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Maintenance of Motivation for Lifestyle Change in Adolescents with Overweight Obesity: A 6-Month Follow-Up Study

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Abstract

Obesity prevalence has increased significantly in recent decades, affecting millions of children and adolescents worldwide. This study aimed to evaluate the maintenance of effect of an interdisciplinary intervention based on the transtheoretical model of change and on the motivation for behavior modification in adolescents with overweight and obesity. A total of 135 participants were randomly assigned to a psychoeducational control group (CG) or motivational intervention group (IG). The IG participants showed a significant improvement in the variables of motivation to modify eating habits and practice physical exercise, and self-efficacy and decision-making for weight loss, in comparison to the CG. No significant time or group effect was found for the anthropometric and metabolic variables. The intervention proved to be highly effective for its main outcome and could positively enhance long-term changes in anthropometric variables through modification of lifestyle habits.

Key words: *Obesity, Adolescence, Follow-Up, Transtheoretical Model of Change, Intervention.*

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INTRODUCTION

The prevalence of obesity in childhood and adolescence has risen considerably worldwide, having quadrupled in the last 30 years (World Health Organization, 2017). This condition poses different health risks to individuals, being associated with chronic diseases such as type 2 diabetes mellitus, alterations in blood pressure, and lipid level abnormalities, which are risk factors for the development of cardiovascular diseases (Craig & Love, 2008). In addition, obesity in this population is related to psychosocial difficulties, such as low self-esteem, greater body dissatisfaction, bullying, and mental health problems (Gibson et al., 2017; Yen, Liu, Ko, Wu, & Cheng, 2014). Left untreated, overweight adolescents are more likely to become overweight or obese young adults, with difficulties in survival (Lee et al., 2016; Simmonds, Llewellyn, Owen, & Woolacott, 2016; Singh, Mulder, Twisk, Mechelen, & Chinapaw, 2008). Based on this understanding and an expectation of increasing rates for such conditions, the number of studies focused on possible preventive interventions is increasing.

When considering preventive measures for the development of obesity, various researches point out that results having a better effect and

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longer-term maintenance of such are seen in interventions that involve the environment in which the individual is inserted, as well as different areas of knowledge. Therefore, when considering the complexity of obesity treatment in adolescence, the relevance of multi- or interdisciplinary approaches that address concepts of lifestyle change, healthy eating, promotion of regular exercise, and involvement of the parents or guardians of the young people involved is undeniable, as well as addressing their school environment and adopting effective techniques for the age group (Boff, Liboni, Batista, Souza, & Oliveira, 2016; Lobstein et al., 2015; Nixon et al., 2012; Wang, Wu, & Wilson, 2013).

Different clinical trials have used the techniques of cognitive-behavioral therapy (CBT) and motivational interviewing (MI) as a theoretical basis (Boff et al., 2016; Tsiros et al., 2008), with the purpose of promoting behavioral changes related to a healthy lifestyle. The Basic Attention Notebook nº38 developed by the Brazilian Ministry of Health aims to present strategies for the care and treatment of overweight or obese individuals and places the transtheoretical model (TTM) of change and CBT among the effective interventions (Ministry of Health, 2014), corroborating previous studies.

The TTM was developed by authors Prochaska and DiClemente (1983) with the objective of explaining the phenomenon of behavioral change, understanding this process as being temporal and involving many dimensions (Prochaska, DiClemente, & Norcross, 1992). From this perspective, the TTM has been widely adopted as an approach in weight loss interventions through lifestyle behavioral modifications for the obese adolescent population (Han, Gabriel, & Kohl, 2015; Pirzadeh, Feizi, Ghofranipour, & Mostafavi, 2015; Prochaska, Norcross, Fowler, Follick, & Abrams, 1992).

Follow-up studies are relevant for analyzing the stability and maintenance of intervention results, as well as for understanding the variables that can influence them (Breakwell, Fife-schaw, Hammond, & Smith, 2010). Great variability in outcomes has been observed with regard to maintaining the results of interventions. Some studies have found no significant differences between groups in follow-up for most of the variables associated with modification of obesity-related behaviors (Neumark-Sztainer, Story, Hannan, & Rex, 2003; Singh et al., 2008); some have obtained good results in the short term but these were not maintained (Rohm et al., 2014), while others have found sustained results in the long term (Lloyd-Richardson et al., 2012; Reinehr, Temmesfeld, Kersting, de Sousa, & Toschke, 2007). In addition, a high drop-out rate between post-intervention and follow-up evaluations has been observed (Adam, Westenhoefer, Rudolphi, & Kraaibeek, 2013; Rohm et al., 2014; Susin et al., 2015; Zambon et al., 2008).

Nonetheless, there remain few studies that report follow-up data after the end of interventions, which suggests the need for future research to analyze the maintenance of the intervention effect (Waters et al., 2011). The aim of this study therefore was to evaluate the follow-up results of a TTM-based interdisciplinary intervention on the motivation for behavioral modification in adolescents with overweight and obesity, as well as considering the possible maintenance of the outcome.

METHODS

Study design

This study is part of a bigger research, the MERC Program, developed by an interdisciplinary team. The program protocol, randomization, and techniques are published in the Clinical Trials Registry (NCT02455973) and Brazilian Registry of Clinical Trials (RBR-234nb5), and the present follow-up study was approved by the Research Ethics Committee of the Pontifical Catholic University of Rio Grande do Sul (PUCRS) (n°10/834.1) (Ribeiro et al., 2016). After verifying the eligibility of study participants, the caregivers and adolescents read and signed the informed consent form (ICF).

Eligible study participants were randomly allocated to either a control group (CG) or intervention group (IG). The CG's main objective was to conduct educational actions and engage in discussion with the adolescents regarding factors of health promotion, quality of life and risk, while the IG, in addition to this knowledge stimulation on health issues, used a motivational approach and TTM theoretical basis to develop empowerment and autonomy for change in the adolescents. Both interventions were conducted by psychology, physiotherapy, nursing, and nutrition professionals and comprised of 12 weekly sessions over a 3-month period. In addition, a health education session was directed at the responsible caregivers (Ribeiro et al., 2016).

A flowchart showing the participation of adolescents in the recruitment process and evaluations performed at baseline (t0), post-intervention (t1), and follow-up assessment (t2) can be seen in Figure 1.

Measures

Data were collected at three points in time: baseline (t0), post-intervention re-evaluation (t1), and follow-up (t2).

Sociodemographic data questionnaire

A questionnaire was developed to record the sample profile consisting of questions regarding age, gender, race, schooling, employment status, income, and marital status, among others, and issues related to motivation for lifestyle change.

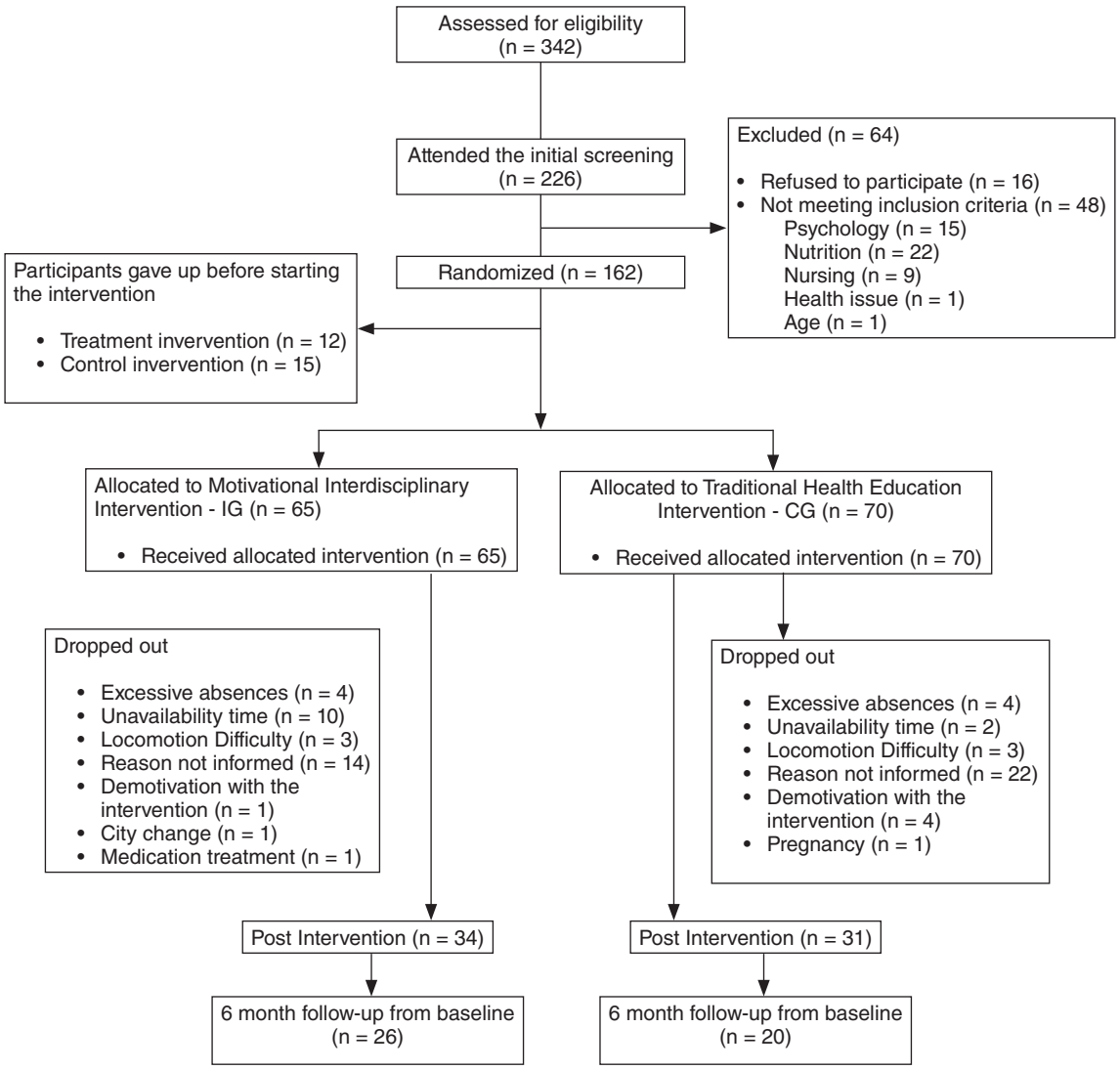
Anthropometric measurements

Anthropometric profile assessment consists of the measurement of body weight, height, and waist circumference. Parameters established by the World Health Organization were adopted for the classification of nutritional status (World Health Organization, 2006). Body weight was measured using a body-weight scale (Cauduro®) with a capacity of 160 kg, duly calibrated, with the participant using the minimum of clothing possible. Height was measured using a Sunny® vertical anthropometer. These figures were used to calculate the body mass index (BMI) of each individual, calculated as weight in kilograms divided by height in meters squared².

Lipid and glucose profile evaluation

Analysis of high-density lipoprotein (HDL), total cholesterol (TC), triglycerides (TG), and glucose was performed by enzymatic reactions with the use of Johnson & Johnson kits (Ortho Clinical Diagnostics), dry chemistry methodology, and a Vitros 750 Autoanalyzer. Low-density lipoprotein (LDL) was

Figure 1. **Flowchart of the participation of adolescents in the recruitment process and evaluations performed at baseline, post-intervention, and follow-up assessment**



established using the formula, LDL = ((TG/5) + HDL) – CT, and insulin resistance (HOMA-IR) was established by the formula, HOMA-IR = fasting glucose × 0.0555 × fasting insulin/22.5.

Psychological and motivational variables

***Readiness-to-change scale* (Velasquez, Maurer, Crouch, & DiClemente, 2001)**

An instrument was developed to evaluate the readiness of an individual to make changes in their lifestyle, for the behaviors set out in the Brazilian Guidelines for the Treatment of Metabolic Syndrome (2005). It consists of two questions that cover frequency and intensity of physical activity and nine questions involving eating behaviors. The individual responds to each item by placing a point on an analogue scale indicating their readiness to change such behavior at that moment in time.

***Exercise self-efficacy scale* (Bandura, 2006)**

This questionnaire comprises of 18 items about situations that could hamper the maintenance of a physical exercise routine, in order to evaluate the strength of an individual's confidence to overcome the challenges they encounter and to continue exercising. The individual responds on a Likert scale of 0 to 100 for each of the items, and the mean of total scores generates a low, moderate, or high self-efficacy rating for the individual. The Brazilian validation for patients with cardiovascular risk is unifactorial and presents an α = 0.97 (Boff, 2012).

***Eating habits self-efficacy scale* (Bandura, 2006)**

A questionnaire composed of 30 items about situations that could hinder the continuance of a healthy eating routine, which aims to evaluate the strength of an individual's confidence to overcome challenges encountered and maintain a diet. The items are answered on a Likert scale of 0 to 100, and the mean of the total scores generates a classification of low, moderate, or high self-efficacy. The Brazilian validation for patients with cardiovascular risk presented three factors: Social Situations (EHSS) (α = 0.93), Physical and Emotional States (EHPES) (α = 0.91) and Generates Craving (EHGC) (α = 0.88) (Boff, 2012).

***Decisional balance for weight loss* (Prochaska et al., 1994)**

A self-report instrument aimed at evaluating how important the aspects are that influence decision-making for weight loss. Composed of 20 items, responses are given using a Likert scale of 1 to 5. The total score obtained represents the importance of the pros and cons in making the decision to lose weight.

Statistical analysis

Quantitative variables are described by mean and standard deviation or standard error, and qualitative variables are described by absolute and relative frequencies. Student's *t*-test and the Mann–Whitney test were used to evaluate the homogeneity of groups at baseline. The comparison between groups at baseline considered the assumption of intention to treat, and a total of 135 participants were included in the analyses performed. Student's *t*-tests for independent samples and the Mann–Whitney U test were used to compare the continuous variables. Pearson's chi-square test and Fisher's exact test were used for the categorical variables.

The generalized estimating equation (GEE) was used for the analysis of variables over time (Costa et al., 2009; Guimarães & Hirakata, 2012). Repeated measures were obtained from follow-up evaluations (baseline, 3 and 6 months). A linear model was applied for variables with a normal distribution and a gamma model for those with asymmetric distribution. The significance level adopted was 5% ($p < 0.05$), and the analyses were performed using the Windows software SPSS v23.

RESULTS

Study population

As presented in Figure 1 flowchart, 135 participants were initially included in the intervention following the first evaluation, of which 65 completed the program of 12 sessions over 3 months, a loss of 70 individuals (51.9% of the sample). At the end of this period, all participants were instructed to re-attend PUCRS after 3 months for a post-intervention reassessment process. Of those participants who completed the intervention, contact was established and a follow-up evaluation was completed for 46 of them, with a further loss of 19 individuals (29.2%). No statistically significant difference was found in the comparison between the groups for the follow-up evaluation ($p = 0.351$). It is important to point out that from the total sample loss, 50 participants belonged to the CG and 26 participants belonged to the IG, suggesting a significantly lower loss in the motivational IG.

The predominant nutritional diagnosis in the study sample of 135 adolescents (mean age 16.4 ± 1.09 years; 100 female (74.1%), 35 male (25.9%)) was obesity (84.4%). The ethnic background of the sample was mainly white (69.6%), brown or mulatto (15.6%), Afro-descendant (11.1%), and the minority group was Asian or indigenous (2.2%).

Table 1. **Effects of the intra- and inter-group interventions**

Variables	Groups				p-value between groups ₸	p-value time effect £	p-value group effect ¥	p-value interaction effect £
	IG (n = 65)		CG (n = 70)					
	Mean	SE	Mean	SE				
Weight (kg)								
Baseline	95.9	2.2	97.0	2.7	0.740			
Re-evaluation	96.8	2.8	94.0	3.7	0.546	0.053	0.814	0.136
Follow-up	98.3	3.3	102.8	5.4	0.472			
BMI (kg/m²)								
Baseline	34.7[a]	0.58	36.0[ab]	0.77	0.199			
Re-evaluation	34.6[a]	0.74	34.7[a]	0.99	0.924	0.034	0.513	0.470
Follow-up	35.2[a]	1.00	36.3[b]	1.30	0.630			
Waist–hip ratio								
Baseline	0.87[b]	0.01	0.89[b]	0.01	0.104			
Re-evaluation	0.83[a]	0.01	0.87[ab]	0.02	0.055	<0.001	0.114	0.514
Follow-up	0.82[a]	0.01	0.83[a]	0.02	0.591			
Glucose								
Baseline	87.6	0.97	87.7	0.95	0.923			
Re-evaluation	87.9	1.27	85.1	1.53	0.148	0.512	0.635	0.202
Follow-up	86.7	1.39	87.6	1.46	0.664			
HDL								
Baseline	48.5	1.64	49.7	1.82	0.613			
Re-evaluation	50.3	2.34	52.8	3.64	0.561	0.383	0.328	0.654
Follow-up	47.3	2.29	52.6	4.01	0.249			
LDL								
Baseline	94.0[a]	2.99	95.9[b]	3.72	0.699			
Re-evaluation	86.9[a]	4.81	80.3[a]	5.13	0.350	0.005	0.599	0.158
Follow-up	86.8[a]	7.29	100.1[b]	6.89	0.182			
Total cholesterol								
Baseline	161.1[a]	3.81	165.2[b]	4.16	0.462			
Re-evaluation	154.9[a]	5.13	150.9[a]	6.04	0.616	0.021	0.386	0.176
Follow-up	154.1[a]	8.33	171.2[b]	8.56	0.151			
Insulin resistance*								
Baseline	72.2[a]	5.43	85.4[b]	5.98	0.104			
Re-evaluation	79.3[a]	7.83	69.3[a]	5.96	0.311	0.426	0.334	0.004
Follow-up	68.2[a]	14.1	99.3[b]	17.6	0.168			
Motivation to exercise								
Baseline	6.17[a]	0.30	6.69[a]	0.24	0.177	<0.001	0.755	0.211
Re-evaluation	8.19[b]	0.31	8.11[b]	0.32	0.861			
Follow-up	8.34[b]	0.44	7.55[ab]	0.58	0.279			
Motivation to eat								
Baseline	6.45[a]	0.24	7.05[a]	0.21	0.055	<0.001	0.300	0.419
Re-evaluation	7.83[b]	0.24	7.87[b]	0.31	0.924			
Follow-up	7.43[b]	0.38	7.71[b]	0.33	0.584			
DB difference between pros and cons*								
Baseline	1.55[a]	0.09	1.59[a]	0.09	0.772			
Re-evaluation	1.62[a]	0.13	2.00[b]	0.17	0.067	0.004	0.927	0.016
Follow-up	2.16[b]	0.15	1.74[ab]	0.18	0.068			
SE physical exercise*								
Baseline	53.8[a]	2.66	51.9[a]	2.65	0.605			
Re-evaluation	56.6[a]	4.17	68.8[b]	4.04	0.036	<0.001	0.491	0.024
Follow-up	63.2[a]	5.27	62.6[ab]	5.81	0.942			
SE EHSS*								
Baseline	44.1[a]	2.80	48.3[a]	3.10	0.307			
Re-evaluation	51.1[a]	4.27	64.3[b]	4.51	0.034	<0.001	0.441	0.016
Follow-up	60.3[b]	4.44	53.3[a]	5.92	0.347			
SE EHPES*								
Baseline	48.9[a]	2.75	50.2[a]	3.12	0.755			
Re-evaluation	54.7[a]	3.95	66.5[b]	4.44	0.046	0.001	0.627	0.038

(*Continued*)

Table 1. **(**continued**)**

Variables	Groups				p-value between groups ₸	p-value time effect £	p-value group effect ¥	p-value interaction effect £
	IG (n = 65)		CG (n = 70)					
	Mean	SE	Mean	SE				
Follow-up	57.4[a]	4.50	51.7[a]	5.82	0.436			
Baseline	51.3[a]	3.07	54.9[a]	3.02	0.411			
Re-evaluation	59.4[b]	3.58	69.9[b]	3.98	0.049	<0.001	0.595	0.043
Follow-up	57.2[ab]	4.47	51.4[a]	5.76	0.428			
SE EH mean*								
Baseline	44.4[a]	3.40	51.1[a]	5.87	0.326			
Re-evaluation	55.7[b]	4.24	66.1[b]	5.64	0.142	<0.001	0.537	0.046
Follow-up	57.2[b]	4.47	51.4[a]	5.76	0.428			

[a,b,c]Equal letters do not differ following the least significant difference (LSD) test at 5% significance.
Underwent log transformation with the use of gamma distribution model.
DB: decisional balance; SE EHSS: self-efficacy to regulate eating habits in social situations; SE EHPES: self-efficacy to regulate eating habits in the face of obstacles related to physical and emotional states; SE EHGC: self-efficacy to regulate eating habits in situations that generate craving; BMI: Body Mass Index; HDL: high-density lipoprotein; LDL: Low-density lipoprotein.

The predominant socioeconomic level according to the Brazilian socioeconomic classification was class B (51.1%), and 63% of participants had completed or were still in high school at the time of evaluation.

Evaluation results

Table 1 presents the results of the anthropometric, metabolic, and psychological variables of the study evaluations, discussed in the text throughout the article.

Anthropometric and metabolic results

No significant interaction effect was observed when evaluating the anthropometric variables, demonstrating the behavior of both groups to be similar throughout the follow-up. However, some significant time effects can be seen. Considering BMI ($p = 0.034$), no significant change over time was found in the IG, whereas there was a significant increase from t1 to t2 in the CG, while remaining stable in the IG. In relation to waist–hip ratio ($p < 0.001$), the IG showed a significant reduction at the revaluation point, and this was maintained at t2, while the reduction in the CG was only significant at t2.

When analyzing the metabolic variables, a significant time group interaction effect was found for fasting insulin ($p = 0.015$) and insulin resistance ($p = 0.004$). No significant change over the course of the follow-up was observed for these two variables in the IG; however, in the CG, a significant reduction was seen when re-evaluated at the end of the intervention, which increased significantly at follow-up, returning to baseline levels. No significant interaction effect between group and time was apparent for the other variables. However, there was an isolated time effect for LDL ($p = 0.005$) and total cholesterol ($p = 0.021$). For both variables, no significant change was found in the IG over the follow-up, and a significant reduction occurred in the CG at re-evaluation, returning to baseline levels by t2.

Results of psychological variables

No statistically significant interaction effect was found when examining the motivational scales for improving eating habits and physical exercise; however, there was an isolated time effect ($p < 0.001$). There was a significant increase in motivation in both groups for these behavioral changes at t1 and was maintained at t2. When evaluating the decisional scale to lose weight or not, an interaction effect was observed between group and time ($p = 0.016$); there was a significant increase for the IG at t2 and for the CG at t1.

Evaluation of self-efficacy to keep practicing physical activity and follow a diet in the face of obstacles showed a significant interaction effect for all variables ($p < 0.05$). No significant change for physical exercise was seen in the follow-up for the IG, while there was a significant increase in the CG at t1. For the self-efficacy to regulate EHSS, the IG presented a significant increase at t2, while the CG presented a significant increase at t1, but returning to baseline levels at follow-up. When assessing self-efficacy to regulate eating habits in the face of obstacles related to physical and emotional states (EHPES), no significant change was noted throughout the follow-up for

the IG, whereas there was a significant increase in the CG at t1, which decreased to baseline levels at t2. In both groups, there was a significant increase at the reevaluation in the self-efficacy variable regulating eating habits in situations that generate craving (EHGC); however, there was a significant reduction in the CG at t2. In the general evaluation regarding the ability of the adolescents to stay on a diet (EH mean), there was a significant increase in the IG at t1 that was maintained at t2, while a significant increase occurred in the CG at t1 only.

DISCUSSION

The application of the MERC Program had statistically significant results linked to the dimensions that make up behavioral change according to the TTM, in that the adolescents showed great advances in psychological variables, which are considered the most relevant for long-term improvement and are the desired primary outcome in this study. The main result of this study pertains to variables related to motivation for behavioral change. Motivation is seen as a necessary first step towards this change (Deci & Ryan, 2000; Ryan & Deci, 2006; Thomas Reinehr, 2011), and studies indicate this concept as being an important predictor of long-term practice of physical exercise (Teixeira et al., 2015; Young, Plotnikoff, Collins, Callister, & Morgan, 2015). In terms of motivation for behavioral change, a growing rise in motivation rates to increase the practice of exercise was observed in both groups and an improvement in eating habits over time. However, the IG mean scores maintained constant growth in the Motivation Scales pertaining to change, suggesting that the intervention was effective in stimulating intrinsic motivators, with these being the personal internal factors of the individual. Based on the MERC Program proposal to focus on motivation and understanding that such a variable defines behavioral change in the long term, the results suggest the IG participants are more motivated and have progressed further in the stages of readiness for change.

In relation to the decision-making process for weight loss, the MERC Program presented significant interaction results between group and time, in a way that IG participants showed continuous growth in the evaluation of importance of actually losing weight, observing more harm than benefits in staying as they were (2.16), in relation to the CG (1.74). The TTM points to the Decisional Scale as one of the main conduits for behavioral change, since it can aid in the resolution of health-related problems through conscious decision-making (Prochaska, DiClemente, & Velicer, 1985; Prochaska et al., 1994). Therefore, the MERC Program proved to be effective in its goal of evoking intrinsic motivators for adolescents to evaluate the advantages and disadvantages, which are the most relevant for the maintenance of decision-making.

In a similar way, it is known that confidence in one's own ability to perform an action, which is one of the main mechanisms for executing change, plays an essential role in maintaining diets and regular physical activity (Sanchez, Ferreira, Schneider, & Habigzang, 2015), with this being one of the main constructs addressed in the MERC Program. In this study, the IG participants presented continuous growth in perception of self-efficacy to keep practicing physical exercise, from baseline to t2, a result not observed in the CG. A significant improvement was also seen in the IG adolescents for self-efficacy to regulate eating habits in the face of obstacles related to social situations, and physical and emotional states, as well as situations that can generate cravings. Increased growth in self-efficacy is an important predictor and mediator of success for weight control, regular physical exercise, and long-term eating habits (Kelly et al., 2017; Teixeira et al., 2015), and therefore, it is our understanding that the intervention in this study achieved important success in the goal of preparing the adolescents to face these future obstacles (Armitage et al., 2014; Burke et al., 2015; Choo & Kang, 2015; Parkinson, David, & Rundle-Thiele, 2017).

Due to the developmental stage of the participants and to previous reviews (Al-Khudairy et al., 2017; Rancourt, Thurston, Sonneville, Milliren, & Richmond, 2017), the improvement in anthropometric and metabolic variables was considered a secondary outcome of the MERC Program. Analysis of the anthropometric variables showed an increase in weight and BMI and a decrease in the waist–hip ratio over time in both groups. Even if modifications to regulate eating habits and physical activity have been addressed in the MERC Program, the evidence suggests the adaptation of intervention regarding factors that prevent weight gain, such as homeostatic, environmental, and behavioral processes (Greenway, 2015). Similarly, the metabolic variables did not present improvements, bearing in mind that a series of different variables can influence and have an impact on these results, which were not controlled in the program.

CONCLUSION

This study aimed to evaluate the maintenance of behavioral changes related to lifestyle improvement

in adolescents with overweight and obesity, from a comparison between a TTM-based health intervention with a motivational (IG) and psychoeducational (GC) approach. The intervention proved to be effective in relation to its main outcome, namely the motivation variables for change of eating habits and the practice of exercise, in the evaluation of decision-making for weight loss and in self-efficacy. In addition, it is important to highlight the greater adherence of the adolescents participating in the motivational intervention, which suggests they have a higher level of motivation, a significant factor for subsequent modifications in habit for a healthy lifestyle.

Among the initial limitations of this study is the development of the interventions, which had many similarities in their approach, suggesting a possible methodological reformulation of the Waiting List + IG to better verify possible intervening variables (Al-Khudairy et al., 2017; Berkowitz et al., 2013; Naar-King et al., 2009; Nguyen et al., 2013; Walpole, Dettmer, Morrongiello, McCrindle, & Hamilton, 2013). Furthermore, the groups being conducted by different therapists could be a bias on the outcome.

Another possible drawback could be in only having a 12-week intervention in the view of much of the research (Boff et al., 2016; Carvalho et al., 2015; Choo & Kang, 2015; Kelly et al., 2017; Marchesini et al., 2016; Reinehr, 2017) and the limited number of sessions with the parents. The impact of parental modeling on child and adolescent learning (Armitage et al., 2014) considers the need to conduct an intervention that includes greater contact with those adults responsible for the parental care of participants (Berge & Everts, 2011; Quattrin et al., 2014).

Evaluations for the measurement of food intake modifications and for the practice of physical exercise have not yet been performed. Therefore, it is concluded that future researches for the program should include indicators of diet quality and a cardiorespiratory capacity test to establish a correlation of the data.

Even though the anthropometric and metabolic variables were not the desired outcome of the intervention in this study, an evaluation of the effectiveness of the strategies and skills covered in the MERC Program should be carried out in order to improve the program.

SOURCES OF FUNDING

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DISCLOSURE OF POTENTIAL CONFLICTS

There are no potential conflicts, real or perceived, for any of the named authors while contributing and producing this study.

CLINICAL TRIALS REGISTRY SITE AND NUMBER

MERC is a randomized clinical trial (RCT) carried out in southern Brazil, with approval of the Committee of Ethics in Research of the Pontifical Catholic University of Rio Grande do Sul (CAAE: 36209814.6.0000.5336). The study protocol is registered with the Brazilian Registry of Clinical Trials (RBR-234nb5) and the Clinical Trial Registry (NTC02455973).

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