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Quality-of-life outcomes of a weight management program for adolescents based on motivational interviewing

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ABSTRACT

Objective: To compare motivational interviewing (MI) with conventional care regarding the health-related quality-of-life (HRQoL) of adolescents with overweight/obesity.
Methods: RCT with parallel design, involving two groups: intervention group (MI group [MIG]) and control group (conventional intervention group [CIG]). The intervention included three 30-minute interviews 3 months apart.
Outcome: Change in Pediatric Quality of Life Inventory (PedsQL) scores. A mixed repeated-measures analysis of variance was used to assess group versus time interactions.
Results: Eighty-three participants finished the protocol (82% girls). MIG participants showed a significant average increase (+4.7) on the Psychosocial ($t[41] = -2.388$, $p = .022$, $d = .37$) and Emotional Subscales (+5.1) ($t[41] = 5.733$, $p < .001$, $d = .88$). CIG participants showed a significant average decrease on the Psychosocial (-6.1) ($t[40] = 5.733$, $p < .001$, $d = .90$), Emotional (-14.1) ($t[40] = 7.249$, $p < .001$, $d = 1.13$) and Social Subscales (-3.8) ($t[40] = 3.782$, $p = .001$, $d = .59$) and on the Total Score (–4.4) ($t[40] = 3.535$, $p = .001$, $d = .55$)
Conclusion: MI improved HRQoL among overweight adolescents participating in a weight management program.
Practice implications: MI increases HRQoL and has the potential to benefit weight management programs for adolescents.

1. Introduction

Overweight in adolescence is seen as a crucial public health concern worldwide [1], and being overweight/obese has adverse consequences for health-related quality of life (HRQoL) [2–10]. The World Health Organization defines HRQoL as an individual's quality of life associated with their physical, mental, and social well-being and considers it to be a most relevant outcome [11]. HRQoL has also been identified by the Centers for Disease Control and Prevention as an important outcome and public health goal in pediatric obesity management research [12].

Some studies have shown a progressive deterioration of perceived HRQoL in overweight adolescents during adolescence [3,13,14], which impairs normal development [15,16] and affects the beginning of adult life [17]. Surprisingly, Swallen and colleagues found that only among younger overweight adolescents (aged 12–14 years) did body mass index (BMI) negatively influence HRQoL [18]. However, they did not use a specific measure of HRQoL because their analysis was based on a sample from the National Longitudinal Study of Adolescent Health, which did not have a specific measure of HRQoL. Thus, the authors approximated a specific instrument for HRQoL using one measure of general health, two measures of physical health, two measures of emotional function, and one combined measure of school and social functioning [18]. Impairments in HRQoL in obese pediatric patients are both generic [9] and specifically related to health [6,9].

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Although a prior study showed that a lower HRQoL was related to both a greater number of medical comorbidities and a higher BMI [19], in another study HRQoL and psychological functioning were found to be distinct in terms of relationships with comorbidities and BMI severity [20].

HRQoL may be an important mediator in adolescents' adherence to a weight loss program [21,22], which is one of the key factors for therapeutic success [23,24]. Consequently, there is evidence that behavioral interventions that affect HRQoL are beneficial to adolescents' weight management.

Motivational interviewing (MI) uses a guiding style that encourages individuals to explore and resolve their ambivalence toward personal barriers and incentives to change [25]. MI has been suggested as a promising approach to increase HRQoL in weight loss programs involving adolescents [21]. In contrast to conventional counseling, in which the encouragement of behavior change is based on maximizing perceived risk and emphasizing medical comorbidities related to obesity, MI attempts to minimize resistance and elicits change stemming from patient motivation [25]. This approach seems to be more meaningful for the obese adolescent, corresponding to his or her emotional experience [20]. Nevertheless, although MI was recommended by the American Academy of Pediatrics as an effective counseling method to promote behavior change conducive to a healthier pediatric weight [26], studies analyzing the effects of MI on the HRQoL of overweight adolescents are scarce and the results are inconclusive [21,27,28].

The aim of this study was to evaluate the effects of an MI-based weight management program on the HRQoL of overweight/obese adolescents. It was hypothesized that participants' perceptions of HRQoL would be significantly higher for those included in the program, when compared with a control group.

2. Methods

The IMAGINE Study was a randomized controlled trial with cluster blocked randomization involving obese/overweight adolescents from eight Portuguese public schools.

A cluster design was chosen to prevent contamination effects due to different styles of counseling in adolescents from the same school. As all the clusters were approximately the same size, the cluster-level sample size calculation and statistical analysis were equivalent to an individual-level sample size calculation and statistical analysis, so the latter were applied [29]. Assuming an effect size of d = .78 [30], a power of 80%, and an alpha level of .05, a minimum sample size of 22 participants per group (44 in total) was calculated [31]. Expecting a response rate of 25% [32] and an attrition rate of 75%, in the upper range of values observed in other similar studies [33], 800 participants were randomly selected.

2.1. Participants

The study took place in eight high schools randomly selected from the 47 public schools of Seixal and Almada municipalities (Portugal). The selected schools were randomly allocated to one of the arms of the study (intervention or control) with a 1:1 ratio. The sample was chosen with a cluster blocked randomization in which the cluster unit was the school. The block size was fixed, with 100 participants randomly selected and invited to participate at each school, allowing for stratification of the sample by the schools. All random sequences were attributed by SPSS® software (version 20.0, SPSS® Inc., Chicago, Illinois). The inclusion criteria comprised both of the following: (1) age between 14 and 19 years and (2) overweight/obesity according to World Health Organization BMI standard-deviation (SD) criteria [34]. The exclusion criteria comprised one or more of the following: (1) recent weight loss of 10% or more, (2) pregnancy, (3) breast-feeding, (4) endocrine condition, (5) depression, (6) eating disorder, or (7) cognitive impairment (either of the student or of his or her legal guardian). All students were weighed and measured following standardized procedures during a physical education (PE) class. At each school, 100 students among those who met the inclusion criteria were randomly selected and invited to participate. Those who agreed to participate were assigned to (1) the motivational interviewing group (MIG) or (2) the conventional intervention group (CIG), according to the school to which they belonged. The participants and the PE teachers who made the anthropometric measures and collected the questionnaires were blinded to the allocation, but the interviewers, the dietitian, and the physical activity counselors were not, so that they could provide specific dietetic and exercise counseling.

2.2. Procedures

Both groups participated in three 30-minute individualized and confidential face-to-face counseling sessions, 3 months apart (baseline, at 3 months, and at 6 months), during which lifestyle was discussed. The interviewer of the intervention group was a pediatrician who had received specific training (80 h of theoretical and practical training) with two members of the Motivational Interviewing Network of Trainers (MINT), an international organization of trainers created to promote good practice in the use, research, and training of MI. The MIG participants received a counseling intervention based on the MI principles described by Miller and Rollnick [25]. The interviewers of the control group were a resident in pediatrics and a school health nurse, both of whom had expertise in adolescent counseling but without training in MI. The CIG participants experienced a conventional counseling style, which is directive and provides information, instruction, and advice without active elicitation of interactive discussion. The confidential interviews were complemented with more specific dietetic and physical activity counseling sessions, following a similar style framework. These complementary advice sessions were administered by registered dietitians with experience in working with adolescents and by a PE teacher from the same school as the participant. Dietetic advice was aimed at weight loss and adapted to the age and gender of the participant, following the recommendations of the Dietary Guidelines for Americans 2015–2020 [35]. The physical exercise plan included 60 min daily of moderate to vigorous activity according to the recommendations of the American Heart Association [36]. Apart from the PE classes, which were included in the curriculum of the student, the students were free to practice the recommended additional exercise plan. The dietitians and the PE teachers were trained for the counseling sessions by the research team for 3 h. They were also given continuous support by the research team through face-to-face contact and via telephone and e-mail throughout the intervention. All sessions (the confidential and the advice sessions) took place in the afternoon/evening, after classes, in the school health room or, when that was not possible because of school agenda constraints, in two cultural and sport associations near the school of the participant. Conditions of privacy and confidentiality were always assured. The confidential sessions were audiotaped and coded according to the Motivational Interviewing Treatment Integrity (MITI) manual [37] version 3.1.1. Interrater reliability for the MITI was assessed using two independent coders. A subset of 50 tapes was randomly selected and independently coded by the coders. Interrater reliability was estimated using the intraclass correlation coefficient and evaluated according to the Cicchetti categorization system [38].

The study had a parallel design, and only the counseling style changed between the two groups. The intervention took place from September 2015 to May 2016.

2.3. Instrument

HRQoL was evaluated using the adolescent version of the *Pediatric Quality of Life Inventory* (PedsQL) version 4.0, originally published by Varni, Seid, and Kurtin [39], and later adapted for the Portuguese population by Lima, Guerra, and Lemos [40]. This self-report questionnaire includes 23 items grouped into four subscales: Physical (8 items), Emotional (5 items), Social (5 items), and Academic Functioning (5 items). The results were analyzed using a total score and two subscores or components, Physical Health (comprising the Physical Functioning subscale) and Psychosocial Health (comprising the Emotional, Social, and Academic Functioning subscales). Each item was classified by the participant using a Likert scale from 0 to 4, in which 0 means *never*, 1 means *almost never*, 2 means *sometimes*, 3 means *often*, and 4 means *almost always*. Values were inversely recoded (recoding value = 100 – 25× the value attributed by the participant) to obtain a value for each item equal to 0, 25, 50, 75, or 100. Subscales were computed by the means of the items on each subscale. The HRQoL assessment was applied immediately before the beginning of the intervention and after its end, at 6 months.

2.4. Ethics

Approval to conduct the study was granted by the Ethics Committee of the Medical Academic Center of Lisbon (CAML) and by the Portuguese Committee on Data Protection. The study is registered at the Clinicaltrials.gov database. Both the randomized students and their parents/guardians received letters explaining the purpose of the study and the description of the intervention. The research was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and with the Uniform Requirements for Manuscripts Submitted to Biomedical Journals. Students who agreed to participate provided written assent, and their parents/guardians were asked to sign an informed consent form. The privacy rights of the participants were always guaranteed.

2.5. Statistical analysis

Sample characteristics were described using frequencies (percentages) for categorical variables and means and SDs for continuous variables. Differences in the distribution of socio-demographic characteristics between the two groups (MIG versus CIG) were compared using the χ^2 test for categorical variables and the unpaired *t*-test or Mann–Whitney *U* test for continuous variables. Normality of distributions and homogeneity of variances were evaluated with the Kolmogorov–Smirnov test using the Lilliefors correction and Levene test, respectively. When a possible confounding variable was identified, it was entered into the analysis as a covariate. PedsQL scores were compared by a paired *t*-test. A mixed repeated-measures analysis of variance (ANOVA) was conducted to assess the group (MIG/CIG) versus time (from baseline to follow-up) interaction. For each significant interaction of intervention and time, individual variables were compared, using a paired *t*-test for normally distributed variables and a Wilcoxon signed-rank test for non-normal variables. The Bonferroni correction was used following the univariate tests. Effect sizes were calculated for each ANOVA with eta-squared measures (η^2) and for each *t*-test with Cohen d (*d*) measures. Values of $p < .05$ were considered statistically significant. The data were analyzed using SPSS® software (version 20.0; SPSS® Inc., Chicago, Illinois).

3. Results

Ninety-seven (70 girls [72.2%], 27 boys [27.8%]) of the 800 randomized students (Fig. 1) were included (response rate = 12.1%). Nonrespondents did not differ significantly from the participants with regard to their age, sex, and BMI z-score (Table 1). At the end of the study, 83 participants remained in the intervention (82% of the girls, 93% of the boys). Dropouts were not significantly different from completers in terms of baseline demographic and clinical variables. Baseline characteristics (age, sex, average score for socioeconomic status) did not differ significantly between the two groups except for the BMI z-score (MIG: 1.54 ± .48; CIG: 1.83 ± .28; $p = .001$) and abdominal circumference (MIG: 92.65 ± 11.05; CIG: 99.57 ± 11.45; $p = .006$), which were lower in the MIG (Table 2). These two variables were entered into the analysis as covariates.

The Cronbach alpha values of the PedsQL at baseline and at the end of the study were .889 and .910, respectively.

The intervention coding summary of the proficiency ratings according to the MITI were significantly different between the two groups in terms of the average global rating (MIG: 4.7 ± .31; CIG: 3.2 ± .68; $p < .001$), percentage of MI-adherent behaviors (MIG: 97.0 ± 3.4; CIG: 59.8 ± 16.3; $p < .001$), percentage of open questions (MIG: 78.9 ± 9.6; CIG: 34.2 ± 10.8; $p < .001$), and percentage of complex reflections (MIG: 79.7 ± 6.9; CIG: 42.7 ± 14.9; $p < .001$) (Table 3). Interrater reliability estimates ranged from .61 to .98, i.e., from good to excellent, according to Cicchetti's proposed categorization system [38] (Table 4).

The evolution of the PedsQL Total Score ($p < .001$, $\eta^2 = .205$) and of its Psychosocial ($p < .001$, $\eta^2 = .220$) and Physical ($p = .031$, $\eta^2 = .56$) components depended on the type of intervention (Fig. 2). The evolution of these variables between the baseline and 6 months was significantly different between the two groups (MIG versus CIG; Table 5). With regard to the Psychosocial Component, the evolution of the Emotional ($p < .001$, $\eta^2 = .350$) and Social ($p = .006$, $\eta^2 = .090$) subscales further depended on the type of intervention (Table 5).

The intragroup analysis is shown in Table 6. The Psychosocial Component revealed a significant ($p = .022$) average increase among MIG participants and a significant ($p < .001$) average decrease among CIG participants (+4.7 versus −6.1, respectively). The Emotional Subscale registered a significant ($p < .001$) average increase among MIG participants and a significant ($p < .001$) average decrease among CIG participants (+5.1 versus −14.1, respectively). The Social Subscale showed a nonsignificant ($p = .125$) average increase among MIG participants and a significant ($p = .001$) average decrease among CIG participants (+4.0 versus −3.8, respectively). The Academic Subscale showed a nonsignificant ($p = .074$) average increase among MIG participants and a nonsignificant ($p = .305$) average decrease among CIG participants (+4.1 versus −.5, respectively). The Physical Component showed a nonsignificant ($p = .094$) average increase among MIG participants and a nonsignificant ($p = .129$) average decrease among CIG participants (+2.8 versus −1.2, respectively). The total PedsQL score showed a nonsignificant ($p = .109$) average increase among MIG participants and a significant ($p = .001$) average decrease among CIG participants (+3.2 versus −4.4, respectively).

4. Discussion and conclusion

4.1. Discussion

Positive effects on anthropometric outcomes among MIG participants have already been reported [41]. This article provides additional data on the effect of MI on the quality of life of overweight/obese adolescents participating in a weight management program in a school setting. The MIG participants showed a

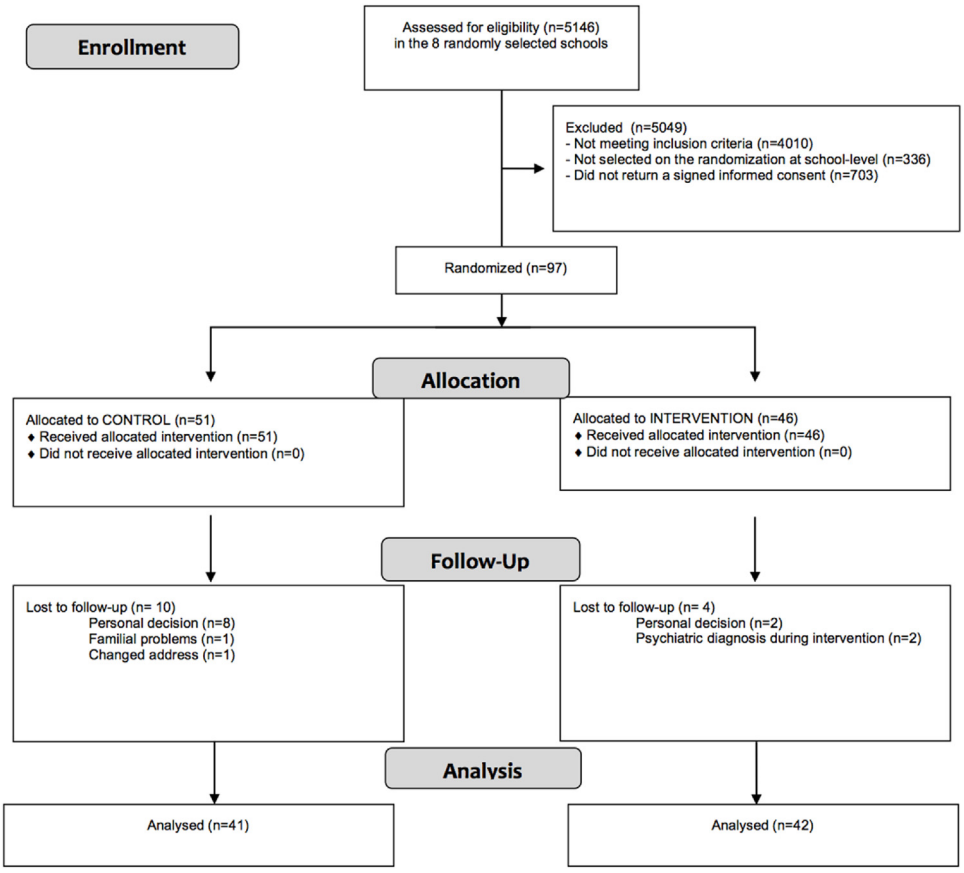

Fig. 1. Title: CONSORT 2010 flow diagram, Description: Study flow diagram.

significant increase in the Psychosocial Component as well as in the Emotional Subscale. The CIG participants showed a significant decrease in the Psychosocial Component, in the Emotional and Social Subscales and in the Total Score.

Previous research has suggested that Emotional and Academic functioning domains are among the least affected by BMI throughout childhood and adolescence, while Physical and Social functioning are highly affected [3,6,7,42]. On the contrary, the participants of this study showed lower scores on the Emotional and Academic Subscales. These different findings may be justified by the older age and treatment-seeking nature of the sample [3].

An internet intervention based on the principles of MI, and aimed at improving HRQoL, showed moderate positive results in a sample of overweight 13- to 15-year-old adolescents [21]. In a study involving an older sample than ours, 45 university students with a BMI $\geq$ 30 kg/m^2, aged 18–24 years, were randomized to receive a telephone-based 12-week intervention that could be based on either MI (MI-via-CALC condition) or a prescriptive program (LEARN Program condition) [28]. Both groups showed favorable results in HRQoL evolution over time, but no group effects or group-by-time interactions were observed. The authors concluded that, while some participants respond well to a dialogue-based, introspective intervention, for others the provision of pertinent educational information accompanied by didactic and specific instructions on how to make changes may be a preferable method [43]. These results must be interpreted bearing in mind that this sample comprised academically differentiated adults, making the conclusions difficult to compare with those from a younger sample.

Research on MI interventions involving parents has shown conflicting results. In the Parent-Led Activity and Nutrition for Healthy Living study, a pilot trial that evaluated an MI intervention delivered only to caregivers, no statistically significant improvements were observed in any of the domains of HRQoL when compared with the control group [27]. Nevertheless, neither the intervention nor the evaluation of HRQoL was aimed at pediatric patients [27]. In another family-based intervention, involving 7- to 17-year-old participants and aimed at physical activity and dietetic modification (the Positively Fit Study), parents and children/adolescents attended separate meetings and reported HRQoL independently. The results indicated clinically significant improvements in parent-reported HRQoL immediately after the intervention and in adolescents' self-reported HRQoL at 12-month follow-up [44]. The better results of the Positively Fit Study could be explained by the characteristics of the intervention and outcome evaluation, allowing for privacy and support of autonomy, which are much appreciated by adolescents.

In our study, MI prevented the decrease in HRQoL observed in the control group. A similar effect was observed in the Young & Active Controlled Trial, a 12-week online program providing

Table 1
Characteristics of respondents and non-respondents.

Characteristic	Respondents (n = 97)	Non-respondents (n = 703)	*p-value*
Age in years (mean ± SD)	15.96 ± 1.30	15.58 ± 1.53	.089
Sex (% male)	30.1%	28.2%	.863
BMI z-score (mean ± SD)	1.65 ± .39	1.68±.42	.249

Table 2
Baseline characteristics of the MIG and the CIG.

Chara Characteristic	MIG (n = 42)	CIG (n = 41)	Test	*p-value*
Age in years (mean ± SD)	16.2 ± 1.49	15.8 ± 1.04	$t(81)$=-1.36	.524
Sex (% male)	33.3%	26.8%	$\chi^2(1)$=.63	.343
BMI z-score (mean ± SD)	1.54 ± .48	1.83±.28	$t(81)$=3.46	.001
Abdominal circumference (mean ± SD)	92.65 ± 11.05	99.57 ± 11.45	$t(81)$=2.80	.006
Average score of socioeconomic status (mean ± SD)				
Mother's job (mean ± SD)	2.8 ± .8	3.0 ± .5	$\chi^2(3)$=4.27	.162
Father's job (mean ± SD)	2.8 ± .6	3.0 ± .4	$\chi^2(3)$=5.86	.116
Mother's education level (mean ± SD)	2.8 ± .8	2.8 ± .5	$\chi^2(3)$=6.79	.056
Father's education level (mean ± SD)	2.8 ± .6	3.0 ± .5	$\chi^2(3)$=4.80	.184
Sources of financial support (mean ± SD)	2.9 ± .8	2.9 ± .5	$\chi^2(3)$=3.94	.202
Neighborhood aspect (mean ± SD)	2.9 ± .8	2.90± .5	$\chi^2(3)$=4.55	.233
Quality of Life subscales (mean ± SD)				
Psychosocial Component (mean ± SD)	71.1 ± .13.1	69.3±.16.8	$t(81)$=-.558	.578
Physical Component (mean ± SD)	80.6 ± 12.3	74.8 ± 15.3	$t(81)$=-1.905	.060
Emotional (mean ± SD)	66.2 ± 18.6	62.4 ± 20.1	$t(81)$=-.882	.380
Social (mean ± SD)	77.0 ± 16.4	76.2 ± 21.8	$t(81)$=-.190	.850
Academic (mean ± SD)	70.2 ± 16.9	69.3 ± 17.3	$t(81)$=-.258	.797
Physical (mean ± SD)	80.6 ± 12.3	74.8 ± 15.3	$t(81)$=-1.905	.060
Total score (mean ± SD)	75.3 ± 14.6	71.4 ± 16.9	$t(81)$=-.966	.337

MIG - Motivational Interviewing Group; CIG - Conventional Intervention Group.

Table 3
Intervention coding summary of proficiency ratings for MIG and CIG according to the MITI.

MITI variables		MIG (n = 42)	CIG (n = 41)	*p-value*
Average global score	Global Rating (mean ± SD)	4.7 ± .31	3.2±.68	<.001
Behavior counts	% of MI adherent behaviors (mean ± SD)	97.0 ± 3.4	59.8 ± 16.3	<.001
	% of open questions (mean ± SD)	78.9 ± 9.6	34.2 ± 10.8	<.001
	% of complex reflections (mean ± SD)	79.7 ± 6.9	42.7 ± 14.9	<.001

Global rating = (evoking + collaboration + autonomy)/3.
MIG - Motivational Interviewing Group; CIG - Conventional Intervention Group; MITI – Motivational Interviewing Treatment Integrity.

tailored physical activity counseling based on principles from Self-Determination Theory and MI [21]. While the HRQoL of the intervention groups increased, the control group showed a decrease in HRQoL [21].

MI has been used in pediatric samples, including adolescents affected by other conditions, such as asthma [45,46] and diabetes mellitus [47], with positive HRQoL outcomes. However, in a program involving stimulation of physical activity in children with cerebral palsy, MI did not show significant positive results with regard to HRQoL, although the authors found some improvement in gross motor capacity, a positive trend in attitude toward sports, and an increase in social participation [48]. It is possible that the difficulties in introspection presented by these patients hampered a more positive outcome.

Self-Determination Theory can provide a theoretical framework for understanding the better results observed in the MIG in our study. MI can foster self-motivated behavior change by facilitating the internalization and integration of the regulation of a new behavior that is more in accordance with the person's own goals, values, and sense of self [49]. This process is promoted by the style of MI, as well as its specific strategies, which provide contextual support for the needs of competence, autonomy, and relatedness [49].

The current study has several strengths, including the fidelity of the intervention, which was monitored with audio recordings and MITI coding of the sessions; high retention rates; the tailored format of the intervention; and the school setting, which facilitated participants' accessibility.

Some limitations were identified. These include the fact that most participants were female and recruited from an urban community, which may limit the generalization of our findings. Further research should study the benefits of MI versus conventional counseling in a male adolescent population. Another limitation is the absence of long-term follow-up. Future studies should assess whether our positive results can be sustained over time. The MI intervention was delivered by only one person, which may also limit the generalization of the results. Future research should include several interviewers using MI to evaluate whether the results are person-specific. Another possible limitation was the

Table 4
ICC for each item of the MITI scores.

MITI scores	ICC
Global Scores	
Evocation	.80
Collaboration	.83
Autonomy/ supportive	.85
Direction	.77
Empathy	.72
Behaviour counts (average)	
Providing information	.86
MI adherent	.78
MI non-adherent	.61
Closed questions	.98
Open questions	.96
Simple reflections	.83
Complex reflections	.66

ICC - Intra-class correlation coefficients; MITI - Motivational Interviewing Treatment Integrity.

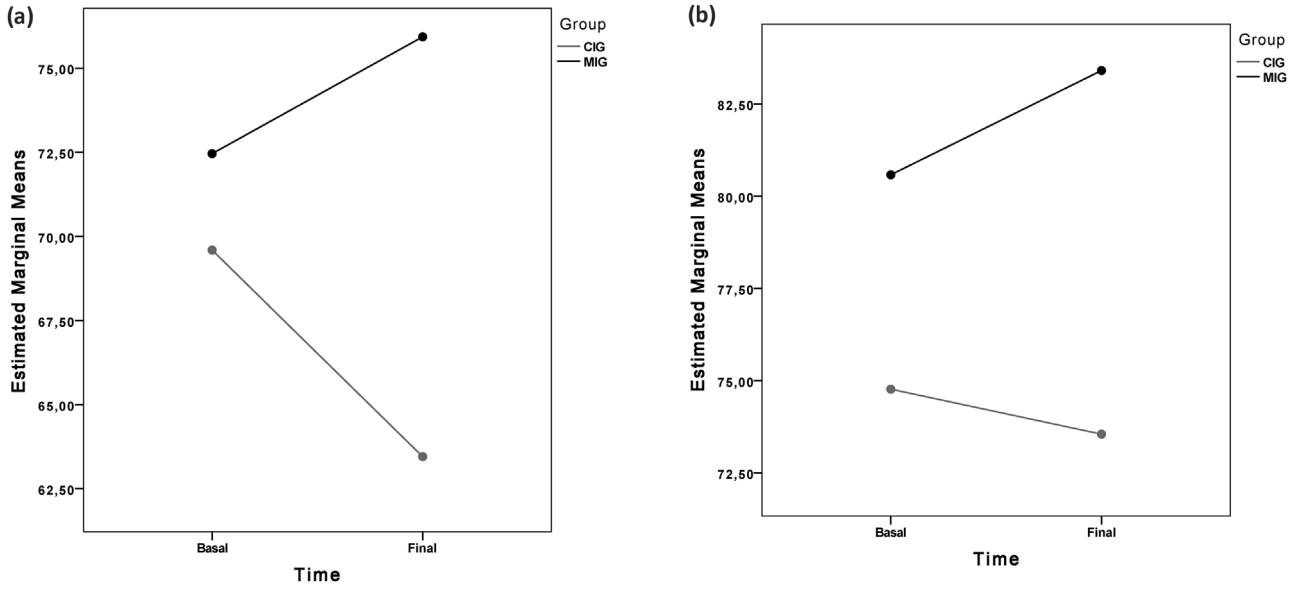

Fig. 2. Title: Estimated marginal means of Psychological and Physical Components of the PedsQL. Description: Estimated marginal means of (a) Psychosocial Component of the PedsQL and (b) Physical Component of the PedsQL.
Footnotes: PedsQL - Pediatric Quality of Life Inventory; MIG - Motivational Interviewing Group; CIG - Conventional Intervention Group.

Table 5
F values of time versus group and time effects on motivational scores of MIG and CIG.

	MIG		CIG		F-value	
PEDsQL	Basal	Final	Basal	Final	Time*Group	Time
Psychosocial Component	71.2 ± 13.1	75.9 ± 13.2	69.3 ± 16.8	63.2 ± 16.5	22.877***	.365
Physical Component	80.6 ± 12.3	83.4 ± 13.1	74.8 ± 15.3	73.6 ± 16.5	4.831*	.763
Emotional Subscale	66.2 ± 18.6	71.3 ± 17.7	62.4 ± 20.1	48.3 ± 19.5	43.711***	9.597**
Social Subscale	77.0 ± 16.4	81.0 ± 16.8	76.2 ± 21.8	72.4 ± 22.8	8.012**	.003
Academic Subscale	70.2 ± 16.9	74.3 ± 16.4	69.3 ± 17.3	68.8 ± 17.8	2.367	1.458
Physical Subscale	80.6 ± 12.3	83.4 ± 13.1	74.8 ± 15.3	73.6 ± 16.5	4.831*	.763
Total score	75.3 ± 14.6	78.5 ± 11.8	71.4 ± 16.9	67.0 ± 15.1	20.940***	.092

MIG - Motivational Interviewing Group; CIG - Conventional Intervention Group.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 6
Intragroup analysis of the evolution of PedsQL scores in MIG and CIG.

	MIG					CIG				
PEDsQL	Basal	Final	*t*	*p*	*d*	Basal	Final	*t*	*p*	*d*
Psychosocial Component	71.2 ± 13.1	75.9 ± 13.2	−2.388	.022	.37	69.3 ± 16.8	63.2 ± 16.5	5.733	<.001	.90
Physical Component	80.6 ± 12.3	83.4 ± 13.1	−1.714	.094	.26	74.8 ± 15.3	73.6 ± 16.5	1.551	.129	.24
Emotional Subscale	66.2 ± 18.6	71.3 ± 17.7	5.733	<.001	.88	62.4 ± 20.1	48.3 ± 19.5	7.249	<.001	1.13
Social Subscale	77.0 ± 16.4	81.0 ± 16.8	−1.567	.125	.24	76.2 ± 21.8	72.4 ± 22.8	3.782	.001	.59
Academic Subscale	70.2 ± 16.9	74.3 ± 16.4	.033	.074	.01	69.3 ± 17.3	68.8 ± 17.8	1.040	.305	.16
Physical Subscale	80.6 ± 12.3	83.4 ± 13.1	−1.714	.094	.26	74.8 ± 15.3	73.6 ± 16.5	1.551	.129	.24
Total score	75.3 ± 14.6	78.5 ± 11.8	−1.636	.109	.25	71.4 ± 16.9	67.0 ± 15.1	3.535	.001	.55

MIG - Motivational Interviewing Group; CIG - Conventional Intervention Group.

use of BMI z-scores instead of BMI or BMI percentiles. Although the effect estimates provided by the change in BMI z-scores are difficult to interpret and have been argued to be less powerful than the changes in the raw values of BMI or in BMI percentiles in longitudinal studies [50–52], a recent study showed that the measures demonstrate little difference in the tracking of adiposity change, except in severely obese adolescents [53]. In addition, BMI z-scores are dimensionless values that are used for comparisons across indicators and populations, especially when participants are adolescents of different ages and genders undergoing rapidly changing trajectories in their BMI [54].

4.2. Conclusion

Our results support the finding that MI is a promising tool for improving HRQoL (particularly in its Emotional and Social Subscales) among overweight/obese adolescents participating in a weight management program. The school is a good setting in

which to apply MI interventions aimed at improving HRQoL in adolescents with obesity and overweight.

4.3. Practice implications

MI increases HRQoL and has the potential to benefit weight management programs targeting the adolescent population. School health care could include MI sessions to improve the HRQoL of students with obesity and overweight.

Author contributions

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Conflicts of interest

None.

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I confirm that all personal identifiers have been removed or disguised so the persons described are not identifiable and cannot be identified through the details of the story.

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