (14.66)	71.74 (14.79)	76.64 (12.11)	73.99 (15.81)	76.19 (11.34)	$F(4) = 1.71$; $p = 0.15$	—	0.01	
Frustration tolerance									
ECHO + TAU	76.30 (13.08)	83.53 (9.09)	84.64 (9.64)	83.61 (8.56)	87.42 (7.57)	$F(4) = 13.15$; $p < 0.001$	$T0 < T1$**; $T0 < T2$**; $T0 < T3$**; $T0 < T4$***	0.18	$F(4) = 5.58$; $p < 0.001$
TAU	76.51 (13.08)	74.87 (12.46)	77.00 (15.03)	78.90 (11.91)	76.95 (9.57)	$F(4) = 1.12$; $p = 0.35$	—	0.00	

characteristics of BN, such as increased impulsivity or emotional dysregulation due to lower cognitive control, which could impact treatment response, as stated in previous studies (Testa et al. 2022). With respect to comparisons by level of care, a main effect of time was found for most variables, suggesting that MANTRA + TAU led to improvements regardless of the level of care.

Carers in the ECHOMANTRA group showed greater improvements in expressed emotion and psychological well-being, as well as reductions in illness accommodation and burden, compared to those in the TAU group. In terms of caregiving skills, the ECHO + TAU group showed improvements across all factors of the CASK, whereas the TAU group only demonstrated changes in the Self-care factor, with a greater effect size observed in the ECHO + TAU group. For the remaining factors, significant improvements were found exclusively in the ECHO + TAU group. Notably, for the Bigger Picture and Emotional Intelligence factors, medium to large effect sizes emerged after 6 months of follow-up, suggesting that these changes occurred once carers had fully integrated the programme's content. Overall, these findings align with the goals of ECHO-based programs, which aim to strengthen interpersonal relationships and reduce dysfunctional emotional responses within families, ultimately benefiting carers (Treasure, Duarte, and Schmidt 2020; Treasure, Rhind, et al. 2020). These results confirm our third and fourth hypotheses.

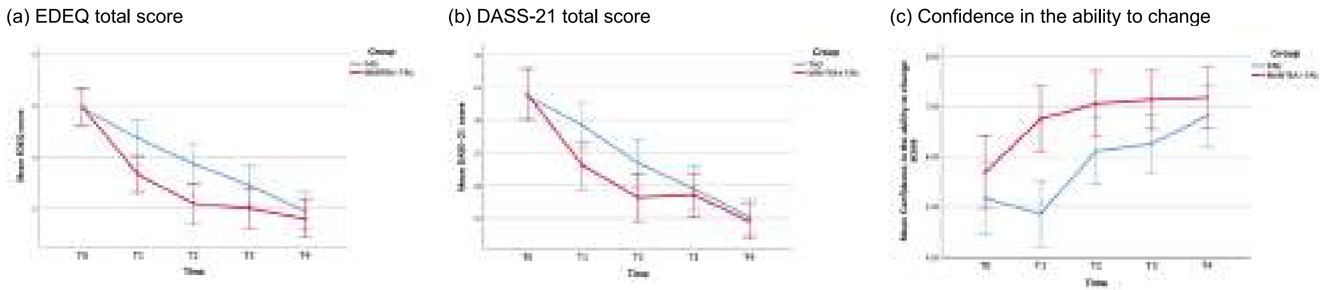
Compared to previous studies on the implementation of the ECHOMANTRA programme in carers of adult patients with AN, our results show significant differences in the improvement of outcomes. The study by Cardi et al. (2024) found no differences between groups, and Adamson et al. (2019) reported moderate improvements in caregiver burden and a slight increase in skills. As said before, these discrepancies may be attributed to methodological differences in intervention delivery. This may suggest that the individual and online format of ECHO used in this study, unlike the self-help and group-based applications previously reported in the scientific literature, contributed to these improvements in carers too. Additionally, the shorter illness duration in adolescent patients may have contributed to lower caregiver burden compared to carers of adults with AN, who often face more severe symptoms and a prolonged course of the illness. Over time, long-term caregiving can lead to greater emotional exhaustion and reduced responsiveness to interventions, which may partly explain the differences in outcomes between our study and those involving adult patients.

Regarding adherence to the programme, 87.04% of patients and 81.48% of carers completed all eight sessions. Additionally, patients completed 72.87% of the assigned tasks between sessions and read the workbook materials 69.95% of the time. Carers reported reading the workbook most of the time (> 75%), but they only completed 43.97% of the assigned homework. These high completion rates suggest that ECHOMANTRA is both viable and feasible for adolescents with eating disorders and their carers. Notably, these percentages are significantly higher than those reported in previous studies. For instance, Cardi et al. (2024) found that only 20% of carers and patients attended at least four out of the eight scheduled online group sessions. Similarly, Adamson et al. (2019) reported a 16% dropout rate at discharge, with 42% of patients and 48% of carers failing to complete their 3-month follow-up assessment when using a structured intervention that included self-help materials, group sessions, and guided practice meals.

A key difference between these studies and ours lies in the format of intervention delivery. In both previous studies, sessions were conducted in a group format and centred on self-help materials. In contrast, our study implemented individually delivered online sessions, with each participant receiving a printed workbook, likely improving engagement and adherence.

When comparing adherence rates, the original study authors noted that ‘it was not possible to access data on the usage of other components of the intervention (i.e., written psychoeducational materials and video clips), although qualitative findings suggested they were widely used’ (Clark Bryan et al. 2024). The differences in adherence between the two studies may be attributed to the delivery format.

The qualitative findings from the original study revealed that patients with AN often found the online group setting


(a) EDEQ total score (b) DASS-21 total score (c) Confidence in the ability to change

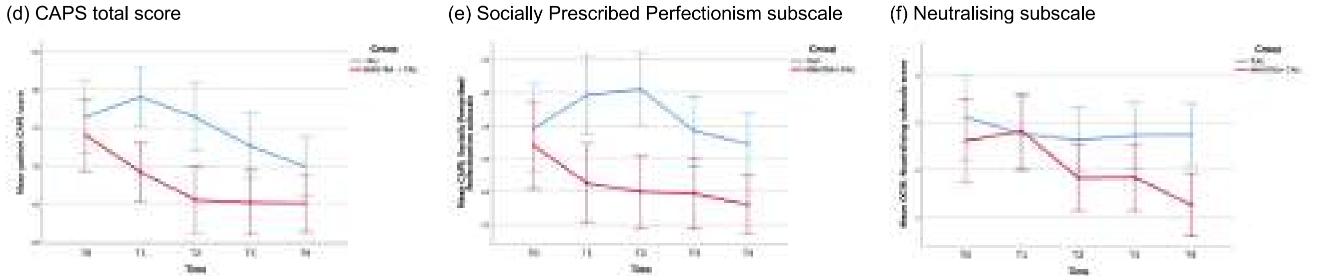
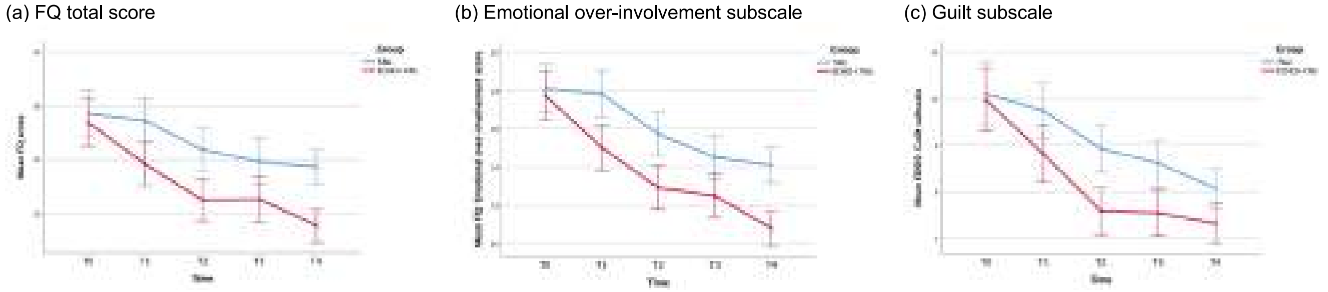
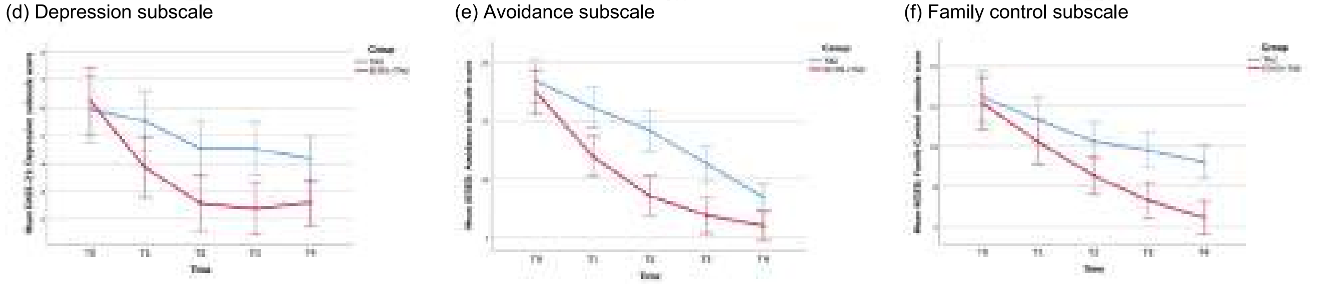

(d) CAPS total score (e) Socially Prescribed Perfectionism subscale (f) Neutralising subscale

FIGURE 2 | Profile plots: Changes in patients regarding the mean (a) EDEQ total score, (b) DASS-21 total score, (c) Confidence in the ability to change, (d) CAPS total score, (e) Socially prescribed perfectionism subscale, (f) Neutralising subscale.


(a) FQ total score (b) Emotional over-involvement subscale (c) Guilt subscale


(d) Depression subscale (e) Avoidance subscale (f) Family control subscale


(g) CASK total score

FIGURE 3 | Profile plots: Changes in carers regarding the mean (a) FQ total score, (b) Emotional over-involvement subscale, (c) Guilt subscale, (d) Depression subscale, (e) Avoidance subscale, (f) Family control subscale, (g) CASK total score.

overwhelming and emotionally exhausting. Some also reported experiencing a sense of competition among participants. The study further emphasised the need for a more personalised approach: one that considers individual characteristics, including readiness for change, illness duration, and severity (Clark Bryan et al. 2024). In the present study, we have incorporated these recommendations from the original authors, improving participant adherence while successfully maintaining the content and protocol of both MANTRA and ECHO.

These findings highlight the effectiveness of the ECHOMANTRA programme in enhancing treatment outcomes for adolescents with EDs. The significant improvements observed in ED symptoms, emotional well-being, confidence in change, and

TABLE 5 | Patient feedback on the MANTRA intervention.

	M (SD)	Range
1. Do you think the sessions have been useful in helping you understand and better address aspects of your eating disorder and related elements?	8.55 (1.41)	4–10
2. Do you think the sessions have helped you to...		
2.1. Better understand the consequences/effects of your eating disorder on your body and brain?	8.66 (1.39)	5–10
2.2. Improve your motivation for recovery?	7.98 (1.64)	2–10
2.3. Gain a better understanding of how your eating disorder developed and why it persists?	8.13 (2.12)	1–10
2.4. Develop a more compassionate attitude toward yourself, take better care of yourself, and be less self-critical?	7.51 (1.74)	1–10
2.5. Understand how different thinking styles affect the way we relate to others and ourselves?	8.49 (1.28)	5–10
2.6. Recognise and manage your emotions better?	7.34 (1.95)	1–10
2.7. Improve your relationships with those around you?	7.47 (1.68)	2–10
2.8. Plan your 'transition' from the service that is treating you to home?	8.06 (1.39)	5–10
2.9. Enhance your problem-solving skills for challenges you may face in your recovery process?	8.09 (1.46)	4–10
2.10. Set goals for your recovery?	8.29 (1.75)	2–10
2.11. Gain more skills and tools to cope with your eating disorder?	8.60 (1.25)	5–10
3.To what extent has this programme:		
3.1. Been useful in helping you address your eating disorder?	7.81 (1.75)	2–10
3.2. Been satisfactory for you?	8.26 (1.88)	2–10
3.3. Met your expectations?	5.85 (3.06)	1–10
3.4. Would you recommend it to a friend who is experiencing the same problem?	9.06 (1.67)	3–10

socially prescribed perfectionism suggest that ECHOMANTRA provides valuable therapeutic benefits beyond standard treatment. Furthermore, the programme has proven effective across all ED diagnoses and in various treatment settings, demonstrating its versatility. Integrating it into routine care could enhance the overall effectiveness of interventions for these patients by offering a structured and supportive approach that fosters recovery. In conclusion, this study highlights the potential of ECHOMANTRA as an add-on to TAU, offering an adaptable, scalable, and patient-centred approach to ED treatment. Integrating online individual sessions increases the reach of this intervention and facilitates the integration of personalised models of care across service pathways (Reay et al. 2022).

The strengths of this study lie in its use of a randomized controlled trial design and the implementation of a protocolised therapist guidance system, ensuring fidelity throughout the intervention process. Furthermore, the trial includes tailored interventions for both patients and carers. Notably, the online format of the programme enhances accessibility, allowing patients and their families to incorporate therapeutic practices into their daily routines, thereby promoting greater engagement in treatment.

This study has some limitations. At the 12-mont follow-up, the dropout rate was 55.5% for the patient sample. Unfortunately, this is a prevalent issue in treatment studies involving ED (Giel et al. 2021). These findings largely align with those from the original TRIANGLE trial (Cardi et al. 2024), and emphasise the importance of considering strategies to strengthen uptake, adherence, and retention in ED treatment trials. The trial design may also have limited the representativeness of the participants. For example, the requirement to include a carer may have excluded some potential participants, and the inclusion of only one carer results (mainly mothers) may have biased the feedback from the family. Additionally, the dyadic nature of the intervention may have introduced additional complexity to adherence and retention rates, as participation depends on both the patient and the caregiver consistently attending sessions and completing the required tasks. Generalisability may also be limited, as findings from dyadic trials may not fully apply to patients who lack a caregiver or whose carers are unable to participate actively in treatment. Moreover, it should be noted that the sample consisted exclusively of female patients. Therefore, it would be of interest for future studies to include the male population. Another limitation is that most outcomes were assessed using self-reported questionnaires. Furthermore, the representativeness of the sample, since most patients had a diagnosis of anorexia and 53% were receiving treatment in a day-care setting. Finally, although the ECHOMANTRA programme is based on a manualized intervention originally developed with contributions from individuals with lived experience of eating disorders, this study did not incorporate first-person narratives or testimonies beyond those already embedded in the original training materials and session exercises. Future intervention based in this model could benefit from a more explicit integration of lived-experience testimonies to enhance engagement, empathy, and relatability for both patients and carers.

Future research should continue refining the intervention to further optimise adherence and effectiveness across diverse clinical settings and patient profiles. Research should focus on strategies to enhance participant retention and adherence in ED treatment trials. Developing and testing engagement strategies, such as digital reminders or motivational interventions, could help reduce drop-out rates and improve long-term follow-up. It would also be interesting to include the study of other variables such as cost-effectiveness analysis, and other efficacy indicators as readmission or time of admission.

As a continuation of this line of research, our team is currently adapting and implementing the ECHOMANTRA programme for Spanish adults with anorexia nervosa. This new study (Quiles et al. 2025) will allow us to evaluate the feasibility and preliminary efficacy of the intervention in a different population and healthcare context, and may provide key insights for future adaptations and broader implementation. In addition, in this new research we have incorporated interviews, both with patients and family members, in order to carry out a qualitative analysis of the information and incorporate first-person narratives or testimonies to enhance the intervention.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

Article 5

Validation of the Spanish version of the eating disorders quality of life instrument (EDQOL)

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METHODOLOGY **Open Access**

Validation of the Spanish version of the eating disorders quality of life instrument (EDQOL)

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Abstract

Background The Eating Disorders Quality of Life instrument (EDQOL) is a disease-specific health related quality of life self-report questionnaire designed for disordered eating patients. Although the EDQOL is one of the most suitable and widely used questionnaires in many countries, no prior research has addressed the psychometric properties of the Spanish adaptation of the EDQOL. Therefore, the aim of this study is to examine the psychometric properties of the Spanish version of the EDQOL among ED patients.

Methods 141 female eating disorder patients, with a mean age of 18.06 years (SD = 6.31), completed the EDQL in addition to the Eating Disorder Examination Questionnaire (EDEQ), the Depression, Anxiety and Stress Scales (DASS-21), the Clinical Impairment Assessment (CIA 3.0) and the Health Survey (SF-12). We calculated item/scale characteristics, internal consistencies and bivariate correlations with other measures of quality of life and adjustments. We assessed the goodness-of-fit of the 4-factor model using confirmatory factors analysis and explored the sensitivity of change following skill-based interventions.

Results The fit of the 4-factor model was acceptable (Root Mean Square Error of Approximation: 0.07, Standard Root Mean Square Residual: 0.07). Cronbach's alpha was excellent for the total (.91) and acceptable for all subscales (0.78–0.91). The construct validity was found with measures of psychological distress, depression, anxiety, quality of life and clinical impairment. The psychological and physical/cognitive scales and the EDQOL global scale were responsive to change.

Conclusion The Spanish EDQOL version is a useful instrument to assess quality of life in eating disorder patients and to evaluate outcomes of skills-based interventions.

Keywords Eating disorders, Quality of life, Validation, Psychometrics, EDQOL

Plain English Summary

Eating Disorders (EDs) have a severe impact on many domains of quality of life (QOL). Therefore QOL needs to be addressed in effectiveness research and clinical practice. Furthermore, QOL is a very relevant concept in the treatment of chronic diseases and its evaluation requires specific health-related questionnaires. One widely used self-report measure to assess the quality of life in eating disorders is the Eating Disorder Quality of Life (EDQOL). Despite its high

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clinical relevance, EDQOL has not been previously investigated in the Spanish context. To overcome this gap, the present study aimed to validate the Spanish version of the EDQOL in a sample of Spanish eating disorder patients. The findings showed that the Spanish version of the EDQOL is robust in terms of reliability, factor structure and construct validity. This questionnaire may be preferred by clinicians and researchers interested in ED-specific health related quality of life impairment and as an additional indicator of ED severity.

Background

Eating disorders (ED) have long been known to be associated with a wide range of impairment in physical and psychological domains, however patients who have suffered from an ED for a long time experience associated impairment in other important areas of daily life, such as in the work/study, family, social and leisure domains [1, 2]. This is the reason why, in the process of recovery in these patients, it is not only necessary to consider the "symptom improvement", using domains such as frequency of ED behaviors (e.g., restricting, bingeing and purging), psychological symptoms, and general diagnostic severity, but it is also necessary to take into account how their lives are affected by such disorders in other important areas such as social, family and/or academic/occupational [3].

Literature review on Quality of Life (QOL) in EDs has shown that EDs are associated with more impaired QOL than those with a diagnosis of another psychiatric illnesses, including severe depression and healthy controls [1, 2, 4]. Despite the multitude of available quality of life instruments, concerns have been raised regarding the content validity of these instruments, and as a result, their suitability for use in mental health [5]. In the assessment of QOL two types of measures exist; one addressing a broad range of topics and indicated for use across conditions (generic measures), and another (disease-specific measures) focused on a certain condition or population. In the case of ED, criticisms have been made that generic measures may not be sensitive to the true level of impairment associated with EDs and may not capture the magnitude of disability caused by the illness or accurately differentiate between ED diagnostic groups [6, 7]. In contrast, specific questionnaires are more suitable at identifying the severity and response to treatment of the disease [3].

Five instruments have been developed to assess quality of life specifically in EDs: Eating Disorders Quality of Life (EDQOL) [6], Health-Related Quality of Life in Eating Disorders (HeRQoLED [8] and the short version HeRQoLED-s [9]), Eating Disorders Quality of Life Survey (EDQLS) [8] and Quality of Life Eating Disorders (QOLED) [11]. Tirico, Stefano and Blay [12] conducted a systematic review in which analyzed the characteristics of specific QOL instruments for eating disorders, and they concluded that the EDQOL, the HeRQoL and the EDQLS presented adequate development procedures and psychometric properties. Furthermore, a recent meta-analysis study carried out by van Krugten and colleagues [5] assessed the content validity and the suitability of existing QOL instruments for use in economic evaluations in mental health problems. This study concluded that among the specific instruments for assessing QOL in eating disorders, only the EDQOL included the seven dimensions, identified by Connell and colleagues, known to be important to the QOL of people with mental health problems [13, 14].

EDQOL is a disease-specific health related QOL self-report questionnaire designed for disordered eating patients [6]. It is a 25-item scale with four subscales (Psychological, Physical/Cognitive, Work/School, and Financial) and a meaningful total score. This questionnaire has good psychometric properties, EDOOL has shown high internal reliability that ranged from 0.86 to 0.95 and it has demonstrated adequate convergent and discriminant validity. An advantage of this questionnaire compared to others is that it includes only 25 items. It is well known that short instruments are more useful in epidemiological studies, clinical trials, and clinical practice, as short questionnaires improve compliance of patients and response rates and improve the quality of responses [15]. EDQOL may be useful as an outcome measure in clinical research, as a means of assessing patient improvement (or deterioration) in treatment. The development and validation study of the EDQOL showed that this instrument is sensitive to group differences between disordered eating and non-disordered eating groups, it differentiates groups based on symptom severity, it explains more symptom severity and group-related variance than a generic QOL instrument [6]. This questionnaire has shown excellent psychometric properties including adequate reliability and validity, in its Italian, Japanese and German versions [16–18].

To date, there are no studies that have adapted and validated the EDQOL in Spanish ED patients. The existing Spanish version of the HeRQoLED [8] and the short version HeRQoLED-s [9] have shown adequate psychometric properties and its reduced version facilitates the assessing of the QOL, but it has been criticized because it focuses predominantly on symptoms and behaviors

[10] and doesn't assess other important domains affected in ED such as work/school, financial or autonomy [5]. This is a preliminary study validation, and the aim was to examine the psychometric properties of the Spanish version of the EDQOL among ED patients.

Method

Participants

The sample consisted of 141 female participants from a clinical sample. The mean age was 18.06 (*SD* = 6.31, range 12–47). 56% (*n* = 79) of them met diagnostic criteria for Anorexia Nervosa restricting type (AN-R), 7.1% (*n* = 10) for Anorexia Nervosa purging type (AN-P), 11.3% (*n* = 16) for Bulimia Nervosa (BN), 5% (*n* = 7) for Binge Eating Disorder (BED) and 20.6% (*n* = 29 for Eating Disorder Not Otherwise Specified (EDNOS). The mean age of onset was 14.65 (*SD* = 2.93) and mean time of evolution was 44.42 (*SD* = 69.83) months. Their mean BMI was 19.73 (*SD* = 5.28). Regarding level of treatment, 36.9% (*n* = 52) of them received treatment in an ED specialized outpatient setting, 53.2% (*n* = 75) on a hospital-day and 9.9% (*n* = 14) in an inpatient unit. Regarding the level of education, 1.4% (*n* = 2) of them completed primary education, 72.4% (*n* = 102) secondary education, 11.3% (*n* = 16) superior education cycle and 14.9% (*n* = 21) university degrees.

Procedure

Data was collected as part of the baseline assessment of research that evaluated a skills-based intervention for patients with an eating disorder (Trial Identifier: ISRCTN43554732). The Ethics and Research Integrity Committee of the university, as well as the hospitals where ED specialized units participated approved the conduct of this study.

The sample was collected in five different Spanish centers specialized in the treatment of ED. Once their informed consent was given, the participants completed the self-administered paper-and-pencil questionnaire. Afterwards, the therapists who attended the case provided the corresponding clinical data. No compensation of any kind was offered. To evaluate the sensivity to change of this questionnaire, we re-administered this scale another two months later following the completion of the skills-based intervention.

Adaptation and cultural validation

The questionnaire's translation and adaptation procedure took place using the guidelines for instrument translation across countries proposed by López-Roig and Pastor [19]: 1. Translation. Two bilingual people (residents in Spain whose native language was English) were first instructed about the study's conceptual framework, and then they translated two versions into Spanish independently. This created the first Spanish version. 2. Back translation. The resulting version was translated back to English by two separate bilingual individuals who had not previously been informed about the objectives of the construct to be measured. The outcome was a version which is practically equal to the original. 3. Expert review. A team composed by members of the investigative group (two experts in eating disorders and one statistician) reviewed all versions and evaluated comprehension, as well as the semantic, linguistic, and conceptual equivalency. So after modifying and adjusting the instructions, and some items, a consensus was reached. 4. Pilot program. In order to evaluate the comprehension, reliability, and acceptance of both the items and the response scale, the questionnaire was administered to a pilot sample of 10 patients. The pilot sample was also interviewed, and opinions concerning different aspects related to understanding the instructions, the wording of the items, and so on were given. This resulted in some modifications being made to the Spanish version of the instrument.

Instruments

*Sociodemographic and clinical items.*Age and educational level are reported by the patients. Clinical variables were completed by the therapist attending the case: diagnosis (according to the diagnostic criteria of the DSM-V), age of onset, time of evolution of the ED, treatment and BMI.

Eating disorders quality of life (EDQOL) [6]. EDQOL is a disease-specific health related QOL self-report questionnaire designed for disordered eating patients. It is a 25-item scale with four subscales (Psychological, Physical/Cognitive, Work/School, and Financial) and a meaningful total score. Participants respond to items on a scale from 0 (never) to 4 (always). EDOOL has shown high internal reliability that ranged from 0.86 to 0.95.

Eating disorder examination questionnaire (EDEQ) [20]. This scale measures the severity of psychopathology associated with eating disorder features. It consists of 36 items with a six-point Likert-type response scale distributed in four dimensions: restraint, eating concern, shape concern and weight concern. High scores indicate greater severity. The Spanish validation shows adequate internal consistency in the dimensions (α = 0.83, α = 0.75, α = 0.93, and α = 0.74, respectively) and in the global scale (α = 0.81) [21].

Depression, anxiety and stress scales (DASS-21) [22]. This scale measures emotional distress through 21 items rated on a four-point Likert-like scale distributed in three subscales of depression, anxiety, and stress. The Spanish validation shows adequate internal consistency in the subscales (α = 0.84, α = 0.70, and α = 0.82) [23].

Clinical impairment assessment (CIA 3.0) [24]. This scale measures psychosocial impairment due to ED features. It consists of 16 items rated on a four-point Likert-like scale distributed in three subscales of impairment: personal, social and cognitive. Higher scores indicate greater severity of clinical impairment. The Spanish validation has shown adequate internal consistency in the subscales (α = 0.92, α = 0.93, and α = 0.90, respectively) and in the global scale (α = 0.96) [25].

Health survey (SF-12) [26]. The SF-12 consists of a subset of 12 items from the Spanish validation of the SF-36. This scale measures health-related quality of life through 12 items rated on a three-to-four-point Likert-like scale. It is composed of eight scales to assess physical (general health, physical functioning, physical role and body pain) and mental health (vitality, social functioning, emotional role and mental health), which show adequate internal consistency (α = 0.85 and α = 0.78, respectively) [27].

Data analysis

The statistical computing R environment 4.2.1 was used for the data analyses. The lavaan package [28] was used to conduct a Confirmatory Factor Analysis (CFA). The method of parameter estimation was MLR (maximum likelihood estimation with robust standard errors). According to Rhemtulla, Brosseau-Liard, and Savalei [29] the maximum likelihood method is suitable for variables with 5 or more categories and the sample size is small. The indices used for testing the model fit were the chi-square test, the comparative fit index (CFI > 0.90 indicates acceptable fit, > 0.95, good fit), the Tucker-Lewis index (TLI > 0.90 indicates acceptable fit, > 0.95, good fit), the root mean square error of approximation (RMSEA < 0.06), and the standardized root mean-square residual (SRMR < 0.08), following Hu & Bentler [30] criteria. These criteria, however, should be used with caution as the sample size is lower than N = 250, and maximum likelihood estimations tend to yield lower results in the CFI and TLI [30]. Particular attention was paid to the SRMR as it is a robust indicator regardless of the method of estimation [31]. In addition, the Akaike Information Criterion (AIC) was used to compare the fit of the models.

The psych package for R [32] was used to obtain the descriptive analyses, internal consistency (Cronbach's α and McDonald's ω coefficients), Pearson's correlations, and Student's t-test for paired samples.

Results

Factor structure

The CFA was carried out through the MLR estimation. Replicating the original study, a four-factor solution was tested, and 9 items were assigned to the psychological factor, 6 to physical/cognitive, 5 to economic, and 5 to work/school. Part of the results showed an acceptable fit of the model, according to the cutoff values proposed by Hu et al., [30] [$\chi 2(269) = 440.09$, $p < 0.001$; RMSEA = 0.07 (90% CI 0.06 ~ 0.08); SRMR = 0.07; CFI = 0.90]. One of the indices did not show an adequate fit (TLI = 0.88). The factors were correlated with each other.

An additional one-factor model was tested in order to compare the fit between the original and the single-factor model. In this case, the results showed that the fit of the one-factor model was not adequate ($\chi 2(275) = 889.00$, $p < 0.001$; RMSEA = 0.13 (90% CI 0.12 ~ 0.14); SRMR = 0.12; CFI = 0.61; TLI = 0.58). When AIC indexes were compared, the four-factor model was a more parsimonious solution (AIC = 9390.03) than the one-factor model (AIC = 10,140.48). Therefore, the original model was deemed the most appropriate. Parameter estimates of the four-factor model are presented in Table 1.

Reliability

Reliability coefficients for each of the factors are shown in Table 1. The global scale showed adequate internal consistency ($\alpha = 0.91$; $\omega = 0.91$).

Construct validity

Eating pathology, emotional distress, psychosocial impairment, and quality of life measures were selected to examine its relations with ED related quality of life. The descriptive analyses of the selected variables, as well as the Pearson's correlations with the EDQOL factors are shown in Table 2. Psychological and physical/cognitive factors correlated with all the variables. The financial factor correlated with all the variables except for the restraint scale of the EDEQ and the social impairment scale of the CIA 3.0. The work/academic factor correlated with all the variables except for the anxiety scale of the DASS-21.

Responsiveness to change

Fifty-eight cases participated in a specialized ED intervention for two months and were assessed twice over time. Analyses of group means at Time 1 (T1) and Time 2 (T2) and responsiveness to change are shown in Table 3. The psychological and physical/cognitive scales and the EDQOL global scale were responsive to change. Their mean values were significantly reduced at T2 and showed a moderate responsiveness ranging from − 0.39 to − 0.59.

Discussion

The main aim of the present study was to analyze the psychometric properties of the Spanish version of the EDQOL in a sample of ED patients. Results obtained with the CFA analysis with the original four-factor

Table 1 Descriptive statistics of the items, item-factor correlations, CFA parameter estimates, and internal consistency

	M (SD)	Item-factor *r*	CFA parameter estimators	*α*	*ω*
Psychological				0.91	0.91
I1	3.64 (1.11)	0.66	0.69		
I2	4.04 (1.02)	0.70	0.73		
I3	3.17 (1.19)	0.72	0.76		
I4	3.55 (1.17)	0.66	0.70		
I5	3.31 (1.34)	0.71	0.76		
I6	3.56 (1.23)	0.73	0.78		
I7	3.60 (1.23)	0.63	0.67		
I8	3.29 (1.22)	0.73	0.76		
I9	3.13 (1.39)	0.60	0.64		
Physical/cognitive				0.85	0.86
I10	3.38 (1.41)	0.51	0.44		
I11	2.89 (1.32)	0.59	0.60		
I12	3.27 (1.27)	0.63	0.63		
I13	3.43 (1.21)	0.73	0.90		
I14	2.63 (1.35)	0.67	0.75		
I15	3.29 (1.25)	0.69	0.86		
Financial				0.79	0.83
I16	1.65 (1.12)	0.44	0.49		
I17	1.29 (0.82)	0.62	0.69		
I18	1.12 (0.51)	0.60	0.67		
I19	1.44 (0.96)	0.66	0.80		
I20	1.28 (0.77)	0.69	0.82		
Work/academic				0.78	0.80
I21	2.53 (1.57)	0.59	0.62		
I22	2.19 (1.25)	0.55	0.69		
I23	2.12 (1.44)	0.53	0.59		
I24	1.86 (1.47)	0.54	0.56		
I25	2.66 (1.34)	0.68	0.83		

M (SD) mean (standard deviation), *CFA* confirmatory factor analysis

model showed acceptable indices (except for the TLI), and superior to the one-factor model. Therefore, it was decided to keep the original four factors with all the items, as the saturations in all cases were adequate. Moreover, results at the level of internal consistency and construct validity were also satisfactory. As expected, the Spanish version of the EDQOL showed relationships with almost all the measures of eating pathology, emotional distress and psychosocial deterioration in the sense that the greater the eating symptoms, emotional distress and psychosocial deterioration, the worse the quality of life. This result has been found in previous studies using other versions of EDQOL [6, 16–18]. Specifically, our results posit that the psychological and physical/cognitive factors of the EDQOL scale were associated with all the variables. The financial EDQOL factor was related to all the ED symptomatology variables, apart from the EDEQ restriction scale and the CIA 3.0 social deterioration scale. Finally, the work/academic factor showed relationships with all the measured variables, except with the DASS-21 anxiety scale. The fact that the financial factor has a lower association when compared with the other measures could be due to the fact that the patients have an average age of 18 years old and are not able to have their own financial resources as they are not working. Furthermore, most of these patients were treated for ED in specialized public health centers.

Validation of the instrument in a Japanese sample has shown how the EDQOL subscales and the global quality of life score of patients with eating disorders correlate with most of the EAT-26 and EDI-2 subscales while they have not been found significant correlations between body dissatisfaction and the "physical/cognitive" and "work/school" subscales of the EDQOL [18]. The study by Mitchison et al. [33] found that all the EDQOL subscales, with the exception of financial, were significantly correlated with the symptomatology of the disorder assessed with the EDE. However, in our study, the economic factor is only related to two of the EDEQ symptom factors, specifically shape concern and weight concern. On the other hand, the trend of the EDQOL correlations with the SF-12 questionnaire carried out with a Spanish sample are similar to those found with a German sample and with the Italian version. Thus, the mental health factor of the SF-12 finds its highest degree of relationship with the psychological subscale of the EDQOL, followed by the physical subscale. As expected, in our study, the correlations with the greatest associations of the EDQOL with eating symptoms occurred with the psychological factor followed by the physical-cognitive factor. These results are also observed in similar studies that have evaluated eating symptoms with other instruments such as the EAT-26 and EDI [17, 18], which have found significant relationships among all factors [16].

On the other hand, the means obtained in our study show a medium level of quality of life (2.56 out of 5 in the overall score), with the psychological area presenting the worst level, followed by physical/cognitive and with the financial area as the best quality of life. This trend is also observed in other studies (Engel et al. 2006) and in the German and Japanese versions of the EDQOL [16, 17]. Regarding the responsiveness to change of the EDQOL, the results showed that the psychological, physical/cognitive scales, and the global EDQOL scales were sensitive to change when a second measurement was made after a skill-based intervention. This data would mean that these dimensions, precisely those in which there has been the

Table 2 Descriptive analysis and correlations between EDQOL and other variables

	M (SD)	Range	Psychological	Physical/Cognitive	Financial	Work/Academy
EDQOL—Global score	2.56 (0.67)	1–5	0.79**	0.83**	0.56**	0.73**
Psychological	3.48 (0.92)	1–5		0.65**	0.28**	0.34**
Physical/cognitive	3.15 (0.99)	1–5	0.65**		0.31**	0.41**
Financial	1.36 (0.63)	1–5	0.28**	0.30**		0.28**
Work/academic	2.27 (1.05)	1–5	0.34**	0.41**	0.28**	
EDEQ—Global score	3.91 (1.36)	0–24	0.69**	0.57**	0.15	0.33**
Restraint	3.46 (1.79)	0–6	0.52**	0.52**	0.06	0.23**
Eating Concern	3.31 (1.33)	0–6	0.64**	0.54**	0.17	0.35**
Shape Concern	4.72 (1.41)	0–6	0.67**	0.49**	0.17*	0.31**
Weight Concern	4.17 (1.52)	0–6	0.67**	0.49**	0.19*	0.29**
DASS-21—Global score	33.31 (14.08)	0–63	0.64**	0.54**	0.25**	0.26**
Depression	12.55 (6.14)	0–21	0.63**	0.48**	0.20*	0.30**
Anxiety	8.59 (5.10)	0–21	0.53**	0.49**	0.23**	0.14
Stress	12.16 (4.83)	0–21	0.52**	0.46**	0.23**	0.22**
CIA3.0—Global score	28.29 (11.40)	0–48	0.75**	0.67**	0.25**	0.47**
Personal impairment	12.96 (4.63)	0–18	0.73**	0.52**	0.28**	0.28**
Social impairment	8.13 (4.50)	0–15	0.64**	0.60**	0.14	0.44**
Cognitive impairment	7.19 (3.86)	0–15	0.58**	0.65**	0.24**	0.55**
SF12—Physical Health	13.27 (3.19)	6–20	− 0.40**	− 0.43**	− 0.21*	− 0.39**
SF12—Mental Health	13.92 (3.94)	6–27	− 0.64**	− 0.51**	− 0.22*	− 0.31**

M (SD) mean (standard deviation), *EDQOL* Eating Disorders Quality of Life, *EDEQ* Eating Disorders Examination Questionnaire, *DASS-21* Depression Anxiety Stress Scales, *CIA3.0* Clinical Impairment Assessment, *SF-12* Health survey

**$p < 0.01$; *$p < 0.05$

Table 3 EDQOL responsiveness of group means to change

	T1 (*N* = 58) *M (SD)*	T2 (*N* = 58) *M (SD)*	*t*	*p*	*SRM*
EDQOL-Global Score	2.49 (0.62)	2.28 (0.66)	2.93	0.01	− 0.39
Psychological	3.41 (1.00)	3.04 (1.03)	3.53	< 0.01	− 0.46
Physical/cognitive	2.96 (0.97)	2.46 (1.00)	4.47	< 0.01	− 0.59
Financial	1.24 (0.55)	1.27 (0.36)	− 0.31	0.76	0.04
Work/academic	2.32(0.90)	2.35 (1.12)	− 0.20	0.84	0.03

EDQOL Eating Disorders Quality of Life, *SRM* Standardized response means

greatest interference, would be useful as measures to assess the state of patients during treatment. However, other studies have found that the work/academic factor worked as a predictor at 6 and 12 months of follow-up after treatment, so this scale should be taken into account for possible changes [33].

QOL is a very relevant concept in the treatment of chronic diseases and its evaluation requires specific health-related questionnaires. This validation fills an important gap in the field of ED in Spain. This questionnaire may be preferred by clinicians and researchers interested in ED-specific HRQoL impairment and as an additional indicator of ED severity [33]. Therefore, it could be a useful instrument that allows patients to benefit from interventions directed at the areas most affected by ED.

Regarding its limitations, we must point out several relevant issues of this validation. First of all, we must highlight that, although the sample size is adequate, a limitation of this study is the small sample used to carry out a CFA of 33 items. Although the sample includes diagnoses of AN-P, AN-R, BED, and EDNOS, at least half of the sample corresponds to patients with a diagnosis of AN-R, which must be taken into account when interpreting the results. Therefore, more research is needed with the Spanish version in a larger sample and including a similar percentage of ED diagnoses.

Another limitation is regarding generalization to males. Although the prevalence of ED in females is higher than in males, it is important to include men in validation samples instruments in order to detect possible differences. Therefore, generalization of items to males should be used with caution. Something similar occurs with age, as the mean age of the patients was in their late teens. As the literature shows, it is to be expected that the impact on quality of life may vary with age and with the number of years of disease progression. This will have to be taken into account when applying this instrument to the adult population.

In relation to future psychometric analyses, it would be convenient to study temporal stability and measurement invariance (e.g., gender and diagnostic). Longitudinal studies should also be carried out in order to explore patient and treatment factors that may affect quality of life. This will allow for the development of specific interventions that target on these factors.

Finally, the information concerning a clinical sample of Spanish girls may not be generalizable to other Hispanic clinical samples, and further research is required to validate the factor structure in more diverse Hispanic groups. However, to our knowledge, this is the first study to assess the latent structure of the EDQOL among ED patients in a Hispanic population. Most research on ED has been conducted in populations from Western English-speaking countries [34]. Therefore, this study contributes to the development of cross-cultural research among Hispanics, in order to increase the understanding of ED among patients from understudied populations.

Conclusions

The Spanish version of the EDQOL is an inexpensive, valid, and reliable instrument that assesses health-related quality of life specific to patients with EDs and is recommended for use both in research and clinical settings. Our study provides a useful tool to assess QOL among Spanish ED patients. Our Spanish version of the scale adds to the multitude of translated versions of this scale, allowing for cross-cultural comparisons of QOL among these patients.

Appendix

Spanish translation of the EDQOL.

En los últimos 30 días …

nunca	Rara vez	A veces	A menudo	Siempre

Psicológico

1. ¿Con qué frecuencia tu alimentación/peso ha dado lugar a que te sientas avergonzado/a o “diferente”?
2. ¿Con qué frecuencia tu alimentación/peso te ha hecho sentir peor contigo mismo/a?
3. ¿Con qué frecuencia tu alimentación/peso te ha hecho no querer estar con otras personas?
4. ¿Con qué frecuencia tu alimentación/peso te ha llevado a sentir que nunca te recuperarás?
5. ¿Con qué frecuencia tu alimentación/peso te ha hecho sentir solo/a?
6. ¿Con qué frecuencia tu alimentación/peso ha dado lugar a que tengas menos interés o placer en realizar actividades?
7. ¿Con qué frecuencia tu alimentación/peso te ha llevado a no cuidar de ti mismo/a?
8. ¿Con qué frecuencia tu alimentación/peso te ha hecho sentir raro/a, peculiar o extraño?
9. ¿Con qué frecuencia tu alimentación/peso te ha llevado a no comer delante de otras personas?

Físico/Cognitivo

10. ¿Con qué frecuencia tu alimentación/peso te ha causado tener las manos o los pies fríos?
11. ¿Con qué frecuencia tu alimentación/peso te ha causado tener dolores de cabeza con frecuencia?
12. ¿Con qué frecuencia tu alimentación/peso te ha causado debilidad?
13. ¿Con qué frecuencia tu alimentación/peso ha afectado tu capacidad de prestar atención cuando querías?
14. ¿Con qué frecuencia tu alimentación/peso ha afectado tu capacidad de entender información verbal y escrita?
15. ¿Con qué frecuencia tu alimentación/peso ha reducido tu capacidad de concentrarte?

Económico

16. ¿Con qué frecuencia tu alimentación/peso ha conducido a problemas con tu proveedor(es) de tratamiento en cuanto el coste del tratamiento?
17. ¿Con qué frecuencia tu alimentación/peso te ha llevado a tener problemas con pagar las facturas mensuales?
18. ¿Con qué frecuencia tu alimentación/peso te ha llevado a tener una deuda financiera significativa?
19. ¿Con qué frecuencia tu alimentación/peso te ha llevado a la necesidad de utilizar dinero de tus ahorros o utilizar tu tarjeta de crédito con frecuencia?
20. ¿Con qué frecuencia tu alimentación/peso ha dado lugar a la necesidad de pedir dinero prestado?

Trabajo/Escuela

21. ¿Con qué frecuencia tu alimentación/peso ha conducido a una baja laboral?
22. ¿Con qué frecuencia tu alimentación/peso te ha llevado a sacar notas bajas?

23. ¿Con qué frecuencia tu alimentación/peso ha conducido a una reducción en las horas laborales en el trabajo?
24. ¿Con qué frecuencia tu alimentación/peso te ha llevado a perder tu puesto de trabajo o a abandonar los estudios?
25. ¿Con qué frecuencia tu alimentación/peso ha conducido a fallos en una clase o clases?

Abbreviations

CFA	Confirmatory factor analysis
ED	Eating disorders
EDQOL	Eating disorder quality of life
HeRQoL	Health related quality of life
QOL	Quality of life

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Author contributions

YQ and JM designed the study; AR and JM drafted the manuscript; YQ, PA and ME collected the data and helped with the writing; JM and AR carried out the analysis and interpreted the results; YQ, MR, EL and MJ reviewed the paper for intellectual content; all authors reviewed the final manuscript and gave their consent.

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Availability of data and materials

All data generated or analyzed during this study are not publicly available due the restrictions from the ethics committees.

Declarations

Ethics approval and consent to participate

The Ethics and Research Integrity Committee of the Miguel Hernandez University, as well as the Ethics and Research Integrity Committee of the hospitals where ED specialized units participated approved the conduct of this study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Publisher's Note

Article 6

Quality of Life and Clinical Impairment in Spanish Adolescent Anorexia Nervosa Patients.

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Article

Quality of Life and Clinical Impairment in Spanish Adolescent Anorexia Nervosa Patients

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Abstract: Eating disorders have serious physical, mental and social consequences that can affect the quality of life of the sufferer. This study aimed to evaluate the relationship between the severity of ED-related psychopathology and clinical impairment in adolescents with anorexia nervosa (AN) as well as their perception of health-related quality of life. Eighty-six Spanish young women with AN completed a set of questionnaires assessing eating disorder pathology, clinical impairment, and quality of life. The set included the following instruments: the Eating Disorder Examination Questionnaire, Clinical Impairment Assessment, Short Form-12 Item Health Survey, and the Eating Disorder-Specific Heath-Related Quality of Life instrument. Descriptive and regression analyses were applied to identify associations between variables. Higher scores on clinical impairment domains were associated with greater impairment of mental and physical health. Moreover, clinical impairment domains and concerns due to ED were related to a lower quality of life. In conclusion, adolescents with AN have a poor quality of life. Moreover, the findings suggest that the clinical features of impairment may serve as severity indicators of quality of life.

Keywords: eating disorder behaviors; quality of life; clinical impairment; adolescents

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1. Introduction

Eating disorders (EDs) have serious physical, psychological, social, and familial consequences for the people who suffer from them. As stated by Treasure et al. [1], “eating disorders are disabling, deadly, and costly mental disorders that considerably impair physical health and disrupt psychosocial functioning”. Long-term studies have shown considerable rates of persisting ED pathology [2]. This protracted ED pathology means that EDs have a significant impact on the present and future health and quality of life (QoL) of affected individuals, their caregivers, and society [3].

Traditionally recognized for their effects on physical and psychological well-being, EDs have increasingly been associated with impairments across other vital domains of daily life, encompassing employment, education, familial, social, and recreational pursuits [4,5]. Recent investigations have revealed that individuals with EDs exhibit markedly lower QoL and diminished social functioning compared to non-ED counterparts, with psychological well-being often failing to reach the level of healthy controls, even post treatment [2,6,7]. Furthermore, a review of the literature has indicated that individuals with EDs experience a more pronounced decline in QoL than those diagnosed with other psychiatric conditions, including severe depression [4,5,8].

Several studies have attempted to identify the predictors of QoL in these patients and its association with other clinical variables. In the specific case of anorexia nervosa (AN), the literature has shown that AN symptoms and comorbidity are related to more significant QoL impairments [9]; however, the results are heterogeneous. For example, Başoğlu et al. [10] showed that in AN, extreme calorie restriction was associated with several psychological and neurological complications, which can affect these patients' daily functioning. In this line, Mason et al. [11] showed that dietary restriction was related to lower QoL, and the severity of restriction and bulimic behaviors could serve as severity indicators of QoL in AN. Weigel et al. [12] conducted a study that included both adults and adolescents with AN. Their research showed that, in both age groups, lower BMI, increased levels of depression, and more somatic complaints were associated with lower health-related QoL [12]. However, this research also revealed that neither the duration of the AN nor its psychopathology were associated with QoL [12]. Gonzalez-Pinto et al. [13] indicated an association between psychiatric comorbidity and purging behaviors in these the QoL of those with AN. When the subtype of the AN is considered, Martin et al. [14] showed that patients with restrictive AN experienced a higher QoL than patients with purgative AN.

All the aforementioned points underscore the importance of considering not only symptom improvement but also the impacts of AN on various aspects of patients' lives, such as their social interactions, family dynamics, and academic or occupational functioning [15]. Understanding which of the symptoms and behaviors of AN are associated with QoL can provide valuable insights into treatment targets. Therefore, this cross-sectional study aims to explore the QoL of adolescent patients with AN, on which studies in the literature are scarce. This study seeks to analyze how factors related to the disorder (ED symptoms, AN subtype, duration of illness, and BMI) are associated with QoL. Additionally, we aim to evaluate these associations using both a generic QoL measurement and a specific ED–QoL scale. It is hypothesized that a lower BMI, increased levels of ED psychopathology, and greater psychological distress will be linked to poorer QoL in adolescent patients with AN.

2. Materials and Methods

2.1. Participants

Patients (86 female adolescents diagnosed with AN) were recruited between March 2021 and May 2023 from six different specialist outpatient, daycare, and inpatient ED settings in Comunidad Valenciana and Murcia (Spain). A randomized controlled trial study with a longitudinal design was used (see protocol in Quiles et al. [16]). The research assistant at each center conducted a semi-structured interview to evaluate participants and confirm fulfillment of the following inclusion criteria: (1) aged between 11 and 19; (2) AN diagnosis according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) criteria [17]; (3) no psychiatric comorbidity; and (4) receiving treatment for AN at a specialist outpatient/day-patient/inpatient ED unit.

2.2. Instruments

An ad hoc sociodemographic questionnaire was used to assess age and educational level.

An ad hoc clinical variables questionnaire was submitted by the health care providers at the unit of reference. It assessed diagnosis (according to DSM-V criteria), weight, BMI, and AN time-course.

The Eating Disorder Examination Questionnaire (EDEQ) [18] was used to assess the severity of psychopathology related to eating disorders. It comprised 36 items rated on a six-point Likert scale, divided into four dimensions: Restraint, Eating Concern, Shape Concern, and Weight Concern. Higher scores indicate greater severity of ED features. The cut-off point was ≥20 for the total scale and ≥4 for the subscales, indicating clinical significance. The Spanish validation showed satisfactory internal consistency for the dimensions ($\alpha = 0.83$, $\alpha = 0.75$, $\alpha = 0.93$, and $\alpha = 0.74$, respectively) as well as in the overall scale ($\alpha = 0.81$) [19].

Clinical Impairment Assessment (CIA 3.0) [20] was used to assess psychological impairment related to the features of ED. CIA 3.0 includes 16 items rated on a four-point Likert scale, divided into three subscales of impairment: Personal, Social, and Cognitive. Higher scores on each scale indicate greater severity of clinical impairment. The cut-off point is ≥16 on the global impairment scale, predicting ED case status. The Spanish validation study showed satisfactory internal consistency with the subscales (α = 0.92, α = 0.93, and α = 0.90, respectively) as well as with the overall scale (α = 0.96) [21]. Despite being originally designed for adult populations, CIA has been previously administered in adolescent and young adult populations [22–24]. In this study, it was shown to have satisfactory internal consistency with the subscales (α = 0.93, α = 0.88, and α = 0.83, respectively) as well as with the overall scale (α = 0.94).

Eating Disorders Quality of Life (EDQOL) [6] assesses health-related QoL in ED patients. It comprises 25 items rated on a five-point Likert scale. The instrument is divided into four subscales: Psychological, Physical/Cognitive, Work/School, and Financial. The Spanish validation study showed satisfactory internal consistency with the subscales (α = 0.91, α = 0.85, α = 0.79, and α = 0.79, respectively) and the overall scale (α = 0.91) [25]. Higher scores indicate poorer health-related QoL.

Health Survey (SF-12) [26] was used to measure health-related QoL. It comprises 12 items rated on a three-to-four-point Likert scale, distributed over eight scales: Physical Health (General Health, Physical Functioning, Role Physical, and Body Pain) and Mental Health (Vitality, Social Functioning, Role Emotional, and Mental Health). The Spanish validation showed satisfactory internal consistency for each subscale (α = 0.85 and α = 0.78, respectively) [27]. Higher scores indicate better QoL.

2.3. Procedure

The data were gathered during the initial evaluation phase of a research study that examined the effectiveness of a skills-based intervention for patients diagnosed with an ED. The study received approval from both the Ethics and Research Integrity Committee of the University Miguel Hernández of Elche and the participating ED specialized units (Trial Identifier: ISRCTN43554732).

After confirmation for eligibility to participate, the research assistant at each center obtained participants' and carers' informed consent. Subsequently, patients filled out a self-administered paper-and-pencil questionnaire; the healthcare providers responsible for each case submitted the patients' clinical data.

2.4. Data Analyses

Descriptive analyses (means, standard deviations, and percentages) were used to explore the data. In addition, normality assumptions were assessed. This revealed that the sample was not normally distributed; therefore, non-parametric tests were used to analyze differences and correlations. Wilcoxon and Kruskal–Wallis tests analyzed the differences between AN subtypes, time-course, and QoL. Spearman's bivariate correlation coefficient was employed to analyze the associations between the study variables. Regression analyses were performed to assess QoL predictors, using the EDEQ and CIA dimensions as independent variables and the EDQOL and SF-12 scores as dependent variables. The SPSS (Statistical Package for the Social Sciences, Version 28) was used for statistical analysis.

3. Results

The sample consisted of 86 female adolescents diagnosed with AN (75 restrictive and 11 purgative). Sociodemographic and clinical descriptive data of the participants are shown in Table 1.

Table 1. Sociodemographic and clinical descriptive data.

	M	**SD**	**Range**	**N**	**%**
Age	14.86	1–60	11–19		
Pre-adolescents (11–12 y.o.)				5	5.9
Early adolescents (13–15 y.o.)				52	60.5
Mid adolescents (16–17 y.o.)				26	30.2
Late adolescents (18–19 y.o.)				3	3.5
Education					
Primary school				2	2.3
Secondary school				60	69.8
High school				16	18.6
University				5	5.8
Vocational training				2	2.3
Others				1	1.2
Weight (kg)	41.03	6.92	27–62.4		
BMI	15.93	2.11	11.8–22.30		
AN time-course	20.93	20.83	4–144		
Level of care					
Outpatient setting				24	27.9
Day-patient setting				44	51.2
Inpatient setting				18	20.9

Table 2 presents a comprehensive description of the variables investigated, with their mean values, standard deviations, and the range of minimum and maximum scores observed.

Table 2. Descriptive data of variables.

Variables	**M**	**SD**	**Min.–Max.**
EDEQ Restriction	3.44	1.77	0–6
EDEQ Eating concern	3.26	1.36	0–6
EDEQ Shape concern	4.79	1.36	0–6
EDEQ Weight concern	4.11	1.50	0–6
CIA-Personal	12.13	5.01	1–18
CIA-Social	8.60	4.44	0–15
CIA-Cognitive	6.98	3.89	0–15
EDQOL Psychological	3.48	1.15	1–8.5
EDQOL Physical/cognitive	3.10	1.03	1–5
EDQOL Financial	1.14	0.37	1–3.6
EDEQL Work/school	2.46	0.96	1–4.8
SF-12 Physical	12.92	3.10	5–19
SF-12 Mental	14.20	4.11	6–26

Notes: M = Mean; SD = standard deviation; Min = minimum; Max = maximum; EDEQ (Eating Disorders Examination Questionnaire); CIA (Clinical Impairment Assessment); EDQOL (Eating Disorder-Specific Health-Related Quality of Life instrument); SF-12 (Short Form-12 Item Health Survey).

First, the studied time period was grouped into the following ranges: less than one year; between 1 and 2 years; between 3 and 4 years; and more than 4 years. A Kruskal–Wallis test was performed, showing no significant differences in any of the variables after the data were divided into the previously mentioned timeframes.

A non-parametric Wilcoxon test was carried out to assess differences between AN subtypes and QoL. Two significant differences were found between the variables:

adolescents with purgative AN had worse mental health ($W = 219.50$, $p = 0.021$) and scored higher in the psychological EDQOL dimension ($W = 214.50$, $p = 0.021$) than adolescents with restrictive AN.

Spearman's correlation analyses were conducted to study the relationship between all the variables (Table 3). Timeframe, age, weight, and BMI did not show significant correlations with any study variables. All dimensions of the EDEQ and CIA showed significant relationships with the QoL variables, all scoring above 0.40 except for the EDQOL Work/School and the SF-12 Physical Health dimensions, which were below 0.40. The Psychological dimension of the EDQOL showed the highest correlations with the EDEQ Eating ($r = 0.75$, $p < 0.01$) and Shape ($r = 0.75$, $p < 0.01$) Concern dimensions, and with the CIA Personal Impairment dimension ($r = 0.79$, $p < 0.01$).

Table 3. Spearman's correlations between eating disorders attitudes, clinical impairment, health-related quality of life.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1. EDEQ Restriction	1												
2. EDEQ Eating concern	0.67 **	1											
3. EDEQ Shape concern	0.67 **	0.78 **	1										
4. EDEQ Weight concern	0.63 **	0.74 **	0.85 **	1									
5. CIA-Personal	0.59 **	0.66 **	0.80 **	0.71 **	1								
6. CIA-Social	0.62 **	0.62 **	0.65 **	0.63 **	0.75 **	1							
7. CIA-Cognitive	0.45 **	0.61 **	0.61 **	0.54 **	0.67 **	0.67 **	1						
8. EDQOL Psychological	0.59 **	0.59 **	0.75 **	0.68 **	0.79 **	0.71 **	0.69 **	1					
9. EDQOL Physical/cognitive	0.51 **	0.62 **	0.63 **	0.55 **	0.63 **	0.71 **	0.82 **	0.71 **	1				
10. EDQOL Financial	−0.11	−0.06	0.10	0.04	0.09	−0.01	0.04 **	0.10	−0.00	1			
11. EDQOL Work/school	0.29 **	0.29 **	0.29 **	0.40 **	0.29 **	0.45 **	0.53 **	0.41 **	0.43 **	−0.09	1		
12. SF-12 Physical	−0.48 **	−0.37 **	−0.39 **	−0.32 **	−0.39 **	−0.42 **	−0.49 **	−0.49 **	−0.51 **	0.19	−0.34 **	1	
13. SF-12 Mental	−0.51 **	−0.56 **	−0.62 **	−0.62 **	−0.68 **	−0.72 **	−0.68 **	−0.65 **	−0.63 **	0.01	−0.46 **	0.51 **	1

Notes: ** $p < 0.01$. EDEQ (Eating Disorders Examination Questionnaire); CIA (Clinical Impairment Assessment); EDQOL (Eating Disorder-Specific Health-Related Quality of Life instrument); SF-12 (Short Form-12 Item Health Survey).

To clarify the factors influencing QoL, we conducted a regression analysis, as shown in Table 4. This analysis utilized independent variables from two sources. The Eating Disorders Exploration Questionnaire (EDEQ) covered the following four dimensions: restraint; eating behaviors; weight concern; and body shape concern. The Clinical Assessment of Impairment (CIA) evaluated the following three dimensions: personal; social; and cognitive impairments. The dependent variables were selected from the Eating Disorders Quality of Life (EDQOL) instrument, which comprises the following four dimensions: psychological; physical/cognitive; economic; and work/school. Two dimensions of the SF-12 health survey, physical and mental health, were also included. No problems of multicollinearity, characterized by high intercorrelations among variables, were identified within any of the regression models.

Table 4. Determinants of Health-Related Quality of Life.

Dependent Variables/ Predictors	R_{adj}^2	F	β
EDQOL Psychological	0.611	19.846 ***	
EDEQ Eating concern			0.276 *
CIA Personal			0.412 **
EDQOL Physical/cognitive	0.707	30.290 ***	
CIA Social			0.290 **
CIA Cognitive			0.547 ***

EDQOL Work/school/ EDEQ Eating concern CIA Cognitive CIA Personal	0.317	6.648 ***	−0.439 ** 0.532 *** −0.394 *
SF-12 Physical/ EDEQ Restriction CIA Cognitive	0.314	6.545 ***	−0.385 ** −0.466 ***
SF-12 Mental/ CIA Social CIA Cognitive	0.613	20.254 ***	−0.299 * −0.295 **

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ EDE-Q (Eating Disorders Examination Questionnaire); CIA (Clinical Impairment Assessment); (EDQOL (Eating-Disorder Specific Health-Related Quality of Life instrument); SF-12 (Short Form-12 Item Health Survey).

Concerning the four EDQOL dimensions, higher scores on EDEQ Eating Concern and the CIA Personal Impairment dimensions were related to worse scores on the EDQOL Psychological dimension, explaining 61% of its variance. Two CIA dimensions (Cognitive and Social Impairment) were entered into the model for the EDQOL Physical/Cognitive dimension. These dimensions were found to be predictors of a lower EDQOL Physical/Cognitive score, accounting for 71% of the variance observed in this measure. The EDEQ Eating Concern and the CIA Cognitive and Personal Impairment dimensions explained 32% of the EDQOL Work/School dimension's variance: higher Cognitive Impairment scores were related to worse Work/School dimension scores. Eating Concern and Personal Impairment were also negatively related to this EDQOL dimension. No predictors were observed for the EDQOL Financial dimension.

Regarding the SF-12 QoL questionnaire, higher scores on the EDEQOL Restraint and the CIA Cognitive Impairment dimensions were related to worse SF-12 Physical Health scores, explaining 31% of its variance. Concerning the SF-12 Mental Health dimension, two CIA dimensions (Social and Cognitive Impairment) were found to have a negative correlation, which explained 61% of the variance in the SF-12 Mental Health dimension.

4. Discussion

The study thoroughly examines various factors influencing the QoL among adolescents with AN. Through a comprehensive analysis, the research explores the impact of different variables, including ED psychopathology, various demographic factors, and the dimensions related to ED and impairment. The findings provide valuable insights into the complexities of AN and its repercussions on the QoL of affected individuals.

The results of our study are similar to those found in previous studies in the literature that confirm the existence of strong relationships between suffering from an ED and the deterioration of QoL in adolescent patients [28-30]. Studies in the literature have already highlighted the need to increase the number of studies that relate QoL and ED in adolescent populations due to their high risk of suffering from an ED [31]. It is essential to better understand and identify the specific differences in patients' QoL in different diagnostic groups [32]. The present study was conducted with adolescent patients suffering specifically from AN, which allowed us to delve deeper into the impact of AN on the QoL of this group of patients. Other similar studies have found that patients with AN have a lower psychological and physical/cognitive QoL compared to patients with a BN or an ED not otherwise specified (EDNOS) [33]. Studies have found that patients with purging anorexia had the poorest perception of QoL in all areas assessed [34].

Differences were also detected between the AN subtype and the relationship with adolescents' QoL, showing that adolescents suffering from purgative AN have worse mental health. Likewise, similar studies showed that patients with restrictive AN had a significantly better QoL than those with purgative AN [35], and that patients with purgative AN had greater psychosocial impairment than patients with restrictive AN [36].

One notable finding is the lack of significant differences for all variables studied based on the different timeframes. This suggests that the duration of the disorder does not necessarily correlate with variations in the measured variables, challenging the assumption that longer durations inherently lead to more severe outcomes, in line with previous studies in the literature [15]. Additionally, no significant correlations were found between timeframe, age, weight, BMI, and the variables under consideration, indicating that these factors may not be reliable indicators of the severity or impact of AN in this population. These results contradict other studies that have found BMI to be the strongest predictor of disease recovery [37]. Therefore, further investigation of the impact of these demographic and clinical factors on the QoL of AN patients should be carried out.

Concerning the objective of analyzing the relationships between ED-related psychopathology factors and AN patients' QoL, the results yielded significant and high associations between all dimensions of the EDEQ and CIA with QoL variables, except for the EDQOL Work/School and SF-12 Physical Health dimensions, which were low.

In addition, the psychological dimension of the EDQOL questionnaire showed the highest correlations with the EDEQ dimensions of Eating and Shape Concern and also with the Personal Impairment dimension. These findings highlight the intricate interplay between psychological well-being and the severity of eating and shape concerns, suggesting that addressing these aspects is crucial for improving overall QoL in adolescents with AN. Studies indicate that, in AN patients, comorbidity and symptomatology are related to greater QoL impairment, and that these patients are more likely to report bodily pain, depression, self-harming behaviors, and suicidal ideation [9]. Recently, studies have also revealed strong relationships between QoL and depressive symptoms in patients with AN [38]. Therefore, therapeutically, it would be interesting to adjust the specific goals of the intervention based on the patient's level of physical impairment. This should also be considered when designing intervention programs, adjusting them to the patients' needs to improve their QoL in different areas, as this is a key factor in their recovery [39].

The strong relationships between attitudes towards eating disorders, clinical impairment, and mental health-related QoL of adolescent girls were analyzed in this study. Thus, attitudes towards eating disorders, clinical impairment, and mental health-related QoL in adolescent girls indicated strong negative relationships between the mental health component of the SF-12 with all dimensions of the EDEQ, EDQOL and CIA. Previous studies in the literature have already highlighted how patients with an eating disorder have more impaired mental health than physical health [14], as well as lower QoL than the general population [40]. Weight concerns and their relationship with clinical deterioration translate into lower QoL, even in pre-adolescents [41]. Therefore, mental health interventions for adolescent patients with ED should also address the psychosocial areas impacted [42], and in areas such as academic studies. In addition, our results have shown strong relationships between social and cognitive impairment and the impact of the eating disorder on labor or academic performance in adolescent girls assessed with the EDQOL. Additionally, studies conducted with adult AN patients have also suggested that patients spend more time at home or alone due to their impaired QoL; this impacts their work or studies and may cause more binge eating leading to a worse QoL [11]. Other authors have highlighted work/study impairment as the strongest predictor of overall QoL impairment in EDs [43]. Our work has found that all EDQOL subscales, with the exception of the Financial dimension, had significant correlations with the EDE scales, which is identical to the results obtained by Mitchison et al. [44]. However, in our study, the two components of the SF-12, physical and mental, obtained correlations with the EDE dimension. In other studies, there has only been a relationship between the EDE and the mental components of the SF-12 [44].

Regarding the second objective, which was to evaluate the different relationships of these variables with the QoL measured from a generic measure (SF-12) and with another specific scale of ED QoL (EDQOL), the results showed that 70% of the variance in physical and cognitive QoL evaluated with the EDQOL scale was explained by the CIA social and cognitive dimensions. A comparison with the mental QoL assessment obtained with a general QoL scale (SF-12), indicated that the results were similar, such that the CIA personal and cognitive dimensions explained 61% of the variance, excluding eating symptomatology variables from the explanatory model. Patients with greater ED psychopathology experienced more significant impairment secondary to ED, as previously reported in other studies using clinical samples [14, 18, 37, 38]. These results are in line with previous studies showing that the QoL of patients with AN is greatly affected by eating symptoms, and that this deterioration increases as the symptoms become more intense [39]. These findings underscore the importance of considering the impact beyond clinical symptoms. Individuals with EDs not only face challenges related to eating and weight but also experience a significant burden in their psychosocial functioning, resulting in a lower QoL. This finding underscores the need to address well-being in all areas of life for adolescents with ED. Therefore, the use of specific instruments and adapted measures for this type of patient, in order to assess their functioning in different areas and in their psychosocial impairment as it relates to QoL, should be a future aim [22].

Moreover, as expected, the EDEQ Eating Concern and CIA Personal Impairment dimensions explained a high percentage of variance (61%) in the psychological dimension of the EDQOL. The AN core symptom, eating concern, is related to higher eating pathology, emotional distress, and psychosocial deterioration in the sense that the more intense the eating symptoms, emotional distress, and psychosocial deterioration, the worse the QoL. This result has been found in previous studies [45, 46].

Personal and cognitive impairment are also included as explanatory variables in the case of school and work QoL, together with eating concern. In this case, the explained variance was lower (32%), again highlighting the impairment caused by the core symptoms in patients with AN. On the other hand, the psychological dimension of QoL was explained (61%) by restriction concern and personal impairment. In this case, a core symptom of ED (eating concern) is related to mood and self-perception. Studies with a larger sample should be conducted to assess how this deterioration is associated with the AN time-course, as well as to assess possible differences with other types of ED.

It is remarkable that the cognitive dimension of psychosocial impairment exhibits a noteworthy impact on the physical, school, and mental dimensions of QoL. This confirms that cognitive challenges, such as fixation on body image and self-esteem, exert a profound influence on the lives of adolescents with EDs [47]. These outcomes strongly advocate for implementing interventions specifically designed to address these nuanced aspects within the framework of ED treatment.

Finally, we highlight the fact that neither impairment nor deterioration explained the financial dimension of QoL. This could be because economic concerns are not a central aspect of ED, especially in adolescent girls, and that psychosocial impairment manifests more intensely in other domains of patients' lives. We think that, due to the age of the patients, who are minors and financially dependent on their families, they do not perceive an impairment in this dimension of their EDQOL. However, this aspect can be significantly altered in their families or in adult patients, for whom the illness can involve a high economic cost and a significant loss of QoL for those affected [29].

Based on the results obtained, we can confirm that the specific QoL instrument (EDQOL) is able to explain a higher percentage of AN in psychological and physical dimensions, while the general questionnaire, SF-32, explains a high percentage of variance in the mental domain but not in the physical domain. Previous studies have highlighted this limitation of the generic tool, SF-32, by pointing out that the increased physical activity associated with improved QoL in the SF-36 may be a sign of severity in anorexia nervosa rather than of improvement [48]. However, in a more recent paper, Panea-Pizarro et al. [49] concluded that the SF-36 could be useful for monitoring the impairment of health in adults ED patients. Therefore, it is necessary to develop studies with a larger number of participants and with a longer follow-up to be able to evaluate the usefulness of these scales for collecting changes throughout treatment.

The present study has some limitations. First, its cross-sectional nature implies that we cannot conclude causality between variables. Further research is needed using a longitudinal design. The typical limitations and advantages of using a self-administered questionnaire must also be considered [50]. As this study was carried out with Spanish participants, its generalizability may be limited due to specific characteristics of the sample, such as demographics, cultural backgrounds, and geographic locations. Results may not be representative of the broader population of adolescents with AN. Another limitation concerns generalization to males. Although the prevalence of ED in females is higher than in males, it is essential to include males to detect possible differences [19]. Future studies should analyze the relationship between QoL and the time progression of ED, and whether the results of this investigation can be transferred to patients with BN or EDNOS. Likewise, given that EDs affect not only the patient but also their entire family and social environment, the impact of support systems on treatment outcomes and QoL should be investigated, and interventions involving and enhancing support from family and friends should be developed. In this report, the CIA 3.0 has been administered in adolescent and young adult populations, as previous studies have done [22–24]. Despite showing good reliability scores in this sample, it is worth noting that the CIA is a psychometric tool designed for adult populations. Moreover, the sample size was small because the target population is specific and limited, restricting the availability of subjects for the study. Finally, longitudinal studies should be conducted to explore AN trajectories and how various factors evolve over time. This approach would provide a more dynamic understanding of the disorder, treatment effects, and their implications for QoL.

Among the strengths of this work, we highlight that, to our knowledge, there are few studies to assess the determinants of QoL in adolescent patients with AN. A strength of this study includes the sample we used, which comprises participants with AN from six different ED services. Therefore, it is safe to state that the sample is representative of patients seen in daily clinical practice, and that these results may be generalizable to other populations with ED. Another strength of this study includes the use of a large sample of adolescents with a diagnosis of AN. This is also the first study to examine the QoL of AN patients with a specific QoL questionnaire for adolescent Spanish patients. In addition, there are very limited previous studies that have examined QoL in adolescents with AN; therefore, the current study adds meaningful data to the current literature on the topic.

The results of this study have several practical implications for clinicians, healthcare providers, and researchers working with adolescents with AN. Results provide relevant implications for clinical practice, as they can guide the design of more effective and personalized interventions for patients with AN. By understanding the QoL of these patients, we can address not only the physical symptoms, but also the psychological and social aspects that affect their lives. Previous research revealed that patients receiving treatment can improve their QoL [30]. However, even in the case of remission, patients' QoL has been found to remain lower than that of the general population [51]. The present study showed that anorexia symptoms were associated with the physical, psychological, and social dimensions of QoL. Cognitive impairment was shown to have a positive and significant relationship with the psychological and social QoL of patients, and a negative relationship with the mental subscale of SF-36. These results make cognitive impairment a relevant target in the treatment of ED. Along the same lines, personal impairment should be the target of intensive therapeutic interventions, as it has been shown to be a psychological and academic determinant. Finally, social impairment was shown to have a significant influence on physical, cognitive, and mental dimensions of QoL. The literature states that core symptoms, such as worries about eating or restriction, are essential targets in the treatment of anorexia. To our knowledge, these results suggest that clinicians should consider the dimensions of QoL as therapeutic goals. In addition, including these measures in assessment protocols can provide viability for the treatment of anorexia. Further implications of the study are as follows: (a) The early detection and timely intervention may help prevent the exacerbation of symptoms and contribute to better long-term outcomes; (b) Given the strong correlations between psychological well-being, eating, and shape concerns with QoL, interventions should specifically address these aspects. Cognitive-behavioral therapy or interventions targeting body image and self-esteem may be beneficial to improve well-being; and (c) Clinicians should conduct comprehensive assessments that consider multiple dimensions, including eating concerns, personal impairment, and cognitive and social impairment. This holistic approach can guide treatment planning in addressing the various facets influencing QoL [52].

5. Conclusions

This study showed a deteriorated QoL in adolescent patients suffering from AN. Results showed that patients with a purgative AN diagnosis had worse mental health. Other variables, such as BMI, weight, and timeframe, were not significant. Additionally, the results showed that, although a generic mean QoL is useful for evaluating these patients, it is necessary to develop specific measures, such as EDQOL, that allow for a better understanding of the variability and specificity of these disorders. In summary, this study is one of the only studies to evaluate the QoL of adolescents suffering from ED. Future studies should focus on longitudinal data that allow researchers to observe the changes in QoL in relation to eating symptoms.

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