“BARIATRIC PATIENTS ARE THEM, AND THEIR CIRCUMSTANCES”: PSYCHOSOCIAL PROCESSES BEHIND THEIR (IN)ACTIVE LIFESTYLES

TESIS DOCTORAL

Autor
D. Alejandro Jiménez Loaisa

Director
Dr. D. Vicente Javier Beltrán Carrillo
Codirector
Dr. D. David González-Cutre Coll

Universidad Miguel Hernández de Elche
Centro de Investigación del Deporte
Departamento de Ciencias del Deporte
Programa de Doctorado en Deporte y Salud

2021

La presente tesis doctoral es un compendio de trabajos previamente publicados. Las referencias completas que constituyen el cuerpo de la tesis son las siguientes:

Jiménez-Loaisa, A., Beltrán-Carrillo, V. J., González-Cutre, D., & Jennings, G. (2020). Healthism and the experiences of social, healthcare and self-stigma of women with higher-weight. *Social Theory & Health, 18,* 410-424. https://doi.org/10.1057/s41285-019-00118-9.

Jiménez-Loaisa, A., González-Cutre, D., Beltrán-Carrillo, V. J., & Alcaraz-Ibáñez, M. (2020). Changes in bariatric patients' physical activity levels and health-related quality of life following a postoperative motivational physical activity intervention. *Obesity Surgery, 30*, 2302-2312. https://doi.org/10.1007/s11695-020-04489-1.

González-Cutre, D., Jiménez-Loaisa, A., Alcaraz-Ibáñez, M., Romero-Elías, M., Santos, I., & Beltrán-Carrillo, V. J. (2020). Motivation and physical activity levels in bariatric patients involved in a self-determination theory-based physical activity program. *Psychology of Sport & Exercise*, 51:101795. https://doi.org/10.1016/j.psychsport.2020.101795.

Beltrán-Carrillo, V. J., Jiménez-Loaisa, A., Jennings, G., González-Cutre, D., Navarro-Espejo, N., & Cervelló, E. (2019). Exploring the socio-ecological factors behind the (in)active lifestyles of Spanish post-bariatric surgery patients. *International Journal of Qualitative Studies on Health and Well-Being*, 14:1626180. https://doi.org/10.1080/17482631.2019.1626180.

UNIVERSITAS
Miguel Hernández

INFORME POSITIVO DE LA TESIS DOCTORAL

D. Vicente Javier Beltrán Carrillo, con DNI 23273862R, y D. David González-Cutre Coll, con DNI 48484080B, Profesores Titulares de Universidad del Departamento de Ciencias del Deporte de la Universidad Miguel Hernández de Elche, como director y codirector respectivamente de la tesis doctoral de D. Alejandro Jiménez Loaisa, con DNI 74383394Z, estudiante del Programa de Doctorado en Deporte y Salud de la Universidad Miguel Hernández de Elche.

INFORMAN

Que el citado estudiante ha realizado la tesis doctoral titulada "Bariatric patients are them, and their circumstances": Psychosocial processes behind their (in)active lifestyles. Dicha tesis doctoral, correspondiente con el proyecto de tesis doctoral aprobado por la Comisión Académica del Programa de Doctorado en Deporte y Salud, ha sido realizado bajo nuestra dirección y cumple con los requisitos y condiciones para que sea presentada y defendida como tesis doctoral con mención internacional.

Y para que así conste, firmamos el presente INFORME POSITIVO en Elche, a 4 de diciembre de 2020.

VICENTE JAVIER| BELTRAN| CARRILLO

Firmado digitalmente por VICENTE JAVIER|BELTRAN|CARRILLO
Nombre de reconocimiento (DN): cn=VICENTE JAVIER|BELTRAN|CARRILLO, serialNumber=23273862R, givenName=VICENTE JAVIER, sn=BELTRAN CARRILLO, ou=CIUDADANOS, o=ACCV, c=ES
Fecha: 2021.01.15 16:45:41 +01'00'

DIRECTOR
D. Vicente Javier Beltrán Carrillo

DAVID| GONZALEZ CUTRE|COLL

Firmado digitalmente por DAVID| GONZALEZ CUTRE| COLL
Fecha: 2021.01.17 10:42:35 +01'00'

CODIRECTOR
D. David González-Cutre Coll

El Dr. Francisco Javier Moreno Hernández, coordinador del programa de doctorado Deporte y Salud de la Universidad Miguel Hernández de Elche.

AUTORIZA:

Que el trabajo de investigación titulado: "Bariatric patients are them, and their circumstances": Psychosocial processes behind their (in)active lifestyles*"* realizado por D. Alejandro Jiménez Loaisa, bajo la dirección del Dr. Vicente Javier Beltrán Carrillo y codirección del Dr. David González-Cutre Coll, sea defendido como Tesis Doctoral en esta Universidad ante el tribunal correspondiente.

Lo que firma para los efectos oportunos en:

Elche, a 03 de diciembre de 2020

FRANCISCO JAVIER|MORENO| HERNANDEZ

Firmado digitalmente por FRANCISCO JAVIER|MORENO| HERNANDEZ
Fecha: 2021.01.18 10:39:30 +01'00'

Fdo.: Francisco Javier Moreno Hernández

Coordinador del programa de doctorado

Universidad Miguel Hernández de Elche

AGRADECIMIENTOS

AGRADECIMIENTOS

"*Cultiva el hábito de ser agradecido por todo lo bueno que viene a ti,*

y de dar las gracias continuamente.

Y ya que todas las cosas han contribuido a tu progreso,

debes incluir todas las cosas en tu gratitud"

Ralph Waldo Emerson

Cuando uno para y echa la vista atrás, se da cuenta de que realmente una tesis doctoral no es únicamente un producto que surge tras un proceso formativo como doctorando. Más bien, es el resultado de la influencia de un conjunto de personas y experiencias que me han conformado personal y académicamente a lo largo de toda mi vida, y que me han guiado directa o indirectamente hasta el punto en el que me encuentro en la actualidad. Por tanto, permítaseme en este apartado hacer justamente lo contrario a lo que estamos acostumbrados a hacer en el mundo de la ciencia (es decir, ajustarnos a un número determinado de palabras para escribir nuestros trabajos) para expresar mi más sincera y profunda gratitud hacia todas esas personas y experiencias que han sido fundamentales para mí y mi formación académica. Aunque sea imposible, trataré de devolveros a través de estas palabras todo el cariño que habéis puesto en mí de una forma u otra.

Lo cierto es que mi pasión por el deporte empezó cuando era alumno de secundaria en el IES Victoria Kent de Elche. De hecho, el inicio de esta pasión se la debo a uno de mis profesores de Educación Física, **Alberto**. Aunque él lo desconozca, la excursión que organizó con sus estudiantes de primer curso para visitar la pista de atletismo tuvo una influencia determinante en mí. Recuerdo con afecto las carreras de velocidad que hicimos, y especialmente la última carrera, en la que (por los pelos) te

gané. Jamás sabré si te dejaste ganar o no, pero la realidad es que por tu culpa llegué ese mismo día a casa a decirle a mi padre que me apuntase al atletismo, alentado también por tus palabras de ánimo para que lo hiciera. Al día siguiente, ya estaba practicándolo. Gracias Alberto, porque conmigo conseguiste quizás el reto más difícil para cualquier profesor de Educación Física, que es generar hábitos de actividad física/deportiva fuera de sus clases.

En esta etapa educativa, también me gustaría extender este agradecimiento a **Pedro Amores** y **Borja Contreras**, quienes fueron mis profesores de Historia y Filosofía durante bachillerato, respectivamente. No fui ni de lejos vuestro estudiante más brillante, pero os aseguro que aprendí y disfruté mucho con vuestras clases, con vuestra forma de entender la docencia, y con la manera en la que interactuabais con el alumnado. Unos pocos años después, todavía seguimos recordamos en mi casa experiencias que tuvimos mi hermano y yo con vosotros. Además, os aseguro que vuestra influencia está presente durante mi labor docente, gracias a la huella que dejasteis en mí durante una etapa clave de la formación de mi personalidad. Gracias a los dos, de verdad.

Posteriormente, pasé a ser estudiante de la II Promoción del Grado en Ciencias de la Actividad Física y del Deporte en la Universidad Miguel Hernández de Elche. Me gustaría que el primer de los muchos agradecimientos que tengo que dar de esta etapa fuera para la persona que impartió mi primera clase universitaria, **Adolfo Aracil**. Fito, muchas gracias por tratar de abrirnos los ojos recién aterrizados en la universidad, haciéndonos conscientes de lo afortunados que éramos por ocupar el lugar que estábamos ocupando en aquel momento. Aquel punto que dibujaste en la pizarra y tus palabras fueron adquiriendo más significado para mí con el paso del tiempo. Por favor, nunca dejes de inspirarnos e ilustrarnos con tu sabiduría.

Asimismo, quisiera dar mi más profundo agradecimiento a mis dos directores de tesis, **Vicente Beltrán** y **David González-Cutre**. Gracias por haberme aceptado y guiado en el camino, gracias por haberme enseñado a ser mejor investigador y persona, gracias por vuestra exigencia, y gracias por haberme aconsejado sabiamente para tomar las decisiones más adecuadas a lo largo de todos estos años. Soy consciente de la enorme fortuna que he tenido por haber contado con dos directores como vosotros, precisamente porque habéis acabado siendo algo más que dos directores de tesis para mí. Espero que estéis orgullosos del camino que hemos recorrido juntos y de que hayáis disfrutado de esta etapa tanto como yo lo he hecho. Esta tesis recoge vuestra esencia y me siento muy afortunado por ello.

Vicente, probablemente daría para otra tesis doctoral todas las palabras de agradecimiento que tengo para ti. Ya ha pasado mucho tiempo desde aquella vez que me encontré con Sara y contigo frente a la puerta de tu casa, recién publicadas las notas de tu asignatura de Teoría de la Educación Física y del Deporte, donde me dijiste que te escribiese un correo para reunirnos por primera vez. Recuerdo perfectamente aquella primera reunión en tu despacho, en la que me explicaste cómo funcionaba el "mundillo" de la ciencia, el camino tan duro que representaba, y los pasos que tenía que dar. Con los años, me reconociste que habías sido bastante franco conmigo para ver si aún así aguantaba el tirón y quería seguir para adelante. Y aquí nos hemos plantado. Después de esa reunión llegarían incontables horas de conversaciones académicas y no académicas, de congresos (especialmente nuestros favoritos, los organizados en Valencia), y de paseos de ida/vuelta hacia casa o hacia el CID. Jamás voy a poder agradecerte suficientemente todo el tiempo y la paciencia que me has dedicado. Me has enseñado a ser metodológicamente correcto, a ser meticuloso con la redacción de ideas, y a ser lo más riguroso posible con su presentación. No obstante, también me has enseñado con

tus consejos a ser agradecido con lo que me rodea, a ser justo, y a actuar siempre conforme a una serie de principios éticos y morales que sin duda ambos compartimos. En definitiva, siempre te has preocupado por formarme íntegramente, lo cual deja clara tu infinita calidad humana y profesional. Espero poder seguir contando con la amistad que hemos forjado durante muchos años más, ya que esta es realmente el verdadero producto que deja esta tesis doctoral. Gracias de corazón, Vicente.

David, de ti me llevo muchísimas cosas y todas ellas son positivas. Creo que no te descubro nada nuevo (exacto, ya no es novedad) si te digo que la pasión y el cariño que le pones a las cosas son pegadizos. Desde que era alumno del grado, admiraba tu capacidad para transmitir conocimientos con energía y convencimiento. Además, tu cercanía, tu empatía, y tu preocupación por el bienestar de tus estudiantes son aspectos que dicen mucho acerca de tu forma de ser con aquellos que formas a diario. No creo, en este sentido, que el hecho de que tengas siempre la puerta de tu despacho abierta sea casualidad. Gracias porque tu humildad ha supuesto y supone en la actualidad una potente fuente de inspiración para mí. Quisiera agradecerte también la enorme cantidad de tiempo que has invertido en mi formación académica y personal. Me has enseñado a ser altamente perfeccionista con todos los detalles de nuestras investigaciones y a no dar nunca nada por hecho, pero lo que realmente valoro es la tranquilidad y el optimismo que me has transmitido cuando he pasado por momentos difíciles a lo largo de este camino. Ahora echo la vista atrás y veo cuanta razón tenías en todas aquellas charlas que mantuvimos sentados en tu despacho. Finalmente, me gustaría darte las gracias por dejarme participar en tu idea de que la novedad puede ser una necesidad psicológica básica dentro de la teoría de la autodeterminación. Me siento increíblemente afortunado de haber podido aportar mi granito de arena para ayudarte a demostrar que la novedad

es una parte fundamental de la motivación y el bienestar de las personas. Sabemos que tarde o temprano así acabará siendo, si no lo es ya. Mil gracias por todo, David.

No pienso olvidarme tampoco de mi "compi", **María Romero**. María, gracias por todos esos ratos que hemos compartido desde nuestras sillas en el laboratorio, hablando de nuestras inquietudes, de nuestro futuro, y de nuestras dudas existenciales. Estoy convencido, al igual que lo estarán Vicente y David, de que serás una profesional espléndida. Tu capacidad de sacrificio y de esfuerzo por conseguir lo que quieres te llevarán a buen puerto con toda seguridad. Ahora mismo te encuentras en la mitad de este difícil proceso de doctorado, pero no tardarán en llegar los primeros frutos de los muchos que recogerás. Tus pacientes tienen mucha suerte de poder contar contigo y te lo recompensarán con creces. Sigue así compañera.

De igual modo, me gustaría agradecer el apoyo que he tenido durante todo este período de **Eduardo Cervelló**. Muchas gracias, Eduardo, por confiar en mí y estar siempre disponible para ayudarme en todo, especialmente en lo referente a la consecución de una beca de investigación predoctoral. La de papeles que te he hecho rellenar y firmar para ello no lo sabe nadie, pero al final lo conseguimos y gran parte de la culpa la tienes tú. Ha sido un verdadero placer ser tu alumno dentro del grado y también formar parte de la gran familia del CID de la que tantos años te has encargado de guiar, convirtiéndolo en un centro lleno de excelentes profesionales. Aprovecho la oportunidad para darles las gracias a todos ellos también, incluyendo a **Dori**, que todas y cada una de las mañanas me ha recibido en la puerta del laboratorio con un "buenos días" y una gran sonrisa. Así era mucho más fácil comenzar mis días laborales.

También quiero dar las gracias a todos y cada uno de los coautores que han participado en los artículos que componen este documento. Especialmente, quisiera hacer mención especial a tres personas, como son **George Jennings**, **Manuel Alcaraz,**

e Inês Santos. George, thank you very much for receiving me with open arms during my research stay at Cardiff Metropolitan University in Wales. It was an incredible experience in which I lived moments that I will never forget. Our research meetings at The Discovery Inn, our dinners (and desserts) at The Claude and our American coffees at the Students' Union Bar will always remain stored in my memory. Thank you very much for taking care of me. I learned a lot from you, and I enjoyed with you. I hope to visit you again soon. Thanks, friend. Manuel, tu asesoramiento respecto a la racionalidad de los artículos cuantitativos y a los análisis estadísticos que utilizamos han sido vitales para que esta tesis viese la luz. No puedo estar más agradecido de lo que lo estoy contigo por todas las horas que pacientemente me has dedicado, enseñándome estadística a través del descubrimiento guiado y aguantando mi asedio constante de preguntas en algunas ocasiones. Ha sido un lujo increíble poder contar con una persona tan brillante como tú para nuestros trabajos. Muchas gracias, compañero. Espero que tengas la suerte que te mereces en el futuro y que podamos cruzarnos nuevamente en él. Inês, gracias de verdad por atenderme de la mejor manera durante mi estancia portuguesa con vuestro grupo de investigación PANO-SR (Universidad de Lisboa). Siempre te preocupaste de que estuviera cómodo y no me faltase de nada. Aunque solo pude disfrutar de vosotros un mes, fue una experiencia increíble a nivel personal y profesional. Disfruté mucho contigo, al igual que con **Marlene, Jorge, Bruno, Eliana y Antonio**. Además, desde la primera semana me diste a conocer las deliciosas francesinhas portuguesas, que disfruté todos y cada uno de esos maravillosos viernes de reunión gastronómica grupal. Muito obrigado por todo ello, ojalá podamos coincidir nuevamente en un futuro cercano.

No quiero olvidarme tampoco de las instituciones que han sido esenciales para la puesta a punto y desarrollo de los proyectos en los que se enmarca mi tesis doctoral. En

este sentido, me gustaría mostrar mi agradecimiento tanto a la **Fundación MAPFRE** como a la **Escuela de Estudios Universitarios Real Madrid - Universidad Europea de Madrid**, por haber confiado en nuestros proyectos para dotarlos de financiación. Agradecer profundamente también la colaboración del **Hospital Universitario del Vinalopó de Elche** y de todo su personal administrativo y médico. Nada de esto hubiera sido posible sin el generoso apoyo que nos han brindado y sin el inestimable trabajo que realizan con sus pacientes. Adicionalmente, me gustaría dar las gracias a la anteriormente denominada **Conselleria de Educación, Investigación, Cultura y Deporte** (actual Conselleria de Innovación, Universidades, Ciencia y Sociedad Digital) de la Comunitat Valenciana por haberme concedido financiación dentro del marco de las subvenciones para la contratación de personal de investigación de carácter predoctoral (ACIF). Su apoyo ha sido clave para dedicarme plenamente a la realización de esta tesis doctoral. No obstante, la realidad es que este trabajo habría sido inviable sin la participación de los verdaderos protagonistas de los proyectos; los **pacientes** y sus **instructores**. A todos ellos, mi más sincera gratitud por haberse entregado durante tantos meses (años, más bien) con las mediciones y con el propio programa de entrenamiento. Sin todos vosotros, jamás habría podido embarcarme en un proyecto tan bonito como este. Mil gracias.

Llegados a este punto, me gustaría dedicar el siguiente apartado a todas aquellas personas que han formado parte de mi día a día durante los últimos años “fuera de la academia”, pero que han sido parte indispensable de mi desarrollo personal y profesional de uno u otro modo.

Empezaré por las personas que me han acompañado durante más de catorce años en mi formación deportiva como (intento de) atleta. En este sentido, agradecer a mis entrenadores **José Valeriano Zapata y Andrés Alarcón** todo su esfuerzo y cantidad de

tiempo invertido por haber intentado convertirme en un mejor deportista. José, mi familia y yo no olvidaremos todo lo que has hecho por mi hermano y por mí. Siempre te has preocupado por nosotros y así lo has demostrado con tus actos. En la memoria de todos nosotros quedará aquella "maldita" centésima en la pista de Valencia que nos dejaba fuera del Campeonato de España, o aquella vez que llevaste a mi hermano desde Valencia a Alicante en tiempo récord, con final feliz para todos. Son experiencias de aprendizaje que guardaré de por vida en mi memoria. Gracias por haber estado ahí siempre. Andrés, nunca olvidaré tus entrenamientos de "minutos", la isometría, o la cuesta de Arenales del Sol, pero realmente lo más importante que me dejas son tus consejos, tus conocimientos y tu capacidad de haber conseguido que sea una persona más resiliente. Ya sabes que no he sido nunca un gran velocista, pero te aseguro que tus entrenamientos han tenido otros efectos más allá de los puramente fisiológicos en mí, y que probablemente sean más elementales para mi día a día. Conociéndote, sé que estarás de acuerdo con lo que digo. Muchas gracias míster.

A mis compañeros del **C.A. Decatlón Elche** con los que tantos buenos momentos he pasado, **Adrián, Paula, Miguel Ángel, Gonzalo, Rubén, AJ, Fernando, José Antonio Conesa, Javi Alcaraz, Alex Juan** y **Álvaro**. El atletismo me deja gente como todos vosotros. Todos me habéis enseñado algo durante todo este tiempo, tanto en nuestra querida pista de atletismo Manolo Jaén, como fuera de ella. Siempre os desearé lo mejor.

También agradecer a toda la familia de **Mirca Sport** su cariño hacia mí desde que entré a formar parte de ella, especialmente a **Fabián Campanini**. Fabián, gracias por haberme dado la oportunidad de realizar las prácticas de final de grado en vuestra clínica. Desde entonces, más de 250 personas han pasado por nuestras clases de HIT, y varias de ellas siguen viniendo religiosamente desde hace bastantes años ya. Creo que el

ambiente “festivo” que hemos generado cada martes y jueves por la tarde ha mejorado la calidad de vida de muchos de nuestros clientes, algunos de ellos sin experiencia previa en el mundo de la actividad física y el ejercicio. Espero que estés orgulloso de ello. A nivel personal, ha sido una experiencia increíble que me ha permitido escaparme del laboratorio para conocer las necesidades de gente absolutamente maravillosa. A toda esa gente de mis grupos de las 15:00h, 19:30h, 20:00h, 20:30h y 21:00h que han llenado de alegría y buen humor mis tardes, mil gracias también. **Alejandra, Roberto, Juan Carlos**, no me olvido de vosotros. Gracias por aguantar mis “berridos” semanalmente con paciencia y con una sonrisa siempre en la boca. No me hago una idea de cuántas cajas de ibuprofeno habréis gastado después de los dolores de cabeza que os habré generado por mi culpa. Siempre os estaré agradecido por el genial trato que me habéis dado.

En este apartado me gustaría detenerme para agradecer a todo el **FSF Joventut d’Elx** la oportunidad de haberme hecho descubrir un deporte que me resulta apasionante, como es el fútbol sala. Gracias **Esther Menárguez**, por haber confiado en mí plenamente a lo largo de estos cinco años de aventura y por haberme “mimado” tanto como preparador físico del club. Sin duda una de las principales causantes de mi pasión por esto eres tú. Son incontables los momentos que hemos vivido juntos, tanto buenos como malos, pero creo firmemente que la principal sensación con la que debemos quedarnos es con la del increíble crecimiento del club que tanto amas. Todo ello gracias a tu trabajo intenso y desinteresado. Asimismo, me gustaría dar las gracias a todos los integrantes de los **cuerpos técnicos** con los que he podido aprender tanto de este deporte, así como a todas las **jugadoras**, que son las verdaderas protagonistas de esta historia. Me habéis enseñado muchísimas cosas, hemos vivido momentos inolvidables, y me habéis aportado una tremenda felicidad durante todo este período. De

esta experiencia, me llevo amigos y amigas que permanecerán para siempre en mi vida. Gracias de verdad.

Para concluir esta sección de agradecimientos, me gustaría poner el broche final con las personas más importantes de mi vida, **mi familia**.

A mi madre y a mi padre, **Encarni y Fran**, por haber estado siempre ahí para apoyarme y educarme con todo su amor posible. Me resulta muy difícil expresar en palabras la suerte que tengo de tener unos padres como vosotros. Siempre habéis estado a mi lado para darme un abrazo tanto en los momentos buenos como malos de mi día a día. Siempre os habéis preocupado de escucharme y de guiarme cuando ha habido algún desajuste en mi vida. Incluso habéis estado a mi lado para ayudarme a pasar cuestionarios a la base de datos de la que salen algunos resultados de esta tesis doctoral. En definitiva, sois unos padres perfectos. Mamá, gracias por querer lo mejor para mí. Tu energía y vitalidad son mi ejemplo para luchar por las cosas que quiero tener presentes en mi vida. No las pierdas nunca. Muchas gracias también por todo lo que haces por nuestra familia todos los días. Jamás podremos devolverte todo lo que nos has dado cuando no tenías por qué hacerlo. Eres increíble. Papá, podría darte las gracias por muchas cosas, pero esta vez me gustaría dártelas por tu humildad y por tu capacidad de trabajo y sacrificio. Siempre te has preocupado por la felicidad de todos, aunque eso supusiera realizar alguna que otra locura (me viene a la cabeza aquella vez que nos llevaste a Benicarló a competir). Eres el mejor padre del mundo. Ambos sabéis que siempre estaremos unidos, especialmente gracias a nuestra tradicional "caminata" familiar de los domingos que nunca abandonaremos. Os quiero con todas mis fuerzas.

A mi hermano, **Javier**, por todos esos momentos que hemos compartido hablando de metodología de la ciencia y de autores que solo tú conocías. Gracias por escucharme y por darme tu opinión cuando he acudido a ti pidiéndote consejo. Tu sensatez y visión

crítica de las cuestiones que nos rodean me resulta envidiable. Todos sabemos que tienes una mente portentosa que te va a llevar a ser un sociólogo de referencia en el ámbito de la sociología de la ciencia, o de la sociología del conocimiento, o de la sociología de la ciencia del conocimiento (me tienes hecho un lío con este tema). De hecho, estás a punto de emprender los mismos pasos que me han llevado a mí a estar escribiendo estas palabras ahora mismo, por lo que estoy convencido de que más pronto que tarde acabaremos escribiendo nuestro primer "paper" juntos (como sabes, alguna idea loca tenemos ya en la cabeza). Mientras tanto, sigue leyendo tanto como lo haces habitualmente, trabaja con dedicación y con humildad, y cuida de las personas que te quieren. En este sentido, espero que **Marta** y tú seáis muy felices. Formáis una pareja excepcional. Siempre estaré a vuestro lado para lo que necesitéis. Os deseo toda la suerte del mundo.

A mi compañera de vida, **Sara**, por estos seis años llenos de felicidad y amor mutuo. Ambos sabemos que no ha sido fácil mantener nuestra relación tan viva como la hemos mantenido a lo largo de todo este tiempo. Demasiados kilómetros de AVE, de BlaBlaCar y de aviones hacia (o desde) Madrid y Palma para recibirnos siempre con un abrazo y una sonrisa. Incontables horas detrás de Skype o de videollamadas de WhatsApp hablando sobre los planes que nos hubieran gustado hacer si hubiésemos estado juntos en esos momentos. Todo ello ha merecido la pena. Gracias por haber creído siempre en nosotros. Gracias también por tu apoyo incondicional durante la realización de esta tesis doctoral, apoyándome a tomar decisiones que ni yo mismo tenía claras, acompañándome a congresos en el extranjero para que me sintiese más tranquilo, y animándome a trabajar incluso cuando no debía hacerlo cuando me has visto agobiado. Eres la persona más buena y solidaria que conozco. Sin tu comprensión y tus palabras de aliento no hubiera sido posible llegar hasta aquí. Aunque ya lo sabes, me

gustaría decirte una vez más que eres un pilar fundamental de mi vida. Ahora que te has embarcado en el estresante camino de opositar, espero por lo menos estar a la misma altura de lo que lo has estado tú conmigo. En este sentido, quiero decirte que te admiro por tu valentía a la hora de decidir el rumbo de tu propia vida. Pocas personas se atreven a luchar contra el miedo de tener que abandonar caminos que apasionan pero que están llenos de piedras que los hacen intransitables. Y tú lo has hecho. De tu mano iré siempre en cada decisión que tomes. Te quiero con todo mi corazón. Al igual que quiero a nuestra **Bimba**, quien nos tiene completamente enamorados de ella y nos alegra los días con esa carita y orejas que tiene. Estoy convencido de que le hubiera encantado conocer y compartir su pelotita rosa con nuestro **Rufo**.

Finalmente, muchas gracias también a mis suegros **Ángela y Juan,** y a mi cuñada **Paola**, por recibirme siempre en su casa con los brazos abiertos (aunque casi siempre llegue a la hora de la siesta o por la noche). No podría tener más suerte con vosotros tampoco. Gracias de verdad.

Por último, me gustaría disculparme si en la redacción de este apartado me he olvidado de mencionar a alguien. Tengo la suerte de sentirme querido por todas las personas que componen los entornos de mi vida diaria y todos merecéis un espacio dentro de este apartado, así que espero que no se haya dado el caso. Para terminar, quisiera dedicar esta tesis doctoral a las dos mujeres de mi vida, mi madre Encarni y mi novia Sara, y a los dos hombres que más quiero en el mundo, mi padre Fran y mi hermano Javier. Sin vosotros ninguna de estas líneas jamás hubiera sido escrita. Os adoro.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF TABLES AND FIGURES

Tables

Figures

ABREVIATTION LIST

ABBREVIATION LIST

Abbreviation	Meaning
AF	Actividad Física
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
BMI	Body Mass Index
CG	Control Group
CI	Confidence Interval
ES	Effect Size
EWL	Excess Weight Loss
HRQoL	Health-Related Quality of Life
M	Mean
MCS	Mental Component Summary
MPAI	Motivational Physical Activity Intervention
MPAI-G	Motivational Physical Activity Intervention - Group
MVPA	Moderate to Vigorous Physical Activity
PA	Physical Activity
PCS	Physical Component Summary
SDT	Self-Determination Theory
SD	Standard Deviation
SF-36	Short-Form 36 Health Survey
SG	Sleeve Gastrectomy
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

ABSTRACT/RESUMEN

ABSTRACT

This PhD thesis includes a set of studies addressing 1) psychosocial effects of surgery and physical activity (PA) in bariatric patients, 2) the role of social discourses such as healthism in the experiences of weight stigmatization, 3) changes on bariatric patients' health-related quality of life (HRQoL), PA levels, and exercise motivation derived from a postoperative motivational PA program, and 4) facilitators and barriers perceived by bariatric patients to do PA one year after finishing this program. Overall, this thesis examines the psychosocial processes hidden behind the (non)acquisition of an active lifestyle by this population. Taking these processes into account, the role of a postoperative PA intervention based on a motivational framework to promote long-term active lifestyles in these patients is also explored. Data were obtained from both quantitative and qualitative techniques. The document begins with a review of the literature on the psychosocial effects of surgery and PA in bariatric patients. Afterwards, four studies are presented. **Study 1** qualitatively explores how weight stigma is constructed, manifested and maintained by the social discourse of healthism through experiences of social, healthcare and self-stigma in women who had lived with morbid obesity. It also examined the role that healthism plays in the construction of some theoretical dimensions of stigma that are closely linked to weight stigma. In brief, this study brings to light the neoliberal values associated with healthism, which are manifested in the day-to-day lives of people with obesity, causing situations of stigmatization and discrimination that ultimately promote inequality and social injustice. **Study 2** analyses the effects of a 6-month postoperative motivational PA intervention on bariatric patients' PA levels and HRQoL from pre-surgery to the end of the intervention (7 months post-surgery) and 13 months post-surgery. The program was based on self-determination theory. Results of this study showed that PA levels did not

significantly differ between experimental and control groups as a consequence of the intervention. Nonetheless, clinically significant differences favoring the experimental group were found for several dimensions of bariatric patients' HRQoL. Based on this work, the **Study 3** examines the associations between bariatric patients' motivation and PA levels after the intervention. It also explores how patients' perception of autonomy support and basic psychological need satisfaction during the program were associated with changes in their motivation to exercise. Results illustrated decreases in controlled forms of motivation and amotivation, which were related to higher PA. However, introjected regulation increased, and it was also related to higher PA. On the other hand, bariatric surgery patients perceived a high autonomy support and satisfied their basic psychological needs during the program, which were associated with positive changes in their exercise motivation. Finally, from a socio-ecological and qualitative perspective, **Study 4** identifies the facilitators and barriers that bariatric patients perceived to do PA one year after finishing the PA program. It revealed that both individual (in a psycho-physical sense) and environment (understood as a blend of familial, social, economic and atmospheric conditions) played a major role in the consolidation of (in)active lifestyles of bariatric patients. Taken the results of the studies together, this PhD thesis ends by proposing some practical implications and conclusions which could be useful for health professionals. Future research directions emerging from this work are also mentioned.

RESUMEN

Esta tesis doctoral incluye un conjunto de estudios sobre 1) efectos psicosociales de la cirugía y de la actividad física (AF) en pacientes bariátricos, 2) el rol de discursos sociales como el salutismo en las experiencias de estigmatización de las personas con elevado peso corporal, 3) cambios en la calidad de vida percibida, niveles de AF, y motivación hacia el ejercicio de los pacientes bariátricos derivados de un programa postoperatorio y motivacional de AF, y 4) facilitadores y barreras percibidas por los pacientes bariátricos para hacer AF un año después de acabar dicho programa. En general, la tesis examina los procesos psicosociales que se esconden detrás de la (no)adquisición de un estilo de vida activo por parte de esta población. Teniendo en cuenta estos procesos, se explora también el papel de una intervención postoperatoria de AF basada en un marco teórico motivacional para promocionar los estilos de vida activos de los pacientes bariátricos a largo plazo. Los datos fueron obtenidos a través de técnicas cuantitativas y cualitativas. El documento empieza con una revisión de la literatura sobre los efectos de la cirugía y de la AF en pacientes bariátricos. Después, se presentan cuatro estudios. El **Estudio 1** explora cualitativamente como el estigma del peso es construido, manifestado y mantenido por el discurso social del salutismo a través de experiencias de estigmatización social, sanitaria, e incluso de auto-estigmatización en mujeres que vivieron con obesidad mórbida. Se examina también el rol que juega el salutismo en la construcción de algunas dimensiones teóricas del estigma que se relacionan estrechamente con el estigma del peso corporal. De forma resumida, este estudio pone de manifiesto los valores neoliberales asociados al salutismo, que se manifiestan en el día a día de las personas con obesidad, causando situaciones de estigmatización y discriminación que promueven la desigualdad y la injusticia social. El **Estudio 2** analiza los efectos de una intervención postoperatoria y

motivacional de AF de 6 meses de duración sobre los niveles de AF y calidad de vida percibida de los pacientes bariátricos desde la pre-cirugía hasta el final de la intervención (7 meses post-cirugía) y 13 meses post-cirugía. El programa se basó en la teoría de la autodeterminación. Los resultados de este estudio mostraron que los niveles de AF no difirieron significativamente entre el grupo experimental y control como consecuencia de la intervención. No obstante, se encontraron diferencias clínicamente significativas a favor del grupo experimental para varias dimensiones de la calidad de vida percibida por los pacientes. Basado en este trabajo, el **Estudio 3** examina las asociaciones entre la motivación de los pacientes bariátricos y sus niveles de AF después de la intervención. También explora la forma en la que su percepción del apoyo a la autonomía y la satisfacción de sus necesidades psicológicas básicas durante el programa se asociaron con los cambios en su motivación hacia el ejercicio. Los resultados ilustraron disminuciones en formas controladas de motivación y desmotivación, las cuales se relacionaron con mayores niveles de AF. No obstante, su regulación introyectada aumentó, y también se relacionó con realizar más AF. Por otro lado, los pacientes bariátricos percibieron un alto apoyo a la autonomía y satisficieron sus necesidades psicológicas básicas durante el programa, lo que se asoció con cambios positivos con su motivación hacia el ejercicio. Finalmente, desde una perspectiva socio-ecológica y cualitativa, el **Estudio 4** identifica los facilitadores y las barreras que los pacientes bariátricos percibieron para hacer AF un año después de finalizar el programa motivacional de AF. El trabajo reveló que tanto el individuo (en un sentido psicofísico) como el ambiente (entendido como una mezcla de condiciones familiares, sociales, económicas y atmosféricas) juegan un papel muy relevante a la hora de consolidar los estilos de vida (in)activos de los pacientes bariátricos. Tomando en conjunto los resultados de los estudios, esta tesis doctoral finaliza proponiendo algunas

implicaciones prácticas y conclusiones que podrían ser de utilidad para los profesionales de la salud. Algunas futuras líneas de investigación derivadas de este trabajo también son mencionadas.

INTRODUCTION

INTRODUCTION

In 2018, the World Health Organization (WHO) released concerning data on increases in obesity rates around the world (WHO, 2018). These data warned that worldwide prevalence of obesity nearly tripled between 1975 and 2016, currently affecting about 13% of the world's adult population (11% of men and 15% of women). Together, the prevalence of severe or morbid obesity, defined as having a body mass index (BMI) greater than or equal to 40 kg/m^2, a BMI of greater than 35 kg/m^2 with at least one serious obesity-related condition, or being more than 100 pound over ideal body weight (IBW), is also increasing rapidly (Basterra-Gortari et al., 2011; Ward et al., 2019). As examples, countries such as Spain have evolved from 1.8 to 6.1 severe obesity cases per thousand participants from 1993 to 2006 (Basterra-Gortari et al., 2011). Meanwhile, countries like the U.S. predict that about 1 of each 4 adults will have severe obesity by 2030, having a prevalence greater than 25% in 25 of their states, and being the most common BMI category among women, non-Hispanic black adults, and low-income adults (Ward et al., 2019).

The adverse health implications of severe obesity have been profoundly described by epidemiological and meta-analytical research (Aune et al., 2016; Bhaskaran, dos-Santos-Silva, Leon, Douglas, & Smeeth, 2018). Possibly, one of the most important health consequences has to do with the impact on the life expectancy of individuals with severe obesity. In this regard, having a BMI $\geq$ 40 kg/m^2 has been associated with shortening of life expectancy by 9.1 years in men and 7.7 years in women (Bhaskaran et al., 2018). Given this worrying stat, bariatric surgery has gained popularity as a method to induce sustained weight loss changes after failed behavioral and pharmacologic weight loss therapies in this population (Kang & Le, 2017). According to the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO,

2019), bariatric surgery leads to 31.1% weight loss on average during the first year after surgery, which in turn is associated with several improvements for the patients' health and well-being, including large reductions in medication for obesity-related diseases such as type 2 diabetes (64.2% of patients no longer needed their medication), hypertension (45.4%) and dyslipidemia (51.8%).

However, research on lifestyles and post-bariatric patients shows the complexity of changing some of their behaviors after the operation, among which physical inactivity stands out (Bond et al., 2017). Authors such as King et al. (2012, 2015) have shed light on this matter, revealing that most patients remain inactive and far from the recommended physical activity (PA) guidelines for general health and weight control. In fact, some evidence has observed that about 50% of patients experimented weight regain after surgery (Magro et al., 2008). For that reason, there is a need of research on the personal and environmental factors that help or hinder PA adoption by this population. The need is even greater if we consider the role of PA as a fundamental adjunct not only to prevent weight regain (Egberts, Brown, Brennan, & O'Brien, 2012), but also to produce additional post-surgery improvements related to metabolic health (Coen & Goodpaster, 2016), cardiorespiratory fitness (Tettero et al., 2018), or psychosocial health (Maggisano et al., 2019), among other variables.

This dissertation emerges from these concerns. Framed on the research projects 'Physical and psychological effects of an exercise program in bariatric patients', funded by the Escuela de Estudios Universitarios Real Madrid - Universidad Europea de Madrid, and 'Physiological and psychological effects of a physical activity program on bariatric patients', funded by the Fundación MAPFRE, the present PhD dissertation consists of a literature review and four studies addressing the "more psychological part" of these projects. Previously, my colleague Artur Marc Hernández presented in 2017 his

thesis titled 'Pre and postoperative effects of different exercise programs in patients undergoing bariatric surgery', in which he explored the benefits of these programs in variables related to physical fitness, cardiovascular risk factors, and weight regain. The results of this PhD thesis revealed the potential of preoperative PA programs to improve patients' cardiovascular risk factors and decrease their total weight and fat mass, reducing their preoperative risk and facilitating the surgery process. Artur also found several benefits of carrying out postoperative PA programs in parameters related to physical fitness and weight regain. For his part, Ángel Megías Boró presented (also in 2017) the thesis 'Morbid obesity and physical activity: from frustration to satisfaction of basic psychological needs', which is based in three qualitative studies focused on understanding the psychological, social and behavioral factors associated with the etiology of morbid obesity; understanding how morbid obesity can impair optimal functioning and well-being via experiences of psychological need frustration; and analyzing the psychosocial benefits that post-bariatric patients perceived from their participation in an exercise program grounded in self-determination theory (SDT). The results of this PhD thesis illustrated the advisability of incorporating psychological aspects based on SDT in diets and PA programs, as well as developing coping strategies and social interventions to reduce the stigmatizing effects of social discourses on obesity.

My thesis is complementary to what Ángel did a few years ago. Due to the influence of our PhD supervisors (who are the same), both theses are concerned with the psychosocial processes that lead people with severe obesity to acquire (in)active lifestyles. In addition, both documents use qualitative methodology in their studies, convinced of the importance of this research methodology to explore perceptions and thoughts of individuals that are difficult to capture under other types of research

approaches. However, there are several aspects that differentiate the present dissertation with respect to my colleague's thesis, including a previous literature review on the psychosocial effects of surgery and physical activity in bariatric patients, different study objectives, different theoretical frameworks to interpret the results obtained, and the use of quantitative methodology to analyze data derived from the psychosocial part of the research projects. Next, I will explain the rationale for incorporating each article within this thesis, as well as the differentiating aspects previously commented:

Study I

The first study is titled 'Healthism and the experiences of social, healthcare and self-stigma of women with higher-weight', and it was published in the journal *Social Theory & Health*. This is perhaps the most thought-provoking work included in this dissertation. In it, we adopt a relativist ontology and a constructionist epistemology to analyze how the social discourse of healthism contributes to the social construction of weight stigma in women with higher-weight. Although this work is not directly related to the patients' PA, we include it in this PhD document because it illustrates the uncomfortable daily situations that people usually have to deal with in different life contexts due to their high weight, and especially when they are women. The rationale of including it makes more sense when we are talking about women who were part of the experimental group framed in the exercise intervention analyzed by this thesis. For that reason, we believe that this view complements the approaches of the other articles when explaining the psychosocial processes that may affect the (non)acquisition of an active lifestyle by them. Note that we used the term "women with higher-weight" instead of "women with obesity" or "obese women" following the advice collected by Angela Meadows and Sigrún Daníelsdóttir in their paper on weight stigma and terminology (2016).

From our perspective, the main novelty of the study lies in the combination of two different theories to interpret the experiences of social, healthcare and self-stigma of nine women who had lived with high weight during many years, and that had made the decision to reduce it by undergoing bariatric surgery. This mixture of theories stems from our interest in socially interpreting the data, and not just describing them (Braun & Clarke, 2006). In this way, we selected the theory about healthism as a well-established theoretical framework to study how frequently society situates fatness, and its solutions, uniquely at the level of the individual (Crawford, 1980). Together with it, we tried to identify some dimensions that post-Goffmanian authors such as Jones et al. (1984), Feldman and Crandall (2007), or Corrigan et al. (2000) devised for mental stigma (e.g., origin, controllability, concealability, aesthetics and pity) to the stigma suffered by people with higher-weight, while also exploring the role that healthism plays in the creation and perpetuation of these dimensions. Consequently, we wrote an article where all coauthors and I finally put on manifest how the neoliberal values of individualism and consumerism are usually hidden behind the stigmatizing life experiences of people with higher-weight.

At this point, it is necessary to emphasize that Ángel Megías already warned about some of these stigmatizing episodes in his dissertation. Using SDT, he explored the impact of living with morbid obesity on individuals' experiences of psychological need frustration. His results make an interesting contribution when it comes to understand the personal and social factors that thwart basic psychological needs satisfaction in this population, leading to negative cognitive, affective, and behavioral consequences which result from experiences of need frustration and impact of daily living. At the end, Ángel also alerts about how society supports obesity discourses throughout building negative attitudes and behaviors towards people with higher-

weight, which ultimately thwart their needs. This is what the article of the present thesis adds. We inquire into the *intentional* creation of a concrete obesity discourse such as healthism to maintain certain neoliberal values that reject anyone who does not adapt to them, as is the case of the people who support this document. The difference between both works, therefore, is the use of different theoretical frameworks to analyze people's subjective reality and the social origin of their stigmatizing experiences.

Study 2

The second study we present in the thesis is entitled 'Changes in bariatric patients' physical activity levels and health-related quality of life following a postoperative motivational physical activity intervention', and it was published in *Obesity Surgery*. This work is the first of the two included studies that use quantitative methodology to examine the effects of a 6-month postoperative motivational PA intervention on a group of bariatric patients. Concretely, we explored the possible changes on their PA levels and health-related quality of life (HRQoL) from pre-surgery to the end of the intervention (7 months after surgery) and 13 months post-surgery. This work is partially inspired by the qualitative results obtained in the Ángel's thesis, which were published in the Journal of Health Psychology (see González-Cutre, Megías, Beltrán-Carrillo, Cervelló, & Spray, 2020), and where they found positive results related to some HRQoL' dimensions (e.g., pain reduction) and intention to be physically active after the intervention. In this line, we corroborated these results by taking advantage of the quantitative data (i.e., questionnaires and accelerometry) derived from the psychosocial part of the research projects.

As a final product, we performed a study that shows several innovative issues that differentiate it from previous specialized literature. Probably the main study strength is associated with the own postoperative PA intervention performed with patients, which

contained elements in its design that are worth being highlighted. The first remarkable aspect is the face-to-face and supervised character of the intervention. We made a 6-month intervention where the patients came to train with us, and where they had exercise professionals at their disposal guiding them in the training process. This is no longer too common in research on bariatric patients and PA. Normally, postoperative intervention studies conduct counseling sessions where patients are advised about PA contents, but *outside* the gym (Bond et al., 2015). When they have been done *within* the gym, efforts have traditionally focused on enhancing physical aspects, but not psychosocial aspects to encourage PA after the end of such interventions (Stolberg et al., 2018). The second notable aspect of our program would be related to this detail. Framed on SDT (Ryan & Deci, 2017), instructors were trained to apply diverse motivational strategies to patients while they were training, aimed at promoting their motivation towards PA and exercise. Additionally, we adjusted some structural aspects of the program in line with this theoretical framework. For example, patients trained in group to foster their relatedness, which is considered a basic psychological need related to positive motivation' outcomes and adaptative consequences (e.g., enjoyment or adherence to PA). Finally, the use of a unique motivational framework within this study could be its third remarkable point. As we explain in the article, only Bond and colleagues (2015, 2016, 2017) has applied behavioral theory within a PA program to improve bariatric patients' adherence to PA. However, they used several principles of various theories at the same time, which did not allow them to explore the isolated role of a concrete theory in their intervention. For that reason, our study is the first carried out with bariatric surgery patients that has developed a supervised PA intervention based on a single motivational framework such as SDT.

Study 3

The third study, entitled 'Motivation and physical activity levels in bariatric patients involved in a self-determination theory-based physical activity program', derives from Study 2. This work is published in *Psychology of Sport & Exercise*. Based on the results found in Study 2 for PA variables, our main objective was to examine the associations between changes in bariatric patients' motivation and PA levels following the aforementioned postoperative PA program based on SDT. We also explored the extent to which patients' perception of autonomy support and basic psychological need satisfaction during the program were associated with changes in their motivation to exercise. The current study represents the second and last work included in this thesis which employs quantitative methodology.

Overall, our intention was to show the patients' evolution of their motivational processes towards PA following the program. This work makes more sense if we consider that the intervention failed to increase PA levels of patients who participated in the intervention. Therefore, we were interested in knowing *what did not work* by establishing associations between pre- to post-intervention changes in both variables (motivation and PA). Previously, Bond et al. (2016) performed a similar work where they achieved significant increases in daily bout-related moderate-to-vigorous PA after a preoperative behavioral PA intervention, but they did not find relationships between objectively measured PA changes and motivational processes. At this point, an aspect that differentiates Bond et al's work from this study is related to the PA variables included in the analysis. While Bond et al. (2016) included two variables associated with moderate-to-vigorous PA, we add also sedentary activity and light PA. This is perhaps one of the main contributions of this work. Although research has showed that moderate-to-vigorous PA is associated with higher health benefits, we consider it relevant to further study the motivational processes that could be related to decreases in

sedentary activity and increases in light activity as a first step to engage patients in active habits. This makes special sense when we talk about populations groups who are particularly inactive, as is the case of bariatric surgery patients. Additionally, promoting light activity could be a more attainable option than moderate-to-vigorous PA recommendations to initiate in exercise (Chastin et al., 2019).

Another potential contribution is represented by the fact that we measured the patients' perception of autonomy support that their instructors gave them during the program, and the extent in which their basic psychological needs for autonomy, competence and relatedness were fulfilled. Taken these variables, we related them to the pre- to post-intervention changes in each type of motivation we measured. To our knowledge, our study is the first who has explored the associations between variables related to the role of the instructors' intervention and changes in types of motivation in bariatric surgery patients after a motivational PA program. Previously, Ángel Megías qualitatively reported experiences of patient satisfaction with the performance of their instructors, along with improvements in their motivation to exercise (González-Cutre et al., 2020). This study allowed us to quantitatively corroborate these results and establish associations between both groups of variables.

Study 4

The fourth and last study included in this thesis is entitled 'Exploring the socio-ecological factors behind the (in)active lifestyles of Spanish post-bariatric surgery patients', and it was published in the *International Journal of Qualitative Studies on Health and Well-Being*. This research presents qualitative data about the bariatric patients' intention to perform PA just after finishing the motivational PA program. Likewise, the study also shows the facilitators and barriers that patients found to perform PA one year after participating in such program. We focus the article under a

socio-ecological perspective, where personal, physical environmental and social environmental factors were considered to explain the (in)active behaviors of bariatric patients.

Taking into account the patients' opinions and experiences, we close the thesis by adding qualitative evidence to the quantitative results presented in Studies 2 and 3 on this matter. In our view, this article provides a global perspective about the complexity of adopting or maintaining an active lifestyle in these individuals even after participating in a supervised PA program. Again, this work and the one carried out by Ángel have some similarities and differences that are worth highlighting. In his dissertation, Ángel already collected several patients' experiences about their positive intentions to become physically active after the program. Based on SDT, Ángel also found positive consequences related to body image improvements, fun, self-confidence and attitudes for a better social life during the program. We corroborated part of his results but using a socio-ecological model to interpret the patients' experiences from another perspective. For example, we also included results associated with positive intentions to perform PA by patients after the program. However, while Ángel considers this result as a personal consequence derived from the patients' improved motivation towards exercise, we put the focus on the role of instructors as potent socio-environmental factors for the promotion of PA in this population. Thus, the theoretical framework chosen allowed us to adopt *a more ecological stance* in this work. Another difference is constituted by the temporal space in which the qualitative data were collected in both studies. Ángel included data regarding what was happening during and just after the program, while we included what happened a year after it. This circumstance allowed us to explore the facilitators and barriers that patients found to do PA when they *returned to reality*. That is, when they did not have the supervision of

their instructors and the support of the other patients. This is probably one of the strengths of this article. By exploring the impact of ending the program for patients, we can get an idea of the importance that these programs can have on the patients' well-being and, therefore, on the possible suitability of including them in public health systems.

Final preliminary considerations

Before moving on to the presentation of the literature review and the full studies included in this dissertation, there are some additional considerations that deserve to be considered. First, we would like to justify the choice of the title that gives name to this doctoral thesis. The sentence of the title "bariatric patients are them, and their circumstances", paraphrases a famous sentence written in 1914 by the Spanish philosopher José Ortega y Gasset in his work "Meditaciones del Quijote" [Meditations on Quixote]. This sentence was the following "yo soy yo y mi circunstancia" [I am I and my circumstance]. With this phrase, Ortega y Gasset meant that people's lives are irretrievably composed of their "self", but also of the environment that surrounds them. Thus, the circumstances that surround people directly impact and influence them, shaping them together with their own "self". These circumstances, therefore, should also be understood by the individuals themselves. If we pay attention on the population analyzed in this document, we understand that this thesis constitutes a good example of efforts focused on understanding those circumstances that surround bariatric patients, which end up influencing their "self" (and their health, well-being and quality of life) and facilitating or harming their PA behavior.

Second, this thesis is framed by mixed research methods and crosses transversally multiple knowledge disciplines such as health psychology, health sociology, and medicine. It includes from qualitative articles published in social theory journals to

quantitative articles published in biomedical journals. The reason for this approach is underpinned by the way my supervisors and I understand science, and its different epistemologies and ontologies. We declare in this sense our deep respect for all research methodologies, as long as they are carried out systematically and coherently. Personally, I would also like to express my gratitude to my supervisors for having trained me in this methodological pluralism. I honestly think that the work done by Onwuegbuzie and Leech (2005) about being a pragmatic researcher gathers many of the thoughts that my supervisors and I have discussed so many times on this matter, which could perhaps be included in the following fragment:

> *"By having a positive attitude towards both techniques, pragmatic researchers are in a better position to use qualitative research to inform the quantitative portion of research studies, and vice versa. For example, the inclusion of quantitative data can help compensate for the fact that qualitative data typically cannot be generalized. Similarly, the inclusion of qualitative data can help explain relationships discovered by quantitative data"* (Onwuegbuzie & Leech, 2005; p. 383).

As it will be discovered throughout the studies, I believe this doctoral thesis illustrates a clear example of what it is declared in the previous quote.

Third, we have to emphasize that the quantitative variables introduced in this document do not assume all the variables that our research group has measured throughout the projects. Regarding psychosocial constructs, they can be consulted at clinicaltrials.gov with registration number NCT03666481. Physical constructs derived from the physical part of the research projects can also be consulted in this database with registration number NCT03613766. It is our intention to continue providing

scientific evidence on the remaining variables in the future, combining them even with qualitative data to carry out mixed methods studies.

Fourth, it should be noted that published studies included in this thesis have been published in both American and British English-speaking journals. However, we have opted for American English to write the entire document. The reasons for choosing this version are justified because most of the specialized scientific evidence around this population is usually published in American journals. The references format has also been unified and followed the 6th edition of the American Psychological Association (APA) Publication Manual. With regard to language form, it is necessary to highlight the preference of first-person plural instead of first-person singular for all those sections that allow it, as the reader will have already noticed. This choice refers to all the components of the research team that have actively participated in this process.

Fifth, according to the regulations of the Doctorate Program in Sport and Health of the Miguel Hernández University of Elche to apply for the international PhD mention, some sections such as the abstract and the conclusions appear in Spanish, in addition to the English language. The four studies that make up this document also appear in English, since they have been published or will be published in English-speaking journals.

Sixth, we would like to thank all the patients involved in the research projects, for being the main protagonists of this dissertation. We would also like to thank the exercise instructors for their efforts and professionalism during the PA program and for their caring attitude toward the patients during the training sessions. Thanks also to the University Hospital of Vinalopó of Elche for kindly collaborating with us and making possible the recruitment of patients for this project. Without the generous support of the hospital and its medical and administrative staff, it would have been impossible to carry

out the intervention. Finally, we really appreciate the role of the funders, Escuela de Estudios Universitarios Real Madrid - Universidad Europea de Madrid and Fundación MAPFRE, for making these projects viable. I would also like to personally thank the Valencian Council of Education, Research, Culture and Sports for supporting me through a predoctoral grant with reference ACIF/2017/155. Institutional support has been essential to get fully involved in this doctoral thesis.

A LITERATURE REVIEW

Psychosocial effects of surgery and physical activity in bariatric patients

Introduction

Obesity has become one of the major health problems of today's society, affecting more than 500 million people worldwide in 2008 (World Health Organization, 2014). Moreover, severe or morbid obesity (defined as having a Body Mass Index [BMI] ≥ 40 kg/m^2) is increasing at an exponential rate and reaching epidemic proportions (Josbeno, Jakicic, Hergenroeder, & Eid, 2010; Sturm, 2003).

The impact of morbid obesity on the physical, psychological and social health of patients is significant (Costa, Yamaguchi, Santo, Riccioppo, & Pinto-Junior, 2014; van Hout et al., 2006). With regard to physical health, several studies have shown an association between morbid obesity and the manifestation or aggravation of a variety of other health problems such as diabetes mellitus, cardiovascular risk, hypertension, dyslipidemia, cancer, obstructive sleep apnea, or joint disease (Haslam & James, 2005; Kwok et al., 2014; Ricci, Gaeta, Rausa, Macchitella, & Bonavina, 2014; Shetty & Schmidhuber, 2006). Concerning psychological and social health, this condition is also associated with depression, negative body attitude, poor body image, low self-esteem, low health-related quality of life (HRQoL) (de Zwaan et al., 2014; Grilo, Masheb, Brody, Burke-Martindale, & Rothschild, 2005; Hainer, Toplak, & Mitrakou, 2008; Lier, Biringer, Hove, Stubhaug, & Tangen, 2011; Mathus-Vliegen, & de Wit, 2007; Strain et al., 2014), discrimination, stigmatization, dissatisfying relationships, and occupational problems (Chen & Brown, 2005; Puhl & Heuer, 2010; van Hout et al., 2006).

In order to avoid these issues and achieve a healthy condition, people suffering from morbid obesity need to follow medical treatment, including changes in their diet and physical activity (PA) habits (Avenell et al., 2004). However, sometimes, these methods are not sufficient for people who suffer this type of obesity, and they must resort to other methods such as bariatric surgery. Bariatric surgery is currently

considered the most effective treatment to achieve sustained weight loss in patients with severe obesity (Buchwald et al., 2004). In its various procedures, this surgery can either involve stomach restriction alone or combine stomach restriction with intestinal diversion (Padwal et al., 2010) in order to reduce calorie intake and minimize or eliminate the numerous consequences of obesity through sustained weight loss. In this way, bariatric surgery can decrease obesity-associated diseases and lead to physical, psychological and social benefits (Mathus-Vliegen & de Wit, 2007). Several studies have shown a remission of Type 2 diabetes, a reduction of musculoskeletal pain, hypertension, and lipid disturbances, and a decrease of mortality from diabetes, cardiovascular diseases and cancers after bariatric surgery (Moya et al., 2014; Svane & Madsbad, 2014). Moreover, improvements after surgery have also been found in HRQoL, body image, anxiety, depression and other mental health disorders (Greenberg, Sogg, & Perna, 2009; Lier, Biringer, Hove, Stubhaug, & Tangen, 2011; Madan, Beech, & Tichansky, 2008; Mathus-Vliegen & de Wit, 2007; Strain et al., 2014).

Nevertheless, the surgery will not succeed if it is not followed by a change in the patients' lifestyle, including an appropriate diet and sufficient participation in PA. The role of PA for optimizing bariatric surgery outcomes has been receiving growing attention, and it is considered an important adjunct to bariatric surgery in the treatment of severe obesity (Herman, Carver, Christou, & Andersen, 2014). PA has been found to be a determinant of the long-term maintenance of weight loss after bariatric surgery (Jakicic, Clark, & Coleman, 2001; Moya et al., 2014), avoiding weight regain and the return of comorbidities associated with this condition (Sjöström et al., 2004). PA is also an important contributor to the prevention or treatment of psychological disorders such as depression or anxiety, and it is associated with improved quality of life after surgery (Bond et al., 2009; King et al., 2013). Moreover, PA can serve as an intermediary to

enhance the participation of bariatric patients in social activities (Wiklund, Olsén, Olbers, & Willén, 2014), to reduce their feelings of embarrassment and to increase their self-confidence (Wouters, Larsen, Zijlstra, & van Ramshorst, 2011).

In the scientific literature, there are already reviews focused on the psychosocial effects of surgery in bariatric patients (Livhits et al., 2011; Pataky, Carrard, & Golay, 2011; Sarwer et al., 2008). However, these reviews do not include either the most recent studies about this topic or studies based on qualitative methodology, which can contribute to understand in depth the psychosocial effects of surgery in these patients. In addition, although there are reviews about the physical effects of PA in bariatric patients (Egberts, Brown, Brennan, & O´Brien, 2012; Gourland, Trouilloud, & Sarrazin, 2011), there are no studies reviewing the psychosocial effects of PA in this population.

Therefore, the aim of this work was to perform a systematic review of the scientific literature concerning the psychosocial effects of surgery and PA in bariatric patients. This review collects the information provided by the most recently published articles and studies based on both quantitative and qualitative methods. In view of the evidence collected in this review, we propose several conclusions and recommendations linking current knowledge with future research and future health-care interventions with this population.

Method

Data sources and search terms

The electronic search was performed using the MEDLINE and SCOPUS databases up to March 2015. Searches included various combinations of five sets of terms: 1) Terms concerning surgery: bariatric surgery; 2) Terms concerning PA: physical activity, exercise; 3) Terms concerning psychological effects: psychological

changes, psychological outcomes, self-esteem, self-efficacy, depression, anxiety, body image; 4) Terms concerning social effects: social isolation, discrimination, social relationships, social support; 5) Terms concerning general psychosocial effects: psychosocial factors, mental health, quality of life. Complete search strategies can be obtained from the authors.

Literature screening and catalogue construction

The selection of studies focused on the psychosocial effects of surgery and PA in bariatric patients was carried out through two levels of screening, represented in Figure 1. At Level one screening, abstracts were reviewed for the following exclusion criteria: publication of abstracts only, case reports, letters, guides or guidelines, comments, and reviews. Eleven out of 58 articles were rejected after reviewing the abstracts for meeting these exclusion criteria established at Level one. Full articles were then obtained for the remaining 47 studies accepted at Level one. For Level two screening, inclusion required the studies to deal with the following categories of information: longitudinal, cross-sectional or qualitative studies with patients who underwent bariatric surgery (regardless of the surgery method performed), studies analyzing psychosocial effects of surgery and/or PA in bariatric patients. In this case, 10 studies did not meet inclusion criteria for the catalogue: 6 studies contained samples of patients who were candidates for surgery, but had not yet undergone bariatric surgery (Boeka, Prentice-Dunn, & Lokken, 2010; Friedman, Ashmore, & Applegate, 2008; Hübner et al., 2014; King et al., 2013; Sarwer, Fabricatore, Eisenberg, Sywulak, & Wadden, 2008; Sierra-Murguía et al., 2012); 1 study analyzed whether weight discrimination was associated with becoming and remaining obese over a four-year period, but participants did not undergo bariatric surgery (Sutin & Terracciano, 2013), 2 studies compared

psychological effects of patients who had undergone bariatric surgery and then underwent another surgery, such as body contouring surgery, so they did not exclusively assess, in any participant or group of participants, the psychological effects of bariatric surgery (Aldaqal et al., 2013; Gilmartin, Long, & Soldin, 2014); and 1 study examined the habits making the operation successful, without assessing psychosocial effects (Cook & Edwards, 1999). Finally, 37 articles were selected: 29 of them analyzed the psychosocial effects of bariatric surgery, 7 of them analyzed the psychosocial effects of PA on bariatric patients, and 1 of them (Wiklund, Fagevik, Olbers, & Willén, 2014) analyzed the psychosocial effects of both bariatric surgery and PA on this population.

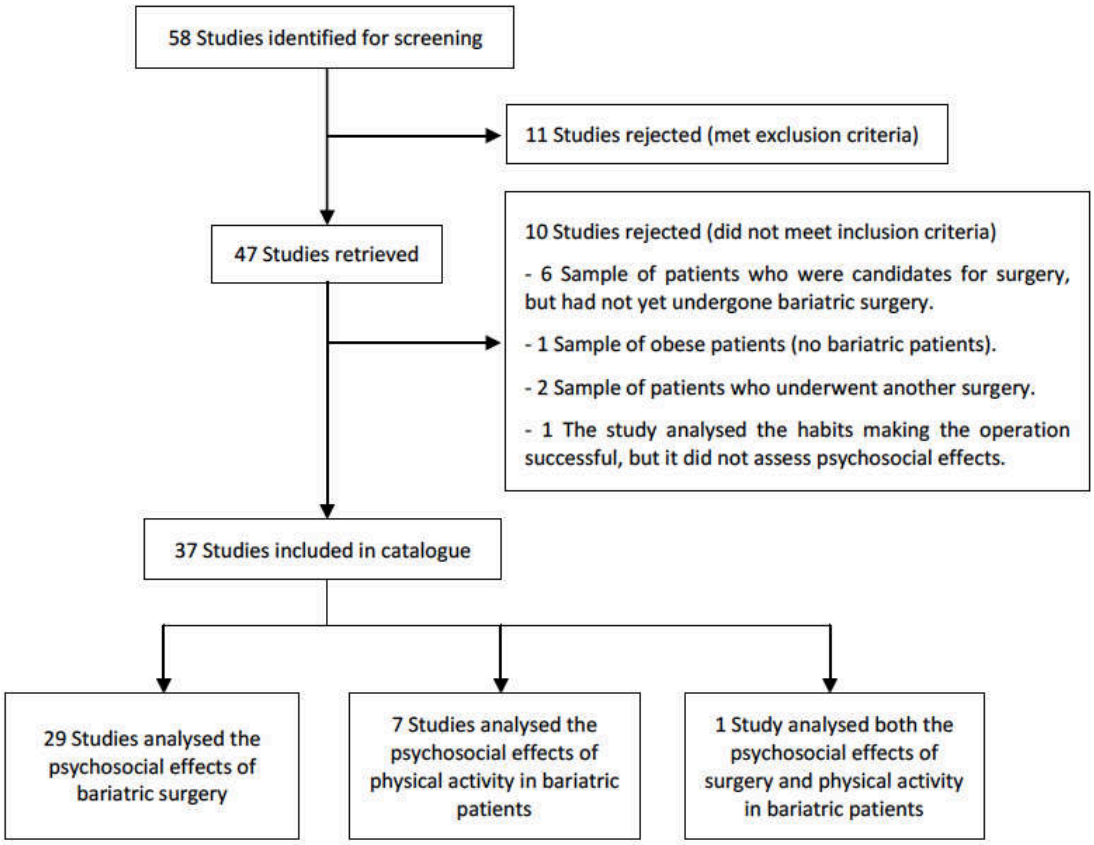

Figure 1. Literature screening and catalogue construction.

Data analysis

The information collected in this review was analyzed following a conventional content analysis (Hsieh & Shannon, 2005). First, all the articles selected for the review were read to get a sense of the whole. Second, the text fragments or concrete results of each article which represented important ideas or concepts for the aim of this review were copied, pasted and coded in a text editor file. Each code was composed of the text fragment or concrete result and a label identifying its content and corresponding bibliographic reference. Third, in another text editor file, all the codes were classified, using inductive reasoning, in a system of categories and subcategories which provided meaning to the data and supported the writing of the findings described in the next section and the elaboration of Tables 1 and 2.

Results and Discussion

Psychosocial effects of surgery in bariatric patients

Thirty studies were included in this review (Table 1). The information about the different psychological and social effects identified in the review is presented in the following sections.

Table 1. Studies that analyze psychosocial effects of surgery in bariatric patients.

References	Number of patients	Assessment methods	Follow-up months	Variables analyzed	Results
Batsis et al. (2009)	296	WEL	48	HRQoL	↑
Canetti et al. (2013)	44	SF-36, MHI, RSE	12	HRQoL	↑
				Self-esteem	↑
				Psychological distress	_
				Psychological	↑

				well-being	
Clark et al. (2014)	361	Surveys	-	Relationship stability and quality	↑
Costa et al. (2014)	143	SF-36, BAROS	12-24-34-48 or + 48	HRQoL	↑
De Carvalho et al. (2014)	8	Semi-structured interviews	36-132	Psychological factors involved in weight regain	↓
De Zwaan et al. (2011)	107	Clinical interviews (SCID)	6-12 and 24-36	Anxiety Depression	– ↓
De Zwaan et al. (2014)	252	IWQOL-Lite, MBSRQ, PHQ-9, GAD-7	12	Anxiety HRQoL Body image Depression	– ↑ ↑ ↓
Dixon et al. (2003)	487	BDI	12	Depression	↓
Ferreira et al. (2013)	20	Clinical interviews	25	Psychiatric disorders	–
Hayden et al. (2010)	32	Focus groups	18	Perceived discrimination and stigmatisation	↑
Järvholm et al. (2012)	37	BDI-II, BYI	4	Depression Anxiety Self-concept	↓ ↓ ↑
Kim et al. (2008)	25	BDI-II	36	Depression	#
Kinzl et al. (2006)	176	Clinical interviews, GSE	30-84	Depression Psychiatric disorders Childhood experiences Self-efficacy	↓ ↑ ↑ ↑

Kruseman (2010)	80	NHP, Hospital Anxiety and Depression Scale	60	HRQoL Anxiety Depression Body image Self-esteem	↑ – ↓ ↑ ↑
Lier et al. (2011)	87	SF-36, MINI, SCID-II	12	HRQoL	↑
Madan et al. (2008)	27	BESAA	-	Self-esteem	↑
Magdaleno et al. (2010)	7	Semi-directed interviews	18-36	Self-esteem Social discrimination Acceptance and social reinsertion	↑ ↑ ↑
Martínez et al. (2010)	100	NHP	12	HRQoL Self-esteem Social relationships	↑ ↑ ↑
Muñoz et al. (2010)	57	SFRS	12	Desired body shape	↑
Nadalini et al. (2014)	110	SF-36	36	HRQoL	↑
Ogle et al. (2015)	13	In-depth interviews	36	Social support	↑
Rutledge et al. (2011)	60	History and physical exam	24	Psychiatric disorders	↑
Sarwer et al. (2008)	200	SF-36, BIQLI, Body Shape Questionnaire, IWQOL	5-10-20	HRQoL Body image Body shape	↑ ↑ ↑
Schowalter et al. (2008)	248	BDI, SESA	60-84	Depression Self-acceptance	↓ ↑
Shiri et al. (2007)	57	SF-36, Perceived Social Support Scales - Family	12 or +12	HRQoL Family support	↑ ↑

Strain et al. (2014)	105	SF-36, BDI, IWQOL-Lite	25	HRQoL Depression	↑ ↓
Tae et al. (2014)	32	BDI, STAI, BITE, WHOQOL	6	HRQoL Depression Anxiety	↑ ↓ ↓
Warholm et al. (2014)	2	In-depth interviews	12	Movement and activity Appearance Social relations	↑ ↑ ↑
Wiklund et al. (2014)	24	Semi-structured interviews	12	Physical, mental and social hindrances	↑
Zeller et al. (2009)	31	BDI, PedsQL, IWQOL-Kids	6-12	HRQoL Depresion	↑ ↓

Note. ↑ = an increment was found after bariatric surgery, − = no differences were found after bariatric surgery, ↓ = a decrease was found after bariatric surgery, # = the study offers prevalence data after bariatric surgery.

Health-related quality of life

Thirteen studies (Batsis et al., 2009; Canetti et al., 2013; Costa et al., 2014; de Zwaan et al., 2014; Kruseman et al., 2010; Lier et al., 2011; Martínez et al., 2010; Nadalini et al., 2014; Sarwer et al., 2008; Shiri et al., 2007; Strain et al., 2014; Tae et al., 2014; Zeller et al., 2009) found positive changes in several or all domains of the patients' HRQoL after bariatric surgery. These enhancements included both physical and emotional aspects of HRQoL, such as physical functioning, general health, vitality, or mental health, and they were usually related to weight loss after the operation (Canetti et al., 2013; Costa et al., 2014; Martínez et al., 2010; Nadalini et al., 2014; Sarwer et al., 2008), although not all the studies found this relationship with weight loss

(Lier et al., 2011; Strain et al., 2014). These gains were particularly significant in certain areas of HRQoL, especially in physical functioning, understood as the patients' perceived limitations in physical activities due to their health problems (Canetti et al., 2013; Costa et al., 2014; de Zwaan et al., 2014; Tae et al., 2014; Nadalini et al., 2014; Zeller et al., 2009). As a result of the weight loss obtained after surgery, perceived physical functioning improved, and patients became physically more active and capable of working and engaging in different social and physical activities (Costa et al., 2014; Nadalini et al., 2014). In addition, the study of Nadalini et al. (2014) also found that perceived physical functioning, when HRQoL was measured prior to surgery, is a positive predictor of weight loss after surgery, independently of age, sex and type of surgery.

Depression

Ten studies (De Zwaan et al., 2011; De Zwaan et al., 2014; Dixon et al., 2003; Järvholm et al., 2012; Kinzl et al., 2006; Kruseman et al., 2010; Schowalter et al., 2008; Strain et al., 2014; Tae et al., 2014; Zeller et al., 2009) found a decrease in depression or depressive symptoms after bariatric surgery. These improvements were found, depending on the study, between 4 months (Järvholm et al., 2012) and 8 years after the operation (Kruseman et al., 2010).

Typically, patients seeking bariatric surgery have a high depressive profile that correlates with poorer physical and mental HRQoL scores. This profile improves after surgery, because weight loss is associated with a significant and sustained drop in depression (Dixon et al., 2003). In this way, patients who lost more weight usually achieved higher reductions of depressive symptoms (Dixon et al., 2003; Schowalter et al., 2008), although BMI is considered a poor predictor of the presence of depressive

symptoms in these patients (Tae et al., 2014). Nevertheless, depressive disorders may not completely remit after surgery, and may attenuate the improvements that occur postoperatively, requiring clinical attention (De Zwaan et al., 2011; Kim et al., 2008; Kinzl et al., 2006).

There were also studies comparing groups of patients who underwent different bariatric surgery methods, such as gastric bypass, adjustable gastric band, biliopancreatic diversion with duodenal switch or sleeve gastrectomy (Strain et al., 2014) and studies that compared bariatric patients to bariatric patients who also underwent body contouring surgery (De Zwaan et al., 2014). In both cases, though all the groups improved depressive symptomatology after surgery, no group differences were found.

Anxiety

One of the most prevalent clinical syndromes before and after surgery was anxiety (Ferreira et al., 2013). Like depression, patients usually have a profile with symptoms of anxiety at moderate levels before the operation, while these symptoms tend to decrease postoperatively. Two studies (Järvholm et al., 2012; Tae et al., 2014) found a reduction in anxiety symptoms after the operation, although 3 studies (de Zwaan et al., 2011; de Zwaan et al., 2014; Kruseman et al., 2010) did not find improvements. De Zwaan et al. (2011) found that preoperative anxiety significantly predicted postoperative anxiety disorders at 6, 12, 24 and 36 months. The same authors found that symptoms of anxiety may persist after surgery. Besides, postoperative anxiety disorder was not associated with the degree of weight loss at any follow-up time-point or with BMI, which is considered, as in the case of depression, a poor predictor of the presence of anxiety symptoms in these patients (Tae et al., 2014).

Psychiatric symptoms

Apart from depression and anxiety, a decrease in other psychiatric symptoms such as personality disorders, adjustment disorders and eating disorders was observed after bariatric surgery (Kinzl et al., 2006; Lier et al., 2011; Rutledge et al., 2011). However, it is important to emphasize that psychiatric symptoms often persist, although to a lesser extent, after surgery. Ferreira et al. (2013), in an observational longitudinal study, found that the most prevalent clinical psychological disorders after bariatric surgery were bipolar disorders, dysthymia disorders, delusional disorders, and personality disorders such as histrionic personality, compulsive personality, and paranoia.

In this regard, Lier et al. (2011) found that patients without postoperative psychiatric disorders achieved a HRQoL comparable to the general population one year after bariatric surgery; whereas patients with postoperative psychiatric disorders showed impaired HRQoL compared to the population norm. Moreover, 2 studies (Kinzl et al., 2006, Rutledge et al., 2011) showed that patients with two or more psychiatric disorders after surgery (such as adjustment disorders and/or personality disorders) experienced less weight loss than patients with one or no psychiatric disorder.

Self-esteem

Bariatric surgery provides a significant improvement in patients' self-esteem (Canetti et al., 2013; Kruseman et al., 2010; Madan et al., 2012; Magdaleno et al., 2010; Martínez et al., 2010). However, the evidence suggests that moderate weight loss is insufficient for improvements in self-esteem. Canetti et al. (2013) compared a post-surgery group of patients to a group of patients who did not undergo bariatric surgery but who followed a specific diet. Although both groups lost weight significantly, results

showed that patients with a greater weight loss (post-bariatric patients) improved self-esteem, whereas the diet group did not report improvements.

Other psychological variables

Other psychological variables which improved after surgery were body image or the perception of body shape (de Zwaan et al., 2014; Kruseman et al., 2010; Muñoz et al, 2010; Sarwer et al., 2008), self-concept (Järvholm et al., 2012), and self-acceptance (Schowalter et al., 2008).

Social relationships

Other quantitative studies also examined social variables, finding an improvement in the stability and quality of social relationships after bariatric surgery (Clark et al., 2014; Martínez et al., 2010). These improvements were related to weight loss and the maintenance of health behaviors associated with weight management in bariatric patients.

Psychosocial effects of bariatric surgery from a qualitative perspective

The psychosocial effects of bariatric surgery were also analyzed in the 6 qualitative studies described in this section. Carvalho et al. (2014) analyzed the meanings of weight regain after surgery among women. A feeling of defeat and failure emerged in patients with weight regain after surgery, with a loss of self-esteem. This situation led to an exacerbated sensitivity to criticism (a feeling of rejection greater than the actually existing rejection), contributing to their social isolation.

In this line, Hayden et al. (2010) assessed patients' perceptions of weight-related stigma and discrimination, comparing a younger (18-35 years) and an older (36-65

years) group of obese women with a younger and an older group of women who had undergone bariatric surgery. The findings showed that the women who had undergone surgery realized that they had contributed to their own social isolation, due to their own withdrawal and closed behavior derived from their lack of self-esteem and poor self-confidence. However, the obese women felt that other people excluded them socially, mainly because of their weight. Interestingly, this study found that the bariatric groups reported more discrimination after the bariatric surgery. According to their perceptions, they were viewed as having taken the easy way to lose weight, and felt judged when people found out that they had undergone bariatric surgery. Moreover, younger women were more worried about their body shape and reported greater discrimination than older women because of their weight, whereas older women were more focused on health, improvements in physical function and the fact that their families no longer had to worry about their health and well-being.

Magdaleno et al. (2010), also with a sample composed exclusively of women, carried out a qualitative investigation to understand the significance of bariatric surgery for these patients. The results showed that bariatric surgery was perceived by these women as an option to restart the process of an active social life. They experienced a strong sensation of acceptance and social reinsertion that led to a significant improvement of their self-esteem. This fact was a motivating factor to face the challenge of weight loss. On the contrary, according to the participants, social discrimination against obese people represented a risk factor leading to a loss of self-esteem and a lack of motivation for weight loss. Warholm et al. (2014), in line with the above-mentioned results, also found an increase in participation in social activities and social relations after surgery. Participants were also excited about the fact that they were able to participate in activities and everyday tasks which were difficult or impossible for

them before. The improvement in their perceived appearance due to weight loss also enhanced their self-assurance. However, weight loss concurrently increased their worries about the excess of skin folds, and women anxiously showed their interest in the available opportunities to correct them.

Ogle et al. (2015) studied the role played by social support in the lives of women who have undergone bariatric surgery. They analyzed the social support provided to participants by health professionals, other bariatric patients, and spouses, family members, and friends. The findings pointed out that participants perceived more social support after surgery, an aspect that enhanced their well-being. Participants especially valued the information they received about how to maintain a healthy lifestyle, as well as the empathy, concern and care shown by others.

Finally, Wiklund et al. (2014) explored patient's perceived barriers to PA participation one year after bariatric surgery. Physical side-effects of surgery, such as excessive skin folds, prevented them from being as physically active as they would have liked. These obstacles made some participants show a low motivation for exercise and express unwillingness to expose themselves to others. For this reason, some participants avoided exercising at the gym, swimming pools or other exercise facilities. However, this study showed that the patients' perception of the benefits of PA increased after surgery. Participants declared that PA was essential to achieve and maintain weight loss after surgery, but they still needed the social support of family and friends to achieve and maintain an adequate level of PA.

Psychosocial effects of PA in bariatric patients

Eight studies were included in this part of the review (Table 2). The collected information is structured and presented in this section.

Table 2. Studies that analyze psychosocial effects of PA in bariatric patients.

References	Number of patients	Assessment methods	Follow-up months	Variables analyzed	Results
Bond et al. (2009)	199	SF-36	12	HRQoL	↑
Forbush et al. (2011)	265	SF-36	12-60	HRQoL	↑
Josbeno et al. (2010)	20	SF-36, PASES, Physical Activity Barriers and Outcome Expectations Questionnaire	3	HRQoL Self-efficacy	↑ –
King et al. (2012)	310	SF-36, BDI, IWQOL-Lite	12	HRQoL Depression	↑ –
Mathus-Vliegen & de Wit (2007)	50	HRQL Questionnaire	12-24-60	HRQoL	↑
Rosenberger et al. (2011)	131	SF-36 BDI	12	HRQoL Depression	↑ ↓
Tompkins et al. (2008)	25	SF-36	3-6	HRQoL	↑
Wiklund et al. (2014)	24	Semi-structured interviews	12	Physical, mental and social achievements	↑

Note. ↑ = an increment was found after bariatric surgery, – = no differences were found after bariatric surgery, ↓ = a decrease was found after bariatric surgery.

Five studies (Bond et al., 2009; Forbush et al., 2011; Josbeno et al., 2012; Rosenberger et al., 2011; Tompkins et al., 2008) found that patients' PA level increased

after bariatric surgery. This increase in PA was related to better scores in vitality, social functioning, role limitations due to emotional problems, and mental health.

Forbush et al. (2011) found that bariatric patients have to do more than 1.5 hours per day of PA to significantly reduce bodily pain and role limitations due to physical health problems, and improve physical functioning and general health (Physical Component Summary [PCS], SF-36). However, this study also pointed out that more than 1 hour per day of PA would be enough to achieve improvements in vitality, social functioning, role limitations due to personal or emotional problems, and mental health (Mental Component Summary [MCS], SF-36).

The findings of Tompkins et al. (2008) showed that higher PA levels after surgery were associated with improvements both in the PCS and the MCS of the SF-36. King et al. (2012) also found that performing more PA was related to lower scores on the factor "role limitations due to emotional problems" 6 months after surgery.

Several studies analyzed differences in psychosocial variables between active and inactive bariatric patients. Concretely, Bond et al. (2009) compared different groups of bariatric patients. A group of patients who were inactive before surgery and active after surgery (Inactive/Active), a group of patients who were active before and after surgery (Active/Active), and a group of patients who were inactive before and after surgery (Inactive/Inactive). Inactive/Active and Active/Active participants reported greater improvements than Inactive/Inactive participants on the MCS score and the general health, vitality and mental health domains. These findings suggested that bariatric patients who become active postoperatively achieve HRQoL improvements that are greater than those experienced by patients who remain inactive and similar to those attained by patients who stay active. In this sense, Forbush et al. (2011) also indicated that patients who reported more hours of PA and energy expenditure per day after

surgery showed significantly better HRQoL, both in the MCS and the PCS, than those patients who were less active.

Mathus-Vliegen and de Wit (2007) analyzed the differences in HRQoL between bariatric patients and individuals with a normal bodyweight. This comparison was made before surgery and 1, 2.5, and 5 years after surgery. After surgery, bariatric patients participated in a weight loss program that included PA and diet. The program consisted of performing biweekly visits to the physician and dietician, behavioral therapy, and aerobic classes during 2.5 years. As a result of the weight loss program, improvements in general well-being, health distress, depression, perceived attractiveness and self-worth were noted in the first year postoperatively. Moreover, patients perceived less negative influence of their body size on work performance. Over the following 4 years, health distress, depression, physical appearance and self-regard improved progressively. Compared with individuals with a normal bodyweight, the degree of final overweight played an important role, as patients with a final BMI below 35 kg/m^2 had values equivalent to those of normal-weight subjects for depression and self-regard, and only those with a BMI below 30 kg/m^2 were at the normal reference level for all scores. The results of this study showed that a program for bariatric patients, with intense and prolonged support of a physician and dietician and with easy access to physical exercise, can be useful to achieve remarkable and sustained improvements in HRQoL.

Rosenberger et al. (2011) examined how frequency and intensity of PA were associated with improvements in psychosocial scores in bariatric patients. Levels of PA were measured before and 12 months after surgery. Both frequency and intensity levels of PA increased significantly from preoperative to postoperative time points, and these changes correlated with better psychosocial outcomes, in depression and physical and mental well-being (PCS and MCS in the SF-36), 12 months after surgery.

Finally, only 1 qualitative study (Wiklund et al., 2014) examined the psychosocial effects of PA in bariatric patients. One year after surgery, these patients reported that they felt better, more satisfied and relieved when finding that they were able to walk without feeling exhausted or afraid of falling. As a consequence of being active and improving their physical functioning, patients were more able to participate in social and family activities, such as playing with their young children or helping other relatives with their jobs. They also realized that they could face daily-life tasks and housework by themselves. All these changes increased their feelings of independence and competence, and improved their social and family life.

Conclusions and Recommendations

In view of the information collected in this review, this work presents the following conclusions and recommendations:

- Bariatric surgery had positive psychosocial effects on patients, such as improvements in HRQoL, depression, anxiety, psychiatric symptoms, self-esteem, body image and social relationships. Many of these psychological and social improvements were usually associated with weight loss after surgery and the increasing effects of weight loss on perceived physical functioning, PA levels and social life.

- Some negative consequences were reported after bariatric surgery. Some patients felt judged by others and thought that they were viewed as having taken the easy way to lose weight. Others reported feelings of failure and defeat with weight regain after surgery, and were more focused on body shape than on health and well-being. Moreover, weight loss was also related to excessive skin folds, which represented an important body concern for bariatric patients. Future interventions with bariatric patients should be focused on the promotion of health, well-being, healthy habits and

inclusive social activities, avoiding an excessive weight-management approach, which can be negative for these patients. In addition, these patients should be informed in depth about the different available alternatives to reduce skin folds. Future studies should analyze whether exercise before and after surgery can reduce skin folds in bariatric patients.

- PA was also related to psychosocial improvements in bariatric patients, and higher levels of PA participation were associated with more benefits. Therefore, the promotion of PA should be a fundamental aim among this population. According to the findings of this review, the following recommendations for the promotion of PA in bariatric patients could be made. 1) To carry out pre- and post-surgery interventions to reinforce patients' perception of the benefits of PA. 2) To offer specific PA programs for these patients before and after surgery. The collaboration between health and sport science professionals would be desirable for the design and implementation of these programs. 3) To guarantee inclusive PA contexts in which participants can feel respected and valued. The support by health professionals, family, friends, other patients, other exercisers and society in general is very relevant for them to maintain an active and healthy lifestyle. 4) Sport facilities should possess specific designs and physical structures to preserve patients' privacy if they have some complex about their body shape, weight or skin folds, and do not want to feel observed by others. In this sense, the availability of individual showers, and swimming pools or fitness rooms closed to external observers would be desirable. 5) To encourage active daily life activities like walking, not only moderate and vigorous exercise, because these low intensity activities are also related to improvements in patients' HRQoL and are also a way to increase energy expenditure and lose weight. 6) To enhance participation in PA

with family and friends, as a way to stay active and improve family and social life at the same time. This can be especially relevant when leisure time is scarce.

- This review has identified a lack of knowledge about the type, frequency, duration, and intensity of PA which is necessary to optimize the physical and psychosocial benefits for bariatric patients. Future intervention studies should tackle this issue, as this information is necessary for an appropriate design and implementation of PA programs for this population.

- Patients seeking bariatric surgery tend to show a depressive profile, anxiety and low HRQoL, aspects that can last even after surgery. Pre- and post-surgery interventions to enhance psychological well-being are necessary in these patients. These interventions could be reinforced with PA programs including psychological intervention through PA (for instance, to improve perceived competence by proposing tasks with adequate difficulty for the participants and by providing them with positive feedback about their performance; to improve social relationships with group and collaborative activities; or to reduce anxiety with relaxing physical activities).

- Future reviews should collect specific information about the behavioral effects of surgery (for instance, concrete effects on PA, eating behaviors, or social life). This review refers to the increase of PA after bariatric surgery to explain the emergence of some psychosocial benefits, but the behavioral effects of surgery were beyond the scope of this article and should be addressed in future research.

- There is a lack of qualitative studies analyzing in depth the psychosocial effects of PA in bariatric patients. Moreover, to our knowledge, there are no qualitative studies evaluating the psychosocial effects of group-based PA programs designed for this population. Future qualitative studies should contribute to palliate these gaps in the

literature, as a more holistic and complete understanding of these issues is necessary to design and implement appropriate PA programs for these patients.

- Finally, although bariatric patients must be resilient against disrespectful people, a more respectful society towards obese people is necessary. Health professionals, teachers, sport science professionals, journalists and other social agents should collaborate to promote health, well-being and healthy habits without promoting intolerant attitudes towards people with specific body shapes.

What does this review add to this doctoral thesis?

To our view, the main contributions that this initial review includes are related to two potential aspects. The first aspect consists in the inclusion within the review of qualitative studies (in addition to quantitative ones) as knowledge to better understand the psychosocial effects of surgery and PA on bariatric patients. In this way, our desire was to include both research methodologies to complement the advantages and disadvantages that each one offers. As a result, quantitative studies allowed us to identify a wide range of psychosocial variables which are generally improved by surgery and/or PA, such as HRQoL, depression, anxiety, psychiatric symptoms, self-esteem, body image, and social relationships. However, these studies also allowed us to pay attention on cases where some variables (e.g., depression or anxiety disorders) may not remit completely after surgery. On the other hand, qualitative studies alerted us about profound feelings and concerns that bariatric patients usually have after surgery or to engage in postoperative PA. These views are particularly relevant, since they are often difficult to detect and measure through quantitative approaches. In this regard, feelings of judgement, weight stigma, discrimination, or concerns about body shape (i.e., skin folds) were found by some of these studies.

The second aspect has to do with the own revision of the psychosocial effects of PA in this population. To our knowledge, previous reviews carried out in this population have examined the effects of PA on biological/physical variables (e.g., weight loss or cardiovascular risk factors) (Moya et al., 2014; Pouwels, Wit, Teijink, & Nienhuijs, 2015), but none of them have included the importance of PA for bariatric patients at the psychosocial level. We consider this aspect as a fundamental issue when promoting PA in this population, since interventions based exclusively on physical aspects of PA do not usually generate adherence to it after such interventions (Carnero et al., 2017; Stolberg et al., 2018).

The general idea of the literature review, therefore, was to have a holistic understanding of the psychosocial processes that arise from surgery and PA in post-bariatric surgery patients. As a preliminary point of the thesis, we believe that this aspect could be especially important to understand and enrich the work and intervention that we introduce in this PhD document later.

DOCTORAL THESIS STUDIES

STUDY 1

Healthism and the experiences of social, healthcare and self-stigma of women with higher-weight

STUDY 2

Changes in bariatric patients' physical activity levels and health-related quality of life following a postoperative motivational physical activity intervention

STUDY 3

Motivation and physical activity levels in bariatric patients involved in a self-determination theory-based physical activity program

STUDY 4

Exploring the socio-ecological factors behind the (in)active lifestyles of Spanish post-bariatric surgery patients

STUDY 1

Healthism and the experiences of social, healthcare and self-stigma of women with higher-weight

Note. This study was published.

Jiménez-Loaisa, A., Beltrán-Carrillo, V. J., González-Cutre, D., & Jennings, G. (2020). Healthism and the experiences of social, healthcare and self-stigma of women with higher-weight. *Social Theory & Health, 18,* 410–424. https://doi.org/10.1057/s41285-019-00118-9.

Healthism and the experiences of social, healthcare and self-stigma of women with higher-weight

Abstract

This study analyzes how the discourse of healthism contributes to the social construction of weight stigma in women with higher-weight. In-depth semi-structured interviews were conducted with nine women who had undergone bariatric surgery and had lived with higher-weight during many years. A thematic analysis from a latent and constructionist perspective showed how the discourse of healthism was behind the experiences of stigma lived by the participants in the social and healthcare field. Even instances of self-stigma were found in our data. This study also illustrates how people influenced by healthism assumed individualism and the importance of body shape, core values of neoliberal consumer societies. In this way, people tended to blame women with higher-weight for their weight and to discriminate against for being far from the socially-established ideal body. The findings can be useful to prevent weight stigmatization and to promote more appropriate and respectful strategies for obesity prevention and treatment.

Keywords: Individualism; Ideal body; Origin; Controllability; Concealability.

Introduction

Weight-based stereotypes and negative attitudes against higher-weight people have been well documented by the scientific literature (Puhl et al., 2008; Puhl & Suh, 2015). Numerous studies have reported clear and consistent weight prejudices towards individuals under this condition, who are accused of being impulsive and lazy, and of having poor willpower, motivation and personal control (Crandall & Schiffhauer, 1998; Puhl & Heuer, 2010). These kinds of social attitudes lead to stigma and discrimination in multiple contexts of the daily life of people with higher-weight. For instance, when they receive healthcare (Phelan et al., 2015), try to find a job (Giel et al., 2012; Schulte et al., 2007), are at work (Friedman et al., 2008; Hayden et al., 2010), or even in their social relationships with friends and close relatives (Puhl et al., 2008).

These circumstances have a profound impact on the psychological and social well-being of people with higher-weight (Sikorski et al., 2015). Research has shown that weight stigmatization is a significant risk factor for psychological stress, body dissatisfaction, depression and low self-esteem, among other psychological disorders (Annis et al., 2004; Friedman et al. 2008). In regard to social disorders, weight stigmatization is associated with avoidance, rejection and marginalization (Puhl & Brownell, 2003). Moreover, there is increasing evidence which associates many of the consequences of weight stigma (e.g., psychological stress, anxiety and/or negative mood) with the excessive activation of hormonal mechanisms (such as glucocorticoids and cortisol) that lead to weight gain (Muennig, 2008).

In a context where stigma is considered a fundamental cause of health disparities and therefore a clear problem for public health (Hatzenbuehler et al., 2013), it is necessary to be aware of the existence of certain socially constructed discourses that aggravate weight stigmatization (Gard & Wright, 2001; Turrini, 2015). These

discourses are manifested in the daily life and face-to-face interactions of people with higher-weight, and can ultimately be internalized and accepted by individuals themselves (Crocker, 1999). Understanding this problem becomes even more essential when it is referred to women, who usually report higher levels of weight-based stigma when they do not conform to the prevailing body discourses (Puhl et al., 2008). The ideal body for women has been associated with youth, beauty, sensuality and thinness, and the social pressure to have an ideal body has historically been higher for women than men (Toro, 2003).

Therefore, the aim of this study was to analyze how the discourse of healthism contributes to the social construction of weight stigma by interpreting the reported experiences and opinions of women with higher-weight. Concretely, informed by the theoretical framework described in the following section, we explored the influence of healthism on social stigma, healthcare stigma and self-stigma, considering different dimensions closely related to weight stigma (*origin, controllability, concealability, aesthetics* and *pity*). Analyzing these issues could be useful to prevent or alleviate stigmatizing situations and their negative consequences in people with higher-weight. It is necessary to remark that this study was underpinned by a relativist ontology, which conceives that social reality is subjectively perceived and humanly constructed, and a constructionist epistemology, which assumes that there is no theory-free or value-free generation of knowledge (Sparkes & Smith, 2014).

The discourse of healthism and weight stigmatization

Western society is characterized by the growing extension and application of principles of the economy and business administration (competition, competitiveness, productivity, efficiency, effectiveness, among others) to spheres of social and individual

life that have nothing to do with these fields, such as the everyday language of people (Kenny, 2015; Marsi, 2007). This "economizing" phenomenon has come to affect the social relationships between people, influencing their cognitive processes and way of thinking, and assimilating them to consumer relationships. Precisely, one of the clearest consequences of this economizing effect of society is the primacy of the "economic behavior" of people and institutions over moral values and human ethics, which, in fact, have also been "economized" (Shamir, 2008).

A clear consequence of these ethical changes is the individualization of responsibility, which falls entirely within the person because of the emergence of the neoliberal notion of individualism over collectivism in these societies (Freeberg & Stein, 1996; Rhee et al., 1996). The weakening of collectivism has caused that the individual is considered the only one responsible, and therefore the architect of their success or failure. Thus, if the individual does not have success, it is due to her/his moral failing, self-indulgence and lack of self-discipline (Quinn & Crocker, 1999).

What is conceived as "success" or "failure" is often previously established according to a set of social standards and norms that the person must accomplish (Quinn & Crocker, 1999). Social discourses play a fundamental role in the consolidation and maintenance of these social standards and norms (Evans et al., 2004; Mansfield & Rich, 2013). Sociologically speaking, discourses are a set of socially constructed ideas that people hold (un)consciously within their social life and which determine particular social practices, forms of subjectivity, and specific relations of power (Denison & Scott-Thomas, 2011). According to Rail et al. (2010), social discourses demonstrate that social reality 'is made and not found', since the political, social and institutional interests participate in and manipulate its construction. For other authors, social

discourses influence the way people understand and interpret their own selves and reality, and the way people behave in life (Beltrán-Carrillo et al., 2018).

Among the discourses rooted on neoliberal values are the so-called "discourses of obesity", as healthism (Beltrán-Carrillo et al., 2018; Crawford, 1980; Gard & Kirk, 2007; Gard & Wright, 2001; Johnson et al., 2013; Turrini, 2015). According to Crawford (1980), healthism can be understood as a form of medicalization that models popular beliefs, which causes a non-political conception of health promotion by situating the problem of health and disease, and its solutions, at the level of the individual. For that reason, from the perspective of healthism, fatness is seen as a sign of the individual's failure and irresponsibility, who, despite having the necessary tools for its surveillance through various control techniques and disciplinary measures related to diet and physical activity, is not able to self-control her/his lifestyle (Evans et al., 2013; Gard & Wright, 2005; Rail et al., 2010). Thus, the person with higher-weight is considered a problem for individual and social productivity and competitiveness, and is accused of lack of self-discipline, and of being a lazy and irresponsible citizen (Puhl & Heuer, 2010; Rich et al., 2015).

Moreover, a fat body also moves the person away from the socially established ideals of beauty and sensuality, so the person with higher-weight is considered as unsightly and is pressured to conform with these ideal standards (Shilling, 2012). Undoubtedly, healthism has much to do with a consumer society where the body is an important element in two ways. On the one hand, social agents (e.g., mass media, fashion industry, health and fitness clubs, etc.) use the body as an element of publicity, associating slim and/or muscular bodies with values of success, beauty, well-being or happiness, and therefore creating the particular vision that these are the ideal bodies to follow. On the other hand, the body is also used by these agents as a recipient of

consumption of products and services to improve the beauty of the body (e.g., cosmetic surgery, creams and pills to lose weight, exercise, etc.). In this sense, body dissatisfaction and concerns about weight are "desirable" elements to promote consumerism within society (Cafri et al., 2005; López-Guimerà et al., 2010).

Therefore, healthism is positioning the body as a central indicator of fitness, health and beauty, promoting simplistic relationships between health and body size/shape (Gard & Wright, 2001; Rail et al., 2010). Consequently, fat bodies are considered as unhealthy, while fit, slim and muscular bodies tend to be classified as healthy (Webb & Quennerstedt, 2010). According to this discourse, avoiding a high weight and achieving health seem simple goals for healthism. People must manage their body through discipline, eating less or carefully and exercising more, and by managing a simple equation between expended and consumed calories to control their weight (Gard & Wright, 2001). Nevertheless, this hegemonic discourse obviates, in its attempt to give full responsibility to the individual, all the socioecological and structural determinants of health that surround the individual, such as the socioeconomic status, education, employment, and the physical and social environment (Rail et al., 2010).

In short, this biased vision of social reality, magnified for years by public and political institutions, weight-loss companies, mass media and positivist science has made people with higher-weight as one of the most stigmatized collectives today (Bell & Green, 2016; Meadows & Daníelsdóttir, 2016; Gard & Wright, 2001). For that reason, throughout this article, we try to unmask how the discourse of healthism hides behind various stigmatizing life experiences of a group of women with higher-weight. Inspired by the research of Ahmedani (2011) on mental health stigma, we divide these experiences in social, healthcare and self- stigma experiences (see results and discussion). Moreover, in the reported information, we attempt to identify some relevant

dimensions of stigma (as *origin, controllability, concealability, aesthetics* and *pity*) which promote that people with higher-weight are "stigmatized or seen as possessors of observable marks of unacceptable difference" (Goffman, 1963). Although these five dimensions were originally devised for mental stigma (Ahmedani, 2011; Corrigan et al., 2000; Feldman & Crandall, 2007; Jones et al., 1984), based on Goffman's initial conceptualization of stigma (1963), we present a novel approach in which we attempt to identify them in the stigma suffered by people with higher-weight, while also exploring the role that healthism plays in the creation and perpetuation of these dimensions.

Defining the dimensions briefly, *origin* would refer to whether the stigmatizing condition comes, at least in part, genetically inherited, or if the individual has acquired it throughout her/his life by other factors such as those that have to do with her/his lifestyle. This dimension is directly related to *controllability*, since if the stigmatizing condition is given by factors that society perceives as controllable, such as diet or exercise, it will be seen worse than a condition in which the habits of people have nothing to do, as in certain diseases. The visibility of the condition or *concealability* also plays a key role when society stigmatizes a person, since if one condition is difficult to conceal and is therefore easily identified, it will be more likely to be stigmatized. *Aesthetics* involves to what extent a stigma is displeasing to the visual sense and far from what society considers beautiful and desirable. Finally, these dimensions are related to *pity*, because society can show more or less sympathy and pity towards different stigmatizing conditions depending on the previous dimensions.

Methods

Participants

A total of nine women, aged between 31 and 60 years, participated in this qualitative study. They were women who had lived with higher-weight during many

years of their lives, and that had made the decision to reduce it by undergoing bariatric surgery. In this regard, the participants were part of a post-operative research project which explored the physical, psycho-social and behavioral effects of a six-month physical activity program on bariatric patients. The inclusion criteria for participating in the research project hindered the access to a bigger sample. First, the inclusion criteria for bariatric surgery included having a body mass index (BMI) greater than 40 kg/m^2, or greater than 35 kg/m^2 with associated co-morbidity, and having no medical, psychological or social contraindication for surgery. Second, participants had to accept their involvement in the six-month PA program.

The program took place in 2012, within the sports facilities of a public university located in a city of the province of Alicante (Valencian Autonomy, Spain). At the time of the study, the economy of this city was mainly based in the footwear industry and tourism, where the most of population pertained to a middle socioeconomic status. The design and procedures of this research project was approved by the Ethical Research Board of the first author's university.

Data collection

Two in-depth semi-structured interviews were conducted and recorded with each participant to collect qualitative data. Both interviews lasted between 40 and 60 min. The first interviews were conducted after the six-month physical activity program, 7 months after the surgical intervention. Although the main objective of these interviews was to gather information about the physical and psycho-social effects of the physical activity program in the participants, these interviews included questions related to the participants' experiences living with high weight (e.g., What has the high weight meant in your life? Do you think that society do everything possible to help people who have a

high weight?). Very rich information was collected about experiences of stigmatization lived by these women, and the idea of the present study emerged. Then, taking advantage of a second round of interviews conducted one year later to analyze the factors hindering or favoring physical activity after the program, new questions about negative experiences related to living with high weight were included (e.g., Have you had any negative experiences related to your weight? How was your day-to-day life with high weight? Which negative comments about your weight are the most annoying for you?). These questions were also focused on addressing gaps of information identified after the first round of interviews. It should be noted that one of the participants did not take part in the second interview, without giving any reason.

All interviews were audio recorded and transcribed verbatim by the interviewer immediately after conducting them. Transcriptions were analyzed with the support of the software NVivo, which was used to organize and classify data efficiently (Bazeley & Jackson, 2013). Before the interviews, participants were informed about the aims and procedure of the study and signed written consent. In addition, the interviewer guaranteed the confidentiality of their testimonies, and the informants' anonymity was preserved by using pseudonyms.

Data analysis

After the transcription of the interviews, a thematic analysis was used to identify and report themes within our data set. First, all the text fragments related to weight stigma were selected in an inductive and descriptive process of initial codification. Second, we checked that the codes could be sorted in three main themes related to social, healthcare and self-stigma experiences, in line with the fields of stigma proposed by Ahmedani (2011). As the purpose of our study was not only to describe the data, but also to interpret them, we adopted a latent position to "go beyond the semantic content

of the data" (Braun & Clarke, 2006). Then, we did a search for social theory which could serve us to analyze, interpret and make sense of the data. We finally selected the theory about healthism and weight stigma, previously described in this article, to analyze and interpret the information included in each of the three main themes. This strategy of analysis let us identify hidden ideas or assumptions behind the participants' testimonies, related to how weight stigma is constructed, manifested and maintained by the social discourse of healthism. Additionally, it is important to remark that the write-up of the article is an important phase of thematic analysis (Braun & Clarke, 2006; Sparkes & Smith, 2014). During this phase, the analysis and the ideas it contains are refined and the authors seek a narrative which can offer a clear description and interpretation of the data.

The data analysis was led by the first author of this article, whereas the other authors played the role of critical friends, reviewing the process of analysis and sharing ideas and reflections with their colleague. The role of critical friends was useful to improve the quality of interpretations, as well as the rigor and trustworthiness of the data analysis (Smith & McGannon, 2018).

Results and Discussion

Healthism and social stigma

The participants of this study reported having been stigmatized by people who associated their high weight condition with their alleged inability to maintain a normal diet, despite not really knowing their eating habits:

> Leslie: People laugh and say: "You are fat because you eat… It's because you eat and it's because you eat!" Always the same issue. And I didn't eat so much to be as I was [referring to her previous high weight condition].

> Emily: You go out on the street and some people always remark to you: "Oh, you are so fat! Go on a diet, as you are very fat…" As if it was so simple!

From the perspective of healthism, people with higher-weight are considered irresponsible for not being able to control their weight and lifestyle through disciplinary measures related to diet and exercise (Evans et al., 2013; Gard & Wright 2005; Rail et al., 2010). This emphasis on individual responsibility is not casual, and seems to have its roots in the neoliberal value of individualism, so spread among postmodern societies. Thus, making reference to the dimensions of stigma proposed by Jones et al. (1984) and Corrigan et al. (2000), a society influenced by healthism tends to perceive that fatness is a highly *controllable* condition whose *origin* is related to a negligent lifestyle (Puhl & Heuer, 2010; Rich et al., 2015). This perception intensifies weight stigma. Ronda's quote illustrates the interconnection between both stigma dimensions and the dissonance between her personal reality and societal prejudices:

> Ronda: Society, or most of society, thinks that a fat person is fat because she/he wants to be fat. And you [society] are wrong. There are people who are big because they are sick, in my case, for example. I had a thyroid surgery ten years ago, and I wasn't able to lose as much weight as I wanted. And the thyroid made me gain weight, instead of losing it. But they [society] think that we are fat because we want to be.

It seems that the biased social perception of the *origin* and *controllability* of high weight involves a moral dimension of the body. The fat body becomes a symbol of negligence and lack of responsibility and willpower. In this way, society usually tends to feel little *pity* or sympathy for people with higher-weight. For this reason, some of them would even prefer to possess a less *controllable* stigma with an unfortunate *origin*,

such as being blind, rather than having high weight (Brewis et al., 2011; Schwartz et al., 2006). This moral dimension of the body has practical effects when these people look for a job and enter social environments where body size/shape is valued:

> Ronda: I was looking for a job and I went to a gift shop … "Ok, you would do this job well but … you are chubby …" And I said, "Look, I am fat, but you are stupid, and my problem has a solution, but yours does not" [She remembers the situation with outrage and annoyance] And I turned around and went home … That has always hurt me a lot. This is unfair not only for me, but for the rest of the people who are like me.
>
> Thelma: I've not been wanted in many jobs because I've been fat. For example, in cafes and places like these I would never ask for work. Never, because I knew I was going to go and they [owners] were going to say no. Many of that people usually say, "No, we don't look at the physique". Bullshit!

With regard to *concealability*, weight stigma is so visible and unconcealable compared to other stigmatizing conditions, such as some mental diseases (Ahmedani, 2011), that prejudices and marginalization towards people with higher-weight bodies seem even more frequent. Weight stigma becomes especially problematic when it reduces the possibilities to labor access, considering that unemployment is one of the main causes of social exclusion (Roehling et al., 2007). In some labor contexts such as shops and cafes, a higher-weight body can clash with the core values of healthism and consumer culture. In this way, an employer influenced by this stigmatizing discourse could think that a person with a fat body could be less productive and hardworking, and could show an *aesthetic* far from the "ideal body" which could increase sales in this

kind of stores. In fact, previous studies have highlighted the difficulties this collective find to get a job (Giel et al., 2012; Schulte et al., 2007).

Healthism and healthcare stigma

One woman participating in this study reported to have felt stigmatized by healthcare professionals, who attributed any health problem to their weight, regardless of whether it was related to weight or not:

> Alice: I've done it [bariatric surgery] for me. Because I understand that obesity is not good for anyone. I don't know what happens, but we go to the doctor and everything is a consequence of… [high weight]. For example, I have varicose veins; "[Doctor's comment] Of course, if you work all day and with the weight you have, what do you expect?" Well, sure, but there are people who are not obese and also have varicose veins… Do only fat people have varicose veins? Or, for example, I went to the cardiologist because I felt a pain in my chest. The cardiologist told me "Considering your weight, and your diabetes profile, I give you five years to suffer a heart attack". We go to the doctor and all our problems are due to… [the high weight]. And sometimes they don't ask more or don't look beyond obesity…in order to see if the problem is not that.

In the same way, Alice declared that healthcare professionals did not propose her any additional solution to lose weight than controlling diet and exercise, while she missed a more intense supervision for achieving these behavioral changes:

> Alice: Now, for example, I have been operated on and I have been controlling my diet since May…but I have stagnated and there is no way to lose weight. And the last time I went to the surgeon, he told me: "You have

> to do more exercise or eat less." Well, I'm going to drink only water, because I'm eating only protein shakes and there's no way, I don't know. The only thing they [the doctors] tell you is "get on a diet". They should get involved a little bit more…

Moreover, health professionals doubted about her ability to autonomously control her weight with diet and physical exercise. These findings are in line with several studies indicating that health professionals base their intervention solely on these behavioral, individual and controllable factors (O'Brien et al., 2010; Raves et al., 2016). Therefore, the dimensions of *origin* and *controllability* were once again present in these experiences, supporting an individualistic discourse of healthism that centers all the attention on the individual. It is not surprising that health professionals adopt discourses of this type when they have been educated under an academic curriculum that has traditionally focused on the individual controllable aspects of high weight, undervaluing the importance of genetic, hormonal, social or environmental factors (O'Brien et al., 2010).

Like Turrini (2015) and Zola (1972), we suppose this fact is not fortuitous, since political and economic powers have often used the apparent neutrality, objectivity and scientific status of the medical approach to propagate the discourse of healthism and emphasize individual responsibility on health issues, avoiding their responsibilities at a socio-political level. With regard to the stigma dimensions of *concealability*, *aesthetics* and *pity*, high weight is clearly identifiable at a glance, and can be a symbol of "one's own health irresponsibility and negligence" for some health professionals who can show a lack of respect for their patients at times. In line with our results concerning healthcare stigma, previous research has pointed out that anti-fat attitudes and prejudices of health professionals towards people with higher-weight equate with or even surpass those

reported by the general population (Phelan et al., 2015; Tomiyama et al., 2015; García et al., 2016).

Healthism and self-stigma

Healthism also influenced the perceptions and opinions of women with higher-weight. For instance, Ronda felt that her own body was hateful, and she even felt anger when her husband looked at her body:

> Ronda: I've never seen myself as pretty. I've always been a little bit ugly… I didn't like myself, either dressed or naked… When I was with my husband, I even felt anger when he stared at me, because I didn't feel pretty.

It seems that Ronda believed that the *aesthetics* of her body was far from the ideal body (slim, toned, young and beautiful). Perhaps she felt anger because she thought her husband could feel disgust or even *pity* about her body, whereas people usually desire to feel perceived as pretty or sexually attractive in intimate/romantic relationships. However, it is remarkable that Ronda showed this negative reaction without a negative comment or attitude of her husband. As previous authors have highlighted, the self-concept that this woman formed of herself seems to be the product of her own concern about how others might evaluate her, adopting the vision that other people could have of her (Crocker & Major, 1989). Moreover, this negative attitude towards herself could be a logical reaction as a result of previous discrimination experiences (Annis et al., 2004), together with the insistent information of a consumer society that encourages the pursuit of an ideal body (Shilling, 2012). Therefore, self-stigmatization seems to appear when women with higher-weight internalize healthism values around body shape and they assume they do not fit in the parameters established by this discourse. This circumstance negatively affects the physical and mental health of these people (Pearl & Puhl, 2016).

The findings of this study also brought to light a different manifestation of self-stigma. For instance, Leslie recognized herself to have stigmatized other people with higher-weight:

> Leslie: The fat person is rejected. I haven't felt like this, I repeat it again, but I see that there is a rejection… because there are very amorphous people who are very unpleasant to see. And I've not lived it, but I tell you, I was lucky that I wasn't amorphous. But I have seen it, you know? I have even rejected this type of people. And those people are… most of them have been people with sadness, sorrow… They usually aren't cheerful or nice people, right?

It is remarkable that Leslie made a distinction between "pleasant" or "unpleasant" people with higher-weight. She included herself in the "pleasant" group, and admitted to have rejected people belonging to the "unpleasant" group. This type of reaction may be related to a self-protective mechanism that stigmatized people use to protect their self-concept and self-esteem (Crocker & Major, 1989). According to these authors, disadvantaged individuals tend to compare themselves with stigmatized others, whose outcomes are also relatively poor, instead of with advantaged outgroup members. Then, the stigmatized people tend to make "ingroup" comparisons and avoid "outgroup" social comparisons which can be painful for them.

The distinction between the "pleasant" and "unpleasant" people with higher-weight was based on the stigma dimensions of *concealability* and *aesthetics*. However, according to healthism discourse, these dimensions related to bodily appearance were perceived as strongly associated with self-identity (a sad or unhappy person, with an unpleasant personality). Previous studies have also indicated that high weight is understood as a problem for individual happiness and well-being (Beltrán-Carrillo et al.,

2018; Mansfield & Rich, 2013), whereas consumer society identify the slim, muscular, young and beautiful body as a symbol of happiness and success (Shilling, 2012). This association, so spread in society, seemed to be also assumed by the women with higher-weight of this study:

> Interviewer: What do you think should be done [to help people with higher-weight]?
>
> Leslie: First, be aware of the problem. Some people seem to be happy being fat. I don't think anyone is happy being fat… honestly.

Conclusions and Implications

In this study, we explored how weight stigma is constructed, manifested and maintained by the social discourse of healthism through experiences of social, healthcare and self-stigma in women with higher-weight. Moreover, we explored the role that healthism plays in the construction of some dimensions of stigma that are closely linked to weight stigma (*origin, controllability, concealability, aesthetics* and *pity*).

Overviewing the aforementioned findings, our study brought to light the neoliberal values associated with healthism. It is important to remark that healthism and the so-called "obesity discourses" are not constructed by chance, but are determined by the interests of political and economic powers to propagate social beliefs that maintain the reality desired by them (Rail & Harvey, 1995). The consequences of these interests are manifested in the day-to-day lives of people who do not adjust to these social parameters, as is the case of people with higher-weight, causing situations of stigmatization and discrimination that ultimately promote inequality and social injustice.

A representative example of this emerges in our study when obesity is understood as a health problem whose *origin* is associated with a negligent role of the individual who is not able to *control* her/his own weight and lifestyle. Comments regarding origin factors that fall under personal control, such as diet or exercise, hide the internalization of the notion of individualism that reigns over postmodern societies (Cockerham, 2005). In this way, a complex and multifactorial health problem is simplified and the responsibility that political institutions should have to promote the welfare of society is avoided or undervalued.

Healthism, through the exaltation of the healthy, fit, slim, muscular, and beautiful body, also plays an important role in the construction of *concealability* and *aesthetics* as stigma dimensions. Whereas the ideal body is a symbol of happiness, success, health and well-being, the fat body becomes a symbol of irresponsibility, sadness and embarrassment (Beltrán-Carrillo et al., 2018). These associations promote the marginalization of people with higher-weight and negatively affect their self-identities.

Several implications could be proposed from this study. Political and educational institutions, healthcare professionals and scientists should go beyond the problem of high weight and not stay on the surface. Individual responsibility regarding lifestyle is, without a doubt, very important for obesity prevention and treatment. Nevertheless, genetic, health, social and environmental factors should also be taken into account as part of the problem and the solution. In this sense, health professionals should avoid victim-blaming comments towards their patients with higher-weight and treat them with all due respect. These professionals could receive teaching courses about healthism discourse, including strategies to avoid its negative effects in society and on their patients. Moreover, healthcare systems should offer precise recommendations and counselling services to help people with higher-weight to maintain a healthy diet and do

beneficial exercise. Doctors, psychologists, nutritionists and sport sciences professionals should be part of work teams to guide these patients. Solutions beyond lifestyle changes should be also offered if obesity is related to other health problems or genetic factors.

At a macro-level, we should also aspire to construct a social and physical environment which could be appropriate for obesity prevention and treatment. We should accept this commitment in view of previous evidence, which points out that education, employment, the socioeconomic status and the physical and social environment are important determinants of population health (Rail et al., 2010). The education system and the mass media also have an important responsibility to prevent weight stigma and promote respect towards this population in all social spheres. In this regard, it would also be interesting that teachers and journalists were educated in social theory about healthism and stigma and in practical strategies to avoid weight stigma. Wider society, family members and health professionals should encourage people with higher-weight to maintain a healthy lifestyle. Nevertheless, at the same time, they should help them to accept themselves promoting their self-esteem and a positive self-identity. Of course, people with higher-weight should act against weight stigma instead of promoting it with negative conceptions and attitudes towards others in a similar condition.

Finally, future studies should analyze whether people with higher-weight who have not undergone bariatric surgery, and do not want to undergo it, cope with healthism and stigmatization in a different way. Perhaps bariatric patients, and people with higher-weight who would undergo bariatric surgery, tend to experience higher-weight in a very negative way, and differently to other people with higher-weight who can be more satisfied with their body shape and self-identity.

STUDY 2

Changes in bariatric patients' physical activity levels and health-related quality of life following a postoperative motivational physical activity intervention

Note. This study was published.

Jiménez-Loaisa, A., González-Cutre, D., Beltrán-Carrillo, V. J., & Alcaraz-Ibáñez, M. (2020). Changes in bariatric patients' physical activity levels and health-related quality of life following a postoperative motivational physical activity intervention. *Obesity Surgery*, *30*(6), 2302–2312. https://doi.org/10.1007/s11695-020-04489-1.

Changes in bariatric patients' physical activity levels and health-related quality of life following a postoperative motivational physical activity intervention

Abstract

Purpose: Self-determination theory (SDT) has been widely used as a useful motivational framework for improving long-term adherence to physical activity (PA) and health-related quality of life (HRQoL). The aim of this study was to examine the effects of a 6-month motivational PA intervention (MPAI) on bariatric patients' PA levels and HRQoL from pre-surgery to the end of the MPAI (7 months post-surgery). Additionally, a re-test was performed 13 months post-surgery.

Methods: 40 participants undergoing sleeve gastrectomy were assigned to a 6-month MPAI or to a control group. The MPAI was based on techniques and messages from SDT. At baseline and post-intervention measures, both groups wore accelerometers for one week and completed the SF-36 questionnaire.

Results: 32 participants (78.1% female) completed all measures and were included in the final analyses. PA levels did not significantly differ between groups as a consequence of the intervention. Clinically significant differences ($d \geq 0.5$) favoring the MPAI group were found for SF-36 domains of bodily pain (at pre-surgery, increasing at 7- and 13-months post-surgery), general health and vitality (7 months post-surgery), and physical functioning and the physical component score (both 7- and 13-months post-surgery). Social functioning also showed clinically significant differences favoring the MPAI group at pre-surgery, increasing at 7 months post-surgery. These differences disappeared at 13 months post-surgery.

Conclusions: SDT-based PA interventions could enhance several dimensions of bariatric patients' HRQoL after surgery. Further research is needed to understand what motivational processes are key aspects to promote PA participation in these patients.

Keywords: Self-determination theory; Sleeve gastrectomy; Exercise; Accelerometry; SF-36 questionnaire.

Introduction

Patients seeking bariatric surgery commonly show reduced levels of physical activity (PA) and impaired health-related quality of life (HRQoL) compared to normal-weight individuals (Bond et al., 2010; Bond et al., 2015, King et al., 2015). Within the first year after surgery, these patients experience not only a significant weight loss but they also substantially improve their HRQoL (Karlsen et al., 2013; Monpellier, Antoniou, Aarts, Janssen, & Jansen, 2017).

Postoperative PA is critical for the improvement of long-term weight and HRQoL' outcomes. Research has shown positive associations between PA and greater weight loss at 12 and 24 months (Egberts, Brown, Brennan, & O'Brien, 2012; Jacobi, Ciangura, Couet, & Oppert, 2011; Livhits et al., 2010). Meeting PA recommendations have also been associated with higher HRQoL 12 months post-surgery (Sellberg et al., 2019). However, in spite of the potential contribution of PA to further increases in weight loss and HRQoL, objectively measured post-surgery PA does not usually increase (Crisp, Verlengia, Ravelli, Junior, & de Oliveira, 2018; Herring et al., 2016). Therefore, increasing the post-surgical PA habits of bariatric patients represents a major concern from a public health perspective.

Self-determination theory (SDT) (Ryan & Deci, 2017) has been widely used as a useful motivational framework for improving long-term adherence to PA (Teixeira, Carraça, Markland, Silva, & Ryan, 2012) and HRQoL outcomes (Campbell et al., 2019; Ng et al., 2012). In health-care contexts, SDT establishes that social agents (e.g., health-care providers, exercise professionals) play an important role in supporting three basic psychological needs which are required for patients' optimal development, integrity, and well-being. These needs are competence, which represents feeling effective (e.g., by receiving feedback about their progress); autonomy, which makes reference to the

feeling of being the origin of one's own behaviors (e.g., by receiving opportunities for choice in how treatment plans are enacted); and relatedness, that consists in feeling understood and cared for by others (e.g., by a professional that listen their perspectives). More autonomous forms of motivation, understood as processes of internalization that facilitate behavioral engagement and its maintenance, will appear if the basic psychological needs are satisfied by practitioners. Need satisfaction and autonomous regulation will lead to positive consequences such as enjoyment, better physical and mental health outcomes, and positive attitudes towards PA (Ng et al., 2012).

SDT has been successfully applied in overweight and obese populations, promoting basic psychological need satisfaction in PA interventions (Silva et al., 2008; Silva et al., 2010). Nevertheless, SDT-based PA interventions aimed at improving both PA and HRQoL in the field of bariatric surgery are scarce. In this regard, the results of a qualitative study revealed promising results related to enjoyment, pain reduction, and intention to be physically active as a result of a 6-month postoperative intervention focused on SDT (González-Cutre, Megías, Beltrán-Carrillo, Cervelló, & Spray, 2020). Regarding quantitative designs, only one randomized trial has tried to apply some SDT principles (e.g., supporting patients' competence and autonomy by providing feedback and reinforcement and increasing their knowledge about PA, respectively) within a preoperative 6-week behavioral PA intervention, finding positive changes in patients' PA levels 6 months post-surgery (Bond et al., 2015; Bond et al., 2017). However, Bond et al. (2015, 2017) conducted face-to-face counseling, but not practical PA sessions in which bariatric patients have to exercise together under a need-supportive environment. In addition, although Bond et al.'s studies (2015, 2017) represent an illustrative example of theory-driven programs to increase bariatric patients' PA, they did not explore the isolated role of SDT to improve both PA levels and HRQoL. Consequently,

the potential of behavioral PA interventions for further increases in PA and HRQoL still remains unknown.

Considering that postoperative PA programs have modestly improved patients' HRQoL (Stolberg et al., 2018) and failed to increase PA levels over time (Carnero et al., 2017; Herring et al., 2017; Stolberg et al., 2018), guiding PA interventions by motivational frameworks such as SDT could help to address both objectives. For instance, Stolberg et al. (2018) did not report significant increases in PA and for any HRQoL domain except for general health after a 26-week supervised physical training. Carnero et al. (2017) reported no significant PA differences between a 6-month exercise training program and lifestyle educational classes. Herring et al. (2017) found that PA declined in their exercise group after the end of a 12-week supervised exercise intervention. Some SDT tenets, such as the introduction of group sessions to improve relatedness or the training of social agents (e.g., instructors) to provide a need-supportive environment, might have increased the effectiveness of these interventions. The aim of this study was to examine the effects of a 6-month postoperative motivational PA intervention (MPAI) on bariatric patients' objective PA levels and HRQoL from pre-surgery to the end of the MPAI (7 months after surgery). Additionally, we explored the (possible) prolonged effects of the SDT-based intervention by performing a re-test 13 months after surgery. Previous research has shown that PA levels (Carnero et al., 2017) and HRQoL (Kolotkin, Davidson, Crosby, Hunt, & Adams, 2012) tend to decline over time in post-intervention follow-up measurements. Persistent postoperative non-related obesity barriers towards PA (e.g., lack of self-efficacy or knowledge to engage in PA) (Zabatiero et al., 2018), and the high rates of physical inactivity after surgery (Bond et al., 2017) could help to explain

this decrease. Thus, carrying out behavioral PA interventions in early postoperative stages could be crucial to counteract this phenomenon.

We hypothesized that: (a) the MPAI group (MPAI-G) would present significantly higher post-intervention PA levels, decreasing sedentary activity, and increasing light and moderate-to-vigorous physical activity (MVPA) when compared to a control group (CG); (b) both MPAI-G and CG would obtain positive changes on HRQoL domains after surgery, but these changes would be greater in the MPAI-G; and (c) positive outcomes would decrease 13 months after surgery but they would remain higher for the MPAI-G compared to the CG.

Methods

Participants

Participants were 40 individuals aged between 31-60 years with morbid obesity (body mass index [BMI] $\geq$ 40kg/m^2) seeking sleeve gastrectomy (SG). To be eligible for bariatric surgery, patients had to have a BMI greater than 40kg/m^2 or greater than 35kg/m^2 with an associated comorbidity. Additionally, patients had to be between 18 and 60 years old, having experienced previous failed obesity treatments with restrictive-caloric diets and medications, having followed endocrinology and nutritional monitoring, adequately adhering to the therapeutic instructions, and having no medical, physical, psychological, or social contraindications. To participate in the MPAI and to continue in it, all patients had to obtain the consent of the surgeon and the clinical psychologist. Consent implied favorable compliance with the usual postoperative medical evaluations of bariatric patients (e.g., regarding medication or nutrition). Exclusion criteria included unavailability to attend the program regularly, having any physical complication derived from SG, as well as suffering any other medical or

psychological condition that prevented habitual participation in PA during the course of the study.

Design

Participants were recruited from a Spanish hospital (University Hospital of Vinalopó, Elche) between November 2011 and May 2013. During their preoperative visit to the clinical psychologist, patients were asked if they wanted to participate in a follow-up intervention to improve their PA levels and various psychological variables related to exercise. Participants who showed interest after this interview (100% of patients asked) were assigned to the MPAI-G or the CG.

A quasi-experimental design with pseudo-random assignment was chosen to carry out this study. The first 10 participants who consulted the clinical psychologist were assigned to the MPAI-G, while the next 10 visitors were assigned to the CG. This procedure was repeated with the following 20 bariatric patients, such that the next 10 patients were assigned to the MPAI-G and started the PA program from the beginning after surgery, while the next 10 were assigned to the CG. We chose this pseudo-random assignment because, considering the tenets of SDT, participation in a group-PA program was a key aspect to improve relatedness, motivation, well-being, and adherence to PA. Taking into account that only 2 to 4 patients were operated per month, the most reasonable way to develop a group program with enough participants was to select patients for each group (MPAI-G and CG) in batches of 10 participants.

Patients were contacted by phone to arrange a baseline visit to the sport research center two weeks before surgery, during which they were informed about the aims and procedure of the study, they provided written consent and completed a questionnaire to assess HRQoL. Moreover, participants were asked to wear an accelerometer at their

right hip for seven consecutive days, warning them to take it off only to sleep, when having a shower, or performing activities that could damage the device (e.g., swimming), as reported in similar studies (Sellberg et al., 2019; Stolberg et al., 2018).

The characteristics of the intervention in the MPAI-G are described below. Regarding the participants in the CG, they only followed the usual exercise recommendations of their doctors. These recommendations focused on trying to maintain an active lifestyle after surgery (e.g., highlighting its importance to weight loss and maintenance), but without giving any more specific information or prescriptions related to exercise (e.g., type, frequency, duration, or intensity).

At post-intervention measurements (7- and 13-months post-surgery), patients again completed the HRQoL questionnaire and wore an accelerometer during another week. Ethical approval was obtained from the hospital and from the Research Ethical Board of the first's author university (clinicaltrials.gov registration NCT03666481). All research was carried out in accordance with the Helsinki Declaration.

Motivational physical activity intervention (MPAI)

The MPAI began one month after surgery, when the surgeon and clinical psychologist gave permission and medical discharge to the patients belonging to this group. The MPAI was carried out during 6 consecutive months and took place in a public fitness center located at the first author's university. The sessions were directed and supervised by two exercise and sport science professionals (Degree in Sport Sciences, Master's degree in PA and Health). These professionals were trained by one of the researchers responsible for the study in the application of SDT-based techniques and messages for the satisfaction of the needs for competence, autonomy, and relatedness (Table 3). Specifically, instructors' training was divided into two parts. The

first one consisted of a 10-hour theoretical and practical lesson about SDT-based techniques and messages in exercise settings. The second part (2-month long) involved the application of these techniques in a real-world context, where an external observer, expert in SDT, rated the instructors' compliance with the techniques using an observation sheet. After that, feedback was provided to the instructors to enhance their need-supportive style.

The frequency of patients' training, as well as the duration of the sessions, progressively increased throughout the 6 months. Thus, the MPAI consisted of two sessions per week during the first two months, three sessions per week during the intermediate two months, and four sessions per week during the last two months. The sessions lasted about 60 minutes the first two months, whereas the rest of months, the duration was about 90 minutes. Patient adherence to training was recorded through a follow-up sheet. Two types of sessions were designed: (a) Cardiorespiratory fitness and muscular strength training with machines; (b) Sessions that introduced novelty and enhanced psychosocial aspects of the PA program. These sessions included body expression, dance, directed activities (aerobic, spinning, etc.), beach and pool activities, core-training, trekking, and traditional Spanish games. STD-based techniques and messages were implemented in both types of sessions. At-home exercises were also provided to the patients, so that they had enough knowledge to do PA without having large resources or joining a gym. For example, participants were instructed to use quotidian materials (e.g., full bottles, shopping bags, etc.) to autonomously exercise at home.

Table 3. Examples of strategies based on SDT applied by instructors (Study 2).

Need	Strategies
Autonomy	Giving options to choose different activities, machines, and working ranges.
	Patients received training on how to perform healthy exercise by themselves.
	Asking participants for their opinion on the activities.
Competence	Providing positive feedback and information to the patients about their progress.
	Establishing short-term goals so that patients assess their progress every month.
	Follow-up of an individualized program with achievable goals.
Relatedness	Proposing physical and nonphysical tasks (e.g., a meeting to have lunch) in which patients had to interact.
	Participants were encouraged to correct each others' performance of exercises.
	The instructors smiled, supported, and encouraged patients. A caring climate was created, in which the instructors showed interest in patients' lives.

The MPAI, therefore, entailed two main purposes. First, to provide a need-supportive environment focused on the satisfaction of competence, autonomy, and relatedness to improve patients' attitudes towards PA, and to increase their PA participation after the intervention. Second, to transfer the physical and psychosocial benefits of the MPAI on patients' perceived HRQoL.

Measures

Physical Activity. Actigraph^{TM} GT3X accelerometers (Pensacola, FL) were used to measure PA levels. Participants were asked to wear the accelerometer at the right hip for 7 consecutive days. A total of ≥ 3 days with at least ≥ 10 hours wear time per day at all measurements was required to estimate the PA of each participant (Trost, McIver, & Pate, 2005). Vector magnitude (V_m) activity counts, calculated as the square root of the sum of the vertical, medio-lateral, and antero-posterior axes, were used according to previous studies performed with this population (Berglind et al., 2015; Berglind et al., 2016). Non-wear time was defined as 60 min of consecutive zeros, allowing for 2 min of non-zero interruptions (Troiano et al., 2008). Cutoffs to classify different intensities of PA were based on the studies of Santos-Lozano et al. (2013) and Hanggi, Phillips, and Rowlands (2013). Time spent in sedentary activity was defined as all minutes showing equal or less than 100 counts per minute (cpm), light PA as 101-3027 cpm, and moderate-to-vigorous PA (MVPA) as the number of minutes showing equal or more than 3028 cpm.

HRQoL. The 36-item Short-Form Health Survey (SF-36) was used to measure patients' quality of life in physical and mental domains. This questionnaire measures eight domains of functioning that can be employed to reflect (a) a physical component score (PCS), consisting of physical functioning, bodily pain, general health, and role-limitations because of physical problems; and (b) a mental component score (MCS), consisting of social functioning, vitality, mental health, and role-limitations because of emotional problems. Scores ranged from 0 (worst possible level of functioning) to 100 (best possible level of functioning). The SF-36 has been widely used in obese and

bariatric surgery populations (Adams et al., 2010; Sockalingam et al., 2015), showing high internal consistency, reliability and validity (Ware, 2000).

Other measures. Socio-demographic characteristics (i.e., sex, age, race/ethnicity, educational level, socioeconomic status, marital status) were collected by the hospital's clinical psychologist, who provided us with the data. The BMI data were taken at the sport research center during the baseline visit and at each post-intervention measurement.

Statistical analysis

All statistical analyses were performed using SPSS 25.0 (IBM, Corp., Armonk, NY, USA) software, excluding the effect sizes (ES) which were computed through an online ES calculator (Lenhard & Lenhard, 2016). Descriptive participants' characteristics are presented as percentages (%) and means ± standard deviations (M ± SD).

Comparison of preoperative differences in PA levels and HRQoL between groups were assessed using analysis of covariance (ANCOVA), adjusting for sex, age, and BMI. The effects of the MPAI on the continuous outcome variables were assessed by mixed-effects model for repeated measures. The model was adjusted by sex, age, and percentage of excess weight loss (% EWL). % EWL was determined by using the midpoint of the 1983 Metropolitan Life Insurance tables for a medium frame: [(operative weight – follow-up weight)/operative excess weight)] x 100.

Effect sizes (Cohen's *d*) with 95% confidence intervals for the differences between groups at each assessment point were calculated. Magnitude of these differences were considered as not statistically significant when the confidence interval included the value zero (Nakagawa & Cuthill, 2007). Differences equal to or greater

than d = 0.5 were considered as clinically relevant in the case of SF-36 dimensions (Norman, Sloan, & Wyrwich, 2003). Effect sizes and 95% confidence intervals of intra-group changes between assessment points are provided in supplementary material (see Appendix 1).

Results

Demographic data and retention

Of the 40 patients who initially agreed to participate in the study, one participant eventually did not participate after the group assignment, alleging personal reasons. From this sample of 39 patients, 32 (82%) completed all the assessment measures and were subsequently included in the final analyses (Figure 2). The retention rates for MPAI-G and CG at the second post-intervention measurement point (13-months post-surgery) were 89.4% and 75%, respectively. Comparison of baseline characteristics showed no statistically significant differences ($p > 0.05$) on any variable of completers compared to those who did not complete post-intervention measurements. Therefore, results are based on complete cases only. The attendance rate for the MPAI-G sessions was 80% on average (range, 68.1–88.9). The final disposition of the groups and the descriptive characteristics of the participants are presented in Table 4.

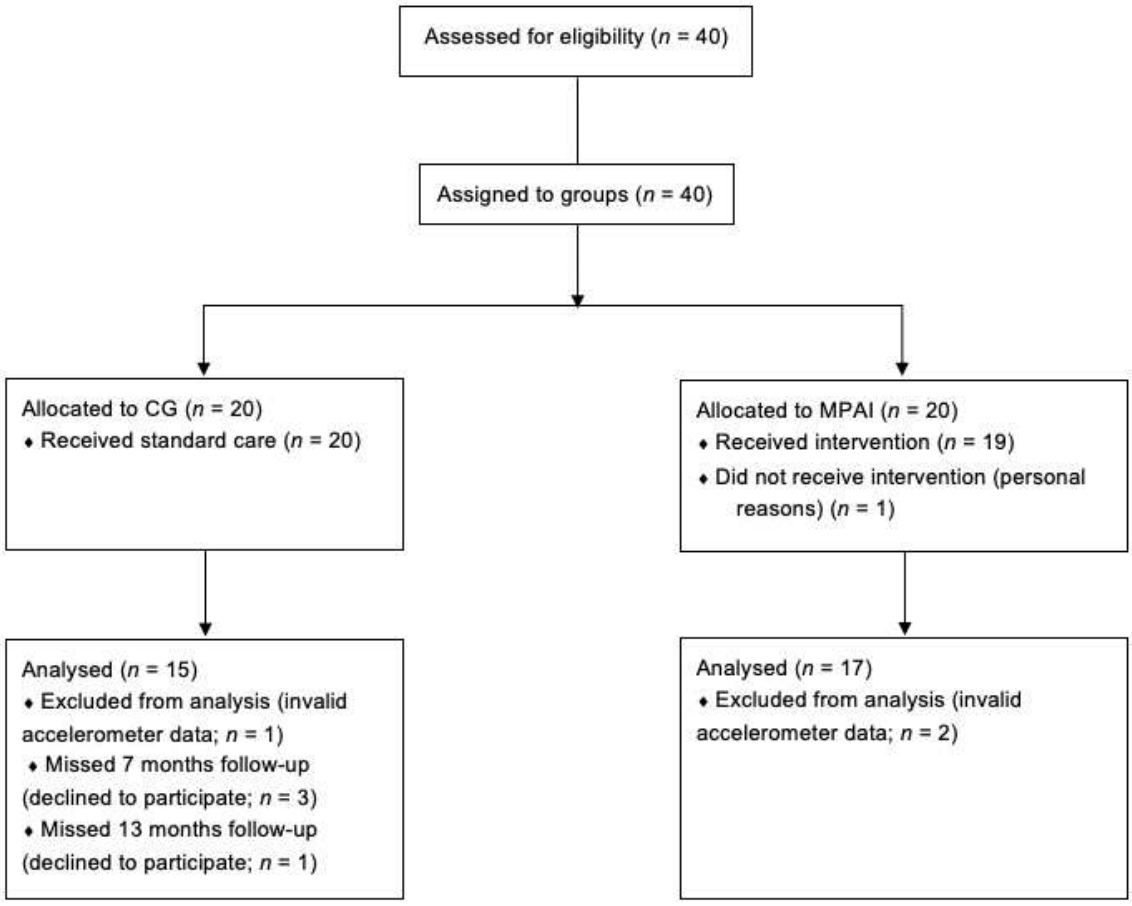

Figure 2. CONSORT flow diagram.

Table 4. Final sample characteristics in Study 2.

Variable	Full sample (n = 32)	CG (n = 15)	MPAI-G (n = 17)
Sex (%)			
Men	21.9	26.7	17.6
Women	78.1	73.3	82.4
Age (years) (M ± SD)	45.2 (± 10.0)	42.6 (± 10.9)	47.5 (± 8.8)
Anthropometric characteristics (M ± SD)			
Weight (kg)	115.7 (± 19.1)	116.6 (± 16.8)	114.9 (± 21.4)
BMI (kg/m^2)	43.9 (± 4.9)	43.1 (± 4.5)	43.8 (± 5.3)
Race/Ethnicity (%)			
White	96.9	100.0	94.1
Hispanic	3.1	–	5.9
Education (%)			
Without/Incomplete Primary school	15.6	26.7	5.9
Primary school	34.4	33.3	35.3
High school	46.9	40.0	52.9
College or university degree	3.1	–	5.9
Socioeconomic status (%)			
Low	18.8	20.0	17.6
Medium	78.1	80.0	76.5
High	3.1	–	5.9
Marital status (%)			
Single	21.9	33.3	11.8
Married/Partnered	68.7	60.0	76.5
Divorced	9.4	6.7	11.7

Note. CG = Control group, MPAI-G = Motivational physical activity intervention-group.

Table 5. Physical activity (PA) levels measured by GT3X accelerometers (expressed in minutes per day) and health-related quality of life' scores measured by the SF-36 questionnaire at pre-SG, 7 months-after SG, and 13 months-after SG (M ± SD).

Variable	Pre- SG*				7 months-after SG**				13 months-after SG**			
	CG	MPAI-G	*d*	95% CI	CG	MPAI-G	*d*	95% CI	CG	MPAI-G	*d*	95% CI
GT3X (min/day)												
Sedentary activity	623.96 (± 37.74)	624.21 (± 35.33)	0.01	[-0.69, 0.70]	603.74 (± 33.15)	612.30 (± 25.36)	0.29	[-0.40, 0.99]	626.27 (± 32.20)	631.65 (± 24.46)	0.19	[-0.51, 0.89]
Light PA	337.03 (± 33.70)	365.04 (± 31.56)	0.86[a]	[0.13, 1.58]	357.81 (± 30.31)	380.28 (± 23.36)	0.84[a]	[0.11, 1.56]	338.25 (± 29.57)	360.69 (± 22.64)	0.86[a]	[0.13, 1.58]
MVPA	48.91 (± 6.87)	29.02 (± 6.43)	-2.99[a]	[-4.01, -1.99]	50.04 (± 5.84)	27.16 (± 4.38)	-4.47[a]	[-5.77, -3.18]	47.09 (± 5.46)	27.84 (± 4.04)	-4.05[a]	[-5.26, -2.84]
Total PA	385.94 (± 37.80)	394.06 (± 35.39)	0.22	[-0.47, 0.92]	407.94 (± 33.23)	406.75 (± 25.42)	-0.04	[-0.73, 0.65]	385.65 (± 32.23)	387.22 (± 24.49)	0.05	[-0.64, 0.75]
SF-36 scores (0-100)												
Physical functioning	54.57 (± 5.90)	56.55 (± 5.53)	0.35	[-0.35, 1.05]	73.75 (± 3.06)	79.42 (± 2.72)	1.96[a,b]	[1.12, 2.81]	74.25 (± 3.18)	78.32 (± 2.90)	1.34[a,b]	[0.57, 2.11]
Bodily pain	49.37 (± 6.88)	55.49 (± 6.44)	0.92[a,b]	[0.19, 1.65]	62.03 (± 4.50)	66.65 (± 4.19)	1.06[a,b]	[0.32, 1.81]	56.81 (± 4.82)	63.03 (± 4.51)	1.34[a,b]	[0.57, 2.10]
General health	53.41 (± 5.46)	55.11 (± 5.11)	0.32	[-0.38, 1.02]	64.55 (± 3.52)	68.84 (± 3.27)	1.26[a,b]	[0.50, 2.03]	65.55 (± 3.79)	66.78 (± 3.55)	0.34	[-0.36, 1.03]
Physical role	55.80 (± 11.10)	56.65 (± 10.40)	0.08	[-0.61, 0.77]	76.92 (± 5.83)	77.72 (± 5.20)	0.14	[-0.55, 0.84]	76.53 (± 5.60)	78.13 (± 5.09)	0.30	[-0.40, 1.00]
PCS	37.28 (± 2.56)	38.41 (± 2.40)	0.46	[-0.25, 1.16]	45.19 (± 1.58)	47.19 (± 1.45)	1.32[a,b]	[0.56, 2.09]	44.58 (± 1.66)	46.33 (± 1.54)	1.10[a,b]	[0.35, 1.84]
Social functioning	77.68 (± 5.11)	81.45 (± 4.79)	0.76[a,b]	[0.04, 1.48]	83.47 (± 2.96)	87.57 (± 2.69)	1.45[a,b]	[0.67, 2.23]	82.64 (± 3.29)	81.34 (± 3.05)	-0.41	[-1.11, 0.29]
Vitality	51.33 (± 6.40)	53.53 (± 5.99)	0.36	[-0.34, 1.05]	60.59 (± 3.83)	63.22 (± 3.53)	0.72[a,b]	[0.01, 1.43]	59.28 (± 3.90)	61.94 (± 3.62)	0.71[b]	[-0.01, 1.42]
Mental health	69.68 (± 4.63)	71.69 (± 4.33)	0.45	[-0.25, 1.15]	73.10 (± 3.20)	74.51 (± 2.99)	0.46	[-0.25, 1.16]	72.40 (± 3.29)	72.00 (± 3.08)	-0.13	[-0.82, 0.57]
Mental role	79.24 (± 9.36)	79.10 (± 8.76)	-0.01	[-0.71, 0.68]	81.28 (± 6.23)	80.97 (± 5.80)	-0.05	[-0.75, 0.64]	81.43 (± 6.69)	80.25 (± 6.28)	-0.18	[-0.88, 0.51]

MCS	50.31 (± 2.53)	51.16 (± 2.37)	0.35	[-0.35, 1.05]	49.62 (± 1.68)	49.99 (±1.57)	0.23	[-0.47, 0.92]	49.52 (± 1.86)	49.12 (± 1.75)	-0.22	[-0.92, 0.47]

Note. * Adjusted by sex, age, and BMI. ** Adjusted by sex, age, and %EWL. SG = Sleeve gastrectomy, CG = Control group, MPAI-G = Motivational physical activity intervention-group, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity, PCS = Physical component score, MCS = Mental component score. [a] Significant differences considering that the 95% CI did not include the value zero. [b] Denotes clinically relevant differences between groups as per criterion of Norman et al., (2003).

Changes in PA levels

Mean PA levels (expressed in minutes/day), effect sizes, and 95% confidence intervals (CI) for all measurement points are presented in Table 5. Differences between groups in PA levels are shown in Figure 3. MPAI-G showed more light PA than CG at preoperative time-point (d = 0.86, 95% CI [0.13, 1.58]), and this difference remained 7 months (d = 0.84, 95% CI [0.11, 1.56]) and 13 months after SG (d = 0.86, 95% CI [0.13, 1.58]). However, CG showed more MVPA than MPAI-G before SG (d = -2.99, 95% CI [-4.01, -1.99]), and this difference was larger 7 months (d = -4.47, 95% CI [-5.77, -3.18]) and 13 months after SG (d = -4.05, 95% CI [-5.26, -2.84]). MPAI-G and CG did not differ significantly on sedentary activity or total PA throughout all time points.

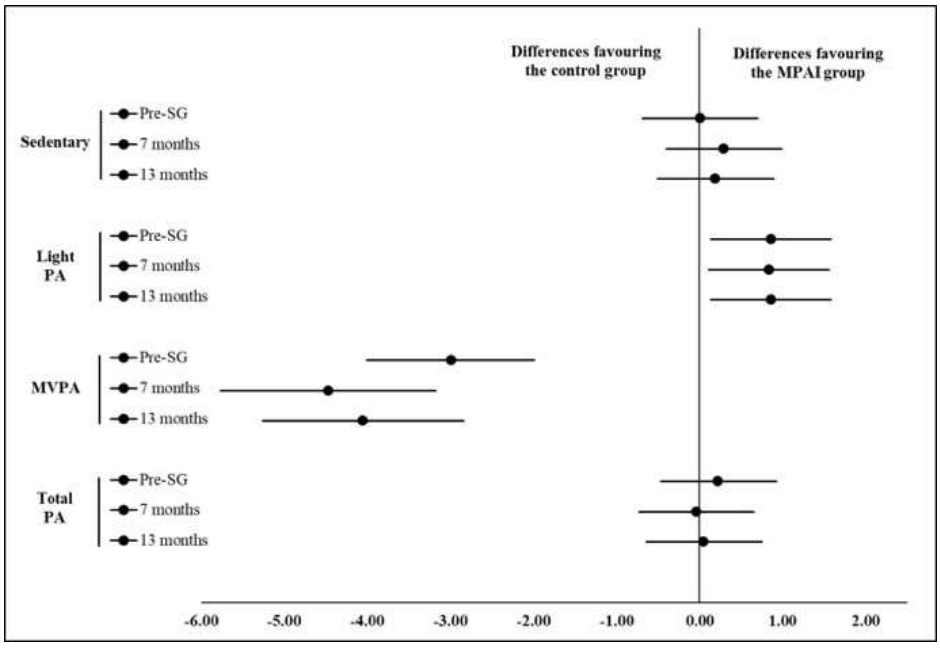

Figure 3. Forest plots of differences (95% confidence intervals) between groups in sedentary activity, light physical activity, moderate-to-vigorous physical activity, and total physical activity at the different time points. Dots represent Cohen's effect sizes; error bars represent confidence intervals. MPAI, motivational physical activity intervention; SG, sleeve gastrectomy.

Changes in HRQoL

HRQoL mean scores, effect sizes, and 95% CIs for all measurement points are presented in Table 5. Group differences in the physical and mental domains of HRQoL are shown in Figures 4 and 5, respectively. Regarding physical domains, no significant group differences were found for physical functioning at the preoperative time-point (d = 0.35, 95% CI [-0.35, 1.35]). However, MPAI-G showed higher physical functioning than CG both 7 months (d = 1.96, 95% CI [1.12, 2.81]) and 13 months after SG (d = 1.34, 95% CI [0.57, 2.11]). With regard to bodily pain, MPAI-G showed higher scores than CG before SG (d = 0.92, 95% CI [0.19, 1.65]), and these differences were greater 7 months (d = 1.06, 95% CI [0.32, 1.81]) and 13 months after SG (d = 1.34, 95% CI [0.57, 2.10]), indicating less pain in MPAI-G. In relation to the general health domain, no significant group differences were observed preoperatively (d = 0.32, 95% CI [-0.38, 1.02]). However, MPAI-G showed more general health than CG 7 months after SG (d = 1.26, 95% CI [0.50, 2.03]), although this difference was not maintained 13 months after SG (d = 0.34, 95% CI [-0.36, 1.03]). No significant group differences were found for the physical role domain at any time point. Regarding PCS, no significant group differences were obtained at the preoperative time-point (d = 0.46, 95% CI [-0.25, 1.16]). However, MPAI-G showed a higher PCS compared to CG 7 months (d = 1.32, 95% CI [0.56, 2.09]) and 13 months after SG (d = 1.10, 95% CI [0.35, 1.84]).

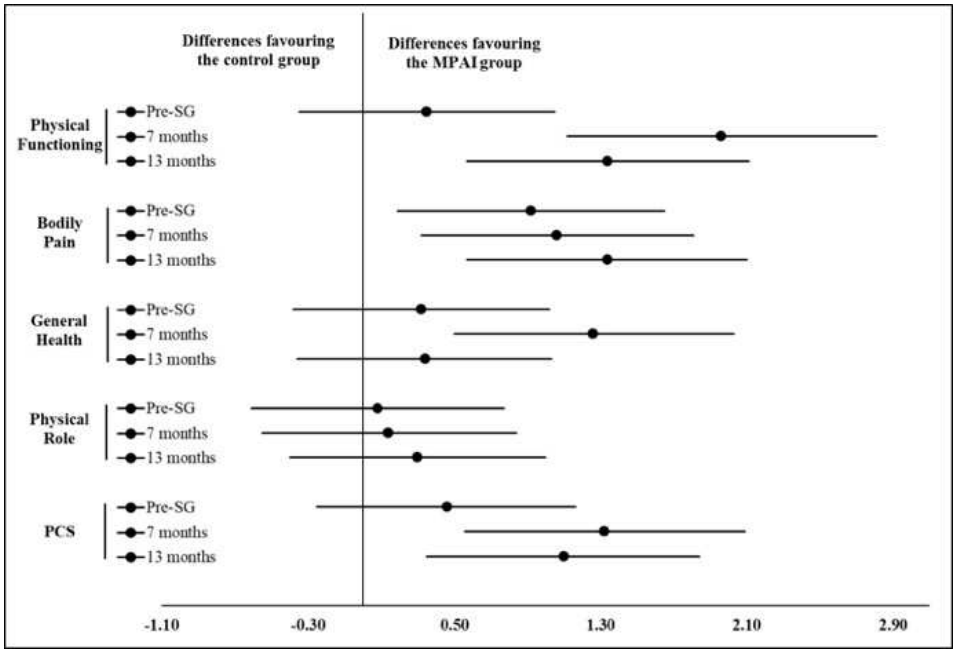

Figure 4. Forest plots of differences (95% confidence intervals) between groups in physical functioning, bodily pain, general health, physical role, and physical component score (PCS) at the different time points. Dots represent Cohen's effect sizes; error bars represent confidence intervals. MPAI, motivational physical activity intervention; SG, sleeve gastrectomy.

Respecting mental domains, MPAI-G showed higher social functioning than CG before surgery (d = 0.76, 95% CI [0.04, 1.48]), and these differences were greater 7 months after SG (d = 1.45, 95% CI [0.67, 2.23]). No significant group differences were found in social functioning 13 months after SG (d = -0.41, 95% CI [-1.11, 0.29]). For vitality, no significant differences between MPAI-G and CG were seen before SG (d = 0.36, 95% CI [-0.34, 1.05]). However, MPAI-G showed more vitality than CG 7 months after SG (d = 0.72, 95% CI [0.01, 1.43]). These differences were similar 13 months

after SG (d = 0.71, 95% CI [-0.01, 1.42]). No significant group differences were found for mental health, mental role, or MCS at any time point.

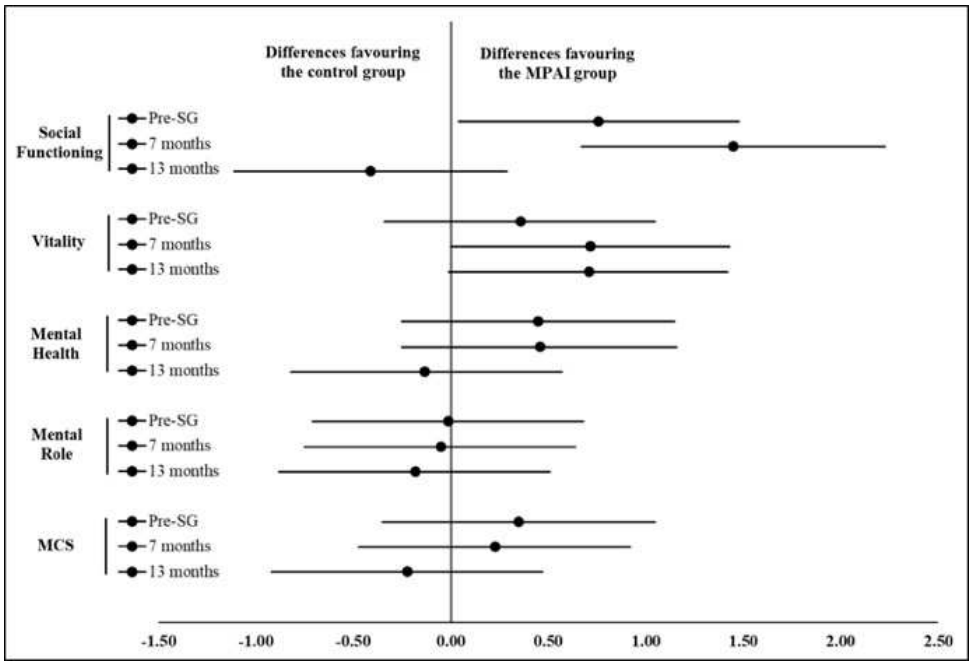

Figure 5. Forest plots of differences (95% confidence intervals) between groups in social functioning, vitality, mental health, mental role, and mental component score (MCS) at the different time points. Dots represent Cohen's effect sizes; error bars represent confidence intervals. MPAI, motivational physical activity intervention; SG, sleeve gastrectomy.

Discussion

Bariatric patients' PA levels did not significantly differ between MPAI-G and CG after a 6-month SDT-based PA intervention. In contrast, we found clinically significant differences favoring MPAI-G for several SF-36 domains immediately after the intervention (7 months post-surgery), which included higher scores in physical

functioning, bodily pain (indicating less pain), general health, PCS, social functioning, and vitality. Some of these differences remained 13 months after SG, as in the case of physical functioning, bodily pain, and PCS.

Effects of the MPAI on bariatric patients' PA levels

Previous research has indicated the need to conduct interventions focused on improving patients' PA after bariatric surgery (Stolberg et al., 2018). Our study was based on SDT, a commonly used framework to promote active behaviors in health-impaired populations (Ng et al., 2012; Ryan & Deci, 2017). However, we found no additional PA improvements favoring MPAI-G at any of the assessment points when compared to CG. These results contradict one of our pre-established hypotheses but are consistent with similar studies (Carnero et al., 2017; Herring et al., 2017; Stolberg et al., 2018). For instance, Stolberg et al. (2018) reported non-significant increases in step count, light PA, and MVPA immediately after a 26-week supervised physical training intervention, which failed to persist 24 months after surgery. In contrast, Bond et al. (2015, 2017) found that preoperative increases in bout-related MVPA after a 6-week behavioral intervention remained 6 months post-surgery.

A possible explanation of why we did not find differences in PA levels in favor of the MPAI-G with respect to the CG, could be that approximately 75% of patients belonging to CG accumulated ≥ 150 min of MVPA per week preoperatively, as recommended by the American College of Sports Medicine (Donnelly et al., 2009). Nevertheless, only 41% of MPAI-G patients accomplished these recommendations at the same stage. This fact could potentially limit the group comparisons, as the initial heterogeneity between them was high. Second, we could also speculate that MPAI-G's PA levels did not increase because we did not include a follow-up intervention, which

could have facilitated the increase of the patients' PA levels after the intervention (González-Cutre et al., 2020). Although part of our primary goal was to develop a positive predisposition towards PA that would lead to PA maintenance over time, we must acknowledge that life for these patients after surgery is complex, with many barriers/factors that can interfere with the maintenance of long-term behaviors (Dikareva, Harvey, Cicchillitti, Bartlett, & Andersen, 2016; Beltrán-Carrillo et al., 2019; Jiménez-Loaisa, Beltrán-Carrillo, González-Cutre, & Cervelló, 2015). Therefore, holding periodic follow-up meetings (e.g., face-to-face or by phone) could have been an appropriate strategy after completing the PA program. Moreover, we have to take into account that we provided MPAI-G patients with an ideal environment to participate in PA immediately after SG. In fact, they participated in four sessions per week during the MPAI. However, although we tried to develop a need-supportive climate, patients may have felt ignored or neglected when they finished the MPAI. According to these results, a key aspect of this type of interventions should be to design strategies that facilitate patients' transition from the intervention to real life. This point is particularly important, taking into account that the services offered by conventional sport centers are usually far from the special needs of bariatric patients.

Effects of the MPAI on bariatric patients' HRQoL

The current study was conducted at an early postoperative stage, characterized by a phase of active weight loss associated with extensive improvements in HRQoL. Consequently, both MPAI-G and CG showed remarkable increases on several HRQoL domains from pre-SG to immediately after the intervention (7 months post-SG), in accordance with our hypothesis. These improvements were especially evident in those dimensions related to the physical component of the SF-36, which coincide with

previous research (Karlsen et al., 2013; Monpellier et al., 2017). However, when comparing both groups, we observed significant and clinically relevant differences favoring MPAI-G for physical functioning, bodily pain, general health, PCS, social functioning, and vitality. Previous PA interventions (without a motivational component) have obtained modest results even in improving variables related to the physical component of the perceived HRQoL, when compared to control groups (Stolberg et al., 2018). To our knowledge, this is the first quantitative study that analyzes the effects of an SDT-based PA intervention in the HRQoL of this population. The design of interventions attending to motivational frameworks could help researchers to better structure ideas and strategies in line with psychological mechanisms and, therefore, to achieve greater positive outcomes (Biddle, Gorely, Mutrie, & Blamey, 2012). A meta-analysis examining the role of SDT on health contexts supports this view, as need-supportive health-care climates were essential predictors of patients' psychological well-being (Ng et al., 2012).

At 13-months post-SG, the significant and clinically relevant differences favoring MPAI-G remained only for the domains of bodily pain, physical functioning, and PCS, compared to CG. Bodily pain showed an improvement with respect to the values found 7 months post-SG, while physical functioning and PCS showed a decrease with respect to the same assessment point. These results coincide with the last hypothesis set out at the beginning of this study and highlight the need to carry out similar studies with longer interventions and/or with longer follow-ups, in order to observe the functioning of the HRQoL variables over time.

In this line, an unexpected result was found for social functioning, which showed clinical differences favoring MPAI-G at pre-surgery and 7 months post-surgery, but disappeared at 13 months post-surgery. We performed a group intervention where

patients were always accompanied by their peers, with activities adapted to them, and with exercise professionals always fully available. It was an "ideal" situation in which they felt accepted and cared for by the people around them. Therefore, although an increase in social functioning was found just after finishing the intervention, an adverse effect may have been generated in patients after completing the PA program and going back to "real life." This aspect could have limited the potential benefits of the program in the long term. Future studies should also consider the deferred effects of SDT interventions on patients' perceptions.

Strengths and limitations

The current study has notable strengths. To our knowledge, this is the first study carried out with bariatric surgery patients that has developed a supervised PA intervention based on a motivational framework (SDT). More research is needed to explore the role of theoretical/motivational frameworks in PA interventions with this population. In this sense, directing programs not only towards biological/physical objectives, but also towards psychosocial objectives, would be desirable to increase patients' well-being and PA adherence. The high attendance rate of patients to the MPAI sessions could be an argument supporting this idea. The use of the $d = 0.5$ criterion to determine clinically relevant differences between groups and to better understand the magnitude of these differences was another strength (Norman et al., 2003).

This study also has some limitations that must be considered. First, the fact of employing a quasi-experimental design with pseudo-random assignment prevents us from inferring causality between the MPAI and PA/HRQoL results. Second, we failed to retain several participants at the post-intervention measures, especially in the CG.

Although there were no differences in the baseline characteristics between completers and non-completers, carrying out retention strategies over time could have prevented this sample loss. Third, we were also limited by the small number of participants involved in the study. The restricted number of bariatric surgeries performed in a small hospital during the intervention period hindered the recruitment of more participants. Consequently, further studies involving MPAI with larger samples are warranted. Finally, despite using accelerometer PA intensities (i.e., cut-offs) that have been commonly used with bariatric patients (Berglind et al., 2015; Berglind et al., 2016; Sellberg et al., 2019), Santos-Lozano et al. (2013) validated their cut-offs points in normal-weight adults and not in obese or bariatric populations. Moreover, these authors validated their equations in laboratory settings, instead of free-living conditions. Regarding this argument, we agree with other authors about the lack of consensus to establish accelerometer PA intensities, which limits comparability between studies (Sellberg et al., 2019). All this advises interpreting the accelerometer data with caution.

Conclusions

Findings from the present study suggest that an SDT-based PA intervention could enhance several HRQoL dimensions of bariatric patients after surgery. These findings suggest that SDT could be applicable for the development of programs framed in health-care settings to enhance bariatric patients' HRQoL. Health-care practitioners, biomedical ethicists, exercise professionals, and public health authorities could benefit from the principles of SDT for delivering their messages towards patients. However, the intervention did not result in greater PA levels for the MPAI-G, when compared to the CG. Further research is needed to understand what motivational processes, and

personal, social, physical, and environmental factors are key aspects to promote PA in these patients.

STUDY 3

Motivation and physical activity levels in bariatric patients involved in a self-determination theory-based physical activity program

Note. This study was published.

González-Cutre, D., Jiménez-Loaisa, A., Alcaraz-Ibáñez, M., Romero-Elías, M., Santos, I, & Beltrán-Carrillo, V. J., (2020). Motivation and physical activity levels in bariatric patients involved in a self-determination theory-based physical activity program. *Psychology of Sport & Exercise,* 51:101795. https://doi.org/10.1016/j.psychsport.2020.101795.

Motivation and physical activity levels in bariatric patients involved in a self-determination theory-based physical activity program

Abstract

Objective: This study examines the associations between pre- to post-intervention changes in motivation and physical activity (PA) levels of bariatric patients involved in a 6-month postoperative PA program based on self-determination theory (SDT). We also explore the extent to which patients' perception of autonomy support and basic psychological need satisfaction during the program were associated with changes in their motivation to exercise. **Method**: Forty patients were assigned to a motivational PA intervention (MPAI-G) or to a control group (CG). Both groups completed questionnaires assessing the variables of interest and wore GT3X accelerometers before surgery and after the program. **Results**: Thirty-two participants (78.1% female) completed all measures and were included in the present analyses. CG showed greater increases in integrated (d = -1.60, 95% CI [-2.40, - 0.81]) and identified regulation (d = -0.75, 95% CI [-1.47, -0.03]) than MPAI-G. However, the MPAI-G experienced increases in introjected regulation (d = 1.95, 95% CI [1.11, 2.79]) and greater decreases in external regulation (d = -1.00, 95% CI [-1.74, -0.27]) than CG, which were associated with decreases in sedentary activity and increases in light and total PA. Oppositely to the CG, amotivation decreased in the MPAI-G (d = -2.98, 95% CI [-3.98, -1.97]) and it was related to increases in light and total PA. Changes in exercise motivation were associated with perceived autonomy support and basic psychological need satisfaction during the program. **Conclusion**: The SDT-based PA program gave rise to greater changes in controlled forms of motivation and amotivation than in autonomous motivation in post-bariatric surgery patients.

Keywords: Sleeve gastrectomy; Self-regulation; Amotivation; Accelerometer; Health settings.

Introduction

Bariatric surgery candidates report several obesity and non-obesity related barriers towards physical activity (PA) (Beltrán-Carrillo et al., 2019; Zabatiero et al., 2018). In this regard, research has shown that non-obesity related barriers (e.g., lack of self-efficacy, motivation, or knowledge to engage in PA) largely persist after surgery (Zabatiero et al., 2018). This fact could explain the few or non-existent pre- to post-surgery changes in PA levels found in this population (Herring et al., 2016; Jacobi, Ciangura, Couet, & Oppert, 2011).

One of the most frequent non-obesity related barriers reported by bariatric patients to engage in PA is lack of motivation (Dikareva, Harvey, Cicchillitti, Bartlett, & Andersen, 2016; Peacock, Sloan, & Cripps, 2014; Zabatiero et al., 2016). For instance, Dikareva et al. (2016) showed that some patients describe exercise as "a chore" and a "waste of time". Peacock et al. (2014) showed that nearly 80% of bariatric patients reported difficulties to maintain exercise behavior, to make exercise a priority, or simply to enjoy it. Participants included in the study of Zabatiero et al. (2016) highlighted that initiating PA every day was an arduous task for them. Therefore, promoting PA among bariatric patients represents a major challenge for health-care practitioners, PA professionals and public health authorities, which needs to be addressed.

Self-determination theory (SDT; Ryan & Deci, 2017) has been widely used to describe the motivational processes underlying behavioral maintenance, including long-term PA adherence (Teixeira, Carraça, Markland, Silva, & Ryan, 2012). According to SDT, individuals' optimal motivation, development, and wellness requires them to perceive that their basic psychological needs are being fulfilled: the need for autonomy (to feel a sense of choice and self-endorsement towards the behavior); competence (to feel a sense of capacity and mastery to accomplish the behavior); and relatedness (to

feel meaningfully connected to others). In PA settings, the satisfaction of basic psychological needs has been empirically associated with more autonomous (internal, non-controlled) forms of motivation and positive outcomes related to behavioral persistence and well-being (Ng et al., 2012; Ntoumanis et al., 2020; Vallerand, 2007). Nevertheless, when these psychological needs are thwarted, people tend to regulate their behavior based on external contingencies and self-judgments (i.e., to develop controlled forms of motivation), which lead to behavioral non-adherence and negative psychological consequences (Santos, Silva, & Teixeira, 2016; Vansteenkiste & Ryan, 2013). For these reasons, SDT could provide a basis on which behavior change interventions, such as those focused on improving PA adherence, can be supported.

To date, few studies have used SDT as the theoretical frame of reference when designing programs to promote PA adherence in bariatric patients. In the *Bari-Active* project, Bond et al. (2015, 2016, 2017) used some SDT tenets (along with other psychological theories) to improve pre- and postoperative PA levels of patients seeking bariatric surgery. Interestingly, they found that preoperative increases in bout-related moderate-to-vigorous PA (MVPA) remained six months post-surgery (Bond et al., 2015), which were accompanied by both a decrease in patients' levels of amotivation and increases in autonomous forms of motivation (Bond et al., 2016). However, they reported no relationships between changes in bout-related MVPA and motivational variables (Bond et al., 2016). The fact that these studies conducted face-to-face counselling, but not practical PA sessions in which patients exercised together in a need-supportive environment, could be a plausible explanation for this lack of correspondence between motivation and PA. Later, González-Cutre, Megías, Beltrán-Carrillo, Cervelló, and Spray (2020) carried out a 6-month postoperative SDT-based program where patients qualitatively reported many factors that contributed to their

psychological need satisfaction (e.g., instructors caring about their opinion, fitness improvement, or knowledge acquisition about PA), which in turn enhanced patients' autonomous motivation and their intention to be physically active. Unfortunately, findings from a subsequent quantitative study with the same patients suggested that such intervention enhanced several dimensions of their health-related quality of life, but did not lead to significant increases in their objectively assessed PA levels at either 7 or 13 months post-surgery when compared to a control group (Jiménez-Loaisa, González-Cutre, Beltrán-Carrillo, & Alcaraz-Ibáñez, 2020).

The present research is based on these PA results found by Jiménez-Loaisa et al. (2020). By analyzing the same participants, this study tried to shed light on the motivational factors that influenced patients' PA levels after a 6-month SDT-guided PA intervention. For that purpose, the objectives of this study were: 1) to examine the associations between pre- to post-intervention changes in exercise motivation and objective PA levels of bariatric patients involved in the postoperative program, comparing with a control group who did not receive the intervention; and 2) to explore the extent to which patients' perception of autonomy support and basic psychological need satisfaction during the program were associated with changes in their motivation to exercise. Therefore, while Jiménez-Loaisa et al. (2020) focused on analyzing the effects of the motivational PA intervention (MPAI) on patients' PA levels from pre-surgery to the end of the MPAI (7 months post-surgery) and 13 months post-surgery, this study tried to delineate the motivational processes that occurred during the intervention, by using the pre-surgery and 7-month post-surgery measurements points, and their associations with PA levels. Several SDT-based variables related to motivational mechanisms underlying PA adoption which were not analyzed in Jiménez-Loaisa et al. (2020), as autonomy support (Ntoumanis et al., 2020), basic need

satisfaction (Ryan & Deci, 2017), and motivational regulations (Teixeira et al., 2012) were included on this occasion. Additionally, in contrast with Bond et al. (2016), we also included light PA to provide a more complete understanding of the behavioral paths chosen by this population to participate (or not) in PA.

Previous research in the field of bariatric surgery and PA have shown high rates of physical inactivity after surgery (Herring et al., 2016; Jacobi et al., 2011), and both theory (Jiménez-Loaisa et al., 2020) and non-theory-guided (Herring et al., 2017; Stolberg et al., 2018) postoperative PA programs have failed to increase patients' PA levels over time. For that reason, analyzing the associations between motivational processes and different forms of PA could be helpful for future behavior change interventions aimed at promoting PA adherence in these patients.

We hypothesized that the MPAI would influence the development of more autonomous forms of motivation towards PA, while decreasing those of a controlled nature and also amotivation; and that potential positive changes in more autonomous forms of motivation would be positively related to changes in PA (light and MVPA). On the other hand, we expected that changes in controlled types of motivation and amotivation would be negatively associated with changes in PA, but positively associated with changes in sedentary activity. Finally, we expected that patients' perception of autonomy support and basic psychological need satisfaction would be positively associated with changes in their autonomous motivation, and negatively associated with controlled motivation and amotivation.

Method

Participants and study design

Adult participants, aged between 31 and 60 years, diagnosed with severe obesity (body mass index [BMI] ≥ 40kg/m^2) were recruited from a Spanish hospital between November 2011 and May 2013. Requirements for sleeve gastrectomy (SG) also included having failed previous attempts of sustained weight loss after endocrinology and nutritional counselling, and not having any physical, medical or psychosocial contraindications.

The details of the intervention design have been previously reported (González-Cutre et al., 2020; Jiménez-Loaisa et al., 2020). CONSORT flow diagram is available at Jiménez-Loaisa et al. (2020). Briefly, patients were recruited preoperatively by their clinical psychologist (100% of patients asked) and were assigned to a motivational PA intervention group (MPAI-G) or a control group (CG). Forty patients were recruited at an initial stage. As one of our main goals was that patients exercised together with their peers, we decided to assign patients following a 10:10 procedure, so that the first 10 patients who attended the baseline meeting were assigned to the MPAI-G, and the next 10 assigned to the CG. This pseudo-randomized procedure was repeated with the next 20 participants. In this way, of the initial 40 participants allocated to groups, 32 (n = 17 MPAI-G; n = 15 CG; 82% of retention) completed all assessment measures and were included in the present analyses. In the CG, reasons for not being included were having invalid accelerometer data (n = 1) or declining to participate at post-intervention assessment (n = 4). In the MPAI-G, a participant did not receive the intervention alleging personal reasons (n = 1), while some patients presented invalid accelerometer data (n = 2). Participants' characteristics are presented in Study 2.

Informed consent was obtained from all participants included in the current intervention study. All research was conducted according to the Helsinki Declaration, approved by the hospital and the first author's university, and registered at

ClinicalTrials.gov (registration number NCT03666481). The quality of the study was assessed using the "Consolidated Standards of Reporting Trials" (CONSORT). The study fulfills 20 of the 25 criteria of the CONSORT checklist (Appendix 2).

Procedure

The MPAI started one month after surgery and lasted 6 months. To be included, all patients had to get the consent of both their surgeon and clinical psychologist and had to confirm their availability to attend the program. Consent implied favorable compliance with the usual postoperative medical evaluations of bariatric patients (e.g., regarding medication or nutrition). Exclusion criteria included unavailability to attend the program regularly, having any physical complication derived from SG, as well as suffering any other medical or psychological condition that prevented habitual participation in PA during the course of the study.

MPAI sessions took place in a public fitness center located at the first author's university. All activities were guided by two sport sciences professionals who received standardized training in the application of SDT-based motivational strategies (see Appendix 2). As previously described (González-Cutre et al., 2020; Jiménez-Loaisa et al., 2020), instructors' training was divided in two blocks. The first one consisted of a 10-hour theoretical and practical seminar about SDT-based motivational strategies in exercise. In the second block (2-month long), the instructors applied these strategies in a real-world setting, where an external observer with expertise in SDT rated their agreement with the strategies using an observation sheet. After that, feedback was provided to the two instructors to improve their need-supportive style.

The frequency and duration of the sessions increased while the program was progressing. Concretely, the MPAI consisted of two sessions per week during the first

two months, three sessions per week during the intermediate two months, and four sessions per week during the last two months (~ 70 exercise sessions). Patients' training attendance was recorded through a follow-up sheet. The sessions lasted about 60 min during the first two months, increasing to approximately 90 min during the following months. This approach was adopted to address the evolution of the physical training variables considered in the research project. In this regard, the content of the sessions was directed in two ways: sessions with activities focused on working physical capabilities with machines (e.g., cardiorespiratory fitness, muscular strength); and innovative sessions to enhance psychosocial aspects among participants (e.g., body expression, beach and pool activities, trekking, traditional Spanish games). The SDT-based motivational strategies were applied in both types of sessions.

The MPAI, therefore, involved two main goals. First, to provide a need-supportive environment focused on the satisfaction of the basic psychological needs for autonomy, competence, and relatedness to improve patients' motivation towards PA, and therefore increasing their PA participation after the program. Second, to translate the physical and psychosocial benefits of the MPAI on patients' perceived quality of life.

The CG verbally received general recommendations of PA from their doctors as part of their usual care, which were focused on trying to maintain an active lifestyle after surgery, but without giving specific information regarding the type, frequency, duration or intensity of the physical activities.

The measurements were carried out before SG (2 weeks pre-surgery) and after the intervention (7-months post-SG). At both measurement points, patients from both groups filled in a questionnaire related to their motivation towards exercise and were encouraged to wear an accelerometer for a week to measure their PA levels. Patients'

autonomy support and basic psychological need satisfaction were only measured in the MPAI-G after the program.

Measures

Motivation to exercise. The 23-item Spanish version of the Behavioural Regulation in Exercise Questionnaire (BREQ-3; González-Cutre, Sicilia, & Fernández, 2010) was used to measure patients' motivation to exercise. BREQ-3 assesses different types of exercise motivation, comprising 6 minor subscales: *amotivation* (e.g., "I don't see why I have to do it"), *external regulation* (e.g., "Because other people say I should"), *introjected regulation* (e.g., "I feel guilty when I don't exercise"), *identified regulation* (e.g., "I value the benefits of exercise"), *integrated regulation* (e.g., "I consider exercise a fundamental part of who I am"), and *intrinsic regulation* (e.g., "I exercise because it's fun"). This questionnaire is rated on a 5-point Likert-scale, from 0 ("totally disagree") to 4 ("totally agree"). External and introjected regulations represent controlled forms of motivation, whereas intrinsic, integrated, and identified regulations represent autonomous forms of motivation (major subscales). Higher BREQ scores on subscales representing more autonomous types of motivation have shown to be predictive of higher levels of PA (Thøgersen-Ntoumani & Ntoumanis, 2006; Markland & Tobin, 2004).

Physical activity levels. Actigraph^{TM} GT3X accelerometers (Pensacola, FL) were used to measure PA. Participants were asked to wear the triaxial accelerometer at their right hip for a 1-week period, excepting for activities that could damage the device (e.g., for sleeping, showering or bathing). Wear-time required to estimate PA levels was as follows: a minimum of 3 days with at least 10 hours of wearing-time per day at all measurements (Trost, McIver, & Pate, 2005). Non-wear time was defined as 60 min of

consecutive zeros, allowing for 2 min of non-zero interruptions (Troiano et al., 2008). Sedentary, light, and moderate-to-vigorous intensity activities were defined as ≤ 100, 101-3027, and ≥ 3028 counts per minute, respectively (Santos-Lozano et al., 2013, Hanggi, Phillips, & Rowlands, 2013). Total PA was obtained through the sum of light PA and MVPA.

Autonomy support. The 12-item Spanish version of the Perceived Autonomy Support Scale for Exercise Settings (PASSES, Moreno-Murcia, Parra, & González-Cutre, 2008) was used to measure the autonomy support that patients perceived of their instructors during the program (e.g., "I feel that the instructor provides me with choices, options, and opportunities about whether to do active exercise in my free time"). This questionnaire is rated on a 7-point Likert-scale, from 1 ("totally disagree") to 7 ("totally agree"), where higher scores represent higher perceptions of autonomy support provided by instructors.

Basic psychological needs in exercise. The 12-item Spanish version of the Basic Psychological Needs in Exercise Scale (BPNES; Sánchez & Núñez, 2007) was used to assess the extent to which the psychological needs of the patients were satisfied during the program. The questionnaire is rated on a 5-point Likert-scale, from 1 ("totally disagree") to 5 ("totally disagree"), which allows to measure *autonomy* (e.g., "The way I exercise is in agreement with my choices and interests"), *competence* (e.g., "I feel I perform successfully the activities of my exercise program"), and *relatedness* (e.g., "My relationships with the people I exercise with are very friendly"). Higher scores represent higher needs' satisfaction.

Other measures. Age, sex, race/ethnicity, level of education, socioeconomic status, and marital status were reported by all participants at study entry. Anthropometric data (i.e., height and weight) was assessed at both assessment moments.

Data analysis

Analyses were performed using SPSS 25.0 (IBM, Corp., Armonk, NY, USA) software, excluding effect sizes (ES) which were extracted online (Lenhard & Lenhard, 2016). Participants' descriptive values for studied variables are presented as relative frequencies (%) or means ± standard deviations (M ± SD). Changes in motivation and PA levels between groups from pre-SG to 7 months post-SG were estimated using analysis of variance (ANOVA), adjusting for sex, age and percentage of excess weight loss (% EWL). These covariates were included for three reasons: 1) to maintain consistency with Jiménez-Loaisa et al. (2020), 2) previous evidence supporting differences according to sex, age and % EWL in PA (Josbeno, Kalarchian, Sparto, Otto, & Jakicic, 2011; Stroebele-Benschop, Damms-Machado, Milan, Hilzendegen, & Bischoff, 2013; Westerterp, 2018), and 3) % EWL is the most common weight loss-related variable used in bariatric surgery research (Brethauer et al., 2015). Bivariate correlations between all covariates and outcome variables are available at Appendix 2.

Additionally, to examine associations between changes in motivation and PA variables from pre-SG to 7 months post-SG, and between autonomy support/need satisfaction and changes in motivation, partial correlations were calculated. Sex, age and % EWL were also used as moderators for partial correlations. % EWL was determined by using the midpoint of the 1983 Metropolitan Life Insurance tables for a medium frame: [(operative weight – follow-up weight)/operative excess weight)] x 100. Bivariate correlations can be consulted at Appendix 2.

ES with 95% confidence intervals were calculated to estimate the magnitude of the difference between groups in the motivation variables and PA levels, which were considered not statistically significant when the confidence interval encompassed the

zero value (Nakagawa & Cuthill, 2007). Intra-group differences in descriptive values are also available at Appendix 2. To interpret these differences, threshold values for Cohen's *d* were used as small (< 0.3), moderate (around 0.5) and large (> 0.8). ES proposed by Morris (2008) was also indicated for weighting the differences of the pre-post-means via pooled pretest standard deviation. For ES of differences between partial correlations across CG and MPAI-G, Cohen's *q* was determined by considering < 0.1 as no effect, 0.1 to 0.3 small effect, 0.3 to 0.5 intermediate effect, and > 0.5 as large effect (Cohen, 1988). Finally, magnitude of correlations between autonomy support/need satisfaction and changes in motivation for MPAI-G were interpreted based on the Gignac and Szodorai (2016) normative correlation guidelines, where r = 0.10, 0.20, and 0.30 represent relatively small, typical, and relatively large associations, respectively.

Results

Descriptive data

Patients' attendance rate for the MPAI-G sessions was 80% on average (range, 68.1–88.9). Demographic and bariatric characteristics did not differ (p > 0.05) between participants who provided complete data from those who did not provide them. The descriptive values for motivation and PA variables are shown in Table 6. Preoperatively, both groups differed significantly only in MVPA, which was higher in the CG (d = -0.72, 95% CI [-1.44, -0.01]).

Table 6. Between-groups descriptive values (M ± SD) for motivation variables and physical activity levels from pre-SG to 7 months-after SG.

Variables	Pre-SG			7 months-after SG			d_{Morris}
	CG (n = 15)	MPAI-G (n = 17)	d	CG (n = 15)	MPAI-G (n = 17)	d	
BREQ-3 scores (0-4)							
Intrinsic	2.50 (± 1.57)	2.44 (± 1.43)	-0.04	3.03 (± 1.10)	3.01 (± 0.95)	-0.02	-0.03
Integrated	2.00 (± 1.32)	1.98 (± 1.23)	-0.02	2.88 (± 1.14)	2.31 (± 1.08)	-0.51	0.44
Identified	3.02 (± 1.38)	3.04 (± 1.20)	0.02	3.35 (± 0.83)	3.29 (± 0.75)	-0.08	0.07
Introjected	1.10 (± 0.97)	1.07 (± 0.88)	-0.03	0.80 (± 0.94)	1.34 (± 0.96)	0.57	-0.59
External	0.87 (± 1.25)	1.22 (± 1.28)	0.28	0.60 (± 0.97)	0.59 (± 0.78)	-0.01	0.32
Amotivation	0.37 (± 0.45)	0.50 (± 0.69)	0.22	0.43 (± 0.57)	0.19 (± 0.34)	-0.52	0.71
GT3X (min/day)							
Sedentary activity	628.45 (± 140.42)	620.25 (± 132.96)	-0.06	617.09 (± 166.66)	614.87 (± 168.20)	-0.01	-0.04
Light PA	332.66 (± 125.36)	368.89 (± 122.60)	0.29	368.34 (± 155.27)	378.38 (± 161.94)	0.06	0.18
MVPA	47.98 (± 29.67)	29.84 (± 20.25)	-0.72*	43.26 (± 31.45)	25.73 (± 22.85)	-0.64	-0.02
Total PA	380.64 (± 143.22)	398.74 (± 132.96)	0.13	411.60 (± 173.83)	404.11 (± 168.20)	-0.04	0.16

Note. SG = Sleeve gastrectomy, CG = Control group, MPAI-G = Motivational physical activity intervention-group, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity. d_{Morris} = Raw differences between groups of the pre-post means divided by the pooled pretest standard deviation. * Significant differences considering that the effect size 95% CI did not include the zero value.

Changes in motivation/PA

Changes in motivation and PA levels, controlling for sex, age, and % EWL, are shown in Table 7. CG showed greater increases in integrated regulation (d = -1.60, 95% CI [-2.40, -0.81]), identified regulation (d = -0.75, 95% CI [-1.47, -0.03]), and smaller decreases in MVPA (d = -0.72, 95% CI [-1.44, -0.01]) than MPAI-G. Otherwise, MPAI-G showed increases in introjected regulation, while CG showed a decrease in this variable (d = 1.95, 95% CI [1.11, 2.79]). MPAI-G also showed greater decreases in external regulation (d = -1.00, 95% CI [-1.74, -0.27]) than CG. Finally, MPAI-G showed a decrease in amotivation, while CG showed increases in this variable (d = -2.98, 95% CI [-3.98, -1.97]).

Table 7. Changes in motivation and physical activity levels from pre-SG to 7 months-after SG adjusted by sex, age and % EWL.

Variables	CG (n = 15)		MPAI-G (n = 17)		d_{Cohen}	95% CI
	M (SD)	95% CI	M (SD)	95% CI		
BREQ-3						
Intrinsic	0.56 (± 0.41)	[-0.28, 1.40]	0.55 (± 0.38)	[-0.23, 1.34]	-0.02	[-0.72, 0.67]
Integrated	0.84 (± 0.31)	[0.21, 1.47] #	0.36 (± 0.29)	[-0.23, 0.95]	-1.60	[-2.40, -0.81] *
Identified	0.42 (± 0.33)	[-0.26, 1.10]	0.18 (± 0.31)	[-0.46, 0.81]	-0.75	[-1.47, -0.03] *
Introjected	-0.20 (± 0.20)	[-0.62, 0.22]	0.18 (± 0.19)	[-0.21, 0.57]	1.95	[1.11, 2.79] *
External	-0.31 (± 0.30)	[-0.93, 0.32]	-0.60 (± 0.28)	[-1.18, -0.02] #	-1.00	[-1.74, -0.27] *
Amotivation	0.16 (± 0.19)	[-0.24, 0.55]	-0.39 (± 0.18)	[-0.76, -0.01] #	-2.98	[-3.98, -1.97] *
GT3X						
Sedentary activity	1.64 (± 34.42)	[-68.98, 72.25]	-16.85 (± 32.18)	[-82.88, 49.19]	-0.56	[-1.26, 0.15]
Light PA	22.93 (± 33.03)	[-44.84, 90.69]	20.74 (± 30.89)	[-42.63, 84.11]	-0.07	[-0.76, 0.63]
MVPA	-1.94 (± 6.64)	[-15.56, 11.68]	-6.56 (± 6.21)	[-19.30, 6.18]	-0.72	[-1.44, -0.01] *
Total PA	20.99 (± 35.60)	[-52.05, 94.02]	14.18 (± 33.29)	[-54.12, 82.48]	-0.20	[-0.89, 0.50]

Note. SG = Sleeve gastrectomy, % EWL = Percentage of excess weight loss, CG = Control group, MPAI-G = Motivational physical activity intervention-group, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity. # Intra-group significant differences considering that the effect size 95% CI did not include the zero value. * Between-group significant differences considering that the effect size 95% CI did not include the zero value.

Associations between changes in motivation and PA variables

Partial correlations (adjusted by sex, age, and % EWL) between changes in motivation and PA across groups are presented in Table 8. In this vein, four main groups of results deserve to be highlighted:

Changes in motivation and sedentary activity. Changes in introjected regulation and sedentary activity were negatively related in the MPAI-G, inversely to the CG (q = 0.80, large). Moreover, changes in external regulation and sedentary activity were positively related for the MPAI-G, opposed to the CG (q = 0.37, intermediate).

Changes in motivation and light PA. Changes in intrinsic regulation and light PA were positively associated for both groups (q = 0.36, intermediate). Changes in introjected regulation and light PA were positively related in the MPAI-G, contrary to the CG (q = 0.59, large). Lastly, changes in external regulation and amotivation were negatively associated with light PA for the MPAI-G, whereas CG showed the inverse pattern (q = 0.64 and 0.41, large and intermediate, respectively).

Changes in motivation and MVPA. Changes in identified regulation and MVPA were negatively associated in the MPAI-G, inversely to the CG (q = 0.43, intermediate). In the same way, changes in amotivation and MVPA were positively related for the MPAI-G, opposed to the CG (q = 0.39, intermediate).

Changes in motivation and total PA. Changes in intrinsic regulation and total PA were positively associated for both groups (q = 0.33, intermediate). For MPAI-G, changes in introjected regulation and total PA were positively related, opposed to the CG (q = 0.59, large). Finally, changes in external regulation and amotivation were negatively correlated with total PA for the MPAI-G, inversely to the CG (q = 0.47 and 0.31, intermediate).

Table 8. Partial correlations among changes in motivation and physical activity from pre-SG to 7 months-after SG.

Variables	Full sample (n = 32)				CG (n = 15)				MPAI-G (n = 17)				q_{Cohen}			
	Sedentary A	Light PA	MVPA	Total PA	Sedentary A	Light PA	MVPA	Total PA	Sedentary A	Light PA	MVPA	Total PA	Sedentary A	Light PA	MVPA	Total PA
Intrinsic	-.27	.30	.12	.30	-.41	.52	.12	.50	-.22	.21	.11	.22	0.21	0.36	0.01	0.33
Integrated	-.33	.34	.18	.35	-.41	.40	.07	.38	-.28	.25	.25	.28	0.15	0.17	0.19	0.11
Identified	-.23	.25	-.08	.22	-.32	.29	.01	.27	-.19	.28	-.40	.19	0.14	0.01	0.43	0.09
Introjected	.00	.08	.06	.08	.44	-.25	-.04	-.24	-.32	.32	.14	.33	0.80	0.59	0.18	0.59
External	.14	-.10	.18	-.06	-.03	.10	.20	.13	.33	-.41	.27	-.33	0.37	0.64	0.07	0.47
Amotivation	.12	-.04	.11	-.01	.08	.09	-.16	.06	.24	-.31	.22	-.24	0.16	0.41	0.39	0.31

Note. SG = Sleeve gastrectomy, CG = Control group, MPAI-G = Motivational physical activity intervention-group, A = Activity, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity. q_{Cohen} = Effect size of differences between partial correlations across CG and MPAI. $q_{Cohen} < 0.1$ - no effect; $q_{Cohen} \geq 0.1$ and < 0.3 - small effect; $q_{Cohen} \geq 0.3$ and < 0.5 - intermediate effect; $q_{Cohen} \geq 0.5$ - large effect. Partial correlations are adjusted by sex, age, and % EWL.

Associations among patients' perception of autonomy support, basic psychological need satisfaction, and changes in motivation

Partial correlations (adjusted by sex, age, and % EWL) among patients' perception of autonomy support, basic psychological need satisfaction, and changes in motivation for the MPAI-G are showed in Table 9. The descriptive values (M ± SD) for autonomy support and need satisfaction at the end of the intervention are also presented. When examining the correlations among the study variables, autonomy support was positively associated with changes in integrated and identified regulations, and negatively associated with changes in introjected regulation, external regulation, and amotivation. Autonomy satisfaction were negatively associated with changes in introjected regulation, whereas competence and relatedness' satisfaction were negatively associated with changes in introjected regulation, external regulation, and amotivation.

Table 9. Partial correlations among patients' perception of autonomy support, basic psychological need satisfaction, and changes in motivation 7 months-after SG.

Variables		MPAI-G (n = 17)					
	M (SD)	Intrinsic	Integrated	Identified	Introjected	External	Amotivation
PASSES (1-7)							
Autonomy support	6.82 (± 0.30)	.15 [-0.36, 0.59]	.26 * [-0.25, 0.66]	.25 * [-0.26, 0.65]	-.41 ** [-0.74, 0.09]	-.40 ** [-0.74, 0.10]	-.21 * [-0.63, 0.30]
BPNES (1-5)							
Autonomy	4.40 (± 0.61)	-.06 [-0.52, 0.43]	-.06 [-0.52, 0.43]	-.13 [-0.57, 0.37]	-.49 ** [-0.78, -0.01]	-.16 [-0.59, 0.35]	.13 [-0.37, 0.57]
Competence	4.66 (± 0.43)	.03 [-0.45, 0.50]	.08 [-0.42, 0.54]	.17 [-0.34, 0.60]	-.40 ** [-0.74, 0.10]	-.54 ** [-0.81, -0.10]	-.25 * [-0.65, 0.26]
Relatedness	4.85 (± 0.37)	.07 [-0.42, 0.53]	.16 [-0.35, 0.59]	.17 [-0.34, 0.60]	-.23 * [-0.64, 0.28]	-.50 ** [-0.79, -0.03]	-.28 * [-0.67, 0.23]

Note. SG = Sleeve gastrectomy, MPAI-G = Motivational physical activity intervention group. Partial correlations are adjusted by sex, age, and % EWL. Magnitude of correlations is based on Gignac and Szodorai (2016) criteria. * Typical magnitude. ** Relatively large magnitude.

Discussion

The present study sought to explore the motivational processes involved in a SDT-based PA program by examining the associations between pre- to post-intervention changes in motivation and PA levels of bariatric patients, and also the extent to which patients' perception of autonomy support and basic psychological need satisfaction during the program were associated with changes in their exercise motivation. In line with our initial hypothesis, bariatric patients belonging to the MPAI-G decreased their external regulation for exercise (the most controlled form), which was related to reduced sedentary activity and increased light and total PA, and decreased their levels of amotivation, which was related to higher light and total PA. However, increases in levels of introjected regulation (also a controlled form of motivation) were observed in this group when compared to the CG, although those were negatively associated with sedentary activity and positively associated with light and total PA.

These results are similar to the ones found in previous studies conducted in adolescents and adults with overweight and obesity (Silva et al., 2011; Verloigne et al., 2011). Higher levels of introjection have usually been linked to the adoption of short-term health behaviors (Pelletier, Fortier, Vallerand, & Brière, 2001; Ng et al., 2012), although they are usually accompanied by states of anxiety and dissatisfaction, which lead to negative psychological outcomes and long-term behavioral non-adherence (Ng et al., 2012). The fact that our intervention program offered a great variety of activities and information regarding PA within a short period of time might have "overloaded" the patients and unintentionally stimulated internal feelings of pressure, guilt and self-criticism when they did not perform sufficient levels of PA.

In addition, while participants from MPAI-G reduced their external regulation, amotivation, and increased their introjected regulation when compared to the CG,

participants from CG experienced greater increases in autonomous types of motivation (integrated and identified regulations) when compared to the MPAI-G. These results were against our hypothesis, but an interesting discussion can emerge from them. On the one hand, behavior change interventions should focus on strengthening autonomous motivation rather than reducing controlled motivation (Koestner, Otis, Powers, Pelletier, & Gagnon, 2008). Nevertheless, considering that bariatric surgery patients usually show a high rejection towards PA (Dikareva et al., 2016; Peacock et al., 2014; Zabatiero et al., 2016), reducing controlled motivation (as was the case of MPAI-G) could perhaps be the first step to increase bariatric patients' PA, particularly in short-term interventions. On the other hand, this study was conducted at an early postoperative stage characterized by a phase of large weight loss. This phenomenon itself might have influenced CG perceptions to autonomously engage in PA. For example, we previously showed that participants from CG experienced remarkable increases in several physical domains of their health-related quality of life (Jiménez-Loaisa et al. 2020), which are associated with enhanced PA in bariatric patients (Sellberg et al., 2019). Moreover, CG showed significantly more MVPA than MPAI-G, both pre- and postoperatively, which might also suggest that CG could be more predisposed to PA than participants enrolled in the MPAI-G.

Changes in intrinsic regulation were positively associated with increases in light and total PA for both groups. In a previous study, Bond et al. (2016) showed no association between changes in PA and motivation variables in 40 bariatric patients participating in a PA intervention. However, these authors only measured bout-related MVPA, and not light PA, as in the present case. Thus, we could speculate that bariatric patients may have a better predisposition to do light PA in early postoperative stages – i.e., may enjoy it more, feel more able to do it and more confident about it –, rather than

more vigorous PA. Considering the potential of light PA for achieving health outcomes in population groups who are particularly inactive, and being a more attainable option than MVPA recommendations for initiating exercise (Chastin et al., 2019), we encourage future PA-based interventions to take special account of the role of light PA to optimize motivational processes towards PA in bariatric patients.

Promoting light PA could make more sense if we attend to the controversial relationships found between changes in identified regulation and amotivation with changes in MVPA for the MPAI-G. In contrast with our hypotheses, in this group we found that increases in identified regulation were related to decreases in MVPA, and increases in amotivation were associated to increases in this type of PA. A plausible explanation for this result may reside in the role that the rise in introjected regulation levels could play over identified regulation: if patients feel guilty and pressured about their performance during the intervention program, they might have not been able to consider PA as an important and valuable part of their lifestyle. Longer-term (follow-up) results may show different clues. Future studies should therefore explore whether this effect of "overloading" messages on the importance of PA can be counterproductive for the internalization processes of this behavior. Likewise, upcoming research should examine the predisposition (or possible rejection) of bariatric patients towards intense forms of PA. Taking into account that performing PA is usually an arduous task for them (Zabatiero et al., 2016), in which they perceive low self-competence (Peacock et al., 2014), promoting MVPA in the initial stages of behavior change interventions could lead to undesirable outcomes related to lack of motivation and enjoyment.

As hypothesized for the variables measured only in the MPAI-G, the participants felt high autonomy support provided by their instructors during the program, which was positively related to changes in integrated and identified regulation, and negatively

related to changes in introjected and external regulation and also amotivation. Moreover, these patients showed high levels of autonomy, competence, and relatedness satisfaction. In line with SDT tenets, autonomy satisfaction was negatively associated with changes in introjected regulation, while competence and relatedness satisfaction were negatively related to the changes in controlled forms of motivation (i.e., introjected and external regulation) and absence of it (i.e., amotivation). Several SDT-based interventions have previously found similar results in other clinical populations (Mazzoni, Carlsson, Berntsen, Nordin, & Demmelmaier, 2019; Ng et al., 2012). However, small associations were found between patients' psychological need satisfactions and changes in their autonomous forms of motivation. Embracing these results together with the previous ones, we can highlight that the intervention had greater effects on changes in controlled forms of motivation and amotivation (in the expected direction), rather than in autonomous motivation.

In any case, our study highlights the important role of interpersonal support when trying to promote changes in bariatric patients' motivation to PA. Future SDT-based studies (both quantitative and qualitative) should continue examining this topic by exploring what motivational strategies facilitate patients' PA via need satisfaction. In the present study, we did not explore the perceptions of basic psychological need satisfaction when CG received advice during their usual care, and that was a limitation. Moreover, since bariatric surgery has a meaningful impact on bariatric patients' life, it could be desirable that future studies explore its own effect on the patients' psychological needs.

Results found in this study should be interpreted with caution. First, the correlational methodology used in part of this research makes it difficult to infer causality among the studied variables. However, the use of this methodology allowed us

to examine some unexplored relationships between motivation and PA variables in two groups of bariatric patients (MPAI-G and CG) that could serve to generate testable hypotheses for future experimental research. Second, we used a pseudo-randomized procedure (rather than a random one) to assign patients to both groups, a fact that might impair the generalizability of our findings. Third, this study involved a small sample size that could have influenced the reporting of unexpected effects for both groups. The limited number of bariatric procedures carried out in the hospital during the intervention period prevented the recruitment of more patients. Nevertheless, to our knowledge, this is the first intervention study carried out entirely under the SDT prism to optimize motivation and consequently increase PA in bariatric patients, an especially inactive population (Bond et al., 2011). Therefore, this research could open the window to future studies based on SDT that try to shed light on the difficult paths towards the internalization of PA in these patients.

STUDY 4

Exploring the socio-ecological factors behind the (in)active lifestyles of Spanish post-bariatric surgery patients

Note. This study was published.

Beltrán-Carrillo, V. J., Jiménez-Loaisa, A., Jennings, G., González-Cutre, D., Navarro-Espejo, N., & Cervelló, E. (2019). Exploring the socio-ecological factors behind the (in)active lifestyles of Spanish post-bariatric surgery patients. *International Journal of Qualitative Studies on Health and Well-Being, 14*(1), 1626180.

Exploring the socio-ecological factors behind the (in)active lifestyles of Spanish post-bariatric surgery patients

Abstract

Purpose: Physical activity (PA) is considered essential for the treatment of morbid obesity and the optimization of bariatric surgery outcomes. The objective of this article was to identify the facilitators and barriers that bariatric patients perceived to do PA one year after finishing a PA program for the promotion of a long-term active lifestyle. This objective was addressed from a socio-ecological and qualitative perspective.

Methods: Nine patients (eight women and one man), aged between 31 and 59 years, participated in semi-structured interviews directly following the PA program and one year after it. A content analysis was carried out to analyze the qualitative data.

Results: Weight loss, improvement of physical fitness, perceived competence, and enjoyment were the main facilitators of PA. Complexes related to skin folds, osteoarthritis, perceived unfavorable weather conditions, lack of social support and economic resources, long workdays, lack of specific PA programs, and other passive leisure preferences were the main barriers to participate in PA.

Conclusions: Results highlight the important interplay between personal, social environmental, and physical environmental factors to explain (in)active behaviors of bariatric patients. The findings of this article could be useful for future research and interventions aimed at promoting PA in bariatric patients.

Keywords: Physical activity; Exercise; Obesity; Environment; Barriers; Facilitators.

Introduction

After the inefficacy of non-invasive methods for the treatment of morbid obesity, bariatric surgery has been shown to be an effective treatment option for long-term weight loss, improving medical comorbidities and psychological and social functioning after surgery (White et al., 2015). However, research has suggested that 10–25% of bariatric patients tend to have weight regain, and 5–25% may have complications postoperatively because of poor adherence to treatment recommendations (Sarwer, Dilks, & West-Smith, 2011). For that reason, successful bariatric surgery requires significant lifestyle and behavioral changes that include an appropriate diet and sufficient participation in physical activity (PA) (Bagdade & Grothe, 2012).

The role of PA in optimizing bariatric surgery outcomes has been receiving growing attention, and it is considered an important adjunct in the treatment of severe obesity (Herman, Carver, Christou, & Andersen, 2014). PA has been found to be a determinant of the long-term maintenance of weight loss after surgery (Moya et al., 2014), avoiding weight regain and the return of comorbidities associated with this condition (Sjöström et al., 2004). Moreover, it is also an important contributor to the prevention or treatment of psychological disorders such as depression or anxiety, and it is associated with improved quality of life after surgery (Jiménez-Loaisa, Beltrán-Carrillo, González-Cutre, & Cervelló, 2015).

The review article by Rudolph and Hilbert (2013) showed that numerous intervention studies have attempted to promote the behavior of PA in bariatric patients. These studies included individual or group education sessions between patients and psychologists and/or dietitians periodically over time, in order to provide them with information for lifestyle changes. Bariatric patients who received a postsurgery

behavioral lifestyle intervention increased their PA levels, in comparison with patients who did not receive an intervention (Rudolph & Hilbert, 2013).

Kalarchian and Marcus (2015), in another review of intervention studies with bariatric patients, pointed out that some studies included the patients' participation in PA programs. However, those programs were mainly aimed at improving physical parameters, and did not include a psychological intervention to maintain an active lifestyle after the PA program (Kalarchian & Marcus, 2015). For this reason, our research project included a PA program based on motivational strategies for the promotion of a sustained active lifestyle (see Methods). These motivational strategies derived from self-determination theory (SDT) (Deci & Ryan, 2008). SDT is a theory of human motivation which assumes the existence of three basic psychological needs: autonomy, competence, and relatedness. Autonomy refers to the need to have control over our own behavior and to make our own decisions. Competence describes the need to feel effective and successful in our interactions with the environment. Relatedness refers to the need to establish good social relationships, and to feel respected and valued by others. According to SDT, if basic psychological needs are satisfied in social contexts, people tend to be more autonomously motivated for the maintenance of healthy behaviors and their psychological well-being tends to improve (Ryan & Deci, 2017). A previous study derived from our research project showed that a PA program based in SDT can promote, in bariatric patients, enjoyment, happiness, self-confidence, motivation and intention to be physically active in the future (González-Cutre, Megías, Beltrán-Carrillo, Cervelló, & Spray, 2020).

However, previous research has also shown that bariatric patients rarely perform the PA they intended (Bond et al., 2013). The long-term PA adherence is a difficult matter, and the studies which analyze the facilitators and barriers to PA in bariatric

patients are necessary to improve the interventions for the promotion of active lifestyles in this population (Dikareva, Harvey, Cicchillitti, Bartlett, & Andersen, 2016).

In recent years, few studies have shed light on the factors influencing PA participation in bariatric patients. For instance, Bergh, Kvalem, Mala, Hansen, and Sniehotta (2017) showed that being single, higher education level, and greater self-regulation predicted PA. Reid et al. (2016) indicated that neighborhood walkability did not influence either daily steps or sedentary time. From a qualitative perspective, Wiklund, Fagevik, Olbers, and Willén (2014) pointed out that some physical side effects of bariatric surgery, such as diarrhea or excess skin, prevented patients from being as active as they would like to be. On the contrary, weight loss, increased vitality, and improved ability after surgery favored PA participation. The support from friends, family and health professionals was also perceived as necessary to be physically active. Another qualitative study (Dikareva et al., 2016), showed that feelings of embarrassment, and discomfort about their bodies are frequent among bariatric patients, especially when they feel socially exposed. Other perceived barriers were physical pain and lack of physical fitness. Some facilitators to PA were social support and access to exercise knowledge.

In spite of this previous evidence, this topic still needs further research (Dikareva et al., 2016), and more quantitative and qualitative studies are necessary. Qualitative studies can be of particular interest to understand the thoughts, feelings and behaviors of a small number of individuals in relation to social processes and particular contexts (Sparkes & Smith, 2014). Moreover, whereas quantitative studies measure variables which are preconceived by researchers, qualitative studies favor the emergence of unknown or unexpected information, giving voice to participants who can report their thoughts and experiences after open questions (Sparkes & Smith, 2014). Thus, in this

emergent phase of the research line, qualitative studies could be useful for the identification of factors influencing PA in bariatric patients (Dikareva et al., 2016). This information could serve as fundament for future quantitative studies, in order to calculate the weight of the factors influencing PA in large samples of bariatric patients.

A socio-ecological approach has been considered an appropriate model to analyze the factors related to PA in different populations, such as children (Hesketh et al., 2017), adolescents (Devís-Devís, Beltrán-Carrillo, & Peiró-Velert, 2015), or women with overweight and obesity (Mama et al., 2015). This approach highlights the influence of personal (e.g., weight, perceived competence), social environmental (e.g., support from friends and family), and physical environmental factors (e.g., availability of PA facilities and natural spaces, weather conditions) on PA participation. To our knowledge, only one previous study has used a socio-ecological perspective to analyze the factors influencing PA in bariatric patients (Dikareva et al., 2016). The study (Dikareva et al., 2016) employed a qualitative methodology and carried out research with bariatric patients recruited from a clinic by poster advertising and word of mouth recommendations, but the participants were not previously involved in any intervention for the promotion of PA.

The aim of this study was to analyze, from a qualitative and socio-ecological perspective, the factors influencing that bariatric patients continue doing (or give up) PA one year after finishing a PA program. This PA program included a motivational intervention for the promotion of a sustained active lifestyle (see Methods).

Methods

Participants

The participants in this qualitative study were nine patients aged between 31 and 59 years (M = 46.77, SD = 9.75), who attended a PA program one month after receiving bariatric surgery. They were mostly women (see Table 10), as it is normally the case in Spain and other countries (Fuchs et al., 2015; Lecube et al., 2016). The participants were recruited from the same hospital by their clinical psychologist. The inclusion criteria for bariatric surgery included having a body mass index (BMI) greater than 40 kg/m^2, or greater than 35 kg/m^2 with associated co-morbidity, and having no medical, psychological or social contraindication for surgery. The participation in the PA program after surgery was optional, and all participants accepted to take part in it before surgery. The PA program was free for the participants and funded with the resources of the study.

As the study was focused on information which was personal and private or contained valuations of other people, patients' anonymity was preserved using pseudonyms. This study was carried out in Elche, a city located in the province of Alicante (Valencian Community, Spain). The economy of this city is mainly dependent on the footwear industry and tourism. The majority of population pertain to a middle socioeconomic status.

Table 10. Characteristics of participants in Study 4.

Pseudonym	Gender	Age	Occupation	Comorbidities (pre-surgery)	BMI (pre-surgery)	BMI (1-month post-surgery)	BMI (post-PAP)	BMI (1-year post-PAP)
Telma	Female	31	Cobbler	No comorbidities	45.3	41.3	37.1	35.5
Alice	Female	31	Hairdresser	No comorbidities	38.2	34.3	25.9	26.9
Pam	Female	45	Cobbler	HTA	40.7	36.9	27.1	27.4
Emily	Female	49	Homemaker	HTA	38.4	35.6	29.1	29.0
Susan	Female	50	Cleaner	DL	40.8	37.6	27.1	24.8
Lucy	Female	53	Cobbler	HTA, DL	44.1	41.3	25.8	23.4
Lezly	Female	54	Psychiatrist	HC	43.1	39.8	33.5	31.6
Sofie	Female	59	Homemaker	No comorbidities	38.7	34.7	30.9	31.1
Andrew	Male	49	Taxi driver	HTA	45.1	38.7	27.2	24.5

Note. BMI = Body Mass Index, PAP = Physical Activity Program, HTA = Hypertension, DL = Dyslipidemia, HC = Hypercholesterolemia.

Procedure and interview protocol

The PA program took place in a public fitness center located in Elche and lasted six months. The instructors were exercise and sport sciences professionals (degree in sport sciences, master's degree in PA and health), who were trained in strategies based on SDT (Deci & Ryan, 2008) focused on the satisfaction of needs for competence, autonomy and relatedness during the sessions (see Table 11). The program consisted of two sessions per week during the first two months, three sessions per week during the intermediate two months, and four sessions per week during the last two months, each lasting 1 hour and 30 minutes. More information about the PA program can be found in González-Cutre et al. (2018).

The research project was approved by the Ethical Research Board of the first author's university (Code: DPS-DGC-001–11; Date of approval: 2 February 2012). The PA program was evaluated and approved by a medical council formed by doctors, surgeons, endocrinologists, nutritionists, psychologists, psychiatrists and exercise science professionals. Participants were informed about the aims and procedure of the study and provided written consent. In-depth semi structured interviews were conducted and recorded with each participant to gather qualitative information. The interviews took place in a quiet room at the first author's research center. Firstly, semi-structured interviews were conducted just after the PA program (July 2012). These interviews were conducted, regarding the purpose of this article, to know if the participants had the intention of participating in PA in the future, after the end of the PA program. Secondly, semi-structured interviews were conducted again one year after the end of the PA program (July 2013) with the same patients with the dual purpose of (1) knowing if participants had performed PA during that year and (2) identifying the factors that favored or hindered their participation in PA during the year. The interviews lasted

between 40 and 60 minutes. An example of the initial questions guiding the first and second interviews is shown in Table 12.

Table 11. Examples of strategies based on SDT applied by instructors (Study 4).

Need	Strategies
Autonomy	To give options to choose different activities, machines and working ranges. Patients received training on how to do healthy exercise by themselves. To ask participants for their opinion on the activities.
Competence	To provide positive feedback and information to the patients about their progress. To establish short-term goals so that patients assess their progress every month. To follow-up an individualized program with achievable objectives.
Relatedness	To propose physical and nonphysical tasks in which patients had to interact. Participants were encouraged to correct execution of exercises among them. The instructors smiled, supported, and encouraged patients. A caring climate was created, in which the instructors showed interested about the patients' lives.

Table 12. Example of the initial questions guiding the interviews.

Need	Strategies
First interview (just after the PA program)	Do you think the PA program will cause changes in your PA habits in the future? During the PA program, did you receive enough information and knowledge to do exercise and keep an active lifestyle after finishing the PA program? Are you going to continue doing PA after the PA program?
Second interview (one year after the end of the PA program)	Have you performed PA after the PA program? Why? Why do you engage with PA now? After the PA program, what barriers have hindered your participation in PA? What difficulties have you found to do PA? What do you think you would need to continue practicing PA? Would you return to the PA program if this was done again? Do you think these types of PA programs should be funded by the public health system or by the participants? Why?

Note. PA = Physical Activity.

Data analysis

Semi-structured interviews were transcribed by the interviewer with a word processor software immediately after conducting them. Transcriptions were analyzed with the support of the software NVivo, which was used to organize and classify data efficiently (Bazeley & Jackson, 2013).

The qualitative data were analyzed following combined strategies of both "conventional" (inductive) and "directed" (deductive) content analysis (Hsieh & Shannon, 2005). The analysis started with an inductive phase to ensure that any information that could shed light on the purpose of the study was included in the analysis. Concretely, all transcriptions were read several times to become familiar with the data and achieve a sense of the whole. Second, those text fragments that captured key thoughts or concepts related to the factors influencing that bariatric patients were active or inactive were identified and coded. Third, these codes (the text fragments labelled with the thoughts they illustrated) were classified, using inductive reasoning, into a map of interrelated categories and subcategories which emerged when codes were compared to identify similarities, differences and relationships. Then, in a deductive phase of the analysis, the research team checked that a socioecological approach fitted well with the data, and was useful to interpret, report and discuss the data without discarding any important information. In fact, a socio-ecological approach was finally considered a more appropriate theoretical framework to analyze the data than SDT, although SDT guided the motivational strategies included in the PA program.

The process of data analysis, led by the second author of this article, was supervised by the other members of the research group, who played the role of "critical friends" (Smith & McGannon, 2018). The members of this research group were different from the instructors of the PA program. This group consisted of a clinical psychologist, sport sciences researchers, and experts in qualitative methods. During a series of three meetings, the leader of the analysis presented the data analysis using diagrams, outlined the codes included in the different categories, and responded to the questions and suggestions of the critical friends. The critical friends help their colleague to refine the names and contents of the different categories and to arrive to a more

coherent system of categories. The final system of categories sustained the headlines and structure of results presented in the following section. The critical friends also collaborated to improve the write-up of the analysis and the entire article. The involvement of critical friends during the process of data analysis encouraged the quality of interpretations and favored a more rigorous and plausible data analysis (Smith & McGannon, 2018).

Results and Discussion

Three main categories derived from our content analysis: 1) Bariatric patients' intention of participating in PA just after the PA program; 2) Facilitators to PA one year after the end of the PA program; and 3) Barriers to PA one year after the end of the PA program. These categories, with their corresponding subcategories, are described and discussed in the following sections.

Bariatric patients' intention of participating in PA just after the PA program

Just after the PA program, all bariatric patients who participated in this study reported their intention of engaging in PA in the future:

> Telma: I'm sure that exercise will be part of my life. In fact, I have already bought a bike for me. And I have started to walk and even run, something I had never done in my life. Because I don't want to get fat again. I've not doubt about it. Would I go back to the way I was? No way!

It is also noteworthy that all participants argued that the program had given them sufficient knowledge to do PA without having large resources or without joining a gym, because of all the talks, advice and practical sessions that the instructors provided them:

> Pam: They [instructors] have given us all the options. Whoever doesn't want to do physical activity now, it's because they don't want to. You cannot say: "Oh, I don't have money to go to the gym!" Well, you don't have money to go to the gym, but you can do it on the street.

From a socio-ecological perspective, the intention to be active and having knowledge to be active are two personal factors related to PA participation, as other studies have pointed out (Dikareva et al., 2016; Peacock, Sloan, & Cripps, 2014; Wiklund et al., 2014). The role of the PA program instructors, who provided support and knowledge to be active, can be considered a potent socio-environmental factor for the promotion of an active lifestyle.

Facilitators to PA one year after the end of the PA program

The perceived benefits of PA

In line with previous research with bariatric patients (Wiklund et al., 2014), weight loss and maintenance and improvements in health and physical function were the main reasons that led participants to do PA:

> Lezly: Because I know it's necessary … I have been able to lose and control my weight doing exercise … so I think it's very important.
>
> Pam: [I do PA] … for my health. To feel better, agile, not so exhausted, to climb stairs that I couldn't climb before … It was at least ten years ago since I last came from my sister's house because she lives on the fourth floor, and she has no lift.

Weight loss and the improvement of physical fitness increased participants' perceived competence. From a socio-ecological approach, perceived physical competence represents a personal factor influencing PA participation, as a previous

study with bariatric patients has shown (Wiklund et al., 2014). A higher physical competence also permitted participants to interact more successfully with their physical environment (e.g., being able to go up to the fourth floor of an apartment block), improving at the same time their interactions with their social environment (e.g., being able to visit a relative). Moreover, improved physical competence allowed participants to enjoy PA:

> Andrew: What used to be hard for me, it isn't now. Before [the surgery and PA program] I walked ten minutes and I was exhausted. Now, ten minutes are like going down the stairs of my house. Or running ten minutes… before I was even wanting to throw up, and now for me it's very little effort. What I am doing now was unthinkable before. Now, I have fun, I have a good time [doing PA].

Previous research has shown that lack of enjoyment is a common obstacle for bariatric patients to do PA (Peacock et al., 2014), whereas perceived physical competence promotes a high intrinsic motivation to PA (doing PA because you like and enjoy it) and adherence to exercise (Silva et al., 2008).

It is also remarkable how, through weight loss, some patients improved their physical self-concept and self-esteem, thus reducing their previous insecurity and avoidance of social relationships:

> Lucy: [Now] I feel comfortable. Before … I avoided people. I always had excuses … "my legs hurt, my head hurts, I'm not well…" Now I like to get involved. I mean, right now, I'm always thinking about making trips or going out on the weekends with my friends … they call me, or I call them … I avoided this kind of activities before. I don't know if I was ashamed of myself.

This kind of psychological (personal) benefits can also favor a better interaction with the social environment and a higher involvement in social activities which can involve PA.

Social support

From a socio-ecological perspective, social support is considered an important socio-environmental factor that fosters PA (Giles-Corti & Donovan, 2002). In this regard, the participants of this study declared that the support of family and friends was crucial to be active. For instance, Susan said that her son helped her to do PA at home every day, because "they were fond of playing in the pool". Andrew reported cycling because he liked "going out with friends and knowing new places". These findings are in line with other studies with bariatric patients which have previously highlighted the importance of social support to acquire an active lifestyle (King & Bond, 2013). In Andrew's case, as knowing new places was also a stimulus for him to do cycling, a mixed influence of social and physical environmental factors on his PA behavior can be observed.

Barriers to PA one year after the end of the PA program

Skin folds and body complexes

Massive weight loss following bariatric surgery frequently results in large skin folds. The excess of skin usually has a negative impact on bariatric patients' quality of life, self-esteem, body image, and physical functioning (Klassen, Cano, Scott, Johnson, & Pusic, 2012). Among our participants, skin folds represented a source of new body complexes that did not exist pre-surgery:

> Telma: Now I've more [body] complexes. Before, I went to the beach in bikini and I even went topless… And now if I'm going to the beach … if I could go with a burka, I would go with a burka. I swear, now I have more complexes, look [the interviewee shows her skin folds].

Other studies have also found that body complexes with skin folds are common among bariatric patients, and that these body complexes are perceived as a barrier to PA when bariatric patients feel socially exposed in activities like swimming (Biörserud, Olbers, & Fagevik-Olsén, 2011; Wiklund et al., 2014).

Knee and hip osteoarthritis

Joint pain is an extensive problem for bariatric patients, due to severe obesity prior to surgery. Although knee and hip pain as a cause of osteoarthritis decreases after bariatric surgery (King et al., 2016), these problems frequently remain (Vincent et al., 2012). In our study, two women reported pain in their knees and one woman in her hip, and this was a personal factor leading to stop walking during specific periods of time, which could be specific days or even full weeks sometimes:

> Susan: I stopped during a period … because my knee hurt a lot, and I took a one-week rest.

Coping with unfavorable weather conditions

Some of our participants reported that unfavorable weather conditions in the province of Alicante, such as fluctuations in the heat, cold or wind, were barriers to their participation in PA:

> Emily: If it's raining, I don't go for a walk, if it's windy, I don't go for a walk, if it's hot, I don't go for a walk. That's why I say that, from January to now [July], I've walked in two months.

Difficulties with coping with the weather have been reported by bariatric patients in previous studies, but these barriers to PA seem to be more related to a "mental obstacle" than to important physical environmental barriers (Dikareva et al., 2016; Wiklund et al., 2014). It is important to note that all the participants in our study lived in the province of Alicante, a Spanish Mediterranean area characterized by having a mild weather throughout the year (information available in www.tutiempo.net). Although summers are hot, the weather does not seem to be a real barrier to do PA for the most part of the year.

Lack of social support

Some participants reported lack of social support from family or friends to be active. They missed having someone to encourage and to coerce them to do PA as when they were involved in the PA program:

> Emily: I would like my daughter or friends to come and tell me "come on, let's go!" I don't have it … I would like them to encourage me to start [to walk]. Many times, I don't have anyone to commit to or anyone who comes to pick me up … so when I have a minimal excuse, I don't go for a walk.

Social support is essential to acquire an active lifestyle in these patients (King & Bond, 2013). Support from friends and family and having a companion for PA have consistently emerged as important correlates of leisure-time PA and walking in adults (Giles-Corti & Donovan, 2002; Shelton et al., 2011). Nevertheless, it is usual that

family members of bariatric patients also cope with obesity and related comorbidities and demonstrate high levels of sedentary behavior (Lent et al., 2016).

Lack of economic resources

The lack of economic resources was perceived by most participants as a barrier to engage in PA. They reported being in a delicate economic situation because they and/or their spouses were unemployed and, as a result, it was impossible to join a gym. They therefore had to opt for inexpensive activities such as walking:

> Emily: I go for a walk, because in our city the gyms are very expensive … my husband is unemployed, and I don't work.
>
> Susan: I have walked [after the PA program]. Unfortunately, the problem is the money … I cannot afford the gym. My husband doesn't work for most of the year, so we cannot spend that money because we need it to pay the house.

Financial reasons have emerged in other studies with bariatric patients as an obstacle that prevent or difficult participation in PA (Wiklund et al., 2014). Moreover, unemployment has been associated with increased physical inactivity, especially in women (Macassa et al., 2016). Some of the participants in this study worked in the footwear sector, which was severely punished during the economic crisis in Spain (about 50% of reduction in the size of this sector and 24% of total loss of employment) (Albertos-Puebla & Sánchez-Hernández, 2014). This was the case of Emily, who worked in this sector before losing her job.

Long workdays

"Lack of time" and "being exhausted" due to long workdays also emerged as important perceived difficulties to be active:

> Telma: I get up at five in the morning, to be at six at work, and I finish at nine p.m. and when I arrive at home, it's ten p.m. When do I take the bike? On Saturdays, I go to work at six in the morning and I finish at four p.m. … While I arrive at home it's five p.m. Exhausted after all week, I don't feel like cycling.

A previous study also showed that having a job is sometimes perceived by bariatric patients as an obstacle to engage in PA, especially in women (Durand-Moreau et al., 2015). In this regard, our study was developed in a context of economic crisis, where women of Southern European countries (such as Spain) had to work long hours to reduce their family's financial stress and ordinarily tended to perform more domestic workload than men (Artazcoz et al., 2016). These social environment factors could increase women's perceived personal barriers to be active, as lack of time or lack of energy/vitality during the scarce leisure time.

Nevertheless, the influence of other personal factors should be considered when some participants in this study understood having a job as an obstacle to do PA. It is possible that "lack of time" hid other perceived personal obstacles to be active, such as boredom, lack of priority or lack of enjoyment with PA participation, as other studies with bariatric patients have found (Peacock et al., 2014; Wiklund et al., 2014). The fatigue associated with an obese condition could be another personal factor influencing that long working hours became a barrier to PA participation (Resnick, Carter, Aloia, & Phillips, 2006). Moreover, the ending of the PA program, mentioned in next section, could represent another socio-environmental factor hindering PA participation. The participants had attended a PA program several times a week. One year later, some of

them reported lack of time as a barrier to PA. Perhaps, PA participation with perceived lack of time is a matter of priority, and PA options need to be attractive enough to encourage participation.

Lack of specific PA programs for this population

To the question "Would you return to the PA program if this was done again?" all patients responded affirmatively (e.g., "Of course", "yes, with my eyes closed"). Unfortunately, after a deliberate six months of intervention, the program of the study ended, and the participants expressed their concern:

> Sofie: This is a disease and the government should pay [the costs of the PA program] … We have been operated and the program has benefited us for four or five months, then we should keep on … it's like when we get a candy and then they remove it. If I have become very good in five months … and I cannot pay, I cannot do more exercise, I'm back again. Well, what do we do?

The participants of our study thought that attending sport and PA facilities was expensive, in line with previous research with bariatric patients (Wiklund et al., 2014). With regard to this economic barrier, the study carried out by Tumiati et al. (2008) showed that cheaper options for PA, such as home-based individualized physical fitness programs, can be motivating for obese patients to do PA.

Nevertheless, in the context in which this study was developed, the public health system did not include specific PA programs or counselling PA services for this population (Jiménez-Loaisa et al., 2015). The program of the study ended, and some patients felt abandoned. The lack of resources, staff and facilities to offer long-term PA

programs for these patients was a social and physical environmental factor hindering their PA participation.

Other passive leisure preferences

Sometimes, PA was not the favorite leisure option for bariatric patients. Some participants stated a preference for other leisure activities, especially in summer and weekends:

> Telma: And on Sundays, now that it's summer, have I to ride a bike? I prefer to go to the beach. Honestly, it's true.

A study carried out with bariatric surgery candidates (Zabatiero et al., 2016) showed that participants also preferred to engage in sedentary leisure activities, such as watching TV or sleeping, rather than taking part in programmed exercise during their leisure time.

Conclusions and Recommendations

The findings of this study revealed that both individual (in a psycho-physical sense) and environment (understood as a blend of familial, social, economic and atmospheric conditions) played a major role in the consolidation of (in)active lifestyles. A qualitative socio-ecological perspective was useful to identify the interrelated influence of personal, social environmental and physical environmental factors on PA participation.

The qualitative design and small sample of our study were not aimed at generalizing results. However, our qualitative design let the collection of in-depth information about the participants, and content analysis made possible the emergence of

insights which can be transferable and useful for future research and interventions aimed at promoting PA in bariatric patients.

After the PA program, all patients intended to be physically active in the future and argued to have enough knowledge to do PA on their own. Nevertheless, one year later, our results pointed out that the move from an intention to the actual behavior of PA is a difficult step to take.

Weight loss and maintenance, coupled with perceived improvements in physical fitness, gave rise to a greater perception of physical competence, greater enjoyment with PA and improvements in the interaction with the physical and social environment. All these factors, together with social support, were identified as facilitators to PA one year after the PA program.

Nevertheless, body complexes caused by skin folds can be a personal barrier to PA in activities requiring revealing clothes, in which participants can feel socially exposed (e.g., activities in the aquatic environments, stroll along the beach, etc.). In this regard, it is of utmost importance that the closest social environment of these patients (health professionals, family, friends, etc.) emphasizes the importance of health and quality of life over aesthetics, to favour that patients are more satisfied with their body shape. Moreover, it would be desirable to guarantee, in PA contexts, inclusive social environments in which exercisers are respectful of other people's appearances. The physical environment should also be inclusive. Exercise facilities should possess specific designs and physical structures to preserve patients' privacy if they have some body complex and do not want to feel observed by others (e.g., individual showers, swimming pools or fitness rooms closed to external observers).

The pain associated with knee or hip osteoarthritis was another barrier to PA. Perhaps, instead of avoiding PA, bariatric patients need to know what type of exercise

they should do to avoid pain, favour rehabilitation, and improve their physical functioning. The exercise counselling by qualified professionals seems necessary for bariatric patients. Coping with unfavorable weather conditions was also reported as a barrier to PA. However, the climate of Alicante (Spain) does not seem to represent an important physical environmental barrier to PA. Lack of motivation, or other passive leisure preferences, may be also influencing bariatric patients' perception of this barrier. Another perceived barrier to be active was lack of social support. Future interventions for the promotion of PA might be also focused on patients' relatives and friends, as a way to enhance more active and supporting social environments.

The lack of economic resources and unemployment were perceived by bariatric patients as obstacles to do PA. Health education focused on healthy habits and PA promotion would be necessary so that unemployed bariatric patients find economical ways to be active. At the same time, some participants perceived the lack of time and exhaustion associated with long workdays as a difficulty to be active. In order to promote PA, employers should make efforts to avoid very long working hours and work-overload for their workers, which seems quite incompatible with an active lifestyle. Companies could also promote active recess especially in those employees who work sitting (e.g., the footwear industry), enable space for exercise in the company facilities or near to them, or contracting a sport sciences professional who could supervise personal or group-based exercise programs for company employees.

The end of the PA program represented one of the most important barriers for the patients to continue with an active lifestyle. It would be beneficial for public health systems to include PA programs and advisory exercise services for these patients. This action requires building bridges of relationships between medical staff and exercise and sport sciences professionals. Moreover, it would be necessary to investigate the cost-

benefit of implementing these services and explore ways to make them economically sustainable. In this regard, previous research has pointed out that the investment in the promotion of PA is necessary to reduce the economic costs of the diseases related to physical inactivity in the health systems (Kruk, 2014).

STRENGTHS AND LIMITATIONS

STRENGHTS AND LIMITATIONS

During the doctoral process, we have encountered a series of strengths and limitations that should be mentioned. Regarding strengths:

1) Trying to provide a comprehensive view of the processes that benefit or hinder the acquisition of an active lifestyle by bariatric patients has been our main purpose when performing this thesis. In this way, we have provided insight into the psychological and social processes that impact their PA behavior. It is well known that PA behavior is a multifaceted complex phenomenon, whose acquisition is influenced by several levels that go beyond the individual itself (Buchan et al., 2012). For that reason, although we did not carry out an ecological-based multilevel intervention with patients, we tried to move away from reductionist perspectives by introducing social frameworks (stigma and social discourses' theories, and the socio-ecological model) to explain social, political and environmental factors which potentially affect patients' PA adoption. This fact complements our use of SDT, which is mostly focused on the individuals' psychological processes rather than on the environmental ones.

2) There is a wide debate on whether behavior change interventions based on behavioral theories work or not in the real world (Hagger & Weed, 2019). In this regard, a meta-analysis by McEwan, Rhodes, and Beauchamp (2020) showed that effect sizes did not vary between theory-based and no-stated-theory interventions when increasing PA at the end of those behavioral interventions. Despite this evidence, we uphold the adequacy of basing our actions on theory whenever possible. This position is aligned with that presented by Hagger, Cameron, Hamilton, Hankonen, and Lintunen (2020) in their recent book "*The Handbook of Behavior Change*", which provides detailed guidance on how to use theories to develop effective interventions to change behaviors. By doing so, researchers could also influence other people's psychological

mechanisms that are also important to their well-being, even without achieving significant improvements in their outcome variables. Being guided by theoretical frameworks also allows researchers to design interventions in a more orderly and logical way, giving coherence to their actions by relying on evidence-based psychological and social mechanisms. Our program was based on SDT, a commonly framework used by health researchers to support positive changes in health behaviors (Ntoumanis et al., 2020). Thus, we consider this aspect as a potential strength of this project. In addition, and to our knowledge, our PA intervention was the first which was informed by this theory focused on enhancing bariatric patients' attitudes toward PA and their perceived HRQoL.

3) Related to the above, there are some elements of our SDT-informed PA program that could be underlined. For example, our patients trained in group. A recent meta-analysis of SDT-guided interventions studies in the health domain indicated the need to conduct interventions to support relatedness satisfaction (Ntoumanis et al., 2020). In this line, patients who trained with us scored 4.85 out of 5.00 for relatedness satisfaction just after finishing the program, being the need with the highest score when compared to the needs for competence (4.66) and autonomy (4.40). At a qualitative level, participants also reported some psychosocial benefits derived from training with their peers. These evidences suggest that carrying out a group design was a positive factor of our research. The training of instructors in the application of motivational strategies based on basic psychological needs proposed by SDT should also be highlighted, since we have not found bariatric patients' PA interventions that have trained social agents' behavior (i.e., instructors) in a specific psychological theory to promote PA and psychosocial outcomes after surgery.

4) The length of the intervention and the frequency of training sessions were ambitious aspects of our project. The intervention lasted six months, where patients trained twice a week for the first two months, three times a week for the following two months, and four sessions per week for the last two months. With the intention of avoiding the monotony of training so many times in the same space, we carried out various activities in different environments such as excursions on the beach, mountains, or pool sessions (among others) that complemented the gym sessions. Recently, we qualitatively investigated whether the inclusion of novel activities was an element valued by patients (González-Cutre, Jiménez-Loaisa, Romero-Elías, & Beltrán-Carrillo, 2019). In this regard, patients indicated that novelty was a key element for the success (in terms of enjoyment) of the program because a "traditional" intervention with machines for endurance and strength training would be boring for them. This fact could be supported by the high rates of patient attendance in our program (see Study 2).

5) The use of different research methodologies allowed us to have a broad perspective of the impact that our program had in bariatric patients both at psychosocial and behavioral levels. By using qualitative methods, we have directly asked patients about their PA behavior one year after the end of the PA program, the perceived personal and environmental factors that influenced their PA behavior, and the effects the program had on them. In parallel, using quantitative methods made it possible to objectively know their PA levels, as well as to compare the differences in HRQoL levels and PA motivation after the program with respect to a control group. Therefore, both approaches have enriched our understanding of the study phenomenon.

6) Examining the associations between pre- to post-intervention changes in motivation and PA' levels of bariatric patients involved in our SDT-based PA program could be considered as a novel perspective of our research. A meta-analysis points out

the need of investigating the relationships between changes in these variables, since they could indicate if interventions succeed/failed to assist individuals in transferring new behavioral routines from intervention contexts into daily life (Knittle et al., 2018). As discussed in Study 3, only a previous study performed by Bond et al. (2016) pursued a similar purpose in 40 bariatric patients belonging to a counseling PA intervention. On this occasion, we analyzed the same variables than these authors, but adding some more variables that could complement our understanding of the relationship between motivation and PA. Concretely, regarding motivation variables, we included "integrated regulation" as the most self-determined type of extrinsic motivation (González-Cutre et al., 2010) to examine the extent in which patients did PA because it was part of their healthy lifestyle. Regarding PA variables, we included "sedentary activity", "light PA" and "total PA" in addition to MVPA, which have important implications for the promotion of PA in bariatric patients as we present in the study.

7) The systematic review and meta-analysis by Herring et al. (2016) on changes in PA behavior and physical function after bariatric surgery detected five studies which had used accelerometers to assess bariatric patients' PA. Thus, accelerometer measures are a remarkable aspect of our project. On the other hand, using accelerometry involves mobilizing a large amount of personal and temporal resources that we would like to emphasize in this doctoral thesis. Finding the most appropriate criteria for programming and use accelerometers, meeting patients to deliver and collect the devices, and data analysis are actions that require considerable efforts when using accelerometry.

Leaving the strengths aside, this dissertation also contains several limitations that must be recognized:

1) A reduced sample size was evident in our quantitative studies. Although we would have liked to have more patients and hospitals involved in the project, the

financial, temporal and material resources we had available did not allow us to tackle this issue. Another possible option to increase the sample could have been to include other bariatric procedures (in addition to sleeve gastrectomy) in our design. Studies such as the one carried out by Strain et al. (2014) would support this strategy, since these authors indicate that there are no differences between surgical procedures in variables such as HRQoL after surgery. However, the hospital that collaborated with us (University Hospital of Vinalopó) only carried out sleeve gastrectomies at the time of the intervention. The number of bariatric procedures performed monthly was also relatively small, due to the hospital's own capacity and the context in which it is located. In any case, sample size is one of the main limitations of quantitative intervention studies.

2) Regarding qualitative approaches, it is important to emphasize that statistical types of generalizability that inform quantitative research are not applicable to judge the value of qualitative research (Smith, 2018). For that reason, we do not consider sample size as a potential limitation of our qualitative studies. Nevertheless, there are some alternatives which we could have used to enrich the results presented in our Study 1 and 4 and improve the rigor and trustworthiness of these studies. For example, interviewing healthcare professionals could have helped to understand more deeply how healthism influenced their discourses when they attend to patients with higher-weight in Study 1. In Study 4, having interviewing patients' relatives could have helped to explain more concisely the personal and environmental factors that influenced PA adoption by patients one year after finishing the PA program. In both cases, the reason for not having included these social agents' views was related to the fact that the objectives of these studies were concreted and refined once the qualitative data were already collected. The post-hoc nature of these studies could therefore be considered as an

additional limitation. However, the post-hoc election and definition of theoretical frameworks and objectives is quite common in qualitative research. This is due to the fact that data collection comes from open questions and the final data collected are quite unpredictable, in contrast to data coming from quantitative studies which measure pre-established and concrete variables.

3) Family members normally share the same PA and diet habits as patients. Consequently, previous research has suggested the suitability of engaging families in behavior change interventions to help them and families themselves to be healthier (Lent et al., 2016). Our PA program included a natural activity (hiking) where patients were encouraged to take their relatives with them. The results of this unique experience were quite positive for both the group and the instructors. Thus, including families more frequently in psychosocial activities throughout the entire program could have been an improvement in our program.

4) Loss of follow-up is a typical issue when tracking long-term clinical outcomes after bariatric surgery (Harper, Madan, Ternovits, & Tichansky, 2007). This circumstance is also present in our research project. We have several participants who declined to participate at the different postoperative measurement points, especially those belonging to the control group. It is understandable that participants from this group were not faithful to treatment when researchers went long periods of time without contacting them. So, it would have been desirable to carry out some retention strategies to avoid sample drop. Invalid accelerometer data was another point related to the sample drop of our studies. We analyzed all patient data once the project was completed, so we could not measure the patients again in a specific time frame if they did not meet the minimum analysis criteria. A suitable alternative could have been to analyze patients during the process, so that the patient who did not meet the minimum

wear time for inclusion in the analysis had to wear the accelerometer again. Therefore, choosing the analysis criteria (cut-off points, minimum of valid days and hours, etc.) at the end of all the measurements was a limitation of our work.

5) In relation to this last idea, we would like to remark that we chose accelerometer PA cut-offs that have been commonly used with bariatric patients (Berglind et al., 2015; Berglind et al., 2016; Sellberg et al., 2019). However, as presented in Study 2 (see limitations section), these cut-off points have limitations which suggest caution with the data interpretation. In this sense, we agree with other authors (Pedišić & Bauman, 2015; Trost & O'Neil, 2014), and consider inappropriate the adjective "objective" when referring to the PA measured by accelerometers, given the great number of subjective decisions that we had to take before and after using these types of devices.

6) The sudden jump between finishing a PA program and returning to reality can be problematic for patients (Gill, Fasczewski, Reifteck, Rothberger, & Davis, 2018). Although we tried to provide them with knowledge to do PA autonomously, they showed the difficulty of moving from an "idyllic" environment for them (i.e., training with peers, with instructors who care about them, with adapted activities, etc.) to a real environment where there are no options adapted to the characteristics of these individuals. As one of our participants told us; "*it's like when we get a candy and then they remove it* [the PA program]" (Study 4). So, instead of suddenly ending the intervention, a transition phase to continue an active lifestyle after our intervention would have been desirable.

7) Studies 2 and 3 employed a quasi-experimental design where participants were not randomly assigned to groups. This fact could limit the generalizability of our findings. Although we know that randomization of participants to interventions would

have been desirable, we considered a quasi-experimental design as appropriate in this case due to the own nature of our PA program. As presented above, our patients trained as a group, since it was an essential requirement to base our intervention on SDT. Due to the few surgeries that were performed in the hospital and time constraints, we preferred to assign the first patients directly to the program so that they could train together as soon as possible, a fact that could have been delayed if we had randomized the participants.

FUTURE DIRECTIONS

FUTURE DIRECTIONS

Based on the results obtained in the four studies, and their strengths/limitations, some future research directions are proposed (see Figure 6 for an overview). These research prospects could be useful for the implementation of designs and interventions related to this field of study:

1) Generally, future intervention studies should take care of psychosocial aspects (in addition to physical contents) when trying to improve postoperative PA levels of bariatric surgery patients. The "technical" aspects of PA (e.g., intensity, volume, frequency, etc.) are undoubtedly fundamental to these programs and must be carefully taken in consideration. A very recent review sheds light on this matter (Hansen et al., 2020). However, it would be advisable to consider the psychosocial side of PA when the interventions are aimed at improving active habits of patients after finishing them. In other words, researchers should think about their own performance when interacting socially with patients, or train instructors or health professionals about it, and measure the psychosocial consequences of such interactions. The interactions between patients may also be considered when the programs are carried out collectively. Therefore, it would be a matter of exploring the impact of such interventions on psychological and social constructs which could help patients adhere to PA.

2) There is a need to conduct PA interventions consistent with behavioral theories in this population. The application of theories should not only be limited to those of cognitive types, but also to those of a social and/or ecological nature. We believe that this fact could be one of the reasons why theory-based interventions have not demonstrated superiority when improving PA over non-theory-based interventions (McEwan et al., 2020). In this sense, using strategies from both branches could help to transfer the desired behavioral habits of the interventions to the patients' real life. For

example, meta-analyses focused on analyzing behavior change interventions have demonstrated positive relationships between SDT constructs (e.g., autonomy support or autonomous motivation) and multiple health behaviors, including PA (Hagger & Chatzisarantis, 2009; Ng et al., 2012; Ntoumanis et al., 2020). However, ecological models of PA, which incorporate both intra- and extra-individual influences, can also positively impact on individuals PA (Spence & Lee, 2003). Although conducting research in both approaches would be desirable in the field of bariatric surgery and PA promotion, we suggest that combining theoretical frameworks from several knowledge disciplines, to consider "bariatric surgery patients and their circumstances", could help to improve the effectiveness of interventions aimed at promoting PA levels and other healthy behaviors.

3) When using SDT, upcoming PA interventions could explore other SDT variables that we have not contemplated in this document. From a quantitative point of view, it could be interesting to measure not only satisfaction, but also the frustration (Chen et al., 2015) of patients' basic psychological needs in the context of exercise and their daily life. In addition to autonomy, competence and relatedness, satisfaction/frustration of candidate needs who are present in the bariatric patients' life, such as novelty (González-Cutre et al., 2019), should also be included. Other psychosocial constructs that indirectly could influence postoperative PA of patients, such as depression, anxiety, self-esteem, or perceptions about body shape, could also be important outcome variables of the interventions. In this way, the possible influence of theory-based PA interventions on these variables should be checked. Predictive models could also be developed to provide a more complete understanding of the weight of factors and their relationships when explaining bariatric patients' PA behavior.

4) Of all the variables mentioned in the previous point, we would like to focus our attention on the ones related to perceptions or concerns about body shape. As stated in the literature review and Study 4, skin folds may represent a potential source of new body complexes after surgery (Beltrán-Carrillo et al., 2019; Jiménez-Loaisa et al., 2015). Future theory-based interventions could explore whether PA is capable of reducing body complexes derived from surgery. Multi-group studies, comparing theory-based interventions, non-based theory interventions and control groups could be attractive options. What theory or theories to use in this regard (i.e., those that pay more attention to the individual or the social environment) would also be a good debate.

5) Larger intervention studies involving multiple social agents close to bariatric patients, such as family members or healthcare professionals, are necessary (Marshall, Mackay, Matthews, Maimone, & Isenring, 2020). Following an ecological design, multilevel and multicomponent interventions that focus on the physical and socio-environmental aspects would be welcome. The literature review made by Ewart-Pierce, Mejía-Ruiz, and Gittelsohn (2016) on obesity prevention and multilevel/multicomponent interventions could offer a useful guide for researchers interested in this approach. As an example, researchers may want to make designs that include modified or unmodified environments. In this sense, modifying the physical conditions of a gym (e.g., promoting healthy messages with posters, or increasing the supply of healthy foods within them), as well as the behavior of its trainers and users to make them respectful of all body forms, could have a positive effect on the patients' behavior towards PA that still remains unexplored. These effects could be explored in gyms (or other settings) where these conditions have not been changed. Differences between one context and another could be addressed from both a quantitative and qualitative perspective.

6) It is highly recommended to design PA programs that include a wide variety of activities which are adapted to the patients' socioeconomic level, which is often low to medium (Liang et al., 2014; Memarian, Sundquist, Calling, Sundquist, & Li, 2019). Future interventions should take this aspect into account, even relying on resources that patients can easily acquire or having available. In this way, there could be a greater transfer between "what" is presented in the intervention, with "what" really happens in the daily reality of these people. For this reason, the financial barrier, which on the other hand as been reported in several qualitative studies with this population (Beltrán-Carrillo et al., 2019; Wiklund et al., 2014; Zabatiero et al., 2016), should be primarily considered when the goal is focused on promoting active habits after PA programs.

7) While our intervention lasted 6 months, there is a need for longer interventions with the intention of exploring several issues. First, it seems that the positive effects that behavioral PA interventions have from baseline to post-intervention are more pronounced as the length of the time between assessments increase (McEwan et al., 2020). Although McEwan et al. (2020) found this effect with interventions ranged from 2 weeks to 26 weeks (6 months), it is possible that longer interventions will entail greater positive benefits when referring to the individuals' PA behavior. Second, it would be stimulating to know if longer interventions are capable of causing a progressive evolution on the patients' motivation (i.e., evolving from controlled forms of motivation to autonomous ones). As we suggested in Study 3, our program reduced amotivation (i.e., lack of motivation) and external regulation (which is the most controlled form of motivation) but increased introjected regulation (i.e., performing exercise to avoid guilty if I do not exercise) with respect to a control group. The question is; would longer programs lead to greater reductions in controlled forms of regulations and greater increases in integrated, identified and intrinsic regulations?

Future research should delve into this question. Third, and related to the previous point, carrying out longer interventions would help to understand if shorter ones could entail effects of "overloading" messages on the importance of PA for patients. As we hypothesized in Study 3, perhaps the active role of researchers/instructors in transmitting information related to PA may become negative due to "excessive desire to achieve changes" in a too short period of time. This effect can be counterproductive for the bariatric patients' motivational processes, promoting controlled forms of motivation (as introjected regulation) instead of autonomous ones. We encourage future research to explore this issue by paying special attention to how to give PA messages to bariatric patients when acting with them.

8) Future behavioral PA interventions carried out with a bariatric surgery population should include follow-up measurements in their designs. This decision would help to really measure the effectiveness of such interventions when changing patients' PA behavior or other types of behaviors. Again, McEwan et al. (2020) found that negative effects of both theory and no-stated-theory interventions are more pronounced as the length of the time between post-intervention and follow-up increase. In other words, the improvements obtained over the course of the interventions failed to persist after them. The same phenomenon appears to occur in PA interventions performed with bariatric patients (Carnero et al., 2017; Herring et al., 2017; Stolberg et al., 2018). Perhaps, including several strategies (e.g., phone calls, regular meetings, etc.) after the end of the intervention to "smooth" the return to the patients' daily reality could be desirable. Future research on the field should explore this matter. It would also be interesting to see what kind of follow-up strategies could be more effective in transferring the effects of the intervention (i.e., if those that are based on theory or those that are not guide by any theory).

9) For interventions that use accelerometry as a way to measure their patients' PA levels, it might be of interest to consider the following: should accelerometry be applied just after the end of the intervention? Is PA measured at this time point representative of a possible change in the patients' behavior produced by a PA program? Oncoming research should investigate whether this post-intervention week is truly representative of (possible modified) patient habits. We think that perhaps patients might need a period of readjustment to reorder their lives/routines after the researchers' interventions. So, establishing a reasonable time to avoid the residual effects of "super motivation" or "under-activity" when the interventions conclude could be suitable before measuring patients' PA again. Regarding accelerometry criteria, there is evidence supporting minimal differences in PA patterns using different methods of data reduction (e.g., different non-wear time periods, minimal daily wear time, number of days with available data, etc.) in people with obesity (Miller et al., 2013). However, this study does not include variations in the use of PA cut-offs points, which is the determinant variable to establish the different PA intensities. Moreover, it is necessary to assess if commonly used accelerometer PA cut-offs points (i.e., Santos-Lozano, 2013) are really applicable to bariatric surgery patients or people with severe obesity, since they are validated in a normal-weight population.

10) Future quantitative research on bariatric patients and theory-guided PA programs should adopt randomized and controlled designs to ensure the efficacy of the treatment. To date, two experimental studies have conducted theory-guided PA programs with this population (Bond et al., 2015, 2017; Jiménez-Loaisa et al., 2020), but only one has applied a randomized design in this regard (Bond et al., 2015, 2017). However, Bond et al. (2015, 2017) did not conduct practical PA sessions in which bariatric patients have to exercise together, a condition which could make the

randomization process more difficult. Calculating sample size *ad-hoc* to ensure statistical power and involving larger samples sizes could also be desirable. From the three studies mentioned above, Bond et al.' studies (2015, 2017) contain the largest sample (n = 75, of which 40 participated in their PA intervention). Regarding qualitative research, few studies have examined the perceived effects of behavioral PA programs in bariatric patients (Beltrán-Carrillo et al., 2019; Gill et al., 2018; González-Cutre et al., 2020; Powell, Fasczewski, Gill, & Davis, 2018). Qualitative data collection techniques used have included from interviews (Beltrán-Carrillo et al., 2019; González-Cutre et al., 2020; Powell et al., 2018) to focus group interviews (Gill et al., 2018) and observations (González-Cutre et al., 2020). Therefore, only one study (González-Cutre et al., 2020) have used two qualitative techniques at the same time. Future studies could be enriched if they included various data collection strategies in their designs. Giving voice to social agents that surround bariatric patients (e.g., families, health professionals) could also be desirable, since none of the cited studies includes them.

11) Bariatric surgery has shown to be cost-effective in the short- and medium-term to reduce obesity-related diseases (IFSO, 2019). However, postoperative PA leads to further physical and psychosocial health improvements after surgery (Jiménez-Loaisa et al., 2015; Tettero et al., 2018), which in turn could potentially decrease health care costs in a greater extent. For example, this idea could be supported by the fact that obesity-related costs increase as BMI increase (Andreyeva, Sturm, & Ringel, 2004). In this way, if large reductions in bariatric patients' BMI due to surgery are accompanied by additional reductions in this variable due to PA, the costs to the health care system might be reduced. Future research is needed to explore the costs-effectiveness and sustainability of these types of programs in public health systems (Ding et al., 2016;

Kruk, 2014). The role of PA programs to reduce costs derived from psychological and psychiatric diseases should also be explored in these patients.

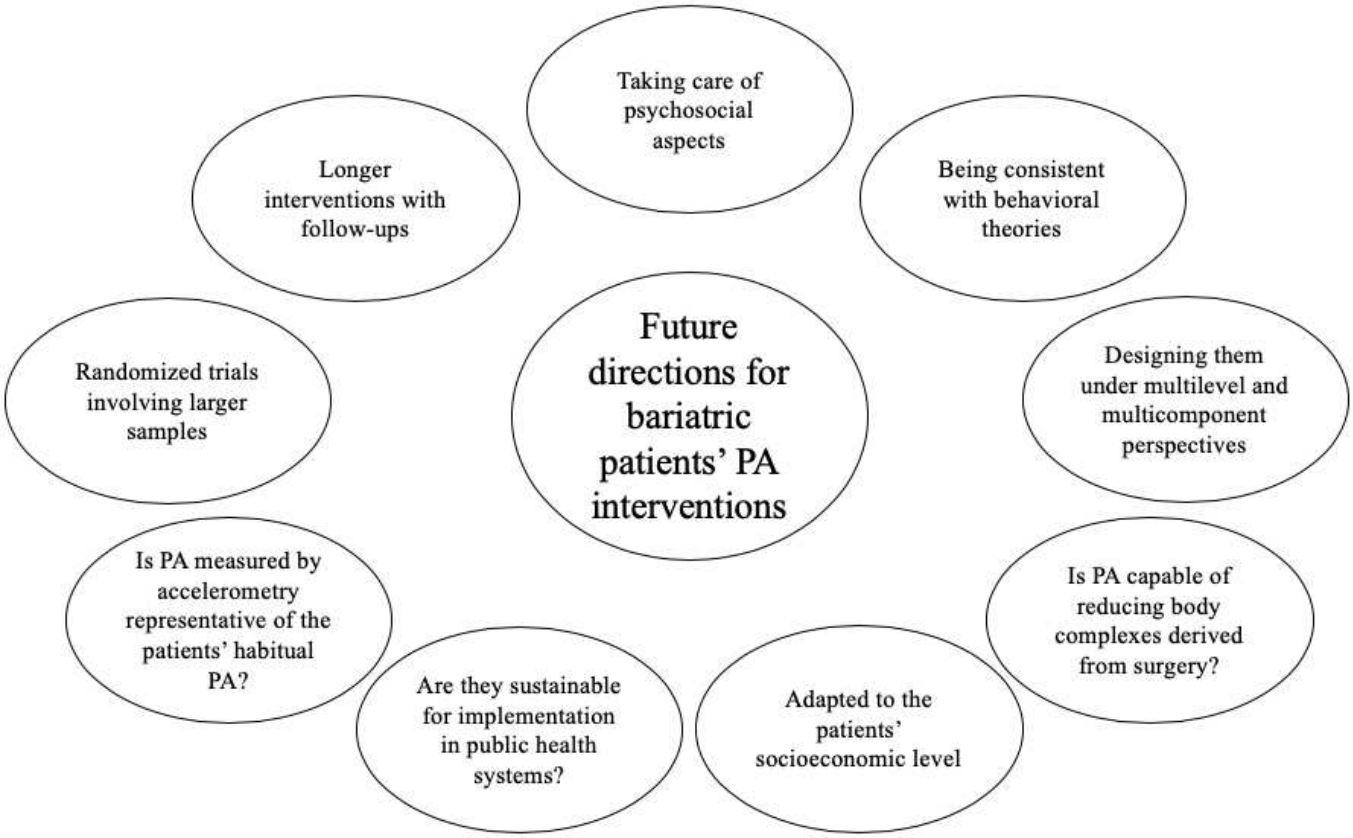

Figure 6. Future directions for PA interventions aimed at improving bariatric patients' active habits.

CONCLUSIONS/ CONCLUSIONES

CONCLUSIONS

The purpose of this thesis was to examine the psychosocial processes influencing the adoption of an active lifestyle by bariatric patients. For it, we included four studies addressing 1) psychosocial effects of surgery and PA in bariatric patients, 2) the role of social discourses such as healthism in the experiences of weight stigmatization, 3) changes on bariatric patients' HRQoL, PA levels, and motivation to exercise derived from a postoperative motivational PA program, and 4) facilitators and barriers perceived by bariatric patients to do PA one year after finishing this program. From these statements, we present below the general conclusions drawn from each study:

Study 1

The main purpose of this study was to analyze how the discourse of healthism contributes to the social construction of weight stigma by interpreting the reported experiences and opinions of women with severe obesity. From here, the main conclusion was as follows:

Conclusion 1: Before surgery, individuals with severe obesity are usually exposed to stigmatization and discrimination situations in multiple areas of their daily life. These experiences are underpinned by the so-called obesity discourses, such as healthism. These discourses are intentionally created by certain political and economic powers, which seek to spread social beliefs that maintain the reality desired by them. The consequences of these interests are manifested in the day-to-day lives of people who do not adjust to these social parameters, as is the case of people with obesity, causing situations of weight stigmatization and discrimination that lead to inequality and social injustice.

Study 2

The aim of this study was to examine the effects of a 6-month postoperative motivational PA intervention on bariatric patients' objective PA levels and HRQoL from pre-surgery to the end of the intervention (7 months after surgery). We also explored the prolonged effects of the SDT-based intervention by performing a re-test 13 months after surgery. This work yields the present conclusion:

Conclusion 2: A 6-month SDT-based PA intervention could enhance several HRQoL dimensions of bariatric patients after surgery. In light of this finding, we suggest that SDT could be applicable for the development of programs framed in health-care settings to enhance bariatric patients' HRQoL. Health-care practitioners, biomedical ethicists, exercise professionals, and public health authorities could benefit from the principles of SDT for delivering their messages towards patients. However, the postoperative intervention did not result in greater PA levels for the patients who participated on it, which highlights the difficulty of changing PA habits in this population.

Study 3

The first objective of this study was to examine the associations between pre- to post-intervention changes in exercise motivation and objective PA' levels of bariatric patients involved in a 6-month SDT-based PA intervention. From this objective, we could conclude that:

Conclusion 3: A 6-month SDT-based PA intervention could have higher effects on changes in controlled forms of motivation and amotivation, rather than in autonomous motivation. These changes were positively associated with reduced sedentary activity and higher PA. In this regard, our intervention program offered a great variety of activities and information regarding PA within a short period of time, which might have "overloaded" the patients and unintentionally stimulated internal

feelings of pressure, guilt and self-criticism when they did not perform sufficient levels of PA.

The second objective explored the extent to which patients' perception of autonomy support and basic psychological need satisfaction during the program were associated with changes in their motivation to exercise. In this regard, we state that:

Conclusion 4: Patients from our intervention felt high autonomy support provided by their instructors during the program. Moreover, the patients showed improved levels of autonomy', competence', and relatedness' satisfaction. In line with SDT tenets, these constructs were negatively related with changes in controlled forms of motivation and amotivation, and positively related with changes in autonomous forms of motivation.

Study 4

This study analyzed, from a qualitative and socio-ecological perspective, the factors influencing that bariatric patients continue doing (or give up) PA one year after finishing the 6-month SDT-based PA intervention. The conclusion was the following:

Conclusion 5: Both individual (in a psycho-physical sense) and environment (understood as a blend of familial, social, economic and atmospheric conditions) played a major role in the consolidation of (in)active lifestyles. After the PA program, all patients intended to be physically active in the future and argued to have enough knowledge to do PA on their own. Nevertheless, one year later, our results pointed out that the move from an intention to the actual behavior of PA is a difficult step to take.

Global conclusion

Bariatric surgery has a great impact on the individuals' lives. The rapid and great weight loss that patients experience after the operation is associated with several physical and psychological benefits. In this regard, the postoperative stage may be a

good chance to promote active lifestyles in these people, due to the role that PA plays to optimize the results of surgery and to produce additional gains in their physical and psychosocial health. However, PA adoption by these patients represents a major challenge to address. On the one hand, some typical personal factors among bariatric patients, such as their lack of motivation towards exercise, are complex to change even after intervening with them. The duration of the interventions, the amount of information provided, the type of PA they do, and its intensity, could be factors that impact on this variable. On the other hand, the circumstances of patients, understood as the physical and social environment that surrounds them, and their previous (sometimes stigmatizing and discriminating) social experiences, could be decisive factors that powerfully influence their acquisition of active physical habits. Therefore, it seems reasonable that health professionals and researchers are concerned with both personal and environmental approaches when promoting PA in this population. Finally, a more respectful society towards obese people is also necessary. Health professionals, teachers, sport science professionals, and other social agents should collaborate to promote health, well-being and healthy habits without promoting intolerant attitudes towards people with specific body shapes.

CONCLUSIONES

El propósito de esta tesis doctoral fue examinar los procesos psicosociales que influencian la (no)adquisición de un estilo de vida activo por parte de pacientes operados de cirugía bariátrica. Para ello, incluimos cuatro estudios sobre 1) efectos psicosociales de la cirugía y de la AF en pacientes bariátricos, 2) el rol de discursos sociales como el salutismo en las experiencias de estigmatización del peso corporal, 3) cambios en la calidad de vida percibida, niveles de AF, y motivación hacia el ejercicio de los pacientes bariátricos derivados de un programa postoperatorio y motivacional de AF, y 4) facilitadores y barreras percibidas por los pacientes bariátricos para hacer AF un año después de acabar dicho programa. Presentamos a continuación las conclusiones generales extraídas de cada uno de los estudios realizados:

Estudio I

El objetivo principal de este estudio fue analizar cómo el discurso del salutismo contribuye a la construcción social del estigma del peso a través de la interpretación de las experiencias y opiniones reportadas por mujeres con obesidad severa. A partir de aquí, la conclusión principal fue la siguiente:

Conclusión 1: Antes de la cirugía, las personas con obesidad severa generalmente están expuestas a situaciones de estigmatización y discriminación en múltiples áreas de su vida diaria. Estas experiencias están respaldadas por los conocidos como discursos sobre la obesidad, como el salutismo. Estos discursos son creados intencionalmente por ciertos poderes políticos y económicos, que buscan difundir determinadas creencias sociales que mantienen la realidad deseada por ellos. Las consecuencias de estos intereses se manifiestan en la vida cotidiana de las personas que no se ajustan a estos parámetros sociales, como es el caso de las personas con obesidad, y provocan

situaciones de estigmatización y discriminación del peso que desembocan en desigualdad e injusticia social.

Estudio 2

El objetivo de este estudio fue examinar los efectos de una intervención motivacional postoperatoria de 6 meses de duración sobre los niveles objetivos de AF y de calidad de vida percibida de los pacientes bariátricos desde la pre-cirugía hasta el final de la intervención (7 meses post-cirugía). También exploramos los efectos prolongados de la intervención realizando un re-test 13 meses después de la cirugía. De este trabajo surge la siguiente conclusión:

Conclusión 2: Una intervención de AF de 6 meses de duración basada en la teoría de la autodeterminación podría mejorar varias dimensiones de la calidad de vida percibida de los pacientes bariátricos después de la cirugía. A la luz de este hallazgo, sugerimos que dicha teoría podría ser aplicable para el desarrollo de programas enmarcados en entornos de atención médica para mejorar la calidad de vida percibida de los pacientes bariátricos. Los profesionales de la salud, los especialistas en ética biomédica, los profesionales del ejercicio y las autoridades de salud pública podrían beneficiarse de los principios de la teoría de la autodeterminación para transmitir sus mensajes a los pacientes. Sin embargo, la intervención postoperatoria no resultó en mayores niveles de AF para los pacientes que participaron en ella, lo que resalta la dificultad de cambiar dicho comportamiento en esta población.

Estudio 3

El primer objetivo de este estudio fue examinar las asociaciones entre los cambios en motivación y niveles de AF de pacientes bariátricos envueltos en una intervención motivacional de AF de 6 meses de duración. De este objetivo, podríamos concluir que:

Conclusión 3: Una intervención de AF de 6 meses de duración basada en la teoría de la autodeterminación podría tener mayores efectos sobre los cambios en las formas controladas de motivación y desmotivación, que sobre las formas autónomas de motivación. Estos cambios se asociaron positivamente con realizar menos actividad sedentaria y realizar más AF. En este sentido, nuestro programa de intervención ofreció una gran variedad de actividades e información sobre AF en un espacio reducido de tiempo, lo que podría haber "saturado" a los pacientes y haber estimulado involuntariamente sentimientos internos de presión, culpa y autocrítica cuando no realizaban suficientes niveles de AF.

El segundo objetivo de este estudio exploró en qué medida la percepción de los pacientes sobre el apoyo a su autonomía y la satisfacción de sus necesidades psicológicas básicas durante el programa se asociaron con cambios en su motivación hacia el ejercicio. En este sentido, declaramos que:

Conclusión 4: Los pacientes de nuestra intervención percibieron un alto apoyo a su autonomía por parte de sus instructores durante el programa. Además, los pacientes mostraron niveles altos de satisfacción de su autonomía, competencia y relación. En línea con los principios de la teoría de la autodeterminación, estos constructos se relacionaron negativamente con los cambios en las formas controladas de motivación y desmotivación, y se relacionaron positivamente con los cambios en sus formas autónomas de motivación.

Estudio 4

Este estudio analizó, desde una perspectiva cualitativa y socioecológica, los factores que influyen en que los pacientes bariátricos continúen haciendo (o que abandonen) AF un año después de finalizar la intervención de AF de 6 meses de

duración basada en la teoría de la autodeterminación. Bajo esta premisa, la conclusión es la siguiente:

Conclusión 5: Tanto el individuo (en un sentido psicofísico) como el ambiente (entendido como una combinación de condiciones familiares, sociales, económicas y atmosféricas) jugaron un papel importante en la consolidación de estilos de vida (in)activos. Después del programa de AF, todos los pacientes tenían la intención de ser físicamente activos en el futuro y argumentaron que tenían suficiente conocimiento para realizar AF por su cuenta. Sin embargo, un año después, nuestros resultados señalaron que el paso de la intención al comportamiento real de AF es un paso difícil de realizar.

Conclusión global

La cirugía bariátrica tiene un gran impacto en la vida de las personas. La gran y rápida pérdida de peso que experimentan los pacientes después de la operación se asocia con varios beneficios tanto físicos como psicosociales. En este sentido, la etapa postoperatoria puede ser una buena oportunidad para promover estilos de vida activos en estas personas, debido al papel que juega la AF para optimizar los resultados de la cirugía y producir ganancias adicionales en su salud física y psicosocial. Sin embargo, la adopción de hábitos de AF por parte de estos pacientes representa un gran desafío que abordar. Por un lado, algunos factores personales típicos de los pacientes bariátricos, como su falta de motivación hacia el ejercicio, son complejos de cambiar incluso después de intervenir con ellos. La duración de las intervenciones, la cantidad de información dada sobre el ejercicio, el tipo de AF que realicen y su intensidad, podrían ser factores que impacten en esta variable. Por otro lado, las circunstancias de los pacientes, entendidas como el entorno físico y social que les rodea, y sus experiencias sociales previas (a veces estigmatizantes y discriminatorias), podrían ser factores decisivos que influyen poderosamente en su adquisición de hábitos físicos activos. Por

lo tanto, parece razonable que los profesionales de la salud y los investigadores se preocupen por ambos enfoques (personales y ambientales) al promover la AF en esta población. Finalmente, también es necesaria una sociedad más respetuosa hacia las personas con obesidad. Los profesionales de la salud, los docentes, los profesionales de las ciencias del deporte y otros agentes sociales deben colaborar para promover la salud, el bienestar y los hábitos saludables sin promover actitudes intolerantes hacia las personas con formas corporales específicas.

IMPLICATIONS AND RECOMMENDATIONS

IMPLICATIONS AND RECOMMENDATIONS

For my supervisors and I, it is fundamental to make explicit the practical recommendations that emerge from our research. This thesis would not be as useful if we did not make an effort to "land" in the real world or connect theory with future practice. Therefore, although we have already outlined a set of key ideas in the final sections of all the studies, it seems pertinent to reflect on how this thesis might contribute to enhance bariatric patients' well-being and the practice of multiple agents (e.g., healthcare workers, PA-related professionals, or policy-makers).

The first point of interest could focus on the advice on healthy lifestyles that patients receive right after surgery. These guidelines represent a focus where some results derived from this thesis could be directed. For example, it could be desirable to build this advice on the facilitators and barriers (see Study 4) that bariatric patients commonly perceive to do PA in their "new life". Following our findings, proposing activities adapted to their perceived physical competence and that are easily achievable from a temporal and economic point of view could be ideal in the initial stages. Social support seems to be also a core factor that facilitates patients' PA participation, so it could be beneficial to include social agents such as families or other patients to achieve this purpose.

At this point, we are aware that such initial recommendations are not easy to materialize. On the one hand, professionals from healthcare settings already spend a large part of their time taking care of the patients' health, making it difficult for these professionals to spend enough time to promote PA among this population. Furthermore, they rarely receive specific training in physical exercise methodology. On the other hand, patients should translate these recommendations into their daily lives by

themselves, which is not a simple matter. It is here where we believe that there should be some kind of connection between healthcare workers and PA professionals.

When facilitating compliance with these guidelines, collaboration between the two groups could take various forms. Holding specific training courses/workshops on PA focused on bariatric patients and directed towards professionals from health settings would be the least expensive way to form this link. This proposition should guarantee training in both the physical and psychosocial aspects that are characteristics of bariatric patients' PA after surgery (we make some recommendations on this matter below).

A second way to increase the chances of success of these recommendations could be for healthcare workers and exercise professionals to be in contact so that the former refer patients to the latter (for example, to specific facilities such as gyms). As indicated in the literature review, it could be desirable to consider (and, if necessary, modify in certain extent) the physical environmental factors that could negatively impact the patients' PA participation. In the case of gyms, these facilities could possess specific physical structures that would preserve patients' (and the rest of users) privacy. Some examples could be the availability of individual showers, or swimming pools/fitness rooms closed to external observers. Avoiding "body worship" environments, where aesthetic is more important than health, would also be beneficial. All these mentioned aspects could help to avoid barriers related to body complexes, promoting more respectful exercise environments. In turn, these actions could alleviate situations of social and self-stigmatization due to the people's weight. In line with what we propose in Study 1, PA professionals would be therefore acting indirectly and positively on some stigma dimensions (in this case, concealability and aesthetics) which could ultimately promote weight discrimination.

A third way would involve legislators and health institutions to offer specific PA programs for this population (among others) in the hospital/health centers. Study 4 showed how patients perceived the lack of specific PA programs as a potential barrier for them. Thus, the health system could promote PA programs focused on educating bariatric patients in active lifestyles at the initial postoperative stages. PA professionals could play an important role in this regard by collaborating with healthcare workers to achieve that purpose. With the amount of evidence currently available on the physical and psychosocial benefits of PA in bariatric patients (as in other health-impaired populations), we understand that it would be desirable to include PA professionals as agents within medical staffs that would help to optimize post-surgery outcomes in these individuals.

Anyway, it should be noted that transversely to the three actions proposed, the training of PA professionals in the psychosocial aspects of PA is necessary. From university education, teachers must ensure training to their students in this regard. Likewise, education on the origin and existence of social discourses that promote intolerant attitudes towards people with specific body shapes should be always present. Taking into account these statements, we detail in depth, along the following paragraphs, some concrete recommendations focused on facilitating bariatric patients' PA from a psychosocial perspective.

We have mentioned above that PA should be adapted to the perceived bariatric patients' physical competence. At this point, healthcare workers and PA professionals should provide knowledge of the MVPA guidelines (at least 150 min of MVPA per week) to these patients. However, as proposed in Study 3, it is important to take these recommendations as a long-term goal. Before doing so, professionals should direct their messages and advice towards less intense forms of PA to make it more attractive for

patients. For example, activities like walking (which require low financial resources) bring multiple health benefits and could be a good way to "hook" these people to PA. It would be also advisable not to overload patients with too much PA information, especially at the beginnings of treatments. Both healthcare and PA professionals should be sensitive and cautious with their messages so as not to provoke feelings of pressure or guilt in patients in they do not perform enough PA. We have to be aware that we are dealing with a highly inactive population, with difficult life stories in some cases, so the actions with them should be very progressive over time.

Whenever possible, instructors could prioritize group sessions over individual ones. This recommendation is based on results found in several of our studies. As examples, in our Study 2 the variable "social functioning" improved considerably in the patients who participated in our group PA program, compared to our control group. In Study 3, the basic psychological need of "relatedness" presented the highest score when compared to autonomy and competence. Study 4 revealed that social support is in turn a facilitator or barrier towards PA participation depending on whether patients consider that they have it or not, respectively. These conclusions suggest that doing group PA (e.g., with families, friends, or other patients) could facilitate the acquisition of an active lifestyle by them.

Instructors should also be concerned about introducing novel stimuli in their PA programs. This aspect was highly valued by the participants of our program, as we found in a complementary work to this thesis (González-Cutre et al., 2019). Concretely, it is not recommended to base PA programs in a single environment and under exclusively physical criteria. According to the patients, the intervention we did would have been boring for them if it had been based only on gym exercises. In this regard, the inclusion of psychosocial activities (also with a physical component) was really

appreciated by them and incited to attend in a great extent to the PA program. This aspect could be supported by the attendance rate (80% on average) registered in our intervention, as we presented in Study 2. From our experience, activities such as aquagym, body expression, traditional games, or trekking in the nature are really enjoyable by patients. Figure 7 shows some memories of these moments.

Beyond all strategies that put the emphasis on caring for the patients' relatedness and novelty needs, it would be desirable for instructors to also apply autonomy and competence strategies during their PA sessions. Table 16 (see Appendix 2) contains up to 24 examples of SDT-based motivational strategies that could be useful for instructors for their performances with this group.

Finally, professionals from exercise and healthcare settings should avoid launching misleading messages that support weight stigmatization when interacting with patients. A clear (and unfortunate) example would be to focus the advice exclusively on those issues that have to do with individual responsibility (i.e., diet and PA). By doing so, professionals are unconsciously supporting some stigmatizing constructs (such as origin and controllability dimensions) that we mention in Study 1. It is equally important for any group that is dedicated to ensuring the health of people with obesity not to promote their self-stigmatization. This is only possible if we are aware of the multifactorial complexity of obesity and the existence of social discourses that try to simplify it. Respect, understanding, listening and interest in knowing the background of each patient are also fundamental when interacting with the patients themselves, and the circumstances that surround them.


CREVILLENT

Figure 7. Some pictures of the psychosocial activities carried out with the participants during the PA program.

REFERENCES

REFERENCES

Adams, T. D., Pendleton, R. C., Strong, M. B., Kolotkin, R. L., Walker, J., Litwin, S. E., … Hunt, S. C. (2010). Health outcomes of gastric bypass patients compared to nonsurgical, nonintervened severely obese. *Obesity (Silver Spring), 18*(1), 121–130. https://doi.org/10.1038/oby.2009.178.

Ahmedani, B.K. (2011). Mental health stigma: Society, individuals, and the profession. *Journal of Social Work Values and Ethics, 8*(2), 410–416.

Albertos-Puebla, J. M., & Sánchez-Hernández, J. L. (2014). *Geografía de la crisis económica en España* [Geography of the economic crisis in Spain]. Valencia: Universidad de Valencia.

Aldaqal, S. M., Makhdoum, A. M., Turki, A. M., Awan, B. A., Samargandi, O. A., & Jamjom, H. (2013). Post-bariatric surgery satisfaction and body-contouring consideration after massive weight loss. *North American Journal of Medical Sciences, 5*(4), 301–305. https://doi.org/10.4103/1947-2714.110442.

Andreyeva, T., Sturm, R., & Ringel, J. S. (2004). Moderate and severe obesity have large differences in health care costs. *Obesity Research, 12*(12), 1936–1943. https://doi.org/10.1038/oby.2004.243.

Annis, N. M., Cash, T. F., & Hrabosky, J. I. (2004). Body image and psychosocial differences among stable average weight, currently overweight, and formerly overweight women: The role of stigmatizing experiences. *Body Image, 1*(2), 155–167. https://doi.org/10.1016/j.bodyim.2003.12.001.

Artazcoz, L., Cortès, I., Benavides, F. G., Escribà-Agüir, V., Bartoll, X., Vargas, H., & Borrell, C. (2016). Long working hours and health in Europe: Gender and welfare state differences in a context of economic crisis. *Health & Place, 40*, 161–168. https://doi.org/10.1016/j.healthplace.2016.06.004.

Aune, D., Sen, A., Prasad, M., Norat, T., Janszky, I., Tonstad, S., ... Vatten, L. J. (2016). BMI and all cause mortality: systematic review and non-linear dose-response meta-analysis of 230 cohort studies with 3.74 million deaths among 30.3 million participants. *BMJ*, 353:i2156. https://doi.org/10.1136/bmj.i2156.

Avenell, A., Broom, J., Brown, T. J., Poobalan, A., Aucott, L., Stearns, S. C., … Grant, A. M. (2004). Systematic review of the long-term effects and economic consequences of treatments for obesity and implications for health improvement. *Health Technology Assessment, 8*(21), 1–182. https://doi.org/10.3310/hta8210.

Bagdade, P. S., & Grothe, K. B. (2012). Psychosocial evaluation, preparation, and follow-up for bariatric surgery patients. *Diabetes Spectrum, 25*(4), 211–216. https://doi.org/10.2337/diaspect.25.4.211.

Basterra-Gortari, F. J., Beunza, J. J., Bes-Rastrollo, M., Toledo, E., García-López, M., & Martínez-González, M. A. (2011). Increasing trend in the prevalence of morbid obesity in Spain: from 1.8 to 6.1 per thousand in 14 years. *Revista Española de Cardiología, 64*(5), 424–426.

Batsis, J. A., López-Jiménez, F., Collazo-Clavell, M. L., Clark, M. M., Somers, V. K., & Sarr, M. G. (2009). Quality of life after bariatric surgery: A population-based cohort study. *The American Journal of Medicine, 122*(11), 1055.e1–1055.e10. https://doi.org/10.1016/j.amjmed.2009.05.024.

Bazeley, P., & Jackson, P. (2013). *Qualitative data analysis with Nvivo*. London: Sage.

Bell, K., & Green, J. (2016). On the perils of invoking neoliberalism in public health critique. *Critical Public Health, 26*(3), 239–243. https://doi.org/10.1080/09581596.2016.1144872.

Beltrán-Carrillo, V. J., Jiménez-Loaisa, A., Jennings, G., González-Cutre, D., Navarro-Espejo, N., & Cervelló, E. (2019). Exploring the socio-ecological factors behind

the (in)active lifestyles of Spanish post-bariatric surgery patients. *International Journal of Qualitative Studies on Health and Well-being*, 14:1626180. https://doi.org/10.1080/17482631.2019.1626180.

Beltrán-Carrillo, V. J., Devís-Devís, J., & Peiró-Velert, C. (2018). The influence of body discourses on adolescents' (non)participation in physical activity. *Sport, Education & Society, 23*(3), 257–269. https://doi.org/10.1080/13573322.2016.1178109.

Bergh, I., Kvalem, I. L., Mala, T., Hansen, B. H., & Sniehotta, F. F. (2017). Predictors of physical activity after gastric bypass—A prospective study. *Obesity Surgery, 27*(8), 2050–2057. https://doi.org/10.1007/s11695-017-2593-x.

Berglind, D., Willmer, M., Eriksson, U., Thorell, A., Sundbom, M., Uddén, J., … Rasmussen, F. (2015). Longitudinal assessment of physical activity in women undergoing Roux-en-Y gastric bypass. *Obesity Surgery, 25*(1), 119–125. https://doi.org/10.1007/s11695-014-1331-x.

Berglind, D., Willmer, M., Tynelius, P., Ghaderi, A., Näslund, E., & Rasmussen, F. (2016). Accelerometer-measured versus self-reported physical activity levels and sedentary behavior in women before and 9 months after Roux-en-Y gastric bypass. *Obesity Surgery, 26*(7), 1463–1470. https://doi.org/10.1007/s11695-015-1971-5.

Bhaskaran, K., dos-Santos-Silva, I., Leon, D. A., Douglas, I. J., & Smeeth, L. (2018). Association of BMI with overall and cause-specific mortality: a population-based cohort study of 3.6 million adults in the UK. *The Lancet Diabetes & Endocrinology, 6*(12), 944–953. https://doi.org/10.1016/S2213-8587(18)30288-2.

Biddle, S. J. H., Gorely, T., Mutrie, N., & Blamey, A. (2012). Interventions for physical activity and sedentary behavior. In: G.C. Roberts GC & D. Treasure (Eds.). *Advances in motivation in sport and exercise* (pp. 357-386). Champaign, IL: Human Kinetics.

Biörserud, C., Olbers, T., & Fagevik-Olsén, M. (2011). Patients' experience of surplus skin after laparoscopic gastric bypass. *Obesity Surgery, 21*(3), 273–277. https://doi.org/10.1007/s11695-009-9849-z.

Boeka, A. G., Prentice-Dunn, S., & Lokken, K. L. (2010). Psychosocial predictors of intentions to comply with bariatric surgery guidelines. *Psychology, Health & Medicine, 15*(2), 188–197. https://doi.org/10.1080/13548501003615282.

Bond, D. S., Graham-Thomas, J., King, W. C., Vithiananthan, S., Trautvetter, J., Unick, J. L., … Wing, R. R. (2015). Exercise improves quality of life in bariatric surgery candidates: Results from the bari-active trial. *Obesity (Silver Spring), 23*(3), 536–542. https://doi.org/10.1002/oby.20988.

Bond, D. S., Graham-Thomas, J., Ryder, B. A., Vithiananthan, S., Pohl, D., & Wing, R. R. (2013). Ecological momentary assessment of the relationship between intention and physical activity behavior in bariatric surgery patients. *International Journal of Behavioral Medicine, 20*(1), 82–87. https://doi.org/10.1007/s12529-011-9214-1.

Bond, D. S., Graham-Thomas, J., Vithiananthan, S., Unick, J. L., Webster, J., Roye, G. D., … Sax, H. C. (2017). Intervention-related increases in preoperative physical activity are maintained 6-months after bariatric surgery: Results from the bari-active trial. *International Journal of Obesity, 41*(3), 467–470. https://doi.org/10.1038/ijo.2016.237.

Bond, D. S., Graham-Thomas, J., Vithiananthan, S., Webster, J., Unick, J. L., Ryder, B. A., & Pohl, D. (2016). Changes in enjoyment, self-efficacy, and motivation during a randomized trial to promote habitual physical activity adoption in bariatric surgery patients. *Surgery for Obesity and Related Diseases, 12*(5), 1072–1079. https://doi.org/10.1016/j.soard.2016.02.009.

Bond, D. S., Jakicic, J. M., Vithiananthan, S., Graham-Thomas, J., Leahey, T. M., Sax, H. C., … Wing, R. R. (2010). Objective quantification of physical activity in bariatric surgery candidates and normal-weight controls. *Surgery for Obesity and Related Diseases, 6*(1), 72–78. https://doi.org/10.1016/j.soard.2009.08.012.

Bond, D. S., Phelan, S., Wolfe, L. G., Evans, R. K., Meador, J. G., Kellum, J. M., … Wing, R. R. (2009). Becoming physically active after bariatric surgery is associated with improved weight loss and health-related quality of life. *Obesity, 17*(1), 78–83. https://doi.org/10.1038/oby.2008.501.

Bond, D. S., Unick, J. L., Jakicic, J. M., Vithiananthan, S., Pohl, D., Roye, G. D., … Wing, R. R. (2011). Objective assessment of time spent being sedentary in bariatric surgery candidates. *Obesity Surgery, 21*(6), 811–814. https://doi.org/10.1007/s11695-010-0151-x.

Bond, D. S., Vithiananthan, S., Graham-Thomas, J., Trautvetter, J., Unick, J. L., Jakicic, J. M., … Wing, R. R. (2015). Bari-active: A randomized controlled trial of a preoperative intervention to increase physical activity in bariatric surgery patients. *Surgery for Obesity and Related Diseases, 11*(1), 169–177. https://doi.org/10.1016/j.soard.2014.07.010.

Braun, B., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Brethauer, S. A., Kim, J., el Chaar, M., Papasavas, P., Eisenberg, D., Rogers, A., ... Kothari, S. (2015). Standardized outcomes reporting in metabolic and bariatric surgery. *Surgery for Obesity and Related Diseases, 11*(3), 489–506. https://doi.org/10.1016/j.soard.2015.02.003.

Brewis, A., Wutich, A., Falletta-Cowden, A., & Rodríguez-Soto, I. (2011). Body norms and fat stigma in global perspective. *Current Anthropology, 52*(2), 269–276.

Buchan, D. S., Ollis, S., Thomas, N. E., & Baker, J. S. (2012). Physical activity behaviour: An overview of current and emergent theoretical practices. *Journal of Obesity*, 546459. https://doi.org/10.1155/2012/546459.

Buchwald, H., Avidor, Y., Braunwald, E., Jensen, M. D., Pories, W., Fahrbach, K., & Schoelles, K. (2004). Bariatric surgery. A systematic review and meta-analysis. *JAMA, 292*(14), 1724–1728. https://doi.org/10.1001/jama.292.14.1724.

Cafri, G., Yamamiya, Y., Brannick, M., & Thompson, J. K. (2005). The influence of sociocultural factors on body image: A meta-analysis. *Clinical Psychology: Science and Practice, 12*(4), 421–433. https://doi.org/10.1093/clipsy/bpi053.

Campbell, R., Vansteenkiste, M., Delesie, L., Soenens, B., Tobback, E., Vogelaers, D., & Mariman, A. (2019). The role of basic psychological need satisfaction, sleep, and mindfulness in the health-related quality of life of people living with HIV. *Journal of Health Psychology, 24*(4), 535–545. https://doi.org/10.1177/1359105316678305.

Canetti, L., Elizur, Y., Karni, Y., & Berry, E. M. (2013). Health-related quality of life changes and weight reduction after bariatric surgery vs. a weight-loss program. *The Israel Journal of Psychiatry and Related Sciences, 3*(50), 194–201.

Carnero, E. A., Dubis, G. S., Hames, K. C., Jakicic, J. M., Houmard, J. A., Coen, P. M., & Goodpaster, B. H. (2017). Randomized trial reveals that physical activity and

energy expenditure are associated with weight and body composition after RYGB. *Obesity (Silver Spring), 25*(7), 1206–1216. https://doi.org/10.1002/oby.21864.

Chastin, S. F. M., De Craemer, M., De Cocker, K., Powell, L., Van Cauwenberg, J., Dall, P., ... Stamakis, E. (2019). How does light-intensity physical activity associate with adult cardiometabolic health and mortality? Systematic review with meta-analysis of experimental and observational studies. *British Journal of Sports Medicine, 53*(6), 370–376. https://doi.org/10.1136/bjsports-2017-097563.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., … Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39*(2), 216–236. https://doi.org/10.1007/s11031-014-9450-1.

Chen, E. Y., & Brown, M. (2005). Obesity stigma in sexual relationships. *Obesity Research, 13*(8), 1393–1397. https://doi.org/10.1038/oby.2005.168.

Clark, S. M., Saules, K. K., Schuh, L. M., Stote, J., & Creel, D. B. (2014). Associations between relationship stability, relationship quality, and weight loss outcomes among bariatric surgery patients. *Eating Behaviors, 15*(4), 670–672. https://doi.org/10.1016/j.eatbeh.2014.09.003.

Cockerham, W. C. (2005). Health lifestyle theory and the convergence of agency and structure. *Journal of Health and Social Behavior, 46*(1), 51–67. https://doi.org/10.1177/002214650504600105.

Coen, P. M., & Goodpaster, B. H. (2016). A role for exercise after bariatric surgery? *Diabetes, Obesity & Metabolism, 18*(1), 16–23. https://doi.org/10.1111/dom.12545.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cook, C. M., & Edwards, C. (1999). Success habits of long-term gastric bypass patients. *Obesity Surgery, 9*(1), 80–82. https://doi.org/10.1381/096089299765553872.

Corrigan, P.W., River, L. P., Lundin, R. K., Uphoff-Wasowski, K., Campion, J., Mathisen, J., … Kubiak, M. A. (2000). Stigmatizing attributions about mental illness. *Journal of Community Psychology, 28*(1), 91–102. https://doi.org/10.1002/(SICI)1520-6629(200001)28:1<91::AID-JCOP9>3.0.CO;2-M.

Costa, R., Yamaguchi, N., Santo, M. A., Riccioppo, D., & Pinto-Junior, P. (2014). Outcomes on quality of life, weight loss, and comorbidities after roux-en-y gastric bypass. *Arquivos de Gastroenterologia, 51*(3), 165–170. https://doi.org/10.1590/s0004-28032014000300002.

Crandall, C. S., & Schiffhauer, K. L. (1998). Anti-fat prejudice: Beliefs, values, and American culture. *Obesity Research, 6*(6), 458–460. https://doi.org/10.1002/j.1550-8528.1998.tb00378.x.

Crawford, R. (1980). Healthism and the medicalization of everyday life. *International Journal of Health Services, 10*(3), 365–388. https://doi.org/10.2190/3H2H-3XJN-3KAY-G9NY.

Crisp, A. H., Verlengia, R., Ravelli, M. N., Junior, I. R., & de Oliveira, M. R. M. (2018). Changes in physical activities and body composition after roux-Y gastric bypass surgery. *Obesity Surgery, 28*(6), 1665–1671. https://doi.org/10.1007/s11695-017-3074-y.

Crocker, J. (1999). Social stigma and self-esteem situational construction of self-worth. *Journal of Experimental Social Psychology, 35*(1), 89–107. https://doi.org/10.1006/jesp.1998.1369.

Crocker, J., & Major, B. (1989). Social stigma and self-esteem: The self-protective properties of stigma. *Psychological Review, 96*(4), 608–630. https://doi.org/10.1037/0033-295X.96.4.608.

De Carvalho, A., Ribeiro, E., Adami, E., & Magdaleno, R. (2014). Weight regain among women after metabolic and bariatric surgery: A qualitative study in Brazil. *Trends in Psychiatry and Psychotherapy, 36*(3), 140–146. https://doi.org/10.1590/2237-6089-2013-0041.

De Zwaan, M., Enderle, J., Wagner, S., Mühlhans, B., Ditzen, B., Gefeller, O., … Müller, A. (2011). Anxiety and depression in bariatric surgery patients: A prospective, follow-up study using structured clinical interviews. *Journal of Affective Disorders, 133*(1-2), 61–68. https://doi.org/10.1016/j.jad.2011.03.025.

De Zwaan, M., Georgiadou, E., Stroh, C., Teufel, M., Köhler, H., Tengler, M., & Müller, A. (2014). Body image and quality of life in patients with and without body contouring surgery following bariatric surgery: A comparison of pre- and post-surgery groups. *Frontiers of Psychology,* 5:1310. https://doi.org/10.3389/fpsyg.2014.01310.

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology, 49*(3), 182–185. https://doi.org/10.1037/a0012801.

Denison, J., and D. Scott-Thomas. 2011. Michael Foucault: Power and discourse. The "loaded" language of coaching. In *The sociology of sport coaching*, ed. R.L. Jones, P. Potrac, C. Cushion, and L.T. Rongland, 27–39. Abingdon: Routledge.

Devís-Devís, J., Beltrán-Carrillo, V. J., & Peiró-Velert, C. (2015). Exploring socio-ecological factors influencing active and inactive Spanish students in years 12 and 13. *Sport, Education and Society, 20*(3), 61–80. https://doi.org/10.1080/13573322.2012.754753.

Ding, D., Lawson, K. D., Kolbe-Alexander, T. L., Finkelstein, E. A., Katzmarzyk, P. T., van Mechelen, W., & Pratt, M. (2016). The economic burden of physical inactivity: A global analysis of major non-communicable diseases. *The Lancet, 388*(10051), 1311–1324. https://doi.org/10.1016/S0140-6736(16)30383-X.

Dikareva, A., Harvey, W. J., Cicchillitti, M. A., Bartlett, S. J., & Andersen, R. E. (2016). Exploring perceptions of barriers, facilitators, and motivators to physical activity among female bariatric patients: Implications for physical activity programming. *American Journal of Health Promotion, 30*(7), 536–544. https://doi.org/10.4278/ajhp.140609-QUAL-270.

Dixon, J. B., Dixon, M. E., & O´Brien, P. E. (2003). Depression in association with severe obesity. *Archives of Internal Medicine, 163*(17), 2058–2065. https://doi.org/10.1001/archinte.163.17.2058.

Donnelly, J. E., Blair, S. N., Jakicic, J. M., Manore, M. M., Rankin, J. W., & Smith, B. K. (2009). American College of Sports Medicine Stand. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Medicine & Science in Sports & Exercise, 41*(2), 459–471. https://doi.org/10.1249/MSS.0b013e3181949333.

Durand-Moreau, Q., Gautier, A., Becouarn, G., Topart, P., Rodien, P., & Salle, A. (2015). Employment and professional outcomes in 803 patients undergoing bariatric surgery in a French reference center for obesity. *International Journal*

of Occupational and Environmental Medicine, 6(2), 95–103. https://doi.org/10.15171/ijoem.2015.502.

Egberts, K., Brown W. A., Brennan, L., & O'Brien, P. E. (2012). Does exercise improve weight loss after bariatric surgery? A systematic review. *Obesity Surgery, 22*(2), 335–341. https://doi.org/10.1007/s11695-011-0544-5.

Evans, J., Davies, B., & Wright, J. (2004). *Body knowledge and control. Studies in the sociology of physical education and health*. London: Routledge.

Ewart-Pierce, E., Mejía-Ruiz, M. J., & Gittelsohn, J. (2016). "Whole-of-community" obesity prevention: A review of challenges and opportunities in multilevel, multicomponent interventions. *Current Obesity Reports, 5*(3), 361–374. https://doi.org/10.1007/s13679-016-0226-7.

Evans, J., Davies, B., Rich, E., & De Pian, L. (2013). Understanding policy: Why health education policy is important and why it does not appear to work. *British Educational Research Journal, 39*(2), 320–337. https://doi.org/10.1080/01411926.2011.647679.

Feldman, D.B., & Crandall, C. S. (2007). Dimensions of mental illness stigma: What about mental illness causes social rejection? *Journal of Social and Clinical Psychology, 26*(2), 137–154. https://doi.org/10.1521/jscp.2007.26.2.137.

Ferreira, A., Santos, O., Raimundo, G., Pegacho, M., & Carvalho, M. (2013). Psychological characterisation of severely obese patients: Pre- and post-bariatric surgery. *Biomedical and Biopharmaceutical Research, 1*(10), 31–42. https://doi.org/10.19277/bbr.10.1.49.

Forbush, S. W., Nof, L., Echternach, J., & Hill, C. (2011). Influence of activity on quality of life scores after RYGBP. *Obesity Surgery, 21*(8), 1296–1304. https://doi.org/10.1007/s11695-010-0184-1.

Freeberg, A. L., & Stein, C. H. (1996). Felt obligations towards parents in Mexican-American and Anglo-American young adults. *Journal of Social and Personal Relationships, 13*(3), 457–471. https://doi.org/10.1177/0265407596133009.

Friedman, K. E., Ashmore, J. A., & Applegate, K. L. (2008). Recent experiences of weight-based stigmatization in a weight loss surgery population: Psychological and behavioral correlates. *Obesity (Silver Spring), 16*(2), 69–74. https://doi.org/10.1038/oby.2008.457.

Fuchs, H. F., Broderick, R. C., Harnsberger, C. R., Chang, D. C., Sandler, B. J., Jacobsen, G. R., & Horgan, S. (2015). Benefits of bariatric surgery do not reach obese men. *Journal of Laparoendoscopic & Advanced Surgical Techniques, 25*(3), 196–201. https://doi.org/10.1089/lap.2014.0639.

García, J. T., Amankwah, E. K., & Hernández, R. G. (2016). Assessment of weight bias among pediatric nurses and clinical support staff toward obese patients and their caregivers. *Journal of Pediatric Nursing, 31*(4), e244–e251. https://doi.org/10.1016/j.pedn.2016.02.004.

Gard, M., & Kirk, D. (2007). Obesity discourse and the crisis of faith in disciplinary technology. *Utbildning & Demokrati, 16*(2), 17–36.

Gard, M., & Wright. J. (2001). Managing uncertainty: Obesity discourses and physical education in a risk society. *Studies in Philosophy and Education, 20*, 535–549. https://doi.org/10.1023/A:1012238617836.

Gard, M., & Wright. J. (2005). *The obesity epidemic. Science, morality and ideology*. London: Routledge.

Giel, K. E., Zipfel, S., Alizadeh, M., Schäffeler, N., Zahn, C., Wessel, D., ... Thiel, A. (2012). Stigmatization of obese individuals by human resource professionals: An

experimental study. *BMC Public Health,* 12:525. https://doi.org/10.1186/1471-2458-12-525.

Gignac, G. E., & Szodorai, E. T. (2016). Effect size guidelines for individual differences researchers. *Personality and Individual Differences, 102*, 74–78. https://doi.org/10.1016/j.paid.2016.06.069.

Giles-Corti, B., & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social Science & Medicine, 54*(12), 1793–1812. https://doi.org/10.1016/S0277-9536(01)00150-2.

Gill, D. L., Fasczewski, K. S., Reifsteck, E. J., Rothberger, S. M., & Davis, P. G. (2018). Evaluation of an exercise programme for post-bariatric surgery patients: Views of participants. *Obesity Science & Practice, 4*(3), 259–267. https://doi.org/10.1002/osp4.165.

Gilmartin, J., Long, A. F., & Soldin, M. (2014). Changing body image and well-being: Following the experience of massive weight loss and body contouring surgery. *Healthcare, 2*(2), 150–165. https://doi.org/10.3390/healthcare2020150.

Goffman, E. (1963). *Stigma: Notes on the management of spoiled identity*. Englewood Cliffts, NJ: Prentice Hall.

González-Cutre, D., Jiménez-Loaisa, A., Romero-Elías, & Beltrán-Carrillo, V. J. (2019). Exploring bariatric patients' need for novelty in a motivational physical activity program: A qualitative study. *European Journal of Human Movement, 43*, 1–12.

González-Cutre, D., Megías, A., Beltrán-Carrillo, V. J., Cervelló, E., & Spray, C. M. (2020). Effects of a physical activity program on post-bariatric patients: A qualitative study from a self-determination theory perspective. *Journal of Health Psychology, 25*(10-11), 1743–1754. https://doi.org/10.1177/1359105318770729.

González-Cutre, D., Sicilia, A., & Fernández, A. (2010). Hacia una mayor comprensión de la motivación en el ejercicio físico: medición de la regulación integrada en el contexto español [Toward a deeper understanding of motivation towards exercise: Measurement of integrated regulation in the Spanish context]. *Psicothema, 22*(4), 841–847.

González-Cutre, D., Sicilia, A., Sierra, A. C., Ferriz, R., & Hagger, M. S. (2016). Understanding the need for novelty from the perspective of self-determination theory. *Personality and Individual Differences, 102*, 159-169. https://doi.org/10.1016/j.paid.2016.06.036.

Gourland, M. J., Trouilloud, D. O., & Sarrazin, P. G. (2011). Interventions promoting physical activity among obese populations: A meta-analysis considering global effect, long-term maintenance, physical activity indicators and dose characteristics. *Obesity Reviews, 12*(7), 633–645. https://doi.org/10.1111/j.1467-789X.2011.00874.x.

Greenberg, I., Sogg, S., & Perna, F. M. (2009). Behavioral and psychological care in weight loss surgery: Best practice update. *Obesity Journal, 17*(5), 880–884. https://doi.org/10.1038/oby.2008.571.

Grilo, C. M., Masheb, R. M., Brody, M., Burke-Martindale, C. H., & Rothschild, B. S. (2005). Binge eating and self-esteem predict body image dissatisfaction among obese men and women seeking bariatric surgery. *International Journal of Eating Disorders, 37*(4), 347–351. https://doi.org/10.1002/eat.20130.

Hagger, M. S., & Chatzisarantis, N. L. (2009). Integrating the theory of planned behavior and self-determination theory in health behaviour: A meta-analysis. *British Journal of Health Psychology, 14*(2), 275–302. https://doi.org/10.1348/135910708X373959.

Hagger, M. S., Cameron, L. D., Hamilton, K., Hankonen, N., & Lintunen, T. (2020). *The Handbook of Behavior Change* (Cambridge Handbooks in Psychology). Cambridge: Cambridge University Press.

Hagger, M. S., & Weed, M. (2019). DEBATE: Do interventions based on behavioral theory work in the real world? *International Journal of Behavioral Nutrition and Physical Activity*, 16:36. https://doi.org/10.1186/s12966-019-0795-4.

Hainer, V., Toplak, H., & Mitrakou, A. (2008). Treatment modalities of obesity: What fits whom? *Diabetes Care, 31*(2), 269–277. https://doi.org/10.2337/dc08-s265.

Hanggi, J. M., Phillips, L. R., & Rowlands, A. V. (2013). Validation of the GT3X ActiGraph in children and comparison with the GT1M ActiGraph. *Journal of Science & Medicine in Sport, 16*(1), 40–44. https://doi.org/10.1016/j.jsams.2012.05.012.

Hansen, D., Decroix, L., Devos, Y., Nocca, D., Cornelissen, V., Dillemans, B., & Lannoo, B. (2020). Towards optimized care after bariatric surgery by physical activity and exercise intervention: A review. *Obesity Surgery, 30*, 1118–1125. https://doi.org/10.1007/s11695-020-04390-x.

Harper, J., Madan, A. K., Ternovits, C. A., & Tichansky, D. S. (2007). What happens to patients who do not follow-up after bariatric surgery? *The American Journal of Surgery, 73*(2), 181–184. https://doi.org/10.1177/000313480707300219.

Haslam, D. W., & James W. P. (2005). *Obesity. Lancet, 366*(9492), 1197-1209. https://doi.org/10.1016/S0140-6736(05)67483-1.

Hatzenbuehler, M. L., Phelan, J. C. & Link, B. G. (2013). Stigma as a fundamental cause of population health inequalities. *American Journal of Public Health, 103*(5), 813–821. https://doi.org.10.2105/AJPH.2012.301069.

Hayden, M. J., Dixon, M. E., Dixon, J. B., Playfair, J., & O´Brien, P. E. (2010). Perceived discrimination and stigmatisation against severely obese women: Age and weight loss make a difference. *Obesity Facts, 3*(1), 7–14. https://doi.org/10.1159/000273206.

Herman, K. M., Carver, T. E., Christou, N. V., & Andersen, R. E. (2014). Keeping the weight off: Physical activity, sitting time, and weight loss maintenance in bariatric surgery patients 2 to 16 years postsurgery. *Obesity Surgery, 24*(7), 1064–1072. https://doi.org/10.1007/s11695-014-1212-3.

Hernández, A. M. (2017). *Pre and postoperative effects of different exercise programs in patients undergoing bariatric surgery*. Universidad Miguel Hernández de Elche, Spain.

Herring, L. Y., Stevinson, C., Carter, P., Biddle, S. J. H., Bowrey, D., Sutton, C., & Davies, M. J. (2017). The effects of supervised exercise training 12–24 months after bariatric surgery on physical function and body composition: A randomised controlled trial. *International Journal of Obesity, 41*(6), 909–916. https://doi.org/10.1038/ijo.2017.60.

Herring, L. Y., Stevinson, C., Davies, M. J., Biddle, S. J., Sutton, C., Bowrey, D., & Carter, P. (2016). Changes in physical activity behaviour and physical function after bariatric surgery: A systematic review and meta-analysis. *Obesity Reviews, 17*(3), 250–261. https://doi.org/10.1111/obr.12361.

Hesketh, K. R., O' Malley, C., Paes, V. M., Moore, H., Summerbell, C., Ong, K. K., … van Sluijs, E. M. F. (2017). Determinants of change in physical activity in children 0–6 years of age: A systematic review of quantitative literature. *Sports Medicine, 47*(7), 1349–1374. https://doi.org/10.1007/s40279-016-0656-0.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687.

Hübner, C., Baldofski, S., Zenger, M., Tigges, W., Herbig, B., Jurowich, C., … Hilbert, A. (2014). Influences of general self-efficacy and weight bias internalization on physical activity in bariatric surgery candidates. *Surgery for Obesity and Related Diseases, 11*(6), 1371–1376. https://doi.org/10.1016/j.soard.2014.11.013.

International Federation for the Surgery of Obesity and Metabolic Disorders (2019). Fifth IFSO global registry report 2019. Retrieved from: https://www.ifso.com/pdf/5th-ifso-global-registry-report-september-2019.pdf (accessed 12 February 2020).

Jacobi, D., Ciangura, C., Couet, C., & Oppert, J. M. (2011). Physical activity and weight loss following bariatric surgery. *Obesity Reviews, 12*(5), 366–377. https://doi.org/10.1111/j.1467-789X.2010.00731.x.

Jakicic, J. M., Clark, K., Coleman, C. K., Donnelly, J. E., Foreyt, J., Melanson, E., … Volpe, S. L. (2001). American College of Sports Medicine position stand. Appropriate intervention strategies for weight loss and prevention of weight regain for adults. *Medicine & Science in Sports & Exercise, 33*(12), 2145–2156. https://doi.org/10.1249/MSS.0b013e3181949333.

Järvholm, K., Olbers, T., Marcus, C., Mårild, S., Gronowitz, E., Friberg, P., … Flodmark, C. E. (2012). Short-term psychological outcomes in severely obese adolescents after bariatric surgery. *Obesity (Silver Spring), 20*(2), 318–323. https://doi.org/10.1038/oby.2011.310.

Jiménez-Loaisa, A., Beltrán-Carrillo, V. J., González-Cutre, D., & Cervelló, E. (2015). Psychosocial effects of surgery and physical activity in bariatric patients: A systematic review. *European Journal of Human Movement, 35*, 12–33.

Jiménez-Loaisa, A., González-Cutre, D., Beltrán-Carrillo, V. J., & Alcaraz-Ibáñez, M. (2020). Changes in bariatric patients' physical activity levels and health-related quality of life following a postoperative motivational physical activity intervention. *Obesity Surgery*, *30*(6), 2302–2312. https://doi.org/10.1007/s11695-020-04489-1.

Johnson, S., Gray, S., & Horrell, A. (2013). 'I want to look like that': Healthism, the ideal body and physical education in a Scottish secondary school. *Discourse, 34*(3), 457–473. https://doi.org/10.1080/01596306.2012.717196.

Jones, E. E., Farina, A., Hastorf, A. H., Markus, H., Miller, D. T., & Scott, R. A. (1984). *Social stigma: The psychology of marked relationships*. New York: Freeman.

Josbeno, D. A., Jakicic, J. M., Hergenroeder, A., & Eid, G. M. (2010). Physical activity and physical function changes in obese individuals after gastric bypass surgery. *Surgery for Obesity and Related Diseases, 6*(4), 361–366. https://doi.org/10.1016/j.soard.2008.08.003.

Josbeno, D. A., Kalarchian, M., Sparto, P. J., Otto, A. D., & Jakicic, J. M. (2011). Physical activity and physical function in individual post-bariatric surgery. *Obesity Surgery, 21*(8), 1243–1249. https://doi.org/10.1007/s11695-010-0327-4.

Kalarchian, M. A., & Marcus, M. D. (2015). Psychosocial interventions pre and post bariatric surgery. *European Eating Disorders Review, 23*(6), 457–462. https://doi.org/10.1002/erv.2392.

Kang, J. H., & Le, Q. A. (2017). Effectiveness of bariatric surgical procedures: a systematic review and network meta-analysis of randomized controlled trials. *Medicine, 96*(46), e8632. https://doi.org/10.1097/MD.0000000000008632.

Karlsen, T. I., Lund, R. S., Røislien, J., Tonstad, S., Natvig, G. K., Sandbu, R., & Hjelmesaeth, J. (2013). Health related quality of life after gastric bypass or intensive lifestyle intervention: A controlled clinical study. *Health and Quality of Life Outcomes*, 11:17. https://doi.org/10.1186/1477-7525-11-17.

Kenny, K. E. (2015). The biopolitics of global health: Life and death in neoliberal time. *Journal of Sociology, 51*, 9–27. https://doi.org/10.1177/1440783314562313.

Kim, R. J., Langer, J. M., Baker, A. W., Filter, D. E., Williams, N. N., & Sarwer, D. B. (2008). Psychosocial status in adolescents undergoing bariatric surgery. *Obesity Surgery, 18*(1), 27–33. https://doi.org/10.1159/000365793.

King, W. C., & Bond, D. S. (2013). The importance of preoperative and postoperative physical activity counseling in bariatric surgery. *Exercise and Sport Science Reviews, 41*(1), 26–35. https://doi.org/10.1097/JES.0b013e31826444e0.

King, W. C., Chen, J. Y., Belle, S. H., Courcoulas, A. P., Dakin, G. F., Elder, K. A., … Yanovski, S. Z. (2016). Change in pain and physical function following bariatric surgery for severe obesity. *JAMA, 315*(13), 1362–1371. https://doi.org/10.1001/jama.2016.3010.

King, W. C., Chen, J. Y., Bond, D. S., Belle, S. H., Courcoulas, A. P., Patterson, E. J., … Wolfe, B. M. (2015). Objective assessment of changes in physical activity and sedentary behavior: Pre- through 3 years post- bariatric surgery. *Obesity (Silver Spring), 23*(6), 1143–1150. https://doi.org/10.1002/oby.21106.

King, W. C., Hsu, J. Y., Belle, S. H., Courcoulas, A. P., Eid, G. M., Flum, D. R., … Wolfe, B. M. (2012). Pre- to post-operative changes in physical activity: Report

from the longitudinal assessment of bariatric surgery - 2. *Surgery for Obesity and Related Diseases, 8*(5), 522–532. https://doi.org/10.1016/j.soard.2011.07.018.

King, W. C., Kalarchian, M. A., Steffen, K. J., Wolfe, B. M., Elder, K. A., & Mitchell, J. E. (2013). Associations between physical activity and mental health among bariatric surgical candidates. *Journal of Psychosomatic Research, 74*(2), 161–169. https://doi.org/10.1016/j.jpsychores.2012.11.010.

Kinzl, J., Schrattenecker, M., Traweger, C., Mattesich, M., Fiala, M., & Biebl, W. (2006). Psychosocial predictors of weight loss after bariatric surgery. *Obesity Surgery, 16*(12), 1609–1614. https://doi.org/10.1381/096089206779319301.

Klassen, A. F., Cano, S. J., Scott, A., Johnson, J., & Pusic, A. L. (2012). Satisfaction and quality-of-life issues in body contouring surgery patients: A qualitative study. *Obesity Surgery, 22*(10), 1527–1534. https://doi.org/10.1007/s11695-012-0640-1.

Knittle, K., Nurmi, J., Crutzen, R., Hankonen, N., Beattie, M., & Dombrowski, S. U. (2018). How can interventions increase motivation for physical activity? A systematic review and meta-analysis. *Health Psychology Review, 12*(3), 211–230. https://doi.org/10.1080/17437199.2018.1435299.

Koestner, R., Otis, N., Powers, T. A., Pelletier, L., & Gagnon, H. (2008). Autonomous motivation, controlled motivation, and goal progress. *Journal of Personality, 76*(5), 1201–1230. https://doi.org/j.1467-6494.2008.00519.x.

Kolotkin, R. L., Davidson, L. E., Crosby, R. D., Hunt, S. C., & Adams, T. D. (2012). Six-year changes in health-related quality of life in gastric bypass patients versus obese comparison groups. *Surgery for Obesity and Related Diseases, 8*(5), 625–633. https://doi.org/10.1016/j.soard.2012.01.011.

Kruk, J. (2014). Health and economic costs of physical inactivity. *Asian Pacific Journal of Cancer Prevention, 15*(18), 7499–7503. https://doi.org/10.7314/apjcp.2014.15.18.7499.

Kruseman, M., Leimgruber, A., Zumbach, F., & Golay, A. (2010). Dietary, weight, and psychological changes among patients with obesity, 8 years after gastric bypass. *Journal of the American Dietetic Association, 110*(4), 527–534. https://doi.org/10.1016/j.jada.2009.12.028.

Kwok, C. S., Pradhan, A., Khan, M. A., Anderson, S. G., Keavney, B. D., Myint, P. K., … Loke, Y. K. (2014). Bariatric surgery and its impact on cardiovascular disease and mortality: A systematic review and meta-analysis. *International Journal of Cardiology, 173*(1), 20–28. https://doi.org/10.1016/j.ijcard.2014.02.026.

Lecube, A., de Hollanda, A., Calañas, A., Vilarrasa, N., Rubio, M. A., Breton, I., … Caixàs, A. (2016). Trends in bariatric surgery in Spain in the twenty-first century: Baseline results and 1-month follow up of the RICIBA, a national registry. *Obesity Surgery, 26*(8), 1836–1842. https://doi.org/10.1007/s11695-015-2001-3.

Lenhard, W. & Lenhard, A. (2016). Calculation of effect sizes. Retrieved from: https://www.psychometrica.de/effect_size.html. Dettelbach (Germany): Psychometrica. doi: 10.13140/RG.2.1.3478.4245.

Lent, M. R., Bailey-Davis, L., Irving, B. A., Wood, G. C., Cook, A. M., Hirsch, A. G., … Franceschelli-Hosterman, J. (2016). Bariatric surgery patients and their families: Health, physical activity, and social support. *Obesity Surgery, 26*(12), 2981–2988. https://doi.org/10.1007/s11695-016-2228-7.

Liam, H., Liu, Y., Miao, Y., Wu, H., Yang, S., & Guan, W. (2014). The effect of socioeconomic and individual factors on acceptance levels of bariatric surgery among Chinese patients. *Surgery for Obesity and Related Diseases, 10*(2), 361–365. https://doi.org/10.1016/j.soard.2013.07.016.

Lier, H., Biringer, E., Hove, O., Stubhaug, B., & Tangen, T. (2011). Quality of life among patients undergoing bariatric surgery: Associations with mental health- A 1-year follow-up study of bariatric surgery patients. *Health and Quality of Life Outcomes, 9*:79. https://doi.org/10.1186/1477-7525-9-79.

Livhits, M., Mercado, C., Yermilov, I., Parikh, J. A., Dutson, E., Mehran, A., … Gibbons, M. M. (2010). Behavioral factors associated with successful weight loss after gastric bypass. *The American Journal of Surgery, 76*(10), 1139–1142.

Livhits, M., Mercado, C., Yermilov, I., Parikh, J. A., Dutson, E., Mehran, A., … Gibbons, M. M. (2011). Is social support associated with greater weight loss after bariatric surgery?: A systematic review. *Obesity Reviews, 12*(2), 142–148. https://doi.org/10.1111/j.1467-789X.2010.00720.x.

López-Guimerà, G., Levine, M. P., Sánchez-Carracedo, D., & Fauquet, J. (2010). Influence of mass media on body image and eating disordered attitudes and behaviors in females: A review of effects and processes. *Media Psychology, 13*(4), 387–416. https://doi.org/10.1080/15213269.2010.525737.

Macassa, G., Nader, A., Alfredsson, J., Barros, H., Soares, J., & Stankunas, M. (2016). Employment status and differences in physical activity behavior during times of economic hardship: Results of a population-based study. *International Journal of Medical Science and Public Health, 5*(1), 102–108.

Madan, A. K., Beech, B. M., & Tichansky, D. S. (2008). Body esteem improves after bariatric surgery. *Surgical Innovation, 15*(1), 32–37. https://doi.org/10.1177/1553350608316135.

Magdaleno, R., Adami, E., & Ribeiro, E. (2010). Understanding the life experiences of Brazilian women after bariatric surgery: A qualitative study. *Obesity Surgery, 20*(8), 1086–1089. https://doi.org/10.1007/s11695-008-9697-2.

Maggisano, M., Maeda, A., Okrainec, A., Wnuk, S., Sockalingam, S., & Jackson, T. (2019). Physical activity and its association with psychosocial health following bariatric surgery. *Applied Physiology, Nutrition, and Metabolism, 44*(12), 1379–1382. https://doi.org/10.1139/apnm-2019-0040.

Magro, D. O., Geloneze, B., Delfini, R., Pareja, B. C., Callejas, F., & Pareja, J. C. (2008). Long-term weight regain after gastric bypass: A 5-year prospective study. *Obesity Surgery, 18*, 648–651. https://doi.org/10.1007/s11695-007-9265-1.

Mama, S. K., Diamond, P. M., McCurdy, S. A., Evans, A. E., McNeill, L. H., & Lee, R. E. (2015). Individual, social and environmental correlates of physical activity in overweight and obese African American and Hispanic women: A structural equation model analysis. *Preventive Medicine Reports, 2*, 57–64. https://doi.org/10.1016/j.pmedr.2015.01.001.

Mansfield, L., & Rich, E. (2013). Public health pedagogy, border crossings and physical activity at every size. *Critical Public Health, 23*(3), 356–370. https://doi.org/10.1080/09581596.2013.783685.

Markland, D. A. & Tobin, V. (2004). A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport & Exercise Psychology, 26*(2), 191–196. https://doi.org/10.1123/jsep.26.2.191.

Marshall, S., Mackay, H., Matthews, C., Maimone, I. R., Isenring, E. (2020). Does intensive multidisciplinary intervention for adults who elect bariatric surgery improve post-operative weight loss, co-morbidities, and quality of life? A systematic review and meta-analysis. *Obesity Reviews, 21*(7): e13012. https://doi.org/10.1111/obr.13012.

Marsi, L. (2007). El pensamiento "economicista", base ideológica del modelo neoliberal [The "economist" thinking: Ideological basis of the neoliberal model]. *Historia Actual Online, 14*, 175–190.

Martínez, Y., Ruiz-López, M. D., Giménez, R., Pérez de la Cruz, A. J., & Orduña, R. (2010). Does bariatric surgery improve the patient´s quality of life? *Nutrición Hospitalaria, 25*(6), 925–930.

Mathus-Vliegen, E. M. H., & de Wit, L. T. (2007). Health-related quality of life after gastric banding. *British Journal of Surgery, 94*(4), 457–465. https://doi.org/10.1002/bjs.5607.

Mazzoni, A. S., Carlsson, M., Berntsen, S., Nordin, K., & Demmelmaier, I. (2019). "Finding my own motivation" – A mixed methods study of exercise and behavior change support during oncological treatment. *International Journal of Behavioral Medicine*, *26*(5), 499–511. https://doi.org/10.1007/s12529-019-09809-z.

McEwan, D., Rhodes, R. E., & Beauchamp, M. R. (2020). What happens when the party is over?: Sustaining physical activity behaviors after intervention cessation. *Behavioral Medicine*. Advance Online Publication. https://doi.org/10.1080/08964289.2020.1750335.

Meadows, A., & Daníelsdóttir, S. (2016). What's in a word? On weight stigma and terminology. *Frontiers in Psychology,* 7:1527. https://doi.org/10.3389/fpsyg.2016.01527.

Megías, A. (2017). *Morbid obesity and physical activity: From frustration to satisfaction of basic psychological needs*. Universidad Miguel Hernández de Elche, Spain.

Memarian, E., Sundquist, K., Calling, S., Sundquist, J., & Li, X. (2019). Socioeconomic factors, body mass index and bariatric surgery: A Swedish nationwide cohort study. *BMC Public Health*, 19:258. https://doi.org/10.1186/s12889-019-6585-8.

Miller, G. D., Jakicic, J. M., Rejeski, W. J., Whit-Glover, M, Lang, W., Walkup, M. P., & Hodges, M. (2013). Effect of varying accelerometry criteria on physical activity: The look AHEAD study. *Obesity (Silver Spring), 21*(1), 32–44. https://doi.org/10.1002/oby.20234.

Monpellier, V. M., Antoniou, E. E., Aarts, E. O., Janssen, I. M. C., & Jansen, A. T. M. (2017). Improvement of health-related quality of life after roux-en-Y gastric bypass related to weight loss. *Obesity Surgery, 27*(5), 1168–1173. https://doi.org/10.1007/s11695-016-2468-6.

Moreno-Murcia, J. A., Parra, N., & González-Cutre, D. (2008). Influencia del apoyo a la autonomía, las metas sociales y la relación con los demás sobre la desmotivación en educación física [Influence of autonomy support, social goals and relatedness on amotivation in physical education classes]. *Psicothema, 20*(4), 636–641.

Morris, S. B. (2008). Estimating effect sizes from pretest-posttest-control group designs. *Organizational Research Methods, 11*(2), 364–386. https://doi.org/10.1177/1094428106291059.

Moya, M., Hernández, A., Sarabia, J. M., Sánchez-Martos, M. A., Hernández-Davó, J. L., López-Grueso, R., ... Fernández-Fernández, J. (2014). Bariatric surgery, weight loss and the role of physical activity: A systematic review. *European Journal of Human Movement, 32*, 145–160.

Muennig, P. (2008). The body politic: The relationship between stigma and obesity-associated disease. *BMC Public Health,* 8:128. https://doi.org/10.1186/1471-2458-8-128.

Muñoz, D., Chen, E. Y., Fischer, S., Sánchez-Johnsen, L., Roherig, M., Dymek-Valentine, M., … Le Grande, D. (2010). Changes in desired body shape after bariatric surgery. *Eating Disorders, 18*(4), 347–354. https://doi.org/10.1080/10640266.2010.490126.

Nadalini, L., Zenti, M. G., Masotto, L., Indelicato, L., Fainelli, G., Bonora, F., … Bonora, E. (2014). Improved quality of life after bariatric surgery in morbidly obese patients. Interdisciplinary group of bariatric surgery of Verona (G.I.C.O.V.). *Il Giornale di Chirurgia, 35*(7-8), 161–164.

Nakagawa, S. & Cuthill, I. C. (2007). Effect size, confidence interval and statistical significance: A practical guide for biologists. *Biological Reviews, 82*(4), 591–605. https://doi.org/10.1111/j.1469-185X.2007.00027.x.

Ng, J. Y. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science, 7*(4), 325–340. https://doi.org/10.1177/1745691612447309.

Norman, G. R., Sloan, J. A., & Wyrwich, K. W. (2003). Interpretation of changes in health-related quality of life: The remarkable universality of half a standard

deviation. *Medical Care, 41*(5), 582–592. https://doi.org/10.1097/01.MLR.0000062554.74615.4C.

Ntoumanis, N., Ng., J. Y. Y., Prestwich, A., Quested, E., Hancox, J. E., Thøgersen-Ntoumani, C., … Williams, G. C. (2020). A meta-analysis of self-determination theory-informed intervention studies in the health domain: Effects on motivation, health behavior, physical, and psychological health. *Health Psychology Review*. Advance Online Publication. https://doi.org/10.1080/17437199.2020.1718529.

O'Brien, K. S., Puhl, R. M., Latner, J. D., Mir, A. S. & Hunter, J. A. (2010). Reducing anti-fat prejudice in preservice health students: A randomized trial. *Behavior and Psychology*, *18*(11), 2138–2144. https://doi.org/10.1038/oby.2010.79.

Ogle, J. P., Park, J., Damhorst, M. L., & Bradley, L. A. (2015). Social support for women who have undergone bariatric surgery. *Qualitative Health Research, 26*(2), 176–193. https://doi.org/10.1177/1049732315570132.

Onwuegbuzie, A. J., & Leech, N. L. (2005). On becoming a pragmatic researcher: The importance of combining quantitative and qualitative research methodologies. *International Journal of Social Research Methodology, 8*(5), 375–387. https://doi.org/10.1080/13645570500402447.

Padwal, R. S., Majumbar, S. R., Klarenbach, S., Birch, D. W., Karmali, S., McCargar, L., … Sharma, A. M. (2010). The Alberta population-based prospective evaluation of the quality of life outcomes and economic impact of bariatric surgery (APPLES) study: Background, design and rationale. *BMC Health Services Research,* 10:284. https://doi.org/10.1186/1472-6963-10-284.

Pataky, Z., Carrard, I., & Golay, A. (2011). Psychological factors and weight loss in bariatric surgery. *Current Opinion in Gastroenterology, 27*(2), 167–173. https://doi.org/10.1097/MOG.0b013e3283422482.

Peacock, J. C., Sloan, S. S., & Cripps, B. (2014). A qualitative analysis of bariatric patients' post-surgical barriers to exercise. *Obesity Surgery, 24*(2), 292–298. https://doi.org/10.1007/s11695-013-1088-7.

Pearl, R. L., & Puhl, R. M. (2016). The distinct effects of internalizing weight bias: An experimental study. *Body Image*, *17*, 38–42. https://doi.org/10.1016/j.bodyim.2016.02.002.

Pedišić, Ž., & Bauman, A. (2015). Accelerometer-based measures in physical activity surveillance: Current practices and issues. *British Journal of Sports Medicine, 49*(4), 219–223. https://doi.org/10.1136/bjsports-2013-093407.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion, 25*, 279–306. https://doi.org/10.1023/A:1014805132406.

Phelan, S. M., Burgess, D. J., Yeazel, M. W., Hellerstedt, W. L., Griffin, J. M., & van Ryn, M. (2015). Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. *Obesity Reviews*, *16*(4), 319–326. https://doi.org/10.1111/obr.12266.

Pouwels, S., Wit, M., Teijink, J. A. W., & Nienhuijs, S. W. (2015). Aspects of exercise before or after bariatric surgery: A systematic review. *Obesity Facts, 8*(2), 132–146. https://doi.org/10.1159/000381201.

Powell, S. M., Fasczewski, K. S., Gill, D. L., & Davis, P. G. (2018). Go with the FLOW: Implementation of a psychological skills intervention in an exercise

program for post-bariatric surgery patients. *Journal of Health Psychology*. Advance Online Publication. https://doi.org/10.1177/1359105318793182.

Puhl, R. M., & Heuer, C. A. (2010). Obesity stigma: Important considerations for public health. *American Journal of Public Health, 100*(6), 1019–1028. https://doi.org/10.2105/AJPH.2009.159491.

Puhl, R. M., & Brownell, K. D. (2003). Ways of coping with obesity stigma: Review and conceptual analysis. *Eating Behaviors, 4*(1), 53–78. https://doi.org/10.1016/s1471-0153(02)00096-x.

Puhl, R. M., & Suh, Y. (2015). Health consequences of weight stigma: Implications for obesity prevention and treatment. *Current Obesity Reports, 4*(2), 182–190. https://doi.org/10.1007/s13679-015-0153-z.

Puhl, R. M., Andreyeva, T., & Brownell, K. D. (2008). Perceptions of weight discrimination: Prevalence and comparison to race and gender discrimination in America. *International Journal of Obesity, 32*(6), 992–1000. https://doi.org/10.1038/ijo.2008.22.

Quinn, D. M., & Crocker. J. (1999). When ideology hurts: Effects of belief in the Protestant ethic and feeling of overweight on the psychological well-being of women. *Journal of Personality and Social Psychology*, *77*(2), 402–414. https://doi.org/10.1037//0022-3514.77.2.402.

Rail, G., & Harvey. J. (1995). Body at work: Michel Foucault and the sociology of sport. *Sociology of Sport Journal, 12*(2), 165–180.

Rail, G., Holmes, D., & Murray, S. J. (2010). The politics of evidence on 'domestic terrorists': Obesity discourses and their effects. *Social Theory & Health*, *8*(3), 259–279. https://doi.org/10.1057/sth.2009.10.

Raves, D. M., Brewis, A., Trainer, S., Han, S. Y., & Wutich, A. (2016). Bariatric surgery patients' perceptions of weight-related stigma in healthcare settings impair post-surgery dietary adherence. *Frontiers in Psychology* 7:1497. https://doi.org/10.3389/fpsyg.2016.01497.

Reid, R. E. R., Carver, T. E., Reid, T. G. R., Picard-Turcot, M., Andersen, K. M., Christou, N. V., & Andersen, R. E. (2016). Effects of neighborhood walkability on physical activity and sedentary behavior long-term post-bariatric surgery. *Obesity Surgery, 27*(6), 1589–1594. https://doi.org/10.1007/s11695-016-2494-4.

Resnick, H. E., Carter, E. A., Aloia, M., & Phillips, B. (2006). Cross-sectional relationship of reported fatigue to obesity, diet, and physical activity: Results from the third national health and nutrition examination survey. *Journal of Clinical Sleep Medicine, 2*(2), 163–169.

Rhee, E., Uleman, J. S. & Lee, H. K. (1996). Variations in collectivism and individualism by in-group and culture: Confirmatory factor analyses. *Journal of Personality and Social Psychology, 71*(5), 1037–1053. https://doi.org/10.1037/0022-3514.71.5.1037.

Ricci, C., Gaeta, M., Rausa, E., Macchitella, Y., & Bonavina, L. (2014). Early impact of bariatric surgery on Type II diabetes, hypertension, and hyperlipidemia: A systematic review, meta-analysis and meta-regression on 6.857 patients. *Obesity Surgery, 24*(4), 522–528. https://doi.org/10.1007/s11695-013-1121-x.

Rich, E., De Pian, L., & Francombe-Webb, J. (2015). Physical cultures of stigmatisation: Health policy & social class. *Sociological Research Online, 20*(2), 1–14. https://doi.org/10.5153/sro.3613.

Roehling, M. V., Roehling, P. V. & Pichler. S. (2007). The relationship between body weight and perceived weight-related employment discrimination: The role of sex

and race. *Journal of Vocational Behavior, 71*(2), 300–318. https://doi.org/10.1016/j.jvb.2007.04.008.

Rosenberger, P. H., Henderson, K. E., White, M. A., Masheb, R. M., & Grilo, C. M. (2011). Physical activity in gastric bypass patients: Associations with weight loss and psychosocial functioning at 12-month follow-up. *Obesity Surgery, 21*(10), 1564–1569. https://doi.org/10.1007/s11695-010-0283-z.

Rudolph, A., & Hilbert, A. (2013). Post-operative behavioural management in bariatric surgery: A systematic review and meta-analysis of randomized controlled trials. *Obesity Reviews, 14*(4), 292–302. https://doi.org/10.1111/obr.12013.

Rutledge, T., Groesz, L. M., & Savu, M. (2011). Psychiatric factors and weight loss patterns following gastric bypass surgery in a veteran population. *Obesity Surgery, 21*(1), 29–35. https://doi.org/10.1007/s11695-009-9923-6.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. New York: Guilford Press.

Sánchez, J. M., & Núñez, J. L. (2007). Análisis preliminar de las propiedades psicométricas de la versión española de la Escala de Necesidades Psicológicas Básicas en el Ejercicio Físico [Preliminary analysis of the psychometric properties of the Spanish version of the Basic Psychological Needs in Exercise Scale]. *Revista Iberoamericana de Psicología del Ejercicio y el Deporte, 2*(2), 83–92.

Santos-Lozano, A., Santin-Medeiros, F., Cardon, G., Torres-Luque, G., Bailón, R., Bergmeir, C., ... Garatachea, N. (2013). Actigraph GT3X: validation and determination of physical activity intensity cut points. *International Journal of Sports Medicine, 34*(11), 975–982. https://doi.org/10.1055/s-0033-1337945.

Santos, I., Silva, M., & Teixeira, P. J. (2016). A self-determination theory perspective on weight loss maintenance. *The European Health Psychologist*, *18*(5), 194–199.

Sarwer, D. B., Dilks, R. J., & West-Smith, L. (2011). Dietary intake and eating behavior after bariatric surgery: Threats to weight loss maintenance and strategies for success. *Surgery for Obesity and Related Diseases, 7*(5), 644–651. https://doi.org/10.1016/j.soard.2011.06.016.

Sarwer, D., Fabricatore, A. N., Jones-Cornelle, L. R., Allison, K. C., Faulconbridge, L. N., & Wadden, T. A. (2008). Psychological issues following bariatric surgery. *Primary Psychiatry, 15*(8), 50–55.

Schowalter, M., Benecke, A., Lager, C., Heimbucher, J., Bueter, M., Thalheimer, A., … Faller, H. (2008). Changes in depression following gastric banding: A 5- to 7-year prospective study. *Obesity Surgery, 18*(3), 314–320. https://doi.org/10.1007/s11695-007-9316-7.

Schulte, P. A., Wagner, G. R., Ostry, A., Blanciforti, L. A., Cutlip, R. G., Krajnak, K. M., … Miller, D. B. (2007). Work, obesity, and occupational safety and health. *American Journal of Public Health, 97*(3), 428–436. https://doi.org/10.2105/AJPH.2006.086900.

Schwartz, M. B., Vartanian, L. R. Nosek, B. A. & Brownell, K. D. (2006). The influence of one's own body weight on implicit and explicit anti-fat bias. *Obesity (Silver Spring), 14*(3), 440–447. https://doi.org/10.1038/oby.2006.58.

Sellberg, F., Possmark, S., Willmer, M., Tynelius, P., Persson, M., & Berglind, D. (2019). Meeting physical activity recommendations is associated with health-related quality of life in women before and after Roux-en-Y gastric bypass

surgery. *Quality of Life Research, 28*(6), 1497–1507. https://doi.org/10.1007/s11136-019-02120-0.

Shamir, R. (2008). The age of responsibilization: On market-embedded morality. *Economy and Society, 37*(1), 1–19. https://doi.org/10.1080/03085140701760833.

Shelton, R. C., McNeill, L. H., Puleo, E., Wolin, K. Y., Emmons, K. M., & Bennett, G. G. (2011). The association between social factors and physical activity among low-income adults living in public housing. *American Journal of Public Health, 101*(11), 2102–2110. https://doi.org/10.2105/AJPH.2010.196030.

Shetty, P., & Schmidhuber, J. (2006). Introductory lecture of the epidemiology and determinants of obesity in developed and developing countries. *International Journal for Vitamin and Nutrition Research, 76*(4), 157–162. https://doi.org/10.1024/0300-9831.76.4.157.

Shilling, C. (2012). *The body and social theory*. London: Sage.

Shiri, S., Gurevich, T., Feintuch, U., & Beglaibter, N. (2007). Positive psychological impact of bariatric surgery. *Obesity Surgery, 17*(5), 663–668. https://doi.org/10.1007/s11695-007-9111-5.

Sikorski, C., Luppa, M., Luck, T., & Riedel-Heller, S. G. (2015). Weight stigma "gets under the skin"— Evidence for an adapted psychological mediation framework—A systematic review. *Obesity (Silver Spring), 23*(2), 266–276. https://doi.org/10.1002/oby.20952.

Silva, M. N., Vieira, P. N., Coutinho, S. R., Minderico, C. S., Matos, M. G., Sardinha, L. B., & Teixeira, P. J. (2010). Using self-determination theory to promote physical activity and weight control: A randomized trial in women. *Journal of*

Behavioral Medicine, 33(2), 110–122. https://doi.org/10.1007/s10865-009-9239-y.

Silva, M. N., Markland, D., Carraça, E. V., Vieira, P. N., Coutinho, S. R., Minderico, C. S., … Teixeira, P. J. (2011). Exercise autonomous motivation predicts 3-year weight loss in women. *Medicine & Science in Sports & Exercise, 43*(4), 728–737. https://doi.org/10.1249/MSS.0b013e3181f3818f.

Silva, M. N., Markland, D., Minderico, C. S., Vieira, P. N., Castro, M. M., Coutinho, S. R., … Teixeira, P. J. (2008). A randomized controlled trial to evaluate self-determination theory for exercise adherence and weight control: Rationale and intervention description. *BMC Public Health,* 8:234. https://doi.org/10.1186/1471-2458-8-234.

Sjöström, L., Lindroos, A. K., Peltonen, M., Torgerson, J., Bouchard, C., Carlsson, B., … Wedel, H. (2004). Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. *New England Journal of Medicine, 351*(26), 2683–2693. https://doi.org/10.1056/NEJMoa035622.

Smith, B. (2018). Generalizability in qualitative research: Misunderstandings, opportunities and recommendations for the sport and exercise sciences. *Qualitative Research in Sport, Exercise and Health, 10*(1), 137–149. https://doi.org/10.1080/2159676X.2017.1393221.

Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology, 11*(1), 101–121. https://doi.org/10.1080/1750984X.2017.1317357.

Sockalingam, S., Wnuk, S., Kantarovich, K., Meaney, C., Okrainec, A., Hawa, R., & Cassin, S. (2015). Employment outcomes one year after bariatric surgery: The

role of patient and psychosocial factors. *Obesity Surgery, 25*(3), 514–522. https://doi.org/10.1007/s11695-014-1443-3.

Sparkes, A. C., & Smith, B. (2014). *Qualitative research methods in sport, exercise and health: From process to product*. New York: Routledge/Taylor & Francis Group.

Spence, J. C., & Lee, R. E. (2003). Toward a comprehensive model of physical activity. *Psychology of Sport & Exercise, 4*(1), 7–24. https://doi.org/10.1016/S1469-0292(02)00014-6.

Stolberg, C. R., Mundbjerg, L. H., Bladbjerg, E. M., Funch-Jensen, P., Gram, B., & Juhl, C. B. (2018). Physical training following gastric bypass: Effects on physical activity and quality of life – a randomized controlled trial. *Quality of Life Research, 27*(12), 3113–3122. https://doi.org/10.1007/s11136-018-1938-9.

Strain, G. W., Kolotkin, R. L., Dakin, G. F., Gagner, M., Inabnet, W. B., Christos, P., … Pomp, A. (2014). The effects of weight loss after bariatric surgery on health-related quality of life and depression. *Nutrition & Diabetes, 4*(9), e132. https://doi.org/10.1038/nutd.2014.29.

Stroebele-Benschop, N., Damms-Machado, A., Milan, F. M. P., Hilzendegen, C., & Bischoff, S. C. (2013). Gender differences in the outcome of obesity treatments and weight loss maintenance–a systematic review. *Journal of Obesity & Weight Loss Therapy*, 3:176. https://doi.org/10.4172/2165-7904.1000176.

Sturm, R. (2003). Increases in morbid obesity in the USA: 2000-2005. *Public Health, 121*(7), 492–496. https://doi.org/10.1016/j.puhe.2007.01.006.

Sutin, A. R., & Terracciano, A. (2013). Perceived weight discrimination and obesity. *Plos One, 8*(7), e70048. https://doi.org/10.1371/journal.pone.0070048.

Svane, M. S., & Madsbad, S. (2014). Bariatric surgery - Effects on obesity and related co-morbidities. *Current Diabetes Reviews, 10*(3), 208–214.

Tae, B., Pelaggi, E. R., Guglielmi, J., Waisberg, J., Luongo de Matos, L., & D'Elia, G. (2014). Impact of bariatric surgery on depression and anxiety symptoms, bulimic behaviors and quality of life. *The Journal of the Brazilian College of Surgeon, 41*(3), 155–160. https://doi.org/10.1590/s0100-69912014000300004.

Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 9:78. https://doi.org/10.1186/1479-5868-9-78.

Tettero, O, M., Aronson, T., Wolf, R. J., Nuijten, M. A. H., Hopman, M. T. E., & Janssen, I. M. C. (2018). Increase in physical activity after bariatric surgery demonstrates improvement in weight loss and cardiorespiratory fitness. *Obesity Surgery, 28*(12), 3950–3957. https://doi.org/10.1007/s11695-018-3439-x.

Thøgersen-Ntoumani, C., & Ntoumanis, N. (2006). The role of self-determined motivation in the understanding of exercise-related behaviours, cognitions and physical self-evaluations. *Journal of Sports Sciences, 24*(4), 393–404. https://doi.org/10.1080/02640410500131670.

Tomiyama, A. J., Finch, L. E., Belsky, A. C., Buss, J., Finley, C., Schwartz, M. B., & Daubenmier. J. (2015). Weight bias in 2001 versus 2013: Contradictory attitudes among obesity researchers and health professionals. *Obesity (Silver Spring)*, *23*(1), 46–53. https://doi.org/10.1002/oby.20910.

Tompkins, J., Bosch, P. R., Chenowith, R., Tiede, J. L., & Swain, J. M. (2008). Changes in functional walking distance and health-related quality of life after

gastric bypass surgery. *Physical Therapy, 88*(8), 928–935. https://doi.org/10.2522/ptj.20070296.

Toro, J. (2003). *El cuerpo como delito. Anorexia, bulimia, cultura y sociedad* [*The body as crime: Anorexia, bulimia, culture and society*] (3rd ed.). Barcelona: Ariel.

Troiano, R. P., Berrigan, D., Dodd, K., Mâsse, L. C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine & Science in Sports & Exercise, 40*(1), 181–188. https://doi.org/10.1249/mss.0b013e31815a51b3.

Trost, S. G., McIver, K. L., & Pate, R. R. (2005). Conducting accelerometer-based activity assessments in field-based research. *Medicine & Science in Sports & Exercise, 37*(11 Suppl), S531–543. https://doi.org/10.1249/01.mss.0000185657.86065.98.

Trost, S. G., O'Neil, M. (2014). Clinical use of objective measures of physical activity. *British Journal of Sports Medicine, 48*(3), 178–181. https://doi.org/10.1136/bjsports-2013-093173.

Tumiati, R., Mazzoni, G., Crisafulli, E., Serri, B., Beneventi, C., Lorenzi, C. M., … Clini, E. M. (2008). Home-centred physical fitness programme in morbidly obese individuals: A randomized controlled trial. *Clinical Rehabilitation, 22*(10–11), 940–950. https://doi.org/10.1177/0269215508092788.

Turrini, M. (2015). A genealogy of "healthism": Healthy subjectivities between individual autonomy and disciplinary control. *Eä Journal, 7*, 11–27.

Vallerand, R. J. (2007). Intrinsic and extrinsic motivation in sport and physical activity: A review and a look at the future. In G. Tenenbaum & R. C. Eklund (Eds.) *Handbook of Sport Psychology* (pp. 59-83). New York: John Wiley & Sons.

Van Hout, G. C. M., Verschure, S. K. M., & van Heck, G. L. (2005). Psychosocial predictors of success following bariatric surgery. *Obesity Surgery, 15*(4), 552–560. https://doi.org/10.1381/096089206779319301.

Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: basic psychological need satisfaction and need frustration as a unifying principle. *Journal of Psychotherapy Integration, 23*(3), 263–280. https://doi.org/10.1037/a0032359.

Verloigne, M., De Bourdeaudhuij, I., Tanghe, A., D'Hont, E., Theuwis, L., Vansteenkiste, M., & Deforche, B. (2011). Self-determined motivation towards physical activity in adolescents treated for obesity: An observational study. *International Journal of Behavioral Nutrition and Physical Activity,* 8:97. https://doi.org/10.1186/1479-5868-8-97.

Vincent, H. K., Ben-David, K., Conrad, B. P., Lamb, K. M., Seay, A. N., & Vincent, K. R. (2012). Rapid changes in gait, musculoskeletal pain, and quality of life after bariatric surgery. *Surgery for Obesity and Related Diseases, 8*(3), 346–354. https://doi.org/10.1016/j.soard.2011.11.020.

Ward, Z. J., Bleich, S. N., Cradock, A. L., Barrett, J. L., Giles, C. M., Flax, C., … Gortmaker, S. L. (2019). Projected U.S. state-level prevalence of adult obesity and severe obesity. *New England Journal of Medicine, 381,* 2440–2450.

Ware, J. E. (2000). SF-36 Health Survey update. *Spine, 25*(24), 3130–3139. https://doi.org/10.1097/00007632-200012150-00008.

Warholm, C., Øien, A. M., & Råheim, M. (2014). The ambivalence of losing weight after bariatric surgery. *International Journal of Qualitative Studies on Health and Well-Being,* 9:22876. https://doi.org/10.3402/qhw.v9.22876.

Webb, L., & Quennerstedt, M. (2010). Risky bodies: Health surveillance and teachers' embodiment of health. *International Journal of Qualitative Studies in Education, 23*(7), 785–802. https://doi.org/10.1080/09518398.2010.529471.

Westerterp, K. R. (2018). Changes in physical activity over the lifespan: impact on body composition and sarcopenic obesity. Obesity Reviews, 19(Suppl. 1), 8-13. https://doi.org/10.1111/obr.12781.

White, B., Doyle, J., Colville, S., Nicholls, D., Viner, R. M., & Christie, D. (2015). Systematic review of psychological and social outcomes of adolescents undergoing bariatric surgery, and predictors of success. *Clinical Obesity, 5*(6), 312–324. https://doi.org/10.1111/cob.12119.

Wiklund, M., Fagevik, M., Olbers, T., & Willén, C. (2014). Experiences of physical activity one year after bariatric surgery. *The Open Obesity Journal, 6*(1), 25–30.

Wimmelmann, C. L., Dela, F., & Mortensen, E. L. (2014). Psychological predictors of mental health and health-related quality of life after bariatric surgery: A review of the recent research. *Obesity Research & Clinical Practice, 8*(4), 314–324. https://doi.org/10.1016/j.orcp.2013.11.002.

World Health Organization (2014). Obesity and overweight. Retrieved from http://www.who.int/mediacentre/factsheets/fs311/en/.

World Health Organization (2018). Obesity and overweight fact sheet 2018. February 2018. Retrieved from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight (accessed 10 February 2020).

Wouters, E. J., Larsen, J. K., Zijlstra, H., van Ramshorst, B., & Geenen, R. (2011). Physical activity after surgery for severe obesity: The role of exercise cognitions. *Obesity Surgery, 21*(12), 1894–1899. https://doi.org/10.1007/s11695-010-0276-y.

Zabatiero, J., Hill, K., Gucciardi, D. F., Hamdorf, J. M., Taylor, S. F., Hagger, M. S., & Smith, A. (2016). Beliefs, barriers and facilitators to physical activity in bariatric surgery candidates. *Obesity Surgery, 26*(5), 1097–1109. https://doi.org/10.1007/s11695-015-1867-4.

Zabatiero, J., Smith, A., Hill, K., Hamdorf, J. M., Taylor, S. F., Hagger, M. S., & Gucciardi, D. F. (2018). Do factors related to participation in physical activity change following restrictive bariatric surgery? A qualitative study. *Obesity Research & Clinical Practice, 12*(3), 307–316. https://doi.org/10.1016/j.orcp.2017.11.001.

Zeller, M. H., Modi, A. C., Noll, J. G., Long, J. D., & Inge, T. H. (2009). Psychosocial functioning improves following adolescent bariatric surgery. *Obesity (Silver Spring), 17*(5), 985–990. https://doi.org/10.1038/oby.2008.644.

Zola, I. K. (1972). Medicine as an institution of social control. *Sociological Review*, *20*(4), 487–504.

ANNEXES

ANNEXES

APPENDIX 1. SUPPLEMENTARY MATERIAL (STUDY 2)

Table 13. Effect sizes (d) and 95% confidence intervals (CI) of intra-group changes between assessments points.

Variables	Pre-SG to 7-months				7-months to 13-months				Pre-SG to 13-months			
	CG	95% CI	MPAI-G	95% CI	CG	95% CI	MPAI-G	95% CI	CG	95% CI	MPAI-G	95% CI
GT3X (min/d)												
Sedentary activity	-0.57	[-1.60, 0.46]	-0.39	[-1.34, 0.57]	0.69	[-0.35, 1.73]	0.78	[-0.21, 1.76]	0.07	[-0.95, 1.08]	0.24	[-0.71, 1.20]
Light PA	0.65	[-0.39, 1.69]	0.55	[-0.42, 1.52]	-0.65	[-1.69, 0.39]	-0.85	[-1.85, 0.14]	0.04	[-0.97, 1.05]	-0.16	[-1.11, 0.79]
MVPA	0.18	[-0.84, 1.19]	-0.34	[-1.30, 0.62]	-0.52	[-1.55, 0.51]	0.16	[-0.79, 1.11]	-0.29	[-1.31, 0.72]	-0.22	[-1.17, 0.73]
Total PA	0.62	[-0.42, 1.65]	0.41	[-0.55, 1.37]	-0.68	[-1.72, 0.36]	-0.78	[-1.77, 0.20]	0.00	[-1.02, 1.00]	-0.22	[-1.18, 0.73]
SF-36 scores (0-100)												
Physical functioning	4.08[a,b]	[2.30, 5.86]	5.25[a,b]	[3.24, 7.25]	0.16	[-0.85, 1.17]	-0.39	[-1.35, 0.57]	4.15[a,b]	[2.35, 5.95]	4.93[a,b]	[3.02, 6.84]
Bodily pain	2.18[a,b]	[0.90, 3.45]	2.05[a,b]	[0.88, 3.23]	-1.12[a,b]	[-2.21, -0.03]	-0.83[b]	[-1.82, 0.16]	1.25[a,b]	[0.15, 2.36]	1.36[a,b]	[0.30, 2.41]
General health	2.42[a,b]	[1.09, 3.76]	3.20[a,b]	[1.77, 4.64]	0.27	[-0.74, 1.29]	-0.60[b]	[-1.58, 0.37]	2.58[a,b]	[1.21, 3.95]	2.65[a,b]	[1.35, 3.96]
Physical role	2.38[a,b]	[1.06, 3.71]	2.56[a,b]	[1.28, 3.85]	-0.07	[-1.08, 0.94]	0.08	[-0.87, 1.03]	2.36[a,b]	[1.04, 3.68]	2.62[a,b]	[1.33, 3.92]
PCS	3.72[a,b]	[2.05, 5.39]	4.43[a,b]	[2.66, 6.19]	-0.38	[-1.40, 0.65]	-0.57[b]	[-1.54, 0.39]	3.38[a,b]	[1.80, 4.96]	3.93[a,b]	[2.30, 5.55]
Social functioning	1.39[a,b]	[0.26, 2.51]	1.57[a,b]	[0.49, 2.66]	-0.26	[-1.28, 0.75]	-2.17[a,b]	[-3.36, -0.97]	1.15[a,b]	[0.06, 2.25]	-0.03	[-0.98, 0.92]
Vitality	1.76[a,b]	[0.56, 2.95]	1.97[a,b]	[0.81, 3.13]	-0.34	[-1.36, 0.68]	-0.36	[-1.32, 0.6]	1.50[a,b]	[0.35, 2.65]	1.70[a,b]	[0.59, 2.81]
Mental health	0.26	[-0.76, 1.27]	0.25	[-0.70, 1.21]	0.02	[-0.99, 1.04]	-0.12	[-1.07, 0.83]	0.27	[-0.75, 1.29]	0.15	[-0.80, 1.10]
Mental role	0.86[b]	[-0.20, 1.92]	0.76[b]	[-0.23, 1.74]	-0.22	[-1.23, 0.80]	-0.83[b]	[-1.82, 0.16]	0.68[b]	[-0.36, 1.72]	0.08	[-0.87, 1.03]
MCS	-0.32	[-1.34, 0.70]	-0.58[b]	[-1.55, 0.39]	-0.06	[-1.07, 0.96]	-0.52[b]	[-1.49, 0.44]	-0.36	[-1.38, 0.66]	-0.98[b]	[-1.98, 0.03]

Note. SG = Sleeve gastrectomy, CG = Control group, MPAI-G = Motivational physical activity intervention-group, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity, PCS = Physical component score, MCS = Mental component score. [a] Significant differences considering that the 95% CI did not include the value zero. [b] Denotes clinically relevant differences between groups as per criterion of Norman et al. (2003).

Table 14. Between-group differences of changes in weight variables across assessments points.

Variables	Pre-SG				7-months post-SG				13-months post-SG			
	CG	MPAI-G	*d*	95% CI	CG	MPAI-G	*d*	95% CI	CG	MPAI-G	*d*	95% CI
Weight (kg)	116.6 (± 16.8)	114.9 (± 21.4)	-0.09	[-0.78, 0.61]	81.53 (± 12.8)	85.44 (± 17.2)	0.25	[-0.44, 0.95]	80.19 (± 14.1)	83.84 (± 16.9)	0.23	[-0.46, 0.93]
BMI	43.1 (± 4.5)	43.8 (± 5.3)	0.14	[-0.55, 0.84]	30.24 (± 4.5)	32.61 (± 5.1)	0.49	[-0.21, 1.19]	29.72 (± 5.0)	32.05 (± 5.3)	0.45	[-0.25, 1.15]
ΔBMI	-	-	-	-	-12.89 (± 4.1)	-11.20 (± 3.2)	0.46	[-0.24, 1.17]	-0.52 (± 1.5)	-0.56 (± 1.4)	-0.03	[-0.72, 0.67]
% EWL	-	-	-	-	59.75 (± 18.1)	49.59 (± 14.2)	-0.63	[-1.34, 0.08]	61.63 (± 20.7)	51.84 (± 17.8)	-0.51	[-1.21, 0.20]
% TWL	-	-	-	-	29.80 (± 8.6)	25.59 (± 6.9)	-0.54	[-1.25, 0.16]	30.91 (± 10.4)	26.78 (± 8.9)	-0.43	[-1.13, 0.27]
% EBMIL	-	-	-	-	73.38 (± 23.6)	61.83 (± 18.8)	-0.55	[-1.25, 0.16]	75.92 (± 27.2)	64.35 (± 22.2)	-0.47	[-1.17, 0.24]

Note. SG = Sleeve gastrectomy, CG = Control group, MPAI-G = Motivational physical activity intervention-group, ΔBMI = (Postoperative body mass index – initial body mass index), % EWL = Percent excess weight loss, % TWL = Percent total weight loss, % EBMIL = Percent excess BMI loss.

APPENDIX 2. SUPPLEMENTARY MATERIAL (STUDY 3)

Table 15. CONSORT 2010 checklist.

Section/Topic	Item Nº	Checklist item	Page Nº
Title and abstract			
	1a	Identification as a randomised trial in the title	–
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	1
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	2-5
	2b	Specific objectives or hypotheses	5
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	6
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	6-7
Participants	4a	Eligibility criteria for participants	6-7
	4b	Settings and locations where the data were collected	7
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	7-8
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	8-10
	6b	Any changes to trial outcomes after the trial commenced, with reasons	–
Sample size	7a	How sample size was determined	–

	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	6
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	6
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	–
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	6
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	–
	11b	If relevant, description of the similarity of interventions	8
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	11-12
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	12
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	6
	13b	For each group, losses and exclusions after randomisation, together with reasons	6
Recruitment	14a	Dates defining the periods of recruitment and follow-up	6
	14b	Why the trial ended or was stopped	–
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	1 (Supp. Mat.)
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	11-12

Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	13-15
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	12
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	12
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	–
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	19
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	19
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	15-19
Other information			
Registration	23	Registration number and name of trial registry	7
Protocol	24	Where the full trial protocol can be accessed, if available	7
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	20

Note. – = Non-reported items.

Table 16. All the motivational strategies applied by instructors during the 6-month postoperative physical activity program.

Autonomy strategies

1. The objectives of each training session and the program in general were explained to the participants.

2. Individual objectives were established according to the characteristics of each patient.

3. Patients could choose different activity options, machines and work ranges in each training session.

4. Patients were frequently asked about their opinions concerning the sessions and the program, in order to readjust them.

5. Patients were cognitively involved through questions about the training program (e.g., about the usefulness of certain activities).

6. Music was used, involving patients in its selection.

7. Advices were provided to encourage autonomous physical activity in leisure time (how to warm up; recommended volume, frequency and intensity of exercise; use of the heart rate monitor, resistance exercises, dumbells, resistance bands).

8. Patients were informed about the offer of physical activities that they could perform in their city at the end of the program.

Competence strategies

9. The operation of the different gym equipment was explained to the patients.

10. Short-term objectives were established so that patients could assess their progress (monthly evaluations).

11. Information was provided on the progress achieved (e.g., they could see how much accumulated distance they had walked and their equivalence with races such as the tour of France).

12. The duration of the proposed activities was sufficient for patients to perform them effectively.

13. Abundant prescriptive feedback was given to correct postures and movements.

14. Affective feedback was given frequently, focused on personal effort and improvement, trying to convince patients that they can always improve.

15. Patients were told how important their participation in this study was to improve the quality of life of other people in the same situation in the future.

16. Patients were integrated as normal users of the University Fitness Center.

Relatedness strategies

17. Permanent communication was maintained through social networks, for example to answer questions about physical activity.

18. The instructors accompanied patients in their autonomous physical activity, improving the "instructor-patient" relationship and helping them whatever they needed.

19. Social relations were promoted: physical and non-physical group activities (meals, etc.), encouraging them to correct each other, choosing things in a consensual way among the whole group.

20. The instructors treated the patients kindly, encouraged them, smiled and supported them, and called them by their name.

21. A caring climate was generated: the instructors were interested in the patients' lives and daily problems.

22. Communication and help between group members was encouraged, especially about what brought them together (i.e., bariatric surgery).

23. At the end of each session a sharing was held on what patients had done.

Novelty strategies*

24. Novel activities were introduced: games, directed activities (e.g., aerobic, indoor cycling, aquagym), dance, body expression, exercises with quotidian materials (e.g., full bottles to improve strength), core-training, physical activities on the beach, and mountain trekking.

Note. * Novelty strategies were applied in line with the González-Cutre et al. (2016) work proposing novelty as a candidate basic psychological need: González-Cutre, D., Sicilia, A., Sierra, A. C., Ferriz, R., & Hagger, M. S. (2016). Understanding the need for novelty from the perspective of self-determination theory. *Personality and Individual Differences, 102*, 159-169.

Table 17. Bivariate correlations between covariates (sex, age and % EWL) and outcome variables (changes in motivation and physical activity).

Variables	Full sample (n = 32)			CG (n = 15)			MPAI-G (n = 17)		
	Sex	Age	% EWL	Sex	Age	% EWL	Sex	Age	% EWL
BREQ-3									
Intrinsic	-0.29 * [-0.58, 0.06]	0.15 [-0.21, 0.47]	-0.10 [-0.43, 0.26]	-0.25 * [-0.68, 0.30]	0.01 [-0.51, 0.52]	-0.09 [-0.58, 0.44]	-0.33 ** [-0.70, 0.18]	0.30 * [-0.21, 0.68]	-0.10 [-0.55, 0.40]
Integrated	-0.20 * [-0.51, 0.16]	-0.12 [-0.45, 0.24]	0.07 [-0.29, 0.41]	-0.22 * [-0.66, 0.33]	0.05 [-0.47, 0.55]	-0.13 [-0.60, 0.41]	-0.13 [-0.58, 0.37]	-0.21 * [-0.63, 0.30]	0.17 [-0.34, 0.60]
Identified	-0.21 * [-0.52, 0.15]	0.20 * [-0.16, 0.51]	-0.18 [-0.50, 0.18]	0.00 [-0.51, 0.51]	0.27 * [-0.28, 0.69]	-0.29 * [-0.70, 0.26]	-0.52 ** [-0.80, -0.05]	0.13 [-0.37, 0.58]	-0.04 [-0.51, 0.45]
Introjected	0.02 [-0.33, 0.37]	0.32 ** [-0.03, 0.60]	-0.35 ** [-0.62, -0.01]	-0.17 [-0.63, 0.38]	0.49 ** [-0.03, 0.80]	-0.45 ** [-0.78, 0.08]	0.20 * [-0.31, 0.62]	-0.08 [-0.54, 0.42]	0.02 [-0.47, 0.50]
External	0.14 [-0.22, 0.47]	-0.12 [-0.45, 0.24]	0.19 [-0.17, 0.51]	0.03 [-0.49, 0.53]	0.31 ** [-0.24, 0.71]	0.16 [-0.38, 0.62]	0.26 * [-0.25, 0.66]	-0.39 ** [-0.73, 0.11]	0.15 [-0.36, 0.59]
Amotivation	0.11 [-0.25, 0.44]	0.05 [-0.30, 0.39]	-0.17 [-0.49, 0.19]	-0.05 [-0.55, 0.47]	0.40 ** [-0.14, 0.76]	-0.54 ** [-0.82, -0.04]	0.34 ** [-0.17, 0.71]	-0.16 [-0.60, 0.35]	0.01 [-0.47, 0.49]
GT3X									
Sedentary activity	0.15 [-0.21, 0.47]	0.07 [-0.29, 0.41]	-0.24 * [-0.54, 0.12]	0.15 [-0.39, 0.62]	-0.05 [-0.55, 0.47]	-0.18 [-0.63, 0.37]	0.14 [-0.37, 0.58]	0.19 [-0.32, 0.62]	-0.32 ** [-0.69, 0.19]
Light PA	-0.21 * [-0.52, 0.15]	-0.06 [-0.40, 0.30]	0.27 * [-0.09, 0.57]	-0.24 * [-0.67, 0.31]	0.15 [-0.39, 0.61]	0.17 [-0.38, 0.63]	-0.16 [-0.60, 0.35]	-0.26 * [-0.66, 0.25]	0.34 ** [-0.17, 0.70]
MVPA	0.04 [-0.31, 0.38]	0.23 * [-0.13, 0.54]	-0.20 * [-0.51, 0.16]	0.04 [-0.48, 0.54]	0.21 * [-0.34, 0.65]	-0.41 ** [-0.76, 0.13]	0.03 [-0.46, 0.50]	0.28 * [-0.23, 0.67]	0.04 [-0.45, 0.51]
Total PA	-0.19 [-0.51, 0.17]	-0.01 [-0.36, 0.34]	0.21 * [-0.15, 0.52]	-0.22 * [-0.66, 0.33]	0.18 [-0.37, 0.63]	0.08 [-0.45, 0.57]	-0.14 [-0.58, 0.37]	-0.19 [-0.62, 0.32]	0.32 ** [-0.19, 0.69]

Note. CG = Control group, MPAI-G = Motivational physical activity intervention-group, Sex coded as 1 = Male, 2 = Female, % EWL = Percentage of excess weight loss, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity. Magnitude of correlations is based on Gignac and Szodorai (2016) criteria. * Typical magnitude. ** Relatively large magnitude.

Table 18. Bivariate correlations between changes in motivation and physical activity from pre-SG to 7 months-after SG.

Variables	Full sample (n = 32)				CG (n = 15)				MPAI-G (n = 17)				q_{Cohen}			
	Sedentary A	Light PA	MVPA	Total PA	Sedentary A	Light PA	MVPA	Total PA	Sedentary A	Light PA	MVPA	Total PA	Sedentary A	Light PA	MVPA	Total PA
Intrinsic	-.26	.30	.13	.31	-.41	.51	.09	.50	-.15	.12	.17	.15	0.28	0.44	0.08	0.40
Integrated	-.36	.37	.12	.37	-.39	.39	.08	.38	-.33	.31	.19	.33	0.07	0.09	0.11	0.06
Identified	-.20	.22	-.02	.20	-.23	.21	.17	.23	-.16	.23	-.28	.16	0.07	0.02	0.46	0.07
Introjected	.09	-.03	.16	.00	.39	-.20	.21	-.15	-.29	.29	.11	.29	0.71	0.50	0.10	0.45
External	.10	-.07	.13	-.04	-.06	.15	.16	.17	.21	-.25	.12	-.21	0.27	0.41	0.04	0.39
Amotivation	.17	-.10	.14	-.07	.15	.00	.17	.03	.22	-.26	.14	-.22	0.07	0.27	0.03	0.25

Note. CG = Control group, MPAI-G = Motivational physical activity intervention-group, A = Activity, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity. q_{Cohen} = Effect size of differences between bivariate correlations across CG and MPAI.

Table 19. Bivariate correlations between patients' perception of autonomy support, basic psychological need satisfaction, and changes in motivation 7 months-after SG.

Variables		MPAI-G (n = 17)						
		M (SD)	Intrinsic	Integrated	Identified	Introjected	External	Amotivation
PASSES (1-7)								
Autonomy support		6.82 (± 0.30)	.20 * [-0.31, 0.62]	.21 * [-0.30, 0.63]	.23 * [-0.28, 0.64]	-.39 ** [-0.73, 0.11]	-.42 ** [-0.75, 0.08]	-.24 * [-0.65, 0.27]
BPNES (1-5)								
	Autonomy	4.40 (± 0.61)	-.10 [-0.55, 0.40]	-.08 [-0.54, 0.42]	-.23 * [-0.64, 0.28]	-.40 ** [-0.74, 0.10]	-.10 [-0.55, 0.40]	.17 [-0.34, 0.60]
	Competence	4.66 (± 0.43)	.10 [-0.40, 0.55]	.08 [-0.42, 0.54]	.19 [-0.32, 0.61]	-.39 ** [-0.73, 0.11]	-.50 ** [-0.79, -0.03]	-.28 * [-0.67, 0.23]
	Relatedness	4.85 (± 0.37)	.08 [-0.42, 0.54]	.14 [-0.37, 0.58]	.13 [-0.37, 0.57]	-.22 * [-0.63, 0.29]	-.44 ** [-0.76, 0.05]	-.26 * [-0.66, 0.25]

Note. MPAI-G = Motivational physical activity intervention group. Magnitude of correlations is based on Gignac and Szodorai (2016) criteria. * Typical magnitude. ** Relatively large magnitude.

Table 20. Intra-group descriptive values (M ± SD) for motivation variables and physical activity levels from pre-SG to 7 months-after SG.

Variables	Pre-SG			7 months-after SG		
	CG (*n* = 15)		*d*	MPAI-G (*n* = 17)		*d*
BREQ-3 scores (0-4)						
Intrinsic	2.50 (± 1.57)	3.03 (± 1.10)	0.39	2.44 (± 1.43)	3.01 (± 0.95)	0.47
Integrated	2.00 (± 1.32)	2.88 (± 1.14)	0.71	1.98 (± 1.23)	2.31 (± 1.08)	0.29
Identified	3.02 (± 1.38)	3.35 (± 0.83)	0.29	3.04 (± 1.20)	3.29 (± 0.75)	0.25
Introjected	1.10 (± 0.97)	0.80 (± 0.94)	-0.31	1.07 (± 0.88)	1.34 (± 0.96)	0.29
External	0.87 (± 1.25)	0.60 (± 0.97)	-0.24	1.22 (± 1.28)	0.59 (± 0.78)	-0.59
Amotivation	0.37 (± 0.45)	0.43 (± 0.57)	0.12	0.50 (± 0.69)	0.19 (± 0.34)	-0.57
GT3X (min/day)						
Sedentary activity	628.45 (± 140.42)	617.09 (± 166.66)	-0.07	620.25 (± 132.96)	614.87 (± 168.20)	-0.04
Light PA	332.66 (± 125.36)	368.34 (± 155.27)	0.25	368.89 (± 122.60)	378.38 (± 161.94)	0.07
MVPA	47.98 (± 29.67)	43.26 (± 31.45)	-0.15	29.84 (± 20.25)	25.73 (± 22.85)	-0.19
Total PA	380.64 (± 143.22)	411.60 (± 173.83)	0.19	398.74 (± 132.96)	404.11 (± 168.20)	0.04

Note. SG = Sleeve gastrectomy, CG = Control group, MPAI-G = Motivational physical activity intervention-group, PA = Physical activity, MVPA = Moderate-to-vigorous physical activity.

APPENDIX 3. QUESTIONNAIRES

CUESTIONARIO DE SALUD SF-36

INSTRUCCIONES:
Las preguntas que siguen se refieren a lo que usted piensa sobre su salud. Sus respuestas permitirán saber cómo se encuentra usted y hasta qué punto es capaz de hacer sus actividades habituales. Conteste cada pregunta tal como se indica. Si no está seguro/a de cómo responder a una pregunta, por favor conteste lo que le parezca más cierto.

MARQUE UNA SOLA RESPUESTA

1. En general, usted diría que su salud es:

1 □ Excelente
2 □ Muy buena
3 □ Buena
4 □ Regular
5 □ Mala

2. ¿Cómo diría que es su salud actual, comparada con la de hace un año?

1 □ Mucho mejor ahora que hace un año
2 □ Algo mejor ahora que hace un año
3 □ Más o menos igual que hace un año
4 □ Algo peor ahora que hace un año
5 □ Mucho peor ahora que hace un año

LAS SIGUIENTES PREGUNTAS SE REFIEREN A ACTIVIDADES O COSAS QUE USTED PODRÍA HACER EN UN DÍA NORMAL.

3. Su salud actual, ¿le limita para hacer esfuerzos intensos, tales como correr, levantar objetos pesados, o participar en deportes agotadores?

1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

4. Su salud actual, ¿le limita para hacer esfuerzos moderados, como mover una mesa, pasar la aspiradora, jugar a los bolos o caminar más de una hora?

1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

5. Su salud actual, ¿le limita para coger o llevar la bolsa de la compra?

1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

6. Su salud actual, ¿le limita para subir varios pisos por la escalera?

1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

7. Su salud actual, ¿le limita para subir un solo piso por la escalera?

1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

8. Su salud actual, ¿le limita para agacharse o arrodillarse?

1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

9. Su salud actual, ¿le limita para caminar un kilómetro o más?

1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

10. Su salud actual, ¿le limita para caminar varias manzanas (varios centenares de metros)?

1 □ Sí, me limita mucho

2 □ Sí, me limita un poco
3 □ No, no me limita nada

11. Su salud actual, ¿le limita para caminar una sola manzana (unos 100 metros)?
1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

12. Su salud actual, ¿le limita para bañarse o vestirse por sí mismo?
1 □ Sí, me limita mucho
2 □ Sí, me limita un poco
3 □ No, no me limita nada

LAS SIGUIENTES PREGUNTAS SE REFIEREN A PROBLEMAS EN SU TRABAJO O EN SUS ACTIVIDADES COTIDIANAS.

13. Durante las 4 últimas semanas, ¿tuvo que reducir el tiempo dedicado al trabajo o a sus actividades cotidianas, a causa de su salud física?
1 □ Sí 2 □ No

14. Durante las 4 últimas semanas, ¿hizo menos de lo que hubiera querido hacer, a causa de su salud física?
1 □ Sí 2 □ No

15. Durante las 4 últimas semanas, ¿tuvo que dejar de hacer algunas tareas en su trabajo o en sus actividades cotidianas, a causa de su salud física?
1 □ Sí 2 □ No

16. Durante las 4 últimas semanas, ¿tuvo dificultad para hacer su trabajo o sus actividades cotidianas (por ejemplo, le costó más de lo normal), a causa de su salud física?
1 □ Sí 2 □ No

17. Durante las 4 últimas semanas, ¿tuvo que reducir el tiempo dedicado al trabajo o a sus actividades cotidianas, a causa de algún problema emocional (como estar triste, deprimido, o nervioso?
1 □ Sí 2 □ No

18. Durante las 4 últimas semanas, ¿hizo menos de lo que hubiera querido hacer, a causa de algún problema emocional (como estar triste, deprimido, o nervioso)?
1 □ Sí 2 □ No

19. Durante las 4 últimas semanas, ¿no hizo su trabajo o sus actividades cotidianas tan cuidadosamente como de costumbre, a causa de algún problema emocional (como estar triste, deprimido, o nervioso)?
1 □ Sí 2 □ No

20. Durante las 4 últimas semanas, ¿hasta qué punto su salud física o los problemas emocionales han dificultado sus actividades sociales habituales con la familia, los amigos, los vecinos u otras personas?
1 □ Nada
2 □ Un poco
3 □ Regular
4 □ Bastante
5 □ Mucho

21. ¿Tuvo dolor en alguna parte del cuerpo durante las 4 últimas semanas?
1 □ No, ninguno
2 □ Sí, muy poco
3 □ Sí, un poco
4 □ Sí, moderado
5 □ Sí, mucho
6 □ Sí, muchísimo

22. Durante las 4 últimas semanas, ¿hasta qué punto el dolor le ha dificultado su trabajo habitual (incluido el trabajo fuera de casa y las tareas domésticas)?
1 □ Nada
2 □ Un poco
3 □ Regular
4 □ Bastante
5 □ Mucho

LAS PREGUNTAS QUE SIGUEN SE REFIEREN A CÓMO SE HA SENTIDO Y CÓMO LE HAN IDO LAS COSAS DURANTE LAS 4 ÚLTIMAS SEMANAS. EN CADA PREGUNTA RESPONDA LO QUE SE PAREZCA MÁS A CÓMO SE HA SENTIDO USTED.

23. Durante las 4 últimas semanas, ¿cuánto tiempo se sintió lleno de vitalidad?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

24. Durante las 4 últimas semanas, ¿cuánto tiempo estuvo muy nervioso?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

25. Durante las 4 últimas semanas, ¿cuánto tiempo se sintió tan bajo de moral que nada podía animarle?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

26. Durante las 4 últimas semanas, ¿cuánto tiempo se sintió calmado y tranquilo?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

27. Durante las 4 últimas semanas, ¿cuánto tiempo tuvo mucha energía?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

28. Durante las 4 últimas semanas, ¿cuánto tiempo se sintió desanimado y triste?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

29. Durante las 4 últimas semanas, ¿cuánto tiempo se sintió agotado?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

30. Durante las 4 últimas semanas, ¿cuánto tiempo se sintió feliz?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces

5 □ Sólo alguna vez
6 □ Nunca

31. Durante las 4 últimas semanas, ¿cuánto tiempo se sintió cansado?

1 □ Siempre
2 □ Casi siempre
3 □ Muchas veces
4 □ Algunas veces
5 □ Sólo alguna vez
6 □ Nunca

32. Durante las 4 últimas semanas, ¿con qué frecuencia la salud física o los problemas emocionales le han dificultado sus actividades sociales (como visitar a los amigos o familiares)?

1 □ Siempre
2 □ Casi siempre
3 □ Algunas veces
4 □ Sólo alguna vez
5 □ Nunca

POR FAVOR, DIGA SI LE PARECE CIERTA O FALSA CADA UNA DE LAS SIGUIENTES FRASES.

33. Creo que me pongo enfermo más fácilmente que otras personas.

1 □ Totalmente cierta
2 □ Bastante cierta
3 □ No lo sé
4 □ Bastante falsa
5 □ Totalmente falsa

34. Estoy tan sano como cualquiera.

1 □ Totalmente cierta
2 □ Bastante cierta
3 □ No lo sé
4 □ Bastante falsa
5 □ Totalmente falsa

35. Creo que mi salud va a empeorar.

1 □ Totalmente cierta
2 □ Bastante cierta
3 □ No lo sé
4 □ Bastante falsa
5 □ Totalmente falsa

36. Mi salud es excelente.

1 □ Totalmente cierta
2 □ Bastante cierta
3 □ No lo sé
4 □ Bastante falsa
5 □ Totalmente falsa

Para cada uno de los enunciados que se presentan, por favor rodea con un círculo el número que corresponda mejor con tu grado de acuerdo o desacuerdo

Yo hago ejercicio físico…	Nada verdadero				Totalmente verdadero
1. Porque los demás me dicen que debo hacerlo	0	1	2	3	4
2. Porque me siento culpable cuando no lo practico	0	1	2	3	4
3. Porque valoro los beneficios que tiene el ejercicio físico	0	1	2	3	4
4. Porque creo que el ejercicio es divertido	0	1	2	3	4
5. Porque está de acuerdo con mi forma de vida	0	1	2	3	4
6. No veo por qué tengo que hacerlo	0	1	2	3	4
7. Porque mis amigos/familia/pareja me dicen que debo hacerlo	0	1	2	3	4
8. Porque me siento avergonzado/a si falto a la sesión	0	1	2	3	4
9. Porque para mí es importante hacer ejercicio regularmente	0	1	2	3	4
10. Porque considero que el ejercicio físico forma parte de mí	0	1	2	3	4
11. No veo por qué tengo que molestarme en hacer ejercicio	0	1	2	3	4
12. Porque disfruto con las sesiones de ejercicio	0	1	2	3	4
13. Porque otras personas no estarán contentas conmigo si no hago ejercicio	0	1	2	3	4
14. No veo el sentido de hacer ejercicio	0	1	2	3	4
15. Porque veo el ejercicio físico como una parte fundamental de lo que soy	0	1	2	3	4
16. Porque siento que he fallado cuando no he realizado un rato de ejercicio	0	1	2	3	4
17. Porque pienso que es importante hacer el esfuerzo de ejercitarse regularmente	0	1	2	3	4
18. Porque encuentro el ejercicio una actividad agradable	0	1	2	3	4
19. Porque me siento bajo la presión de mis amigos/familia para realizar ejercicio	0	1	2	3	4
20. Porque considero que el ejercicio físico está de acuerdo con mis valores	0	1	2	3	4
21. Porque me pongo nervioso si no hago ejercicio regularmente	0	1	2	3	4
22. Porque me resulta placentero y satisfactorio el hacer ejercicio	0	1	2	3	4
23. Pienso que hacer ejercicio es una pérdida de tiempo	0	1	2	3	4

Cuestionario de Regulación de la Conducta en el Ejercicio (BREQ-3)

Respecto a mi programa de ejercicio físico…	Totalmente en desacuerdo	En desacuerdo	Ligeramente en desacuerdo	Neutro	Ligeramente de acuerdo	De acuerdo	Totalmente de acuerdo
1. El monitor/a me facilita con distintas opciones cómo realizar el ejercicio físico o deportivo en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
2. Mi monitor/a entiende por qué he decidido hacer ejercicio físico en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
3. El monitor/a confía en mi capacidad de hacer ejercicio físico o deportivo en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
4. El monitor/a me anima a practicar algún ejercicio físico o deportivo en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
5. El monitor/a escucha mis comentarios sobre el ejercicio físico o deportivo que quiero realizar en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
6. El monitor/a me anima de forma positiva para hacer ejercicio físico o deportivo en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
7. Soy capaz de dirigirme al monitor/a hablándole sobre el ejercicio físico o deportivo que quiero hacer en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
8. Mi monitor/a se asegura de que entienda por qué tengo que hacer ejercicio físico en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
9. El monitor/a contesta a mis preguntas sobre el ejercicio físico o deportivo que quiero realizar en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
10. El monitor/a se preocupa por el ejercicio físico o deportivo que voy a hacer en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
11. Soy capaz de compartir mis experiencias de ejercicio físico o deportivo con mi monitor/a	1	2	3	4	5	6	7
12. Confío en el consejo que el monitor/a me da sobre el ejercicio físico o deportivo que voy a hacer en mi tiempo libre cuando termine el programa	1	2	3	4	5	6	7
Escala de Apoyo a la Autonomía Percibido en Contextos de Ejercicio (PASSES)							

Respecto a mi programa de ejercicio físico…	Totalmente en desacuerdo	Algo en desacuerdo	Neutro	Algo de acuerdo	Totalmente de acuerdo
1. El programa de ejercicio físico que sigo está muy relacionado con lo que me gusta y me interesa	1	2	3	4	5
2. Creo que he progresado enormemente con respecto al objetivo final que persigo	1	2	3	4	5
3. Me siento muy cómodo/a con los otros participantes del programa de ejercicio físico	1	2	3	4	5
4. Estoy convencido/a de que el ejercicio físico que hago se ajusta perfectamente a la manera en que prefiero hacer ejercicio	1	2	3	4	5
5. Creo que realizo con eficacia los ejercicios de mi programa de entrenamiento	1	2	3	4	5
6. Creo que me relaciono con los otros participantes del programa ejercicio físico de forma muy amistosa	1	2	3	4	5
7. Creo que la forma que tengo de hacer ejercicio físico es definitivamente una expresión de mí mismo/a	1	2	3	4	5
8. Creo que el ejercicio físico es una actividad que hago bien	1	2	3	4	5
9. Creo que puedo comunicarme fácilmente con los otros participantes del programa de ejercicio físico	1	2	3	4	5
10. Creo que tengo la oportunidad de tomar decisiones respecto a la manera en que hago ejercicio físico	1	2	3	4	5
11. Creo que soy capaz de cumplir las exigencias del programa de entrenamiento físico que sigo	1	2	3	4	5
12. Me encuentro muy a gusto con los otros participantes del programa de ejercicio físico	1	2	3	4	5
Escala de las Necesidades Psicológicas Básicas en el Ejercicio (BPNES)					