Motivational Interviewing With Parents for Obesity: An RCT

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abstract

BACKGROUND AND OBJECTIVE: Motivational interviewing (MI) has been shown to be an effective strategy for targeting obesity in adolescents, and parental involvement is associated with increased effectiveness. The aim of this study was to evaluate and compare the role of parental involvement in MI interventions for obese adolescents.

METHODS: A total of 357 Iranian adolescents (aged 14–18 years) were randomized to receive an MI intervention or an MI intervention with parental involvement (MI + PI) or assessments only (passive control). Data regarding anthropometric, biochemical, psychosocial, and behavioral measures were collected at baseline and 12 months later. A series of intention-to-treat, 2-way repeated-measures analysis of covariance were performed to examine group differences in change in outcomes measures over the 12-month follow-up period.

RESULTS: Results revealed significant effects on most of the outcome parameters for MI + PI (eg, mean ± SD BMI z score: 2.58 ± 0.61) compared with the passive control group (2.76 ± 0.70; post hoc test, P = .02), as well as an additional superiority of MI + PI compared with MI only (2.81 ± 0.76; post hoc test, P = .05). This pattern was also shown for most of the anthropometric, biochemical, psychometric, and behavioral outcome variables.

CONCLUSIONS: MI with parental involvement is an effective strategy in changing obesity-related outcomes and has additional effects beyond MI with adolescents only. These findings might be important when administering MI interventions in school settings.

WHAT'S KNOWN ON THIS SUBJECT: Motivational interviewing (MI) has been found to increase the effectiveness of weight loss programs in obese children and adolescents. Although parental involvement seems to be linked to its effectiveness, strong conclusions cannot be drawn.

WHAT THIS STUDY ADDS: The present study found that MI with parental involvement is an effective strategy in changing obesity-related outcomes and has additional effects beyond MI with adolescents only. These findings are important when administering MI interventions in school settings.

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Childhood obesity is a global health concern, and many obese adults were obese during childhood.[1,2] Almost 10% of school-aged children worldwide are obese, and >60% of European children are overweight.[3,4] In developing countries, childhood obesity is also reaching critical levels.[5] In Iran, obesity among children and adolescents ranges from 7.1% to 12%.[6,7] Childhood obesity increases complications such as skeletal/joint problems, social and mental health issues due to stigmatization, and reduced self-esteem.[8,9] Prediabetes, hyperglycemia, and sleep apnea are increasingly prevalent among obese children.[8,10] The prevention and treatment of obesity in children are priorities for public health worldwide.

Behavioral interventions targeting changes in physical activity and diet are effective for weight loss.[11,12] Nearly 80% of pediatricians report frustration with modifying children's obesity, however.[13] Patient motivation is associated with program adherence and predicts weight reduction.[14] Including brief motivational techniques such as motivational interviewing (MI) in weight control interventions increases effectiveness.[15,16]

MI is a client-centered clinical method to facilitate behavioral change.[17] Originally developed as an intervention for addictive behaviors, MI is applied to a multitude of behavior change contexts.[18] As part of MI, the participants' readiness to change is assessed and guides the discussions. The core principles of MI are: expressing empathy, developing a discrepancy, rolling with resistance, and supporting self-efficacy.[18,19] MI invites participants to indicate their feelings, thoughts, and ambivalence about change, and it helps reaching decisional balance.[17,20] Compared with other approaches such as education and nonspecific counseling, MI has been found to improve health behaviors and outcomes.[19]

Parental involvement in MI interventions[21] can improve the effectiveness of school-based health programs. In a recent meta-analysis of MI interventions for health behavior change in adolescents, the overall effect size (Hedges' g) compared with other active treatment or no treatment was 0.28 (37 studies). Obesity interventions had a smaller effect size (g = 0.15; 12 studies). Regarding the intervention target/recipient,[22] MI studies targeting both the adolescent and parent yielded the largest effect sizes (g = 0.59) and were more effective than conducting MI with either parent (g = 0.27) or child (g = 0.26) individually.[23]

Although parental involvement is linked to effectiveness, conclusions about the appropriate intensity cannot be drawn due to the small number of studies and inconsistent results.[24,25] Parenting skills (generic and specific to lifestyle behavior) were frequently present in effective weight control interventions,[24] and indirect methods to engage parents were commonly used, although direct approaches were more likely to result in positive outcomes.[24,26]

Parental involvement requires further investigation with the use of randomized controlled trial (RCT) designs.[23] Although meta-analytical differences in effect sizes favor parental involvement, no existing RCT studies compare >2 of the 3 target groups (eg, MI, MI + PI, control) in the same trial experimentally.[23,27–29]

The goal of the present RCT was to evaluate the effectiveness of an MI weight loss intervention for obese adolescents including parental involvement (MI + PI) versus MI without parental involvement (MI only) and a passive control group over a period of 12 months. We hypothesized that MI + PI would be effective in changing BMI and other relevant outcomes compared with a control condition. We further hypothesized that MI + PI would be superior in changing weight loss outcomes compared with MI only.

METHODS

Participants and Recruitment

Obese adolescents (ie, BMI ≥95th percentile for age and gender[30]) between 13 and 18 years of age were recruited from a local outpatient pediatric clinic in Qazvin, Iran. Exclusion criteria were taking weight-related medication, having a diagnosis of an eating disorder, being pregnant, and having clinical mental health conditions or psychosis. Eligible adolescents lived with a parent or adult caregiver who was prepared to be involved in treatment.

Study Design

The present study included a prospective RCT design in which patients were randomly assigned to a control group, MI with parental involvement, or MI without parental involvement (Fig 1). Anthropometric, biochemical, psychosocial, and behavioral measures were obtained at baseline and 12 months later.

All participants provided written informed consent; parental assent was also requested for adolescents aged <16 years. The ethics committee of the Qazvin University of Medical Sciences approved the study. A total of 409 adolescents were recruited between February 2011 and April 2013.

Power Analysis and Randomization Procedure

The sample size was calculated based on previous studies considering an effect size of 0.47, a power of 95%, and an α level of .05.[31] Assuming a dropout rate of 15%, a sample size of 136 participants per condition was estimated.

To ensure adequate concealment of allocation, a research coordinator performed the randomization procedure by using a computer-generated

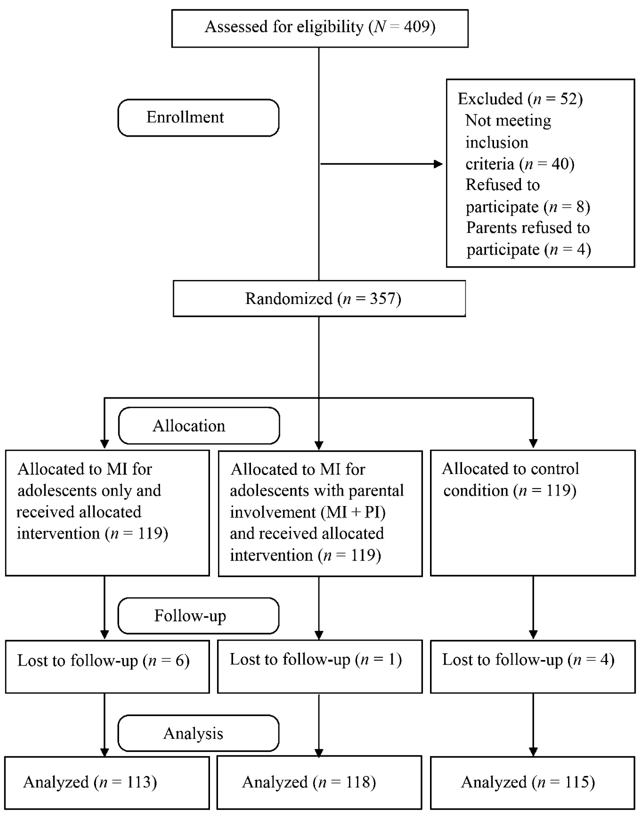

FIGURE 1
Flow chart of participants according to the Consolidated Standards of Reporting Trials.

randomization schedule/sequence (SPSS version 17.0, IBM SPSS Statistics, IBM Corporation, Armonk, NY). After recruitment and consenting procedures were completed, baseline data were collected, and a research coordinator assigned adolescents randomly to the 3 groups: control (n = 119), MI (n = 119), and MI + PI (n = 119). Adolescents could not be blinded to intervention allocation. Anthropometric measures at baseline and 12 months after randomization were taken by 2 assessors blinded to group allocation.

Intervention Groups

The MI intervention component targeted improved eating and physical activity behavior. The adolescents were encouraged to eat a variety of foods from each of the 4 major food groups and low-fat alternatives.[32] They were also encouraged to achieve at least 60 minutes of moderate to vigorous intensity physical activity daily as recommended by the World Health Organization[33] (Supplemental Appendix).

MI Group With Parental Involvement

All sessions were delivered by 2 trained interventionists at the same time; each interventionist had different expertise (ie, registered dietitian and exercise specialist). All participants in the interventional groups attended pediatric clinics and received the weekly sessions lasting for 40 minutes. Both intervention groups received identical MI sessions (Supplemental Appendix). However, parents or guardians of participants from the MI + PI group (n = 119) received 1 additional session with >60 minutes in the clinic delivered by the same 2 interventionists at the end of the 6 sessions. An identical MI style was used for parents, focusing on the adolescents' weight, parents' attitudes and behaviors regarding children's physical activity and dietary habits, parent monitoring, and supervision; the goal was to promote progress toward the child's intervention goals and attitudes by the parents.

MI Integrity

All MI sessions were audiotaped and quality checked by using the Motivational Interviewing Treatment Integrity (MITI) instrument.[34] Twenty-five percent of the interviews were selected randomly and assessed by 2 trained evaluators. The MITI has 2 components: global scores and behavior counts. Five global dimensions are rated on a 5-point Likert scale ranging from 1 (low) to 5 (high): evocation, collaboration, autonomy/support, direction, and empathy. A behavior count requires the coder to tally instances of particular interviewer behaviors, including providing information, MI-adherent behavior, MI-nonadherent behavior, simple reflections, complex reflections, and open and closed questions. In addition to the aforementioned scores, summary scores were computed as the following; global spirit rating (evocation + collaboration + autonomy/support)/3, percent complex reflections (number of complex reflections/number of total reflections) × 100, percent open questions (number of open questions/ number of total questions) × 100, reflection-to-question ratio (number of total reflections/number of total questions) × 100, and percent MI-adherent (number of MI-adherent statements/number of MI-adherent and MI-nonadherent statements) × 100. As recommended according to the MITI, summary scores have applications for therapy coding. For ease of interpretation, we report summary scores for determining competence in MI.

The mean ± SD scores were as follows: percent MI-adherent, 91.51 ± 16.12; percent open questions, 58.61 ± 13.20;

percent complex reflections, 49.37 ± 15.42; reflection-to-question ratio, 1.12 ± 0.38; and global spirit rating, 3.82 ± 1.03. All scores were above proficiency according to the MITI recommendation, with the exception of the percent complex reflections, which was slightly below proficiency.[34]

Measures

Primary outcomes were changes in BMI, the Child Dietary Self-Efficacy Scale (CDSS), the Weight Efficacy Lifestyle questionnaire (WEL), the Physical Exercise Self-Efficacy Scale (PES), and self-reported physical activity and diet. Secondary outcomes were changes in anthropometric measures, cholesterol, triglycerides, and body fat. All outcomes were assessed by 2 blinded and trained physicians. The blinded assessors passed a series of training courses for testing and interviewing according to the standard program protocol. Interrater reliability and interrater reliability were checked for both assessors before conducting the study.

Child Dietary Self-Efficacy Scale

The CDSS is a 15-item tool assessing dietary self-efficacy among children between 7 and 10 years of age. The measure begins with stems such as "How sure are you ...."[35] Responses are gathered on a 3-point Likert scale, ranging from "not sure" to "very sure." Responses ranged from –15 to 15, with higher scores indicating higher dietary self-efficacy. The CDSS had high internal consistency (α = .90).

Weight Efficacy Lifestyle Questionnaire

The WEL is a 20-item tool assessing adolescents' confidence in their ability to lose weight. Items are scored on a 10-point Likert scale, ranging from 0 (not confident) to 9 (very confident), and items scores were averaged. The WEL is valid and reliable in weight management research.[36] The WEL had high internal consistency (α = .88). Psychometric properties of the Persian version of the WEL were assessed in Iranian adolescents, and the WEL was found to be a highly valid and reliable instrument.[37]

Physical Exercise Self-Efficacy Scale

Adolescents' confidence in their ability to perform physical activity was measured by using the PES, a 5-item tool with responses scored on a 4-point Likert scale ranging from 0 (uncertain) to 9 (very certain). Cronbach's α for the PES was 0.92.

Diet

Diet was measured by using the Youth Adolescent Food Frequency Questionnaire (YAQ). The YAQ assesses diet among children and adolescents (aged 9–18 years) and is based on intake over the past year; it is valid and reliable against the 24-hour dietary recall adolescent populations.[38] The YAQ has 152 items and takes ~20 to 30 minutes to complete. The types and amounts of food consumed during the past 12 months were reported, and total energy intake (in kilocalories), total dietary fat, saturated fat, and servings per day of fruits, vegetables, snacks and desserts, milk, nondiet soda, and fried foods were analyzed. The Persian version of the YAQ was found to be valid and reliable for use in Iranian adolescents (A.H.P., Saffari M, Chen H. Psychometric evaluation of the Persian version of the Youth/Adolescent Questionnaire [YAQ] in Iranian obese adolescents, submitted manuscript).

Physical Activity

Physical activity was assessed by using a 7-day physical activity recall interview. This semi-structured interview is used to estimate an adolescent's time spent in physical activity, his or her strength, and flexibility activities for the 7 days before the interview. The total score for the physical activity recall interview was computed by using hours spent in physical activities of moderate, hard, and very hard intensity. To estimate participants' energy expenditure (in kilocalories), the time spent in each activity for the past 7 days are multiplied by an intensity factor (1.5 for light intensity, 4 for moderate intensity, 6 for hard intensity, and 10 for very hard intensity).[39] The validity and reliability of the Persian version of the questionnaire have been well documented.[40]

Objective Physical Activity

Objective physical activity was measured by using a GT3× monitor (ActiGraph LLC, Pensacola, FL), which is a 1-dimensional piezo-electric accelerometer. The GT3× is a light, small device that is a valid and reliable tool to assess physical activity.[41] Due to financial restrictions, only 25 randomly selected adolescents in each group (n = 75) provided accelerometer data. Accelerometers were worn on the right hip for 7 days continuously except during showering or swimming. Adolescents who wore the device <8 hours per day or 4 days per week were excluded from the analysis. Sixty adolescents (~20 adolescents in each group) wore the device as instructed.

Pediatric Quality of Life Inventory

Quality of life was assessed by using the Pediatric Quality of Life Inventory 4.0 Short Form 15 (PedsQL 4.0 SF15). The PedsQL 4.0 SF15 has 15 items covering 4 dimensions: the physical functioning scale (5 items), the emotional functioning scale (4 items), the social functioning scale (3 items), and the school functioning scale (3 items). The physical health summary score is the same as the physical functioning scale, whereas the psychosocial health summary score is computed by the mean items of the emotional, social, and school functioning subscales. Items are reverse scored and linearly transformed to a scale of 0 to 100, with higher scores indicating better quality of life. A recent study supports the feasibility, reliability, and validity of the Iranian version of the PedsQL 4.0 SF15 among Iranian children and adolescents.[42]

Anthropometric, Body Composition, and Biologic Measurements

All clinical measures were performed at baseline and at a 12-month follow-up. Serum triglyceride and total cholesterol levels were assessed by using an autoanalyzer (Hitachi 704, Boehringer Mannheim, Mannheim, Germany).

Height for both adolescents and parents was measured to the nearest 0.1 cm after removing shoes. Height was measured by using a stadiometer (Seca Model 207, Seca, Hamburg, Germany).Weight for adolescents and parents was also measured to the nearest 0.1 kg on calibrated digital scales. BMI was calculated by dividing body weight by squared height in meters. As recommended by the World Health Organization, the growth reference chart based on *z* scores provides useful information on young people's nutritional status and growth. A BMI *z* score or SD score indicates how many units (of the SD) a child's BMI is above or below the average BMI value for his or her age group and gender.[43] The BMI percentile was calculated according to the Centers for Disease Control and Prevention's age- and gender-specific reference norms.[30]

Waist circumference was measured midway between the lowest rib and the superior border of the iliac crest with an inelastic measuring tape at the end of normal expiration to the nearest 0.1 cm.

Percentage of body fat was measured by using the dual-energy x-ray absorptiometry (DXA). The DXA is a valid measure that provides a more accurate assessment of body composition than body weight alone. To further assess the adiposity of the adolescents, a bioelectrical impedance analysis (BIA) was conducted. The BIA has been widely used to estimate body composition with simple, quick, and noninvasive technology.[44] Despite a considerable correlation between DXA and BIA in adult studies,[45,46] results of pediatric studies have shown that these methods cannot be used interchangeably for body fat measurements.[47,48]

Demographic and Socioeconomic Factors

Information on age, gender, monthly household income, and father's and mother's education was gathered via self-report.

Statistical Analysis

A series of intention-to-treat, 2-way repeated measures analysis of covariance were performed with intervention (ie, MI only, MI + PI, control) as the between-subject variable, time (pre–post) as the within-subjects variables and age, gender, and education of the father to examine group differences in change in physical activity, diet patterns and weight over the 12-month follow-up period. Paired *t* tests with Bonferroni adjustment were adopted for the post hoc analysis. Between-group effect size was calculated by using partial η squared. A P value of $<.05$ was considered statistically significant.

RESULTS

Descriptive statistics are shown in Table 1. Of the original 119 adolescents enrolled in each group, 113, 118 and 115 participants for the MI, MI + PI, and control groups, respectively, completed the 12-month assessment. Dropouts were not significantly different from completers on any baseline demographic or clinical variable.

A total of 357 obese adolescents participated in the study. The mean age in each group was 15.59, 15.57, and 15.78 years for the MI, MI + PI, and control groups, respectively. There were no significant differences between the 3 groups in terms of sociodemographic characteristics and anthropometric measurements at baseline.

We hypothesized (hypothesis bloc 1) that MI + PI would be effective in changing relevant weight loss outcomes compared with a passive control condition. Significant post hoc comparisons (Tables 2 and 3) were made for most of the comparisons. The MI + PI group was not superior in changing rates compared with the control condition for servings of vegetables (P = .65) and milk products (P = .27) per day, waist circumference (P = .51), and social functioning (P = .12). For all other psychometric variables (eg, school

TABLE 1 Sociodemographic Characteristics of the Obese Iranian Adolescents According to Study Group

Variable	MI (*n* = 119)	MI + PI (*n* = 119)	Control (*n* = 119)	*P*
Age, y	15.59 ± 1.31	15.57 ± 1.38	15.78 ± 1.19	.38
Gender, *n* (%)				
Male	55 (46.2)	53 (44.5)	65 (54.6)	.24
Female	64 (53.8)	66 (35.9)	54 (45.4)	
BMI, kg/m^2	33.07 ± 8.87	33.09 ± 5.86	32.92 ± 7.79	.95
BMI *z* score	2.83 ± 0.79	2.82 ± 0.62	2.75 ± 0.67	.83
BMI percentile	95.19 ± 4.72	94.63 ± 5.01	95.56 ± 4.63	.72
Mother's BMI, kg/m^2	39.46 ± 9.81	39.48 ± 8.87	39.31 ± 8.64	.77
Father's BMI, kg/m^2	36.22 ± 9.89	36.32 ± 9.83	36.02 ± 8.78	.83
Waist circumference, cm	102.59 ± 9.27	103.48 ± 8.19	95.51 ± 8.75	.94
Mother education, y	6.26 ± 3.42	6.19 ± 3.54	5.92 ± 3.89	.47
Father education, y	7.43 ± 3.86	7.28 ± 3.91	8.26 ± 4.21	.12
Household income (1000 rials)[a]	7434.63 ± 1891.39	7304.10 ± 2136.48	7364.67 ± 1944.10	.79
DXA, % fat	47.73 ± 7.42	47.70 ± 6.35	45.37 ± 8.31	.51
BIA	46.04 ± 4.03	45.85 ± 4.33	45.15 ± 4.72	.93

[a] About 3200 rials = US $1.00.

TABLE 2 Dietary and Anthropometric Outcomes According to Intervention Group for Baseline and Follow-up

Variable	Baseline			12-mo Follow-up			Time Effects						Post Hoc Test[a]	
	MI (n = 119)	MI + PI (n = 119)	Control (n = 119)	MI (n = 113)	MI + PI (n = 118)	Control (n = 115)	Time Effect			Time × Group Effect			MI + PI Versus Control	MI + PI Versus MI
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	P	η_p^2	F	P	η_p^2	P	P
Diet/food intake														
Total calories, kcal	3022.22 ± 1442.70	3000.52 ± 1449.14	2930.36 ± 1342.81	2785.21 ± 1240.31	2256.08 ± 1351.46	2919.95 ± 1471.92	58.09	<.001	0.14	25.03	<.001	0.12	.002	.032
Total dietary fat, g	105.55 ± 63.50	102.80 ± 60.85	95.23 ± 40.16	98.42 ± 49.83	74.40 ± 42.39	95.73 ± 40.10	28.74	<.001	0.75	15.77	<.001	0.09	.012	.041
Saturated fat, g	36.52 ± 23.70	36.29 ± 24.57	36.49 ± 23.75	32.54 ± 22.86	35.52 ± 21.48	30.03 ± 20.84	300.43	<.001	0.46	50.60	<.001	0.22	<.001	.029
Fruits and juice, servings/ d	1.27 ± 0.98	1.27 ± 0.97	1.21 ± 0.97	1.31 ± 0.96	1.33 ± 0.93	1.23 ± 0.97	2.85	.09	0.01	0.26	.77	0.00	.030	.17
Vegetables, servings/d	1.64 ± 0.76	1.66 ± 0.75	1.66 ± 0.73	1.71 ± 0.80	1.77 ± 0.76	1.64 ± 0.80	4.61	.03	0.01	2.24	.10	0.01	.65	.77
Snacks/desserts, servings/d	4.43 ± 1.52	4.33 ± 1.82	4.49 ± 1.63	4.12 ± 1.43	3.89 ± 1.65	4.55 ± 1.71	41.28	<.001	0.10	17.65	<.001	0.09	<.001	.04
Nondiet soda, servings/d	0.87 ± 0.66	0.85 ± 0.53	0.89 ± 0.42	0.77 ± 0.38	0.48 ± 0.35	0.95 ± 0.33	33.23	<.001	0.09	5.46	<.001	0.14	.001	.01
Milk, servings/ d	0.94 ± 0.49	0.95 ± 0.38	0.98 ± 0.48	0.95 ± 0.29	0.96 ± 0.43	0.97 ± 0.37	0.02	.89	0.00	0.08	.92	0.00	.27	.34
Fried foods, servings/d	0.81 ± 0.38	0.82 ± 0.33	0.84 ± 0.45	0.82 ± 0.30	0.63 ± 0.33	0.90 ± 0.44	6.45	.10	0.01	14.76	<.001	0.08	.01	.042
Anthropometry and body composition														
Total cholesterol, mmol/L	4.42 ± 0.73	4.40 ± 0.82	4.18 ± 0.96	4.41 ± 0.72	4.27 ± 0.78	4.20 ± 0.97	4.26	.04	0.01	4.70	.010	0.03	.021	.049
Triglycerides, mmol/L	1.01 ± 0.78	1.02 ± 0.77	1.05 ± 0.68	1.01 ± 0.77	0.86 ± 0.78	1.09 ± 0.72)	5.68	.018	0.02	10.55	.001	0.06	.001	.031
BMI, kg/m^2	33.07 ± 8.87	33.09 ± 5.86	32.92 ± 7.79	32.44 ± 7.45	31.04 ± 6.46	32.95 ± 8.78	25.51	<.001	0.07	14.76	.001	0.08	.01	.032
BMI *z* score	2.83 ± 0.79	2.82 ± 0.62	2.75 ± 0.67	2.81 ± 0.76	2.58 ± 0.61	2.76 ± 0.70	12.73	<.001	0.04	12.13	<.001	0.06	.02	.048
DXA, % fat	47.73 ± 7.42	47.70 ± 6.35	45.37 ± 8.31	46.61 ± 7.91	45.96 ± 6.34	45.40 ± 7.45	44.49	<.001	0.11	13.47	<.001	0.07	.012	.38
BIA	46.04 ± 4.03	45.85 ± 4.33	45.15 ± 4.72	45.62 ± 4.32	42.32 ± 3.56	45.33 ± 4.86	13.45	<.001	0.04	11.77	<.001	0.06	.001	.38
Waist circumference, cm	102.59 ± 9.27	103.48 ± 8.19	95.51 ± 8.75	101.97 ± 9.11	101.70 ± 9.21	99.90 ± 8.26	2.67	.10	0.00	2.36	.09	0.01	.512	.717

Unless otherwise indicated, data are presented as mean ± SD. η_p^2 = partial η squared (measure of effect size).

[a] Bonferroni adjustment.

functioning [P = .03], physical [P = .01] and psychosocial [P = .01] health, exercise [P = .003], dietary self-efficacy [$P < .001$]), dietary factors (eg, fat intake [P = .01], servings of snacks [$P < .001$] and fried food [P = .01], total calories [P = .002]), and anthropometric measures (eg, physical activity [P = .001], energy expenditure [P = .001], BMI [P = .001], cholesterol [P = .02], triglycerides [P = .02], DXA [P = .01], BIA [P = .001]), the comparison of MI + PI versus the control group yielded significant differences in favor of the intervention.

We further hypothesized (hypothesis bloc 2) that MI + PI would be superior in changing weight loss outcomes compared with MI only. The pattern of results was similar, albeit slightly weaker differences were found. For many outcome variables, significant post hoc differences emerged (Tables 2 and 3). The MI + PI group was not significantly superior compared with MI for adolescents only for servings of fruits (P = .17), vegetables (P = .77), and milk products (P = .34) per day; waist circumference (P = .71); DXA (P = .38); BIA (P = .38); and social (P = .10) and psychosocial (P = .35) functioning. For the other psychometric variables (eg, school functioning [P = .02], physical [P = .04], exercise [P = .003], dietary self-efficacy [$P < .001$]), dietary habits (eg, fat intake [P = .04], servings of snacks [P = .04] and fried food [P = .04], total calories [P = .03]), and anthropometric measures (eg, physical activity [P = .01], energy expenditure [P = .003], BMI [P = .048], cholesterol [P = .049], triglycerides [P = .031]), the comparison of MI + PI with MI only for adolescents exhibited significant differences.

DISCUSSION

To evaluate the role of parental involvement in MI weight loss interventions for obese adolescents, a prospective RCT was performed

TABLE 3 Energy Expenditure and Quality of Life Outcomes According to Intervention Group for Baseline and Follow-up

Variable	Baseline			12-mo Follow-up			Time Effects						Post Hoc Test[a]	
	MI (n = 119)	MI + PI (n = 119)	Control (n = 119)	MI (n = 113)	MI + PI (n = 118)	Control (n = 115)	Time Effect			Time × Group Effect			MI + PI Versus Control	MI + PI Versus MI
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	P	η_p^2	F	P	η_p^2	P	P
Measure														
CDSS	6.16 ± 2.46	6.14 ± 2.51	6.02 ± 2.32	6.88 ± 2.72	7.11 ± 2.62	5.71 ± 2.82	34.56	<.001	0.09	23.59	<.001	0.12	<.001	.01
WEL	87.10 ± 27.37	87.29 ± 28.94	93.61 ± 29.14	101.27 ± 27.23)	108.05 ± 24.28)	93.21 ± 29.60	45.01	<.001	0.11	12.51	<.001	0.07	.002	.04
PES	5.61 ± 1.74	5.59 ± 1.87	5.69 ± 1.82	6.75 ± 1.15	6.68 ± 1.97	5.39 ± 2.18	70.12	<.001	0.16	38.01	<.001	0.17	.003	.01
Self-reported PA length	0.84 ± 0.49	0.86 ± 0.45)	0.70 ± 0.35	1.12 ± 0.61	1.30 ± 0.66)	0.66 ± 0.32)	35.16	<.001	0.09	13.43	<.001	0.07	.004	.01
Self-reported energy expenditure	247.73 ± 160.36	220.50 ± 106.63	271.87 ± 127.99	434.07 ± 128.98	509.07 ± 128.15	268.14 ± 109.08	115.08	<.001	0.54	31.92	<.001	0.39	.002	.02
Objective PA length	0.67 ± 0.38	0.68 ± 0.28	0.65 ± 0.39)	0.98 ± 0.37	0.59 ± 0.40	1.34 ± 0.42	36.26	<.001	0.09	17.06	<.001	0.09	.001	.01
Objective energy expenditure	280.17 ± 82.83	274.90 ± 85.32	293.95 ± 81.83)	500.02 ± 94.94	680.08 ± 88.14	262.92 ± 99.22	82.65	<.001	0.59	33.67	<.001	0.54	.001	.003
Measure														
Total score	63.19 ± 20.58	62.46 ± 20.18	64.74 ± 19.91	64.34 ± 21.11	65.14 ± 18.88	63.73 ± 17.16	3.05	.08	0.01	4.081	.01	0.02	.21	.31
Physical health	66.71 ± 19.35	66.17 ± 19.28	65.12 ± 24.53	70.13 ± 19.20	71.84 ± 20.88	62.93 ± 25.85	8.55	<.001	0.02	8.97	<.001	0.05	.01	.04
Psychosocial health	67.69 ± 17.19	67.04 ± 18.49	67.54 ± 19.3	69.08 ± 21.62	70.16 ± 15.09	66.30 ± 16.83	4.26	.04	0.01	5.85	<.001	0.04	.01	.35
Emotional functioning	68.97 ± 19.34	68.35 ± 20.42	69.59 ± 19.92	71.64 ± 19.99	71.81 ± 21.79	68.27 ± 21.82	7.15	.008	0.02	6.20	.002	0.03	.03	.24
Social functioning	69.84 ± 18.41	69.12 ± 19.74	70.12 ± 17.42	70.84 ± 19.08	69.12 ± 19.47	70.01 ± 17.98	3.49	.06	0.01	3.48	.03	0.02	.12	.10
School functioning	65.01 ± 15.79	64.18 ± 16.78	68.83 ± 20.63	66.80 ± 17.62	71.26 ± 18.20	65.73 ± 23.77	5.40	.02	0.01	12.70	<.001	0.07	.03	.02

η_p^2 = partial η squared (measure of effect size); PA = physical activity.

[a] Bonferroni adjustment.

comparing 3 intervention groups: MI for adolescents only, MI for adolescents with parental involvement, and a passive control group. Anthropometric, biochemical, psychosocial, and behavioral data were collected at baseline and 12 months later. Results revealed significant effects for MI with parental involvement compared with the control group (hypothesis bloc 1) and compared with MI for adolescents only (hypothesis bloc 2). This pattern could be shown for most of the anthropometric, biochemical, psychosocial, and behavioral outcome variables supporting the hypotheses.

The present results are in line with findings of a recent meta-analysis regarding MI interventions for different types of health behaviors, as well as interventions targeting the obese adolescent population directly.[23] The additional effectiveness of parental involvement support the associations found in the meta-analysis. According to Gayes et al,[23] studies that assessed MI with both adolescent and parental input reported the largest effects, demonstrating that conducting MI with both parent and adolescent is more effective than conducting MI with either parent or adolescent only. Previous behavioral interventions for obese adolescents were inconclusive regarding the role of parental involvement.[24–26] The present study can strengthen the evidence for parental involvement in the context of an MI intervention.

Some study limitations must be acknowledged. Despite the appropriate sample size and the low dropout rate in an understudied population, the results might be limited to Persian culture. Thus, generalizability to other study contexts should be made with caution, although the present findings are in line with evidence obtained in Western samples.[21] However, more studies are needed to directly compare the effects of parental involvement and MI among samples from different cultures. In addition, we did not use objective outcome physical activity measures for the whole sample. Furthermore, intervention was delivered by trained interventionists; consecutive studies are needed to validate the replicability of our findings with other interventionists but also with other nonspecialist interventionists such as trained teachers (coached according to the MI training manual). Finally, the present study was conducted by using a 12-month follow-up. A subsequent next step would be to investigate the longer term effects of the intervention (ie, after several years).

CONCLUSIONS

Because our study was a clinical assessment, future studies should replicate our findings in real-world settings, such as integrating MI as a brief strategy into the daily routines of a school, particularly for obese adolescents, but for nonobese adolescents as a prevention tool as well. Effects of parental involvement should be tested via invitation letters sent by the school and brief training sessions, in which adolescents and their parents could be motivated to change their dietary and physical activity habits.

Future studies might extend the investigation to different types of the delivery mode, not only involving a parent but also varying the intensity level of parental involvement because this dose–response relation has been examined by previous meta-analyses. Beyond that, examination of subgroup effects would provide further insights into the topic; for example, the effects of parental involvement might vary according to the gender, age, quality of the relationship between adolescent and parent, or the family's cooking habits.[49]

The present study evaluated and compared the role of parental involvement in MI interventions for obese adolescents compared with MI for adolescents only and control subjects. The results show that MI with parental involvement is an effective strategy in changing obesity-related outcomes and has additional effects beyond MI with adolescents only, which is important when administering MI interventions in school settings.

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