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# Autonomy support in an exercise intervention with colorectal cancer patients during chemotherapy: a qualitative perspective

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## ABSTRACT

**Objective:** Physical activity (PA) has emerged as an important element of supportive care for cancer patients, but few patients engage with exercise. Considering that autonomy support is associated with healthy lifestyles, it would be useful to know the specific autonomy-supportive techniques that can help to encourage PA in colorectal cancer (CRC) patients. This study aims to qualitatively explore autonomy support perceptions through a self-determination-theory-based exercise program (FIT-CANCER) with CRC patients during chemotherapy treatment.

**Methods and Measures:** A total of 27 participants were included, 16 CRC patients, six relatives, and five healthcare professionals. Qualitative data from semi-structured interviews and observational field notes were analyzed with thematic analysis.

**Results:** Three main themes were identified: Healthcare professionals encouraging enrollment in the exercise program, Relatives supporting attendance to the exercise sessions, Exercise instructor favoring adherence to the exercise program. The different subthemes showed autonomy-supportive techniques from these social agents to promote CRC patients' participation in the exercise program.

**Conclusion:** The present research showed the importance of autonomy support from healthcare professionals, relatives and the exercise instructor to promote the initiation and maintenance of CRC patients' PA behavior and improve their quality of life, health and well-being.

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Chemotherapy; social support; relatives; healthcare professionals; physical activity

## Introduction

Colorectal cancer (CRC) is the third leading cancer worldwide, reaching 1.8 million new cases per year (Sung et al., 2021). Surgery is the standard treatment for early-stage colon and rectum cancers, followed by adjuvant chemotherapy (Høydahl et al., 2020),

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which entails several side effects that impair CRC patients' short- and long-term well-being. Physical activity (PA) has emerged as an important element of supportive care for cancer patients (Campbell et al., 2019), with numerous benefits during and after the oncological treatment (Dhawan et al., 2020; Oruç & Kaplan, 2019). Specifically, PA alleviates adverse effects associated with chemotherapy, enhances health-related quality of life outcomes, and increases survival in CRC patients (Kim et al., 2019; Lee et al., 2021; Mishra et al., 2012). Nevertheless, PA participation is dramatically reduced after diagnosis, and few patients engage with exercise (Blanchard et al., 2008; Maxwell-Smith et al., 2017). CRC patients show some barriers for PA participation such as fatigue, reduced physical fitness, family overprotection, or healthcare professionals' lack of knowledge and time to prescribe PA (Romero-Elías et al., 2020).

In a recent update of PA recommendations for cancer patients, Rock et al. (2022) advised carrying out 150–300 min of moderate-intensity PA per week, or 75–150 min of vigorous-intensity PA, and at least two days a week of resistance training, flexibility, and balance exercises (Campbell et al., 2019; Schmitz et al., 2010). Although research supports that exercise is safe and feasible in CRC patients, some adverse events have also been reported, such as low-severity muscle pain, stiffness or soreness, and fatigue, with neck and abdominal discomfort during exercise and hip pain following exercise (Singh et al., 2020). Therefore, it is necessary to develop exercise programs that ensure patients' quality of life and increase PA adherence in cancer settings. Previous research suggested that interventions based on behavior change theories could be more effective than non-theory-based interventions (Michie et al., 2018; Sheeran et al., 2017). Specifically, motivational theories have been applied to analyze the modifiable factors and mechanisms associated with health behaviors such as PA (Hagger & Chatzisarantis, 2014).

In this regard, self-determination theory (SDT; Ryan & Deci, 2017) is a comprehensive theory of human motivation that has been useful in understanding PA behavior in the health domain (Ng et al., 2012; Ntoumanis et al., 2021; Teixeira et al., 2020). According to this theory, getting involved in behaviors for autonomous reasons positively affects adaptive health outcomes, including well-being and greater behavioral attainment and adherence. Behavior can be defined as *autonomous* when it is self-initiated and self-managed, and autonomy is considered as 'the organismic desire to self-organize experience and behavior and to have activity be concordant with one's integrated sense of self' (Deci & Ryan, 2000, p. 231). In contrast, *controlled* behavior is defined in terms of acting by pressure and coercive techniques.

Autonomy support is an interpersonal behavior of 'significant' or 'important' social agents (e.g. exercise instructor, relatives, and healthcare professionals), guiding patients to develop and maintain self-determined behaviors. Providing autonomy-supportive techniques is fundamental to promote autonomous motivation and adaptive behavioral consequences throughout health behavior programs. In this regard, PA has become one of the most analyzed behaviors from SDT (Ntoumanis et al., 2021). In clinical research, patients who experienced autonomy support provided by health staff acquired more autonomous motivation for PA adherence (Williams et al., 2006). Within SDT, autonomy-supportive techniques are effective when social agents share the patients' perspective, acknowledge their feelings, provide them with relative information and opportunities to choose, offer a meaningful rationale, encourage

them to increase their participation in health-related activities for autonomous reasons (e.g. benefits of PA), give them positive feedback, and reduce authority or pressure (Gillison et al., 2019; Reeve & Cheon, 2021; Teixeira et al., 2020). Thus, this construct is particularly important for cancer patients, as this disease is associated with autonomy limitation (Cosme & Berkman, 2020; Romero-Elías et al., 2020). Autonomy support has been positively associated with a healthy lifestyle (Bae & Kim, 2019) and PA (Milne et al., 2008; Peddle et al., 2008) in cancer patients. Accordingly, healthcare and exercise professionals play a potential role in providing autonomy support to cancer patients and improving long-term rates of participation and adherence in PA programs (Carroll et al., 2013).

Most previous exercise-related research in cancer settings has included several cancer types, predominantly carried out when the treatments ended. However, cancer patients' demands could differ depending on diagnosis and treatment modalities (Adler & Page, 2008), so specific exercise interventions could be required. In a recent SDT-based exercise intervention, the authors concluded that autonomy support provided by exercise professionals improved well-being and vitality of breast cancer survivors undergoing treatment (Behzadnia et al., 2020). Nevertheless, limited research has applied SDT principles to analyze exercise participation in CRC patients (Kim et al., 2021; Peddle et al., 2008), and the studies developing exercise programs with these patients during the oncological treatment period are still scarce (Hatlevoll et al., 2021). Previous correlational research with CRC patients (Kim et al., 2021; Peddle et al., 2008) showed the important role of autonomy support from people who are close to them, patients' basic psychological need satisfaction and autonomous motivation to predict exercise behavior. These studies used a questionnaire to ask patients about the perceptions of autonomy support provided by healthcare professionals, family and friends for exercise participation. They obtained a general mean score in autonomy and social support that does not allow distinguishing the effect and importance of each social agent, and they did not consider the exercise instructor's autonomy support either. Moreover, the specific actions and techniques that can be used to promote autonomy-supportive behaviors (Wang & Hagger, 2023) from each social agent in an exercise context remain unknown in these studies.

Due to this gap in the literature, this study aims to qualitatively analyze autonomy support perceptions during an SDT-based exercise program (FIT-CANCER) with CRC patients during chemotherapy. This research included the views of patients, healthcare professionals (oncologists and nurses), and relatives (main caregivers) to obtain a richer understanding of autonomy support techniques in this population.

## Method

### Design

This study is part of a broader research project which combined quantitative and qualitative methods. FIT-CANCER was the name assigned to the physical exercise intervention. In brief, FIT-CANCER was designed to carry out a 6-month SDT-based exercise program in CRC patients undergoing chemotherapy (three 60-minute sessions

per week). It was supervised initially face-to-face, to become later online when the COVID-19 pandemic began. The data of this article come from the qualitative evaluation of the exercise intervention.

## **Participants**

Initially, 25 patients were recruited through the oncology unit of a public hospital in the center of Spain to participate in the FIT-CANCER exercise program and the study about autonomy support. The hospital is located in an area in which the population has an average to high socio-economic and cultural level. Patients had to meet the following inclusion criteria: being over 18 years, diagnosed with CRC (stage II-III), treated by curative surgery for colon or rectal cancer followed by chemotherapy, ECOG-PS (performance status) 0–2. Patients were excluded if they were metastatic or diagnosed with incurable CRC. After being informed by the oncologists, nine patients decided not to participate due to schedule incompatibility, distance (when the exercise program was face-to-face) and for not wanting to belong to a cancer patients' group.

Patients' relatives and healthcare professionals were also included as participants to address the aim of the study in a deeper way and get a more comprehensive and integrative knowledge. For many years, the three elementary social perspectives of social support have been described: the recipient's, the provider's, and an outside observer's perspective (Dunkel-Schetter et al., 1992). Nonetheless, most studies only focused on the patients' perspective, and the people who provide patients social support do not usually participate in the studies.

Relatives were the main caregiver who accompanied the patients to the medical appointments. Not all relatives participated in the interviews and the different activities belonging to the exercise program. The two most frequent reasons were: incompatibility with other activities or respect to the patients' individual time and space. The entire oncologic team (oncologists and nurses) participated in the study.

Finally, 16 Caucasian CRC patients (seven women and nine men), aged 41–80 years ( $Mage = 64$ ,  $SD = 11.58$ ), receiving adjuvant treatment from 3 to 6 months, participated in the study. Four patients were in stage II of disease while 12 were in stage III. Only two patients had a rectum cancer diagnosis, and three had a stoma. Six relatives (three patients' wives, a patient's husband and two daughters;  $Mage = 55$ ,  $SD = 15.09$ ) and five healthcare professionals (two female and one male oncologists and two female nurses;  $Mage = 40.40$ ,  $SD = 9.66$ ) also participated in the study. All participants were informed about the research procedures and provided their written consent.

## **Procedure and data collection**

Two qualitative techniques were used for data collection: observation and semi-structured interviews. Observation was performed by the exercise instructor (MR) during the whole exercise program (six months). During the observations, MR collected written information about observed facts and conversations related to the patients' autonomy support perceptions in the exercise program. This information was collected in a research diary (with a pen and paper sheets). Semi-structured interviews were

**Table 1.** Example of interview questions.

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What helped you to sign up/participate in the FIT-CANCER program?
Did you hesitate to sign up? Why? What aspects hampered your attendance at the exercise program? And which ones favored it?
What aspects motivated you to carry on with the exercise program?
Were there any social or environmental factors that influenced your level of participation in the program (exercise instructor, family support or lack of support, support or lack of support from healthcare professionals?)
What did you like most about the exercise program?
What key aspects do you think were relevant to carry out an exercise program for cancer patients?
Did your oncologist do anything to support/encourage you to participate in the FIT-CANCER program? What? Do you think healthcare professionals could have done more to support you?
Did your family do anything to support/encourage you to participate in the FIT-CANCER program? What? Do you think they could have done more to support you?
Did your friends do anything to support/encourage you to participate in the FIT-CANCER program? What? Do you think they could have done more to support you?
Did your exercise instructor do anything to support/encourage you to participate in the FIT-CANCER program? What? Do you think she could have done more to support you?

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carried out immediately after the exercise program, were audio recorded, and lasted between 60 and 120 min. They were conducted by MR in a quiet place considering patients' preferences. [Table 1](#) contains some examples of interview questions related to autonomy support in the exercise program.

A number was assigned to each participant to preserve their confidentiality and privacy. This research was approved by the relevant Ethics Committee.

### **Data analysis**

Qualitative data obtained from the semi-structured interviews and observation were transcribed with a word processor and analyzed using thematic analysis (Braun & Clarke, 2006, 2019; Clarke & Braun, 2017). The thematic analysis was carried out from a relativist ontology and a constructionist epistemology (Sparkes & Smith, 2014), assuming that social reality is subjectively perceived and that generation of knowledge is influenced by researchers' previous theories, ideas, and values. After a deep and prolonged data immersion, themes and subthemes were generated with the combination of a theoretical/deductive and an inductive approach. Some general SDT concepts such as 'autonomy support' or 'social agents' influenced the conceptualization of the three main themes related to the autonomy support provided by healthcare professionals, relatives and exercise instructor, and the different subthemes represented contextualized autonomy-supportive techniques provided by each social agent. However, the thematic analysis also included an inductive approach because the concrete themes and subthemes were not preestablished by SDT, but identified from the data.

MR guided the analysis process, and the rest of co-authors (DG, AR, JT, and VB) played the role of 'critical friends' (Smith & McGannon, 2018). A collaborative and reflexive process was developed through two meetings, in which MR presented the data analysis using diagrams. After the presentation, the research team established a critical dialogue in order to help MR to improve the quality of her reflections, and to refine the conceptualization of themes/subthemes and the classification of data extracts in each theme/subtheme. In line with Smith and McGannon (2018), and our

ontological (relativist), epistemological (constructionist) and methodological (qualitative) perspective (Sparkes & Smith, 2014), the research team did not look for inter-rater reliability, a more appropriate concept for quantitative studies framed in a positivist paradigm. All researchers are inevitably influenced by their subjectivities when analysing data (Elliott et al., 1999), and a complete agreement of five researchers on a thematic analysis does not guarantee reliability or avoid bias. This is not a problem but just an aspect that should be recognized. In this regard, it is useful to know the profile of the research team that performed this qualitative analysis. MR is a Ph.D. specialized in exercise and cancer. She was responsible for carrying out the exercise program, she collected all qualitative data and led the analysis process. DG is specialized in SDT and autonomy-supportive techniques, AR has extensive experience as gastrointestinal medical oncologist and clinical researcher, JT has developed exercise programs with patients with different pathologies, and VB is an expert in qualitative methods.

The definitive set of themes and subthemes, which was coherent for the researchers and defined the structure of the results section, appears in Table 2. As an important part of data analysis, the other members of the research team also helped to improve the drafting of the initial article written by MR, until arriving at a final version. The different roles played by the rest of the research team, as critical friends, represented strategies to enhance the rigor of our data analysis which were coherent with our ontological, epistemological and methodological perspective.

### **Transparency and openness**

The research project was registered at ClinicalTrials.gov. Semi-structured interviews and field notes were transcribed and analysed with the support of NVivo 11 software to organize and classify data efficiently (Bazeley & Jackson, 2013). Raw transcripts, field notes and coding of extracted themes are available online at [https://osf.io/weur4/?view\\_only=c3cc3f36d5764bcda8981937499f0e20](https://osf.io/weur4/?view_only=c3cc3f36d5764bcda8981937499f0e20)

### **Results and discussion**

The results pointed out that patients' received autonomy support for their participation in the exercise program from healthcare professionals, relatives and the exercise instructor. However, the type of autonomy support was different depending on the social agent. Healthcare professionals were mainly focused on encouraging enrollment in the exercise program, relatives fundamentally provided support to attend the sessions, whereas the exercise instructor favored the long-term adherence to the exercise program (see the main themes of Table 2). Each social agent applied different autonomy-supportive techniques which are described in the following sections (see the subthemes of Table 2). The findings of this article are in line with the request of Wang and Hagger (2023), who highlighted the need to elucidate the specific techniques used in SDT-based interventions that are more effective and the mechanisms involved, in order to train social agents to adopt autonomy-supportive behaviors.

**Table 2.** Summary of themes and subthemes.

Themes		
Healthcare professionals encouraging enrollment in the exercise program	Relatives supporting attendance to the exercise sessions	Exercise instructor favoring adherence to the exercise program
Subthemes		
Oncologist informing about the exercise program and its benefits, recommending enrollment	Messages of encouragement for attending exercise sessions	Caring climate and flexibility
Closeness with patients	Taking patients to exercise sessions	Empowering attitude toward patients
Participation in activities related to the exercise program	Participation with patients during exercise sessions and other activities developed in the FIT-CANCER program	Showing specific knowledge about exercise for CRC patients
Asking about exercise participation during medical appointments		Availability and individual attention to patients' needs
Coherence between the messages of different healthcare professionals regarding exercise benefits		Accompanying patients to do additional activities
		The exercise instructor as an intermediary between patients and the oncologist

### **Healthcare professionals encouraging enrollment in the exercise program**

#### **Oncologist informing about the exercise program and its benefits, recommending enrollment**

Relatives and patients considered the oncologist as the main social agent for the patients' initial enrollment in the exercise program. This finding is in line with a previous study which highlighted the relevance of oncologists as the first suppliers of information for PA participation in CRC patients during chemotherapy (Romero-Elías et al., 2020). The oncologist was the first social agent informing about the existence of the exercise program. Moreover, the oncologist represented a qualified and trustworthy professional, an expert in health and CRC who actively recommended the enrollment in the FIT-CANCER program, in view of the scientific evidence about the impact of exercise on reducing treatment side effects, increasing survival rates, and improving well-being. The oncologist focused on autonomous reasons for exercising, using non-controlling informational language, providing a meaningful rationale, and encouraging patients to experiment and self-initiate the behavior (Teixeira et al., 2020). Besides, the oncologist offered patients the exercise program as a voluntary 'part of their treatment'. A treatment in which, contrary to chemotherapy, patients could be actively involved. All these aspects clearly influenced the initial enrollment of patients and the support of their relatives on this matter:

The oncologist gave me a brochure with information regarding the exercise benefits. She (the oncologist) described the FIT-CANCER characteristics and recommended this program to me because it would positively impact my well-being and survival. This caught my attention! Even though I was initially reluctant to do something implying additional time in the hospital (Patient 8).

The fact that, on the first day, the oncologist informed me about the benefits of exercise throughout chemo encouraged me. She (the oncologist) commented to me that I was



going to have a faster recovery, gain more strength, and suffer fewer side effects. Definitely, I was going to be stronger to face the disease (Patient 1).

The fact that oncologists initially promoted the exercise program has been a key point for my wife's participation (Relative 6).

The oncologist also implemented other autonomy-supportive techniques which favored her ability to convince and influence patients' initial enrollment, as showing closeness with patients, participating herself in activities related to the exercise program and showing a high commitment with it, and asking about exercise participation during medical appointments, listening to the patients' perspective. These techniques not only favored initial enrollment but also adherence to the exercise program, autonomous motivations and well-being along the oncologic process:

The oncologist said to my father: 'whenever you want, you can visit me (in the surgery)'. That increased my father's motivation because he felt closer to her (the oncologist), not only for exercise issues but also because she listened to and supported my father's worries, etc. Definitely, my father felt strong support, and he was happy about the oncologist's involvement (Relative 3).

MR: Especially one oncologist participated in several face-to-face and online FIT-CANCER activities. For instance, the oncologist attended a dance activity, hiking excursions, and some regular exercise sessions. She also participated in online educational conferences for patients during the COVID-19 lockdown, designed to increase knowledge and motivation to promote exercise and better deal with chemotherapy's secondary effects (observational field notes).

The oncologists' comments about 'how is the exercise going?' throughout the treatment period were important for participation in FIT-CANCER (Patient 8).

Previous research has remarked that autonomy-supportive consultations have a positive effect on patients' well-being, because physicians are considered reliable and objective sources of health-related information (Kors et al., 2020). Moreover, emotional support has been shown to have a powerful meaning for cancer patients (Reblin & Uchino, 2008). In fact, recent evidence suggests that cancer patients develop maladaptive emotion management related to the disease when they perceive oncologists as disengaged and less supportive (Meggiolaro et al., 2016). Therefore, oncologists should show a specific attitude to focus on patients' needs, and adjust their own relational and communication styles according to the patients' fragile psychological condition.

### *Coherence between the messages of different healthcare professionals regarding exercise benefits*

Patients and relatives frequently reported the relevance of receiving consistent messages about the importance of PA during the oncologic process:

After the surgery, the surgeon insisted on resuming PA, and the oncologist told me about the benefits of exercise for recovery...thus, when there is coherence between the messages by nurses, surgeons, and oncologists about the benefits of exercise ... there is no doubt that exercise is beneficial (Patient 7).

This coherence between the messages of different healthcare professionals was relevant for patient's enrollment in the exercise program and the maintenance of an active lifestyle. In line with our finding, previous studies highlighted the relevance of

homogeneous messages among healthcare professionals for smoking cessation in cancer patients (Hall et al., 2004; Wells et al., 2017). This coherence between different health professionals can reinforce the development of patients' autonomous motivation because the content of the message is the same but with different origins and, therefore, it is more meaningful. Nevertheless, to get this coherence and appropriate advising, it is necessary that the different health professionals acquire and share knowledge about the type, intensity, frequency and duration of exercise which is healthy for CRC patients.

### ***Relatives supporting attendance to the exercise sessions***

#### ***Messages of encouragement for attending exercise sessions***

Patients thought that their relatives supported them with positive feedback to promote and encourage their participation in the exercise sessions. They perceived that relatives emphasized the opportunity for patients to recover and experience well-being, focusing on the positive challenge of the exercise program and supporting an autonomous behavior. This support was very helpful, because patients were living a distressing and uncertain period after CRC diagnosis, and their relatives were their main caregivers and most trustworthy people.

When I told my family that I was going to participate in the exercise sessions, they told me: 'fucking great, exercising will make you recover faster' (Patient 3).

My sons have helped me a lot. They told me: 'Come on Dad!... I know people who had cancer, but they did not exercise and did not feel so good' (Patient 4).

A previous study also found that family support was a positive determinant of PA engagement in breast cancer patients (Barber, 2012). Teixeira et al. (2020) pointed out that providing orientation on the social agents' behaviors and specifying the content of messages could be effective means to develop patients' autonomous motivation and sustained behavior change. In this regard, health and exercise professionals should guarantee the patients' relatives that exercise is safe and beneficial for cancer patients to assure their support.

#### ***Taking patients to exercise sessions***

Many patients perceived autonomy support when their relatives took them to the exercise sessions. Relatives' support with transport was essential for patients' participation, especially for those patients with less physical autonomy or difficulties driving due to chemotherapy treatment. Relatives' views were congruent with the patients' perception:

Our way of supporting my father was making it easier for him to attend the exercise program. For example, taking him to the exercise program when it was face-to-face and when meetings were out in the country (Relative 3).

Relatives' support with transport was essential to facilitate patients' autonomous participation and alleviate the 'distance-to-the-exercise-center' barrier, which a literature review has identified as one of the most critical barriers for PA in cancer patients (Elshahat et al., 2021).

### ***Participation with patients during exercise sessions and other activities developed in the FIT-CANCER program***

Relatives had the option of taking part in the sessions of the exercise program, and some patients mentioned the importance of their relative's active implication for favoring their attendance to the program:

One advantage of the exercise program was that my wife accompanied me during the exercise sessions. This favored everything (Patient 4).

Relatives deal with many challenges due to the elevated burden of cancer care, the round-the-clock concern, and the lack of support for taking care of patients (Imani-Goghary & Ghaljeh, 2020). Thus, psychological interventions oriented toward the family unit can also have essential benefits for caregivers. As previous research had suggested (Northouse et al., 2010), we also intervened with relatives, as they tend to reduce their self-care to care for the patients during the oncological stage. Besides, relatives usually accompany patients to the exercise sessions and remain as observers while patients do PA. Therefore, we promoted relatives' participation with patients during exercise sessions and other activities developed in the FIT-CANCER program. This was a way to promote family ongoing support and represented a strong point of our intervention which could be considered in future attempts.

### ***Exercise instructor favoring adherence to the exercise program***

Our results indicated that the exercise instructor played a key role in favoring adherence to the exercise program, once the patients had enrolled in the exercise program and started to attend the sessions. The exercise instructor's autonomy-supportive techniques are described in the following subsections.

#### ***Caring climate and flexibility***

Patients and relatives highlighted some characteristics of the instructor's behavior related to her caring, personal involvement and patience, which they considered especially relevant—flexible, sympathetic, smiling, close, sensitive, and accessible—which increased the patients' autonomy support perceptions and adherence to the exercise program.

First, how you are, you encourage everyone, you are a person who knows to deal with us wonderfully, you never wear an unhappy face, you tell us wonderful things, very sweetly... to empathize with and understand us perfectly. You have that virtue... you are quite accessible...you are always smiling, you help all of us...When this disease appears, we need someone who can talk sensitively. You encourage people to keep on exercising because you explain the beneficial effects of exercise on our bodies. This aspect supported me a lot (Patient 4).

Your flexibility and understanding of patients' attendance—which sometimes depend on relatives' availability—are important. And understanding that patients will not always attend exercise sessions because their participation depends on many things. You have given us different options. For example, the frequency of attendance to exercise sessions. It is essential to connect with patients and comprehend their situation (Relative 3).

In line with our findings, Mack et al. (2013) showed that positive interpersonal connections and trusting relationships during exercise were associated with PA participation and psychological well-being in breast cancer patients.

### *Empowering attitude toward patients*

Patients preferred being empowered than being treated as victims. The fact that the exercise instructor believed in their capabilities and encouraged them to give their best was very important for them. The instructor promoted patients' initiative, the establishment of realistic and achievable goals, and the exploration of life aspirations and values. Several patients mentioned that 'their motivation and perceived support increased when the exercise instructor treated them normally, as if they were free of disease' (observational field notes).

One of the patients even referred metaphorically to the exercise program as the way of 'salvation' from depression and being completely lost and defeated by CRC:

What you have offered us [FIT-CANCER program] is our salvation (metaphorically). You don't come here to make friends, you come here to save our lives because the difference between following or not following the exercise program is depression. Patients don't die from cancer; they die from depression [metaphorical sense]. You have limited that... eternally grateful! (Patient 6).

### *Showing specific knowledge about exercise for CRC patients*

The exercise instructor's knowledge about exercise for CRC patients and her ability to transfer it to patients had a positive impact, enhancing patients' perceptions of autonomy support. The patients considered that the exercise instructor was a qualified professional and respected her opinions and advice, which favored their adherence to the exercise program and their confidence in this context. This fact was very important for the patients, who might have doubts about chemotherapy side effects or the appropriate exercise in this delicate phase of their disease:

Feeling that you have knowledge about exercise in our conditions makes me confident, and it makes me want to participate more. Also, it encouraged us to continue with the exercise program (observational field notes).

You are the reference person for the exercise topic, and you have solved all our doubts about what we should do regarding exercise during the treatment. You have been the first person to tell us many things, for example, solving our doubts about side effects associated with chemo (Relative 3).

The specific knowledge about exercise for CRC patients shown by the instructor made patients feel confident and enhanced their perceptions of autonomy support and adherence to the exercise program. The identification of exercise barriers and ways to overcome them by the instructor increases patients' confidence and reinforces existing skills and autonomous involvement (Teixeira et al., 2020). In line with our findings, previous authors (Avancini et al., 2020) have mentioned how vulnerable cancer patients feel during the treatment, and have highlighted the importance of having access within the oncology service to exercise specialists with specific knowledge and experience with cancer patients.

### ***Availability and individual attention to patients' needs***

Autonomy support perceptions grew in patients when the exercise instructor worried about each of them and was available to help with their doubts and concerns, conveying feelings of acceptance and respect. Many patients and relatives highlighted the importance of the individualized attention received during the exercise sessions:

If she (patient) was worried about something, she asked you, and you were always available...your role (instructor) was really important for her throughout the cancer period (Relative 6).

Your individualized attention has been essential for us (patients). You (exercise instructor) have not forgotten anyone. If someone had difficulties, you dedicated additional time to explain individually. I am grateful because you have always been attentive to us. It's a strong incentive (Patient 6).

### ***Accompanying patients to do additional activities***

The exercise instructor accompanied patients to carry out extra activities, showing interest in their preferences and personal circumstances. In this manner, she encouraged patients to participate in types of PA that they liked, represented a challenge, and were associated with skill development and immediate positive reinforcement (Teixeira et al., 2020). For example, cycling with a patient who did not feel able to exercise with his friends because he could not keep up. His wife confessed:

Your role has been essential for him (patient). He connected with you. He was amazed at you because you went cycling with him on weekends when he couldn't go with his friends because he didn't feel strong enough. That fact has increased his confidence, and has given him life. We think that's amazing! He said, 'she (exercise instructor) dedicated a day of her life to come with me' (Relative 1).

Although this level of commitment could be considered extraordinary and should not be compulsorily required to ensure the success of PA interventions, it is necessary to remark that the involvement of the different social agents was essential to motivate patients and maintain their PA participation.

### ***The exercise instructor as an intermediary between patients and the oncologist***

A close and direct relationship between the exercise instructor and the oncologist favored CRC patients' perceived autonomy support and their adherence to the exercise program. Patients perceived that the exercise instructor paid attention to them with an empathic listening, acknowledged and respected their perspective and feelings, prompted them to pose questions, created a collaborative relation offering patients to contact her when they had problems, and offered alternatives to address obstacles (Teixeira et al., 2020). Moreover, patients realized their doubts were being transmitted by the exercise instructor to the oncologist, and they learnt to use this link as a facilitator to solve emergent problems:

The key support was that you (exercise instructor) were a messenger between us (patients) and the oncologist. Currently, the health system is saturated, and sometimes, it was impossible to contact the healthcare professionals. The good and close relationship between you and the healthcare professionals helped us to communicate with the hospital. That was fucking great! I felt more protected, better cared for (Patient 8).

One oncologist considered that the intermediary role that the exercise instructor played between patients and oncologists was an unexpected but fundamental finding of the intervention for clinical practice. The exercise instructor could be a privileged informant on the impact of chemotherapy on patients:

You have warned us about two things. First, the poor tolerance to the treatment, and second the weight loss with hypoalbuminemia in Patient 1, because of diminished intake. If you hadn't told us, we probably wouldn't have found it out...

About Patient 5, it's a bit different, but I suspected she was having a 5FU-related vasospasm angina. They (patients) have a contact phone number, but they told you, and then you told me...

That's what I call a windfall. You became an important connecting element in managing the impact of treatment on patients' quality of life and safety (E-mail that one oncologist sent to the exercise instructor. Field notes).

The significant role of the exercise instructor within the hospital provided novel findings. The exercise instructor acted as an intermediary between the oncologist and the patients, obtaining information from patients that was useful for the oncologists who needed to readjust treatment. She was also the messenger for the oncologists, reinforcing information about exercise and the adverse effects of chemotherapy and the potential risks of ostomy. Many times, physicians do not have enough time to support patients during the consultation time (Romero-Elías et al., 2020). However, exercise professionals can share with the patients many appropriate times and contexts to listen to their stories and provide the necessary support. The importance of 'narrative medicine' and patients' 'storytelling' to achieve a more humane, ethical, and effective healthcare should be emphasized. Professionals surrounding patients should be able to read and listen closely, absorbing patients' information and trying to support them. Definitively, nobody should be alone in the glare of illness (Charon, 2012). The role of exercise professionals within the comprehensive care group of health centers can be very relevant to support patients during their disease.

## Conclusions and limitations

This qualitative study explored autonomy support perceptions in an SDT-based exercise program carried out with CRC patients during chemotherapy treatment. Previous research has applied several autonomy-supportive techniques during the general CRC patients' treatment such as emotional support, treat-related information, as well as motivating patients for an earlier post-operative physical mobilization. Those techniques showed improvements in patients' quality of life and a reduction in their perceived treatment burden (Husebø et al., 2020). However, to date, the present study is the first that analyzes autonomy support in an exercise-based intervention during chemotherapy in CRC patients. Our study has showed the importance of autonomy support from healthcare professionals, relatives and the exercise instructor to promote the initiation and maintenance of CRC patients' PA behavior during the FIT-CANCER program. The findings also provide specific autonomy-supportive techniques that can help to promote the initiation and maintenance of PA in this population. In addition, the findings of the present study suggest that a correctly oriented exercise program

can improve CRC patients' well-being and quality of life during a very difficult phase of their lives, in which patients are receiving chemotherapy after a CRC diagnosis and surgery.

Nevertheless, some limitations of our study have to be recognized. First, the study was conducted in a very specific site, with patients who had an average to high socio-economic and cultural level. This aspect limits the transferability of the results to other contexts and patients with different profiles. The patients' characteristics could have been related to their involvement in the FIT-CANCER program and the success of the autonomy support intervention. More studies are necessary to explore the benefits of this type of interventions in patients with lower socio-economic status.

Second, only a few family members were included in the sample, and they were mostly women. Two main reasons may justify this issue. One reason was that some relatives preferred, as much as possible, to distance themselves from the patients' activities and the hospital. The other reason was that women usually take more care of their spouses' health, nutrition, and exercise than men (Ungar et al., 2016) and are often regarded as 'health promotion agents' (Marcell et al., 2010) by their partners.

Third, the fact that the instructor of the exercise program (MR) was the person in charge of data collection could be seen as a limitation reducing impartiality. Nevertheless, MR encouraged participants to be frank and indicated that their true opinions were the only right answers. Moreover, MR adopted a learning attitude during data collection and analysis, and she always kept in mind that the findings of the study should be underpinned in the participants' experiences and ideas, and never in her possible potential interests. The rest of the research team also followed these principles of reflexivity due to an ethical commitment with rigor and trustworthiness.

Fourth, another limitation was that the intervention had to change to an online modality due to the COVID-19 pandemic. However, as other authors had recommended, we could keep the patients active despite the COVID-19 lockdown (Newton et al., 2020). Moreover, Gonzalo-Encabo et al. (2022) found that remotely supervised exercise was feasible and effective in cancer patients during the pandemic, although it should be further investigated with larger trials.

Finally, we have to consider that nine patients decided not to participate in our study for different reasons. Online/face-to-face and individual/group exercise programs could be combined depending on the patients' needs to increase their engagement. The adaptation of any exercise intervention to the patients' personal situation seems necessary if we want to foster their participation.

## Ethical approval

This research was approved by the Ethical Research Boards of Hospital Universitario Puerta de Hierro Majadahonda (Reference: PH-UMH-01) and Miguel Hernández University of Elche (Reference: DPS.DGC.01.19).

Clinical trial registration: The research project was registered at ClinicalTrials.gov (registration number NCT04506840).

## Disclosure statement

The authors report there are no competing interests to declare.

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## Data availability statement

The data files from the current study (raw transcripts, field notes and coding of extracted themes) are available in the OSF repository at [https://osf.io/weur4/?view\\_only=c3cc3f36d5764bcd58981937499f0e20](https://osf.io/weur4/?view_only=c3cc3f36d5764bcd58981937499f0e20)

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