



Understanding the antecedents of healthy and unhealthy weight control behaviours: Grit, motivation and self-control

María Marentes-Castillo¹ , Isabel Castillo² , Inés Tomás² , Jorge Zamarripa¹ and Octavio Alvarez^{2,*}

¹Faculty of Sports Organization, Autonomous University of Nuevo León, Ciudad Universitaria, San Nicolás de los Garza, Nuevo León, México: ²Faculty of Psychology, University of Valencia, Avd. Blasco Ibáñez, 21, Valencia 46010, Spain

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Abstract

Objective: To understand the psychological antecedents or personal factors that lead to weight control behaviours that can help to develop more effective prevention strategies.

Design: The present correlational study has a non-experimental, quantitative, cross-sectional design. A model was tested considering types of motivation (autonomous motivation, controlled motivation and amotivation) as mediators in the relationship between the Grit personality and healthy and unhealthy weight control behaviours, with self-control as a moderator in the aforementioned indirect effects.

Setting: Monterrey (Nuevo León, México).

Participants: A representative sample of 1219 adults (men = 599; women = 620) aged 18–65 years ($M = 29.37$, $SD = 11.83$).

Results: Findings supported the mediator role of the types of motivation. Specifically, Grit showed a positive indirect effect on healthy weight control behaviours through autonomous motivation. Conversely, Grit showed a negative indirect effect on unhealthy weight control behaviours through autonomous motivation. Furthermore, findings supported the moderator role of self-control in the relationship between amotivation and healthy and unhealthy weight control behaviours.

Conclusions: This study provides evidence for the key role of Grit in the adoption of healthy or unhealthy control behaviours, as well as the role of autonomous motivation in the development of healthy behaviours.

Keywords

Grit
Healthy behaviours
Unhealthy behaviours
Weight control
Self-determined motivation
Self-control

Overweight and obesity are recognised as serious public health problems⁽¹⁾. Globally, 39% of adults (over the age of 18) were overweight and 13% were obese in 2016, which means that virtually half the world has an unhealthy weight⁽¹⁾, making it a far-reaching health problem. In the particular case of Mexico, in the population over 20 years old, 76.8% of women and 73% of men are overweight and obese⁽²⁾. The WHO⁽¹⁾ mentions that the consumption of healthy foods is an effective strategy for maintaining a healthy weight and weight control. In the Mexican population over 20 years of age, it is common to consume unhealthy foods. In fact, 85.5% of the population consumes non-dairy-sweetened beverages, 35.4% consumes snacks, sweets and desserts and 20.3% consumes fast food and Mexican snacks daily⁽²⁾.

Therefore, it would be helpful to understand the mechanisms underlying the adoption of healthy behaviours to

prevent overweight and obesity. To this end, the aim of the present study is to examine a model that proposes that the quality of the motivation (i.e. autonomous motivation, controlled motivation and amotivation) mediates the relationship between the Grit personality and healthy and unhealthy weight control behaviours, whereas self-control moderates this mediated relationship (see Fig. 1). The present study contributes to understanding the antecedents of healthy weight control behaviours by helping to provide a clearer picture of this complex construct.

Weight control behaviours

The literature differentiates between healthy and unhealthy weight control behaviours^(3,4). On the one hand, healthy weight control behaviours are conceptualised as good practices undertaken by individuals with the goal of

*Corresponding author: Email octavio.alvarez@uv.es

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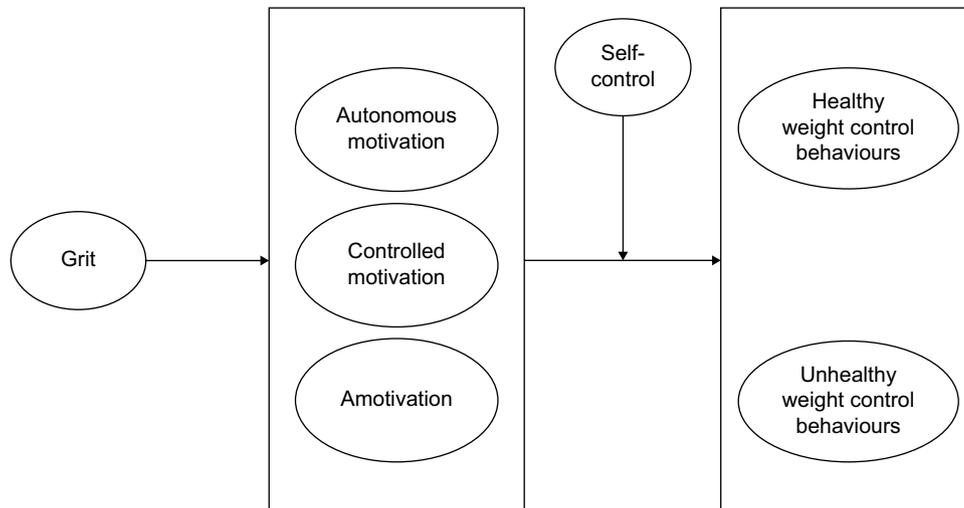


Fig. 1 Hypothesised model of the relations between Grit, types of motivation, self-control and weight control behaviours

maintaining or enhancing their health, preventing health problems or obtaining an ideal body image⁽⁵⁾. These behaviours include increasing fruit and vegetable intake, being physically active, ate less high-fat food and reducing the consumption of sugar-sweetened beverages. On the other hand, unhealthy weight control behaviours are the potentially harmful practices people engage in to lose weight, maintain a healthy weight or achieve a certain body image^(6–8). Some examples are fasting, skipping meals, the use of a food substitute (powder or a special drink), smoke more cigarettes and the use of laxatives or diet pills^(6,7). Studies have found that older adults are more likely to be health motivated than younger adults⁽⁹⁾. In addition, findings have reported differences between men and women in weight control behaviours⁽¹⁰⁾. For example, the results of Lee *et al.*⁽¹¹⁾ study, controlling for age and gender, showed that women use healthy weight control behaviours, whereas men tend to use unhealthy behaviours to control their weight. In contrast, the study by Neumark-Sztainer *et al.*⁽¹²⁾ found that women use weight control behaviours to a greater extent than men, but no gender differences were found between the types of behaviours used (i.e. healthy or unhealthy behaviours).

Motivation and weight control behaviours

Until the development of the self-determination theory^(13,14), motivation or amotivation had been conceptualised as a unitary and quantitative concept (i.e. highly motivated, poorly motivated or non-motivated)⁽¹⁴⁾. Self-determination theory places the attention on the quality of motivation and distinguishes between types of motivation: autonomous motivation (which includes intrinsic motivation and integrated and identified regulations), controlled motivation (which includes introjected and external regulations) and amotivation. Thus, autonomous

motivation is the result of the person's volition and reflects his/her personal values, beliefs and interests. Controlled motivation is the product of forces external to the person that influence behaviour through coercion or pressure to do things that are not consistent with his/her values and beliefs. Finally, amotivation describes passivity and lack of purpose for engaging in a given behaviour⁽¹⁴⁾.

Self-determination theory has been applied in the prediction of healthy behaviours and in interventions, showing that autonomous motivation is more effective than controlled motivation in both cases^(15–17). Specifically, self-determination theory has been used to understand the mechanisms operating in the success of a weight change process, which often involves habit change. With regard to healthy and unhealthy eating, associations have been found between autonomous motivation and healthy food consumption, positive attitudes towards diet, greater perceived control over eating behaviour and positive psychological adjustment, whereas controlled motivation has been related to unhealthy eating and less positive psychological adjustment^(18–21). In summary, autonomous motivation has outcomes in terms of behavioural perseverance, quality of performance and personal health, whereas controlled motivation tends to develop less persistent and lower quality behaviours and more health problems and personal ill-being.

Becoming autonomous is essential for achieving weight control, which involves understanding the reasons for initiating the behaviour and, thus, preventing abandonment, as well as redirecting the objective in overweight treatments towards process-focused treatment rather than outcome-focused treatment^(15,16). Deci and Ryan⁽¹³⁾ suggested that inflexible thoughts and externally controlled behaviour could lead to maladaptive behaviours, such as unhealthy weight control behaviour.

In previous studies, no differences in healthy diet motivation were found based on age group (15–19) or gender in



the type of healthy eating motivation (autonomous and controlled motivation)⁽²²⁾.

Grit personality, motivation and weight control behaviours

Some authors have suggested that certain personality traits may be important in the study of healthy behaviour⁽²³⁾. The literature suggests that personality is related to healthy behaviours through the quality of health practices⁽²⁴⁾ and success in achieving goals^(25,26).

One personality trait that may be of interest is Grit. This variable was described by Duckworth and colleagues⁽²⁵⁾ in terms of perseverance and passion for long-term goals. It is characterised by encouraging people to pursue a fundamental goal in the presence of challenges and setbacks, and this pursuit can last for years or even a lifetime. More recently, Grit has been conceptualised as a trait that leads a person to the tenacious pursuit of a dominant higher goal despite setbacks⁽²⁷⁾. In the health-related literature, Grit has been positively associated with adaptive outcomes such as exercise behaviour⁽²⁸⁾ and health-related quality of life⁽²⁹⁾.

The relationship between Grit personality and types of motivation for healthy eating has been documented in the health-related literature⁽³⁰⁾, indicating a positive and significant relationship between Grit and autonomous motivation for healthy intake and a negative relationship between Grit and controlled motivation and amotivation for healthy eating. Other studies have explored relationships between Grit and health-related behaviours such as health care management and higher quality of life in mental and physical health^(29,31). Recently, the importance of measuring Grit with other health constructs⁽³²⁾, both physical and mental, has been noted. To our knowledge, no studies have specifically explored the relationship between Grit and healthy and unhealthy weight control behaviours.

The moderator role of self-control

Previous studies have indicated that Grit and self-control are strongly correlated, highlighting that some people with high levels of self-control capably handle temptations⁽²⁷⁾. Self-control is an essential and basic mental resource when there is a conflict between two possibilities and the person is capable of inhibiting the undesirable behaviour⁽³³⁾, whereas motivation refers to the reasons, energy, direction and persistence to engage (or not) in a task (i.e. autonomous motivation, controlled motivation or amotivation)⁽¹⁴⁾. Research has found evidence that self-control is associated with motivation⁽³⁴⁾.

Self-control is related to a broad range of health behaviours⁽³³⁾, such as eating healthy foods, adopting an exercise regimen or breaking bad habits. Duckworth and Gross⁽²⁷⁾ established the difference between self-control and Grit, stating that self-control refers to resisting two action

tendencies in the short term, whereas Grit is related to sustained effort over time. This could mean that self-control may be regulating the Grit personality of individuals who set a long-term goal such as healthy behaviours. Although the relationship between Grit and self-control in studies addressing healthy behaviours has not been studied, Tangney *et al.*⁽³⁵⁾ showed that adolescents with high self-control have a healthier lifestyle than those with low self-control. Regarding weight control, Fan and Jin⁽³⁶⁾ found that people who were overweight and/or obese, even if they had a strong intention to lose weight, did not follow the general recommendations for fruit and vegetable consumption, demonstrating a lack of self-control. Moreover, Koike *et al.*⁽³⁷⁾ found that adolescents with low self-control were more likely to gain more weight throughout their lives. This tendency increases across the lifespan, that is, adults with low self-control are expected to be even more overweight than they were in adolescence. These studies suggest that self-control may be acting as a modulator of health-related behaviours.

Considering the aforementioned literature review, we tested the following hypotheses, which are depicted in Fig. 1. Due to differences found in some research when age and gender are considered, the model will control for both age and gender:

*H*₁. The type of motivation (autonomous motivation, controlled motivation and amotivation) will mediate the relationship between Grit and healthy and unhealthy weight control behaviours.

*H*₂. Self-control will moderate the relationship between the type of motivation and weight control behaviours.

*H*₃. Self-control will moderate the indirect effect of Grit on weight control behaviours through the type of motivation.

Methods

Participants and procedure

The study participants were 1219 (599 men, 620 women) adults from Monterrey (Nuevo León, México) from 18 to 65 years old ($M = 29.37$, $SD = 11.83$) who completed the questionnaire package with the variables of interest. Participants were selected using a cluster random sampling design stratified by gender and age with neighbourhood (called 'colonias') as the cluster variable. Of the 912 colonias in Monterrey, fifty were randomly selected. Of the entire sample, 58.1% were single and 28.3% were married. In terms of educational level, 58.2% were university graduates, 25.5% were high school graduates and 10.3% were middle school graduates. In addition, 58.1% were middle class, 18.7% were upper-middle class and 15.5% were lower-middle class. After agreeing to be involved in the research, data collection, which was anonymous and voluntary, was conducted in the participants' homes in

November 2018 and February 2019 by a trained group of undergraduate students, and it lasted 15–20 min.

Instruments

We assessed the variables included in the study with four instruments.

The Grit personality scale^(25,26) adapted to Mexican Spanish⁽³⁰⁾. It contained twelve items divided into two subscales with six items each: consistency of interest (e.g. 'I often set a goal but later choose to pursue a different one') and perseverance of effort (e.g. 'I have achieved a goal that took years of work'). Responses were collected on a 5-point Likert-type scale ranging from 1 (not like me at all) to 5 (very much like me). Although the original Grit scale was developed to measure two Grit factors, some authors consider that an aggregated score represents overall Grit (see Credé *et al.*⁽³⁸⁾ for a systematic review), as in the present study. In this study, the goodness of fit indices of the second-order confirmatory factor analysis testing the two-factor model with a single second-order factor were adequate: χ^2 (43) = 158.79; comparative fit index (CFI) = 0.964; Tucker–Lewis index (TLI) = 0.952; root mean square error of approximation (RMSEA) = 0.041 and standardised root mean square residual (SRMR) = 0.047.

The Behavioural Regulation in Exercise Questionnaire (BREQ-3)⁽³⁹⁾ adapted to weight control and to Mexican Spanish⁽⁴⁰⁾. The questionnaire begins with the stem 'I control my weight...', and it contains twenty-three items divided into six subscales (motivational regulations) consisting of four items each, except for identified regulation, which has three items: intrinsic regulation (e.g. because I enjoy the moments when I control my weight), integrated regulation (e.g. because it is consistent with my life goals), identified regulation (e.g. because I value the benefits of controlling my weight), introjected regulation (e.g. because I feel guilty when I don't), external regulation (e.g. because other people say I should) and amotivation (e.g. I don't see why I should have to control my weight). The responses were collected on a 5-point Likert-type scale ranging from 1 (definitely not true) to 5 (definitely true). Items representing intrinsic, integrated and identified regulation make up the autonomous motivation score, and items representing introjected and external regulation represent the controlled motivation variable. In this study, the goodness of fit indices for the second-order confirmatory factor analysis testing the six-factor model with three second-order factors were adequate: χ^2 (214) = 1685.379; CFI = 0.952; TLI = 0.944; RMSEA = 0.076 and SRMR = 0.071.

The self-control scale (short version)⁽³⁵⁾ adapted to Mexican Spanish for this study. It contained thirteen items (e.g. I am good at resisting temptation) that provide a self-control score. The responses were collected on a 5-point Likert-type scale ranging from 1 (No at all) to 5 (Very much). In this study, the goodness of fit indices for the confirmatory factor analysis testing the one-factor model were

adequate: χ^2 (51) = 239.028; CFI = 0.935; TLI = 0.900; RMSEA = 0.052 and SRMR = 0.040.

The weight-related behaviours scale⁽⁸⁾ adapted to Mexican Spanish for this study. It contained twelve items divided into two subscales: healthy behaviours (e.g. exercised) with four items and unhealthy behaviours (e.g. skipped meals) with eight items (see online supplementary material, Supplemental Appendix 1). The responses were collected on a 5-point Likert-type scale ranging from 1 (never) to 5 (always), and the phrase that preceded the items was: 'During the last four weeks, have you performed any of the following actions for weight loss or to avoid gaining weight?' In this study, the goodness of fit indices for the confirmatory factor analysis testing the two-factor model were adequate: χ^2 (50) = 381.410; CFI = 0.941; TLI = 0.922; RMSEA = 0.070 and SRMR = 0.058.

Following the current recommendations of the International Test Commission⁽⁴¹⁾, the English versions of the self-control scale and the weight-related behaviours scale were translated into Mexican Spanish using the double-translation and reconciliation procedure.

Statistical analysis

We estimated descriptive statistics, reliability and Pearson correlations among the study variables using SPSS 23.0. To examine the factorial structure of each instrument and test the study hypotheses (see Fig. 1), we used Mplus version 8. To test H₁, we ran a mediated regression model; to test H₂ and H₃, we tested a moderated-mediation regression model. To verify the fit of the models, we considered the χ^2 , the TLI, the CFI, the RMSEA and the SRMR. Values of TLI and CFI above 0.90 indicate an acceptable fit. For RMSEA and SRMR, values below 0.08 are considered satisfactory. The structural models were tested using maximum likelihood as the estimation method and modelling the relationships among the observed variables. To test the mediated or indirect effects, we used the bias-corrected bootstrap CI method as implemented in Mplus⁽⁴²⁾. If the CI does not include zero, the null hypothesis of no mediation is rejected, providing empirical support for the indirect effect.

Results

The descriptive statistics and reliability estimator (Cronbach's α) for the study variables are shown in Table 1. The results showed that average scores on Grit, autonomous motivation, self-control perceptions and healthy weight control behaviours were above the mean of the scale, whereas average scores on controlled motivation, amotivation and unhealthy weight control behaviours were below the mean. All the scales showed adequate alpha values, ranging from 0.72 to 0.92. All the relationships between the study variables were statistically significant (showing the expected sign), except for the relationship

Table 1 Descriptive statistics, reliability and correlations between the study variables

	Mean	SD	α	1	2	3	4	5	6
1. Grit	3.47	0.57	0.73						
2. Autonomous motivation	3.30	1.01	0.92	0.22**					
3. Controlled motivation	2.22	0.89	0.83	-0.25**	0.24**				
4. Amotivation	2.02	0.97	0.74	-0.27**	-0.13*	0.52**			
5. Self-control	3.31	0.57	0.73	0.47**	0.18**	-0.36**	-0.34**		
6. Healthy weight control behaviours	3.01	0.90	0.72	0.21**	0.44**	0.06*	-0.14**	0.23**	
7. Unhealthy weight control behaviours	1.73	0.75	0.84	-0.21**	-0.01	0.44**	0.43**	-0.33**	0.04

* $P < 0.05$.
 ** $P < 0.01$.
 Range variables = 1–5.

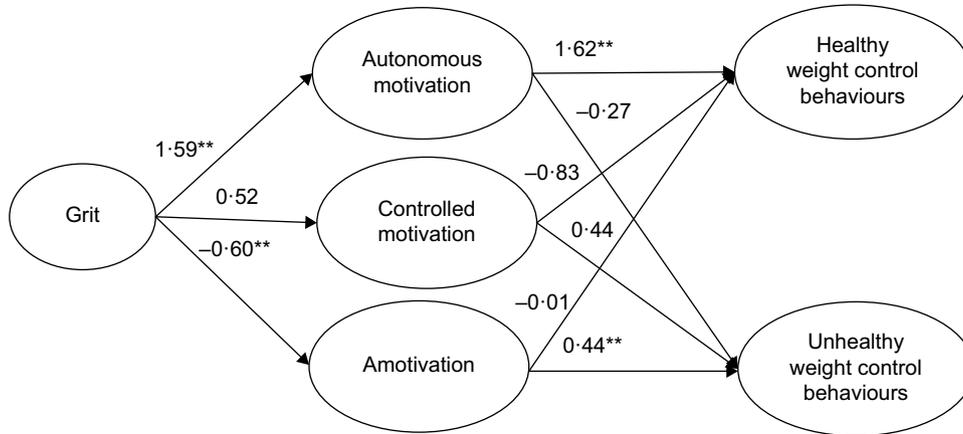


Fig. 2 Mediation model for H_1 testing the relationship between Grit and weight control behaviours through types of motivation. Coefficients are unstandardised. Control variables are not depicted in this figure for clarity of the presentation ** $P < 0.01$; * $P < 0.05$

between autonomous motivation and unhealthy weight control behaviours, which was not statistically significant. It is interesting to notice the fact that autonomous motivation was associated with healthy weight control behaviours (showing not relationship with unhealthy weight control behaviours), while controlled motivation and amotivation were associated with unhealthy weight control behaviours (showing a weak relationship with healthy weight control behaviours).

The mediation model testing H_1 , that is, the indirect effect of Grit on healthy weight control behaviours and unhealthy weight control behaviours through type of motivation, had an acceptable fit to the data ($\chi^2 (1033) = 3135.63$; RMSEA = 0.04; CFI = 0.91; TLI = 0.90; SRMR = 0.06). The model explained 46.2% of the variance in healthy weight control behaviours and 38.9% of the variance in unhealthy weight control behaviours. The results showed that Grit positively and significantly predicted autonomous motivation and negatively predicted amotivation. At the same time, autonomous motivation was positively and significantly associated with healthy weight control behaviours. Finally, amotivation was positively and significantly associated with unhealthy weight control behaviours (see Fig. 2). Autonomous motivation significantly mediated the relationship between Grit and healthy weight control behaviours, whereas amotivation

significantly mediated the relationship between Grit and unhealthy weight control behaviours, given that the bias-corrected bootstrap CI for the two estimated indirect effects did not include zero (see Table 2).

The moderated-mediation model (H_2 and H_3) adequately fitted the data (previous studies⁽⁴⁴⁾ suggest not ignoring the effects of model complexity when judging model fit. Conventional cutoff values for acceptable fit are too restrictive when applied to complex models because models with more items and more factors can be expected to yield smaller fit values) ($\chi^2 (1890) = 6219.94$; RMSEA = 0.043; CFI = 0.84; TLI = 0.83; SRMR = 0.07). However, only the moderation effect of self-control on the relationship between amotivation and healthy weight control behaviours ($\beta = -0.10$; $P = 0.04$) was statistically significant. Moreover, the moderation effect of self-control on the relationship between amotivation and unhealthy weight control behaviours ($\beta = -0.06$; $P = 0.06$) was marginally significant. Due to the difficulty in detecting significant interactions, a P value < 0.10 becomes normative when testing moderator effects⁽⁴³⁾. Thus, the results of the proposed model showed that self-control moderated the relationship between amotivation and healthy and unhealthy weight control behaviours, providing partial support for H_2 . To further interpret the two significant interaction effects, we computed simple slopes for high and low values

Table 2 Indirect effects of Grit personality on healthy and unhealthy weight control behaviours through types of motivation

	Estimate	95 % lower limit	95 % upper limit
Grit–Autonomous motivation–Healthy weight control behaviours	2.568	1.561	4.782
Grit–Controlled motivation–Healthy weight control behaviours	0.005	−0.085	0.065
Grit–Amotivation–Healthy weight control behaviours	0.228	−0.030	1.644
Grit–Autonomous motivation–Unhealthy weight control behaviours	−0.428	−3.043	0.075
Grit–Controlled motivation–Unhealthy weight control behaviours	−0.434	−1.961	0.000
Grit–Amotivation–Unhealthy weight control behaviours	−0.262	−0.465	−0.110

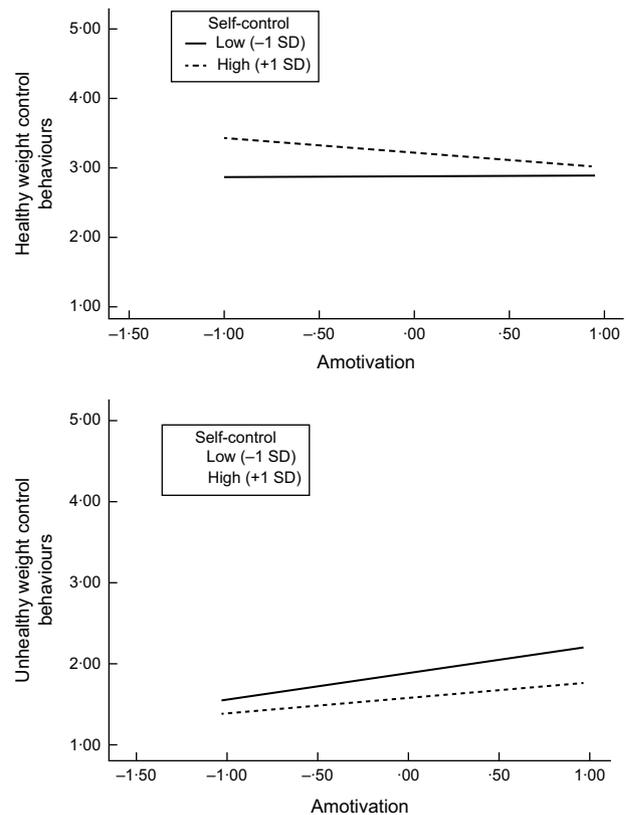
of the moderator (i.e. one SD above and below the sample mean), and we plotted the corresponding regression lines (Fig. 3). Figure 3 shows that when self-control was low (−1 SD), amotivation and healthy weight control behaviours were not related ($\beta = 0.01$; $P = 0.72$), whereas amotivation and unhealthy weight control behaviours were positively related ($\beta = 0.32$; $P = 0.00$). Furthermore, when self-control was high (+1 SD), amotivation was negatively related to healthy weight control behaviours ($\beta = -0.21$; $P = 0.00$), whereas amotivation and unhealthy weight control behaviours were positively related ($\beta = 0.19$; $P = 0.00$).

Finally, based on previous results, we analysed the conditional indirect effects (CIE) of the Grit personality on healthy and unhealthy weight control behaviours through amotivation as a function of self-control (H_3). The CIE on healthy weight control behaviours was not statistically significant (CIE = -0.01 ; bootstrap 95 % CI ($-0.04, 0.02$)) when self-control was low; however, it was positive and statistically significant (CIE = 0.08 ; bootstrap 95 % CI ($0.04, 0.13$)) when self-control was high. The CIE on unhealthy weight control behaviours was negative and statistically significant when self-control was low (CIE = -0.14 ; bootstrap 95 % CI ($-0.19, -0.10$)) and when self-control was high (CIE = -0.09 ; bootstrap 95 % CI ($-0.13, -0.05$)), and it was higher for low self-control. Moreover, the bootstrap CI for the index of moderated mediation did not include the zero value for the CIE on healthy (IMM = 0.08 ; bootstrap 95 % CI ($0.04, 0.13$)) and unhealthy (IMM = 0.05 ; bootstrap 95 % CI ($0.01, 0.09$)) weight control behaviours. These results provide partial support for H_3 .

Discussion

The main interest of the current research, conducted with a representative sample of adults, was to understand the mechanisms underlying the adoption of healthy weight control behaviours to prevent overweight and obesity. To this end, we have considered the importance of personality characteristics and motivational aspects, exploring the mediation role of types of motivation (autonomous motivation, controlled motivation and amotivation) and the moderator role of self-control in the relationship between Grit personality and healthy and unhealthy weight control behaviours.

In relation to the hypothesis (H_1) that the type of motivation would mediate the relationship between Grit personality and

**Fig. 3** Relationships between amotivation and healthy and unhealthy weight control behaviours as a function of self-control

healthy and unhealthy weight control behaviours, our findings provide partial support, confirming that autonomous motivation and amotivation mediated the relationship between Grit and healthy and unhealthy weight control behaviours, respectively. However, controlled motivation did not mediate this relationship. The mediating role of autonomous motivation emphasises that Gritty people tend to adopt weight control strategies based on higher-quality motivations and, in turn, have a better chance of maintaining health-related change. All behaviours associated with weight control will be the result of eligibility, decision-making and personal volition⁽⁴⁵⁾. Eventually, these changes will generate new values and beliefs in relation to the consumption of healthy foods, supporting persistent change^(29,31). Therefore, and in line with previous literature, the present study supports the role of Grit in health-related practices⁽²⁴⁾ and the quality of these practices^(29,31).



Thus, when Gritty individuals decide to take control of their weight, they will face longer-term processes, including setbacks, emphasising their persistence in the behaviour *v.* dropping out. On the other hand, when determining how to achieve the goal, the type of motivation will mark the direction towards healthy or unhealthy behaviours. Our results show that autonomous motivation is the best mediator to lead a Gritty person to healthy weight control behaviour, emphasising the role of personal decision in the process of becoming healthy. Previous literature pointed out that autonomous motivation was positively correlated with the consumption of fruits and vegetables and, in general, with eating healthy foods^(19,21), concern about food quality, positive psychological adjustment and a positive attitude towards dieting and greater perceived control over eating behaviours^(20,21).

Our findings also indicate that controlled motivation did not act as a mediator in the relationship between Grit and healthy and unhealthy weight control behaviours. However, the results suggest that when people accept contexts of pressure from others to control their weight, these external reasons will lead them to use unhealthy weight control practices, such as fasting, skipping meals, taking diet aids or medications and even using laxatives. Our results are in line with previous literature that related controlled motivation to dysfunctional eating⁽¹⁹⁾, lower fruit and vegetable intake^(18,21), concern about intake quantity and less positive psychological adjustment⁽²⁰⁾.

Finally, we found that amotivation mediated the relationship between Grit and unhealthy weight control behaviours. Thus, the Grit personality plays a protective role against being unmotivated about weight control behaviours. In turn, we found an additional mechanism to explain why Gritty people tend to avoid unhealthy weight control behaviours and adopt healthy weight control behaviours. As previous literature pointed out, people with a lack of intentionality to control their weight will tend to have unhealthier behaviours due to a lack of perceived competence or lack of value or interest in this behaviour⁽¹⁴⁾. Thorgersen-Ntoumani and Ntoumanis⁽¹⁷⁾ suggested that people with amotivation towards health-related behaviours are unable to identify why they act and tend to have low intentions and poor acceptance and adherence to healthy behaviours.

Regarding the hypothesis (H_2) that self-control would moderate the relationship between types of motivation and weight control behaviours, and the hypothesis (H_3) that self-control would moderate the indirect effect of Grit on weight control behaviours through types of motivation, our results showed only partial support for the relationship between amotivation and healthy and unhealthy weight control behaviours. These results are partially consistent with previous literature indicating that self-control is a good moderator of lack of motivation for health-related and healthier lifestyle behaviours^(36,37). People with a lack of motivation and high self-control are more likely to control their weight in a healthy way and, thus, reduce the

likelihood of engaging in unhealthy behaviours, that is, when there is a lack of motivation to control weight, self-control can improve the quality of the subject's behaviour. However, self-control does not moderate the relationship between autonomous and controlled motivation, indicating that when people have reasons (autonomous or controlled) to control their weight, self-control has no effect on motivation, with the latter being more relevant in predicting weight control behaviours. Moreover, self-control also moderates the indirect effects of Grit on healthy and unhealthy behaviour, showing that a Gritty person who has high self-control is more likely to engage in healthy weight control. On the other hand, when Gritty people have low self-control, there is a greater likelihood of engaging in unhealthy weight control behaviour. This moderating role of self-control in the Grit personality had previously been mentioned by Duckworth and Gross⁽²⁷⁾.

The present study reinforces the role of personality in the types of motivation in explaining the adoption of healthy and unhealthy control behaviours. Our study deepens our understanding of what precedes the choice of good or bad weight control behaviours (healthy *v.* unhealthy). Our explanation includes the role of types of motivation and self-control. The final reflection of this study is that it is not enough to have Grit to engage in healthy behaviour, but rather the individual's motivation to lose weight (i.e. his/her reasons for losing weight) and self-control are what determine the path to healthy weight control behaviour.

In terms of the limitations of this study, it is a cross-sectional design that keeps us from generalising the results and understanding the evolution of the phenomena studied. All the information in the study is obtained from self-reported measures, and so future studies could include objective measures such as daily intake, weight, levels of physical activity and BMI measures. Furthermore, the sample did not target only overweight and obese people. However, this variability allows us to know how these health-related psychological variables are associated in the general population and transfer this knowledge to test this health model with other more specific populations, such as adolescents and overweight and/or obese people. Future studies could stratify by weight status, using a longitudinal approach if possible.

Practical implications

The results of this research have two main implications for professional practice. First, it is important for health centres to have psychologists who can explore personality patterns, particularly the Grit personality, which will help to plan more successful weight control interventions. Health professionals will identify the elements of personality and motivation to assess their clients, focusing on the most important goal for each person. Individuals with high levels of Grit may better prioritise pursued skills as a mechanism for long-term health behaviour⁽³¹⁾. In sum,

we recommend an interdisciplinary approach to interventions involving lifestyle changes.

Second, we suggest a self-determined approach to health interventions involving long-term changes. This approach would be carried out through motivational interviewing, which has previously been related to autonomously motivated therapeutic processes in the literature^(14,46,47), and specifically among nutritionist practitioners⁽⁴⁸⁾. Markland and colleagues pointed out that the aim of motivational interviewing is client reflection, self-exploration and self-regulation, all of which match autonomy-supportive approaches⁽¹⁴⁾. The principles that encompass the motivational interviewing approach are open-ended questions, empathy, affirmation, reflection and summarisation⁽⁴⁷⁾. Moreover, it would be advisable to continue to promote autonomous motivation throughout the weight control process by continuously monitoring the client's emotions, opinions, values and beliefs about his or her process.

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Supplementary material

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