



The Effect of Hope Training on the Physical Activity and Body Mass Index of Overweight and Obese Adolescents

Atefeh Soltanifar^{1*}, Azadeh Soltanifar², Azita Khalatash², Zeitab Moinfar²

¹Department of Psychiatric and Behavioral Sciences, Mashhad University of Medical Sciences, Iran

²Department of Social Medicine, Tehran University of Medical Sciences, Iran

ABSTRACT

Introduction: The high prevalence and negative biopsychosocial consequences of excess weight in adolescence highlight the need for effective adolescent overweight and obesity interventions. This research was designed to investigate the effect of a hope-based intervention on physical activity and body mass index [BMI] in adolescents with obesity and overweight.

Methods: 90 children and adolescents aged 9-12 were selected through convenient sampling from students at girls' elementary school based on inclusion and exclusion criteria. Students were randomly divided to two groups. Monthly 2-hour sessions on healthy eating and physical activity were conducted for all students. 4 weekly hope training sessions were also held for the intervention group. Assessment of height and weight and completion of IPAQ were done for all the participants at the baseline, and 3 and 6 months later. Subjects in the intervention group also completed Children's Hope Scale (CHS) at baseline, after hope training sessions, and 3 and 6 months after intervention.

Results: The findings showed a significant difference in total hope score in the intervention and control groups after hope training, and 3 and 6 months later ($P=0.005$, $P=0.005$, $P=0.000$, respectively). Physical activity also significantly increased in both groups after 3 and 6 months compared to baseline, but there was no significant difference between the two groups ($P=0.005$, $P=0.005$, $P=0.625$, respectively). BMI significantly decreased in both groups when adjusting for its baseline value, with a greater decrease in the first 3 months ($F=4.15$, $P=0.035$, $\eta^2=0.151$). The decrease in BMI during this period was significantly larger in the intervention group ($F=4.15$, $P=0.000$, $\eta^2=0.151$). Results also showed that changes in the hope score were significantly associated with changes in physical activity and BMI.

Conclusion: The findings revealed that the inclusion of hope training was effective in increasing hope and achieving better results in weight reduction interventions for obese and overweight adolescents.

Keywords: Adolescents; Obesity; Hope; Body Mass Index (BMI); Physical activity

INTRODUCTION

The terms "youth," "adolescents" and "young people" are used to describe people in the transition from childhood to adulthood. The World Health Organization (WHO) defines "adolescents" as individuals 10 to 19 years old [1]. Obesity has been declared as a health emergency in this age group by the WHO

[2]. Obesity in children and adolescents refers to an excessive or abnormal accumulation of body fat that is harmful to a person's health. This condition is quantitatively defined as a body mass index [BMI] greater than the 95th percentile for age and gender [2,3].

Obesity in childhood and adolescence is a serious health problem that affects a person's body and mind and can therefore af-

Received:	29-March-2023	Manuscript No:	IPJCO-23-16494
Editor assigned:	31-March-2023	PreQC No:	IPJCO-23-16494 (PQ)
Reviewed:	14-April-2023	QC No:	IPJCO-23-16494
Revised:	19-April-2023	Manuscript No:	IPJCO-23-16494 (R)
Published:	26-April-2023	DOI:	10.36648/2572-5394-8.2.20

Corresponding author Atefeh Soltanifar, Department of Psychiatric and Behavioral Sciences, Mashhad University of Medical Sciences, Iran, E-mail: soltanifara@mums.ac.ir

Citation Soltanifar A, Soltanifar A, Khalatash A, Moinfar Z (2023) The Effect of Hope Training on the Physical Activity and Body Mass Index of Overweight and Obese Adolescents. *J Child Obesity*. 8:20.

Copyright © 2023 Soltanifar A, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

fect daily activities [4,5]. Overweight and obesity in childhood and adolescence can increase the risk of endocrine, gastrointestinal, pulmonary, neurological, and orthopedic disorders [6,7]. In addition, adolescent obesity is associated with decreased performance in school as well as psychological problems [8]. Obese children are exposed to pain, fatigue, social exclusion, and difficulty in physical activities [9,10].

Obesity is on the rise in children and adolescents. According to NCD-RisC, which currently has the largest database of overweight and obesity in children and adolescents compiled from 2416 data sources across the world, the prevalence of obesity increased from 0% to 5.6% in girls and from 0.9% to 7.8% in boys between 1975 and 2016. However, there is variability in this trend in different parts of the world. The global prevalence of adolescent obesity is estimated at 18% in girls and 19% in boys. Obesity in childhood and adolescence can continue into adulthood. For example, a 2016 meta-analysis by Simonds et al. found that 55% of obese children were obese during adolescence and 80% of obese adolescents were obese during adulthood.

In a review and meta-analysis conducted by Kamyar et al. in 2019, the prevalence of overweight and obesity in Iran was calculated to be 8% and 9%, respectively. The study also reported a 7% prevalence for obesity in girls and 9% in boys, while the prevalence of overweight was 9% in girls and 10% in boys.

It seems that the best way to treat obesity is to perform interventions to improve energy balance by controlling energy intake (diet) and consumption (physical activity). Physical activity is one of the behavioral factors that prevent obesity in childhood and adolescence. Dose relationship studies have shown a negative response between physical activity and obesity in adolescence. Physical activity is defined as any physical activity produced by skeletal muscles that requires energy. The benefits of physical activity in childhood and adolescence include strengthening muscles and bones, increasing endurance and muscle strength, angiogenesis, neurogenesis, as well as reducing the risk of chronic diseases such as overweight, diabetes, and heart disease. Physical activity at this age can also have psychological effects on adolescents, including improved self-esteem and mental health, and reduced stress, anxiety, and depression. The recommended amount of physical activity for adolescents is 60 minutes of moderate to vigorous activity per week.

School is a good place to treat adolescent obesity. Compulsory education up to secondary school ensures that a high percentage of adolescents go to school. Adolescents also consume between one-third and one-half of their daily food intake in the school environment, and school-related physical activity makes schools a good place to offer prevention and treatment for obesity in adolescents. Also, due to the regular presence of adolescents in school, lifestyle change interventions in schools have good continuity. In addition, due to the presence of trained professionals in schools, weight management interventions can be easily provided in the school environment.

Along with proper nutrition and physical activity, psychological factors are also very important in the treatment of obesity. For weight management interventions to succeed, it is necessary to persist with the lifestyle changes and maintain hope through-

out the treatment, therefore hope has been considered as an effective psychological factor in this field. Snyder has conceptualized hope, which is very close to optimism, as a structure consisting of two components: 1 the ability to design paths to goals in spite of existing obstacles, and 2 having the motivation to travel and cross these paths. According to this theory, hope is meaningless without realistic and achievable goals. It is also necessary to have motivation and desire and to maintain hope in order to navigate the challenging path to a goal. By focusing on setting goals for problems and determining paths to achieve goals and face life challenges, this approach to the concept of hope can turn a person's sense of helplessness into hope and increase self-esteem, self-efficacy and self-worth. This approach can also increase courage, stimulate the development of adaptive behaviors and management, and ultimately lead to better psychological performance in interpersonal relationships.

Nothor et al. studied hope in a behavioral model of overweight and obesity in the United States. In this cross-sectional study, hope was measured in 178 subjects using an overall hope score along with the two subscales of agency and pathways. Diet and physical activity were measured on 2 and 5 subscales, respectively. The results showed that there was a significant relationship between the overall hope score and the agency score as well as all behavioral strategies. That is, those who were more hopeful were more likely to adhere to behavioral strategies (physical activity and dieting). The researchers concluded that measuring hope in weight loss interventions and taking the necessary measures to increase hope can be effective in improving treatment outcomes.

In a clinical trial conducted in 2012 entitled "The Relationship between Change in Hope and Change in Physical Activity in the Weight Loss Program in Children," weight loss and physical activity were measured in 67 children aged 7-17. The results showed change in hope significantly altered physical activity during treatment. Researchers suggested that more objective scales for physical activity be used in future research.

Considering these studies and the importance of obesity and its negative physical and psychological consequences especially in adolescence, and given the importance of adolescence in stabilizing or threatening people's health, and the role of hope in pursuing goals and following treatment instructions, interventions based on Snyder's theory of hope are expected to have positive effects on weight control in obese adolescents. Therefore, the present study was designed and conducted to investigate the effect of hope training on physical activity and BMI of overweight and obese adolescents.

METHODS

This study was performed on 9-12 year old female children and adolescents selected by convenience sampling from the third-grade students at a primary school according to the inclusion and exclusion criteria. After explaining the conditions and purpose of the study, written consent was obtained from at least one of the parents following agreement to participate in the study. Participants were randomly divided into two groups (intervention and control). A 2 hour consultation was provided by a nutritionist for all participants but a diet was not prescribed.

Additionally, the intervention group received hope training including training on setting goals, recognizing barriers, recognizing values, setting a vision, recognizing capabilities, and planning to achieve the goal and overcome obstacles. Hope training was conducted by a pediatric psychiatrist as 4 two-hour group sessions (one session per week). The control group was a group in the waiting list and hope education was conducted for them after the 6 month follow-up period. Physical activity and nutrition training recommendations continued under the supervision of a nutritionist until the end of the study for all subjects according to each subject's unique conditions. A nutritionist took a complete history and performed examinations and tests to diagnose specific issues (such as hypothyroidism) for both groups. The inclusion criteria were as follows:

- 9-12 years of age
- Overweight or obesity according to IOTF (International Obesity Task Force) and age specific cut-offs for BMI
- Absence of known systemic diseases such as high blood pressure or diabetes
- Not being candidates for surgery due to obesity
- Failure to treat obesity in the past month, including through a diet

Data Collection

Adolescents height and weight were measured at the beginning of the study, and 3 and 6 months later. Subjects were asked to wear light clothes and take off their shoes for weight measurement. The hope questionnaire (Snyderr Children's Hope Scale) was completed under the supervision of researchers at the beginning of the study, at the end of hope training sessions, and after 3 and 6 months from the beginning of the intervention. Physical activity was measured with the International Physical Activity Questionnaire (IPAQ), which was completed by the subjects 3 and 6 months after the beginning of the study. Following data collection, information was extracted from the questionnaires and analyzed using SPSS 21. Blinding was performed only on the analyst; the researchers and subjects were aware of group assignment and treatment method.

Measurement of Hope and Physical Activity

To assess hope, we used Children's Hope Scale (CHS) developed by Snyder et al. (1997) to measure goal-related hopeful thinking in children and adolescents aged 8 to 16. This scale has 6 items scored on a Likert scale from 1 (never) to 6 (always). The total score ranges from 6-36 with higher scores indicating more hope. Research has shown that this scale has favorable psychometric properties; the internal consistency of this scale is 0.73-0.86 and the reliability of one-month test-retest is reported between 0.71 to 0.73. Past research using CHS indicates that this scale can be used in clinical and non-clinical settings for different ages. The validity and reliability of CHS in Iran was assessed by Nejati, Ismailian and Amani (2014), who tested the scale on 8-15 year old students in Tehran. Cronbach's alpha coefficient for the scale was 0.69, demonstrating its reliability.

The International Physical Activity Questionnaire (IPAQ) was used to measure physical activity. This questionnaire evaluates physical activity in the previous 7 days in the form of the

duration and frequency of different types of physical activity. METs (metabolic equivalent of task) for walking=3.3, for moderate physical activity METs=4 and for intense physical activity METs=8. To calculate the total amount of physical activity in the past 7 days, you should add the amount of walking (minutes × day) with the amount of moderate physical activity (× minute × days) and the amount of intense physical activity (× minute × day). Vigorous activity refers to high-speed activities such as basketball, mountaineering, aerobics, and high-speed cycling which require more than 6 calories per minute. Activities that require 2 to 6 calories per minute such as badminton, walking, volleyball and doing household cleaning are considered moderate physical activity. Also, any activity done for less than 12 minutes is classified as a weak activity. IPAQ calculates the total energy intensity of activities in the last 7 days. A total between 0 and 599 indicates poor physical activity, a total between 600 to 3000 indicates moderate physical activity, and a total of more than 3000 indicates intense physical activity. IPAQ has been used in Iran in the past and its validity and reliability have been confirmed (Figure 1).

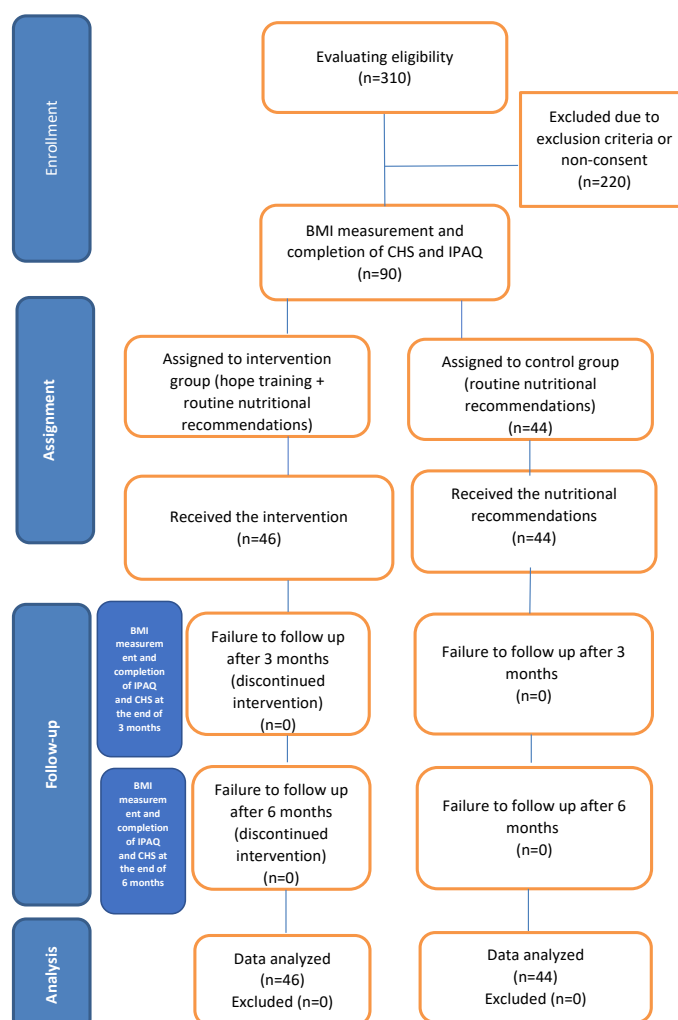


Figure 1: The diagram for the research process

Data Analysis

Statistical analysis was performed in Excel and SPSS version 22. Descriptive statistics of central tendency and dispersion were calculated for the participants as a whole as well the intervention and control group, including mean, standard deviation,

and percentage. Fisher exact test, chi square test and Ttest were used to compare demographic variables in groups. ANOVA was used to evaluate for significant differences in demographic variables in addition to changes in hope and physical activity.

The primary outcome in this study is treatment compliance and physical activity. The physical activity score was obtained from the IPAQ questionnaire score and was divided into 3 categories (poor to intense). To assess how hope and physical activity change over and to control for the effects of age repeated measures ANOVA was used. In all tests, the significance level was set at P=0.05.

RESULTS

Demographic and Socio-Economic Characteristics

Based on the chi-square test, Fisher's exact test, and t-test, there were no differences between the intervention and control group in terms of age (P=0.496), family status (P=1.000), father's level of education (P=0.726), mother's level of education (P=0.460), area of residence per person (P=0.382), child's rank in the family (P=0.538), number of children in the family (P=0.496), ownership of a personal car (P=0.781), and ownership of a personal computer (P=0.367). **Table 1** presents further details on the socioeconomic and demographic variables of the participants (**Table 2**).

Table 1: Socioeconomic and demographic variables of the participants

Variable	Classes	Intervention group		Control group		p-value	t
Age	-	10.4 ± 1.0 (mean ± sd)		10.3 ± 0.9 (mean ± sd)		0.496	0.684
Number of children in the family	-	2.22 ± 0.917 (mean ± sd)		2.07 ± 0.789 (mean ± sd)		0.410	0.536
		n	%	n	%		
Family status	Parent live together	42	93.2	41	91.3	1.0	Fisher
	Parent live separately	4	6.8	3	8.7		
Father's level of education	High school diploma and lower	18	39.1	18	40.9	0.726	0.624
	Associate's and Bachelor's	22	47.8	18	40.9		
	Higher	6	13.0	8	18.2		
Mother's level of education	High school diploma and lower	14	30.4	18	40.9	0.460	1.55
	Associate's and Bachelor's	22	47.8	20	45.5		
	Higher	10	21.7	6	13.6		
Area of residence per person (m2)	<25	8	17.4	4	9.1	0.382	1.92
	25-60	32	67.9	36	81.8		
	>60	6	13	4	9.1		
Ownership of personal car	Yes	30	65.2	33	75	0.781	1.02
	No	16	34.8	11	25		
Ownership of personal computer	Yes	34	73.9	36	81.8	0.367	0.81
	No	12	26.1	8	18.2		
Child's rank in family	1st	27	58.7	21	47.7	0.538	1.24
		13	28.3	17	38.6		

Table 2: The results of repeated measure ANOVA for changes in BMI

Model 1		F	P	η
	Time	22.387	0.000	0.000
	time × group	27.424	0.000	0.000
Model 2		F	P	η
	Time	6.141	0.015	0.066

	time × BMI1	6.443	0.013	0.069
	time × group	4.458	0.038	0.049
	BMI1	156.653	0.000	0.643
	Group	15.468	0.000	0.151
Model 3		F	P	η
	time	11.941	0.001	0.122
	time × hope	6.072	0.016	0.066
	time × BMI1	7.924	0.006	0.084
	time × group	4.382	0.039	0.048
	hope	4.758	0.032	0.052
	BMI1	167.045	0.000	0.660
	group	15.573	0.000	0.153

Comparison between the Two Groups at the Beginning of the Study

Based on an independent t-test, the average scores for hope, agency, and pathways did not significantly differ between the two groups at the beginning of the study ($P=0.658$, $P=0.411$, and $P=0.964$, respectively). Similarly, mean BMI ($P=0.104$) and mean physical activity scores ($P=0.274$) were not significantly

different.

Comparison of Hope Score before and after Training in the Intervention Group

Based on a paired t-test in the intervention group, mean total hope score ($P=0.000$) and components of hope (agency: $P=0.0010$, and pathways: $P=0.001$) were significantly different. Details of this comparison are given in [Table 3](#).

Table 3: Comparison between the two groups in terms of BMI, total hope score, the agency and pathways components of CHS, and physical activity

	Time	Intervention group (mean ± sd)	Control group (mean ± sd)	SE of MD	MD	p-value	t
BMI	Beginning	26.11 ± 2.22	25.34 ± 2.23	0.47	0.77	0.104	1.64
	Middle	24.87 ± 1.70	25.13 ± 2.36	0.43	-0.25	0.55	-0.59
	End	24.74 ± 1.86	25.41 ± 2.41	0.45	-0.66	0.14	-1.46
Total hope	Beginning	28.30 ± 5.481	28.75 ± 3.93	1.003	-0.44	0.65	-0.44
	After training	31.36 ± 3.62		0.56	2.68	0	-4.77*
	Middle	30.91 ± 3.52	28.06 ± 3.70	0.76	2.84	0.005	3.73
	End	29.76 ± 3.36	27.40 ± 4.32	0.81	2.35	0.005	2.88
	Beginning	14.67 ± 2.81	15.11 ± 2.18	0.53	0.43	0.41	-0.82
	After training	15.93 ± 1.77		0.28	-1.04	0.001	-3.66*
	Middle	15.34 ± 2.02	15.13 ± 2.20	0.44	0.21	0.63	0.47
	End	15.02 ± 1.99	15.04 ± 2.25	0.44	-0.02	0.95	-0.05
Agency	Beginning	13.63 ± 4.30	13.59 ± 3.84	0.86	0.03	0.96	0.04
	After training	15.43 ± 2.92		0.45	-1.63	0.001	-3.59*
	Middle	15.56 ± 3.47	12.93 ± 4.04	0.79	2.63	0.001	3.31
	End	14.73 ± 2.76	12.36 ± 4.68	0.81	2.37	0.005	2.94
Pathways	Beginning	2575.5 ± 2327.7	2442.84 ± 2256	779.62	-100.03	0.78	0.27
	Middle	4692.12 ± 3444.81	4792.15 ± 3944.02	566.72	577.49	0.89	-0.12
	After training	15.43 ± 2.92		0.45	-1.63	0.001	-3.59*
	End	4457.91 ± 2806.78	3880.41 ± 2556.84	483.56	132.65	0.31	1.01

Note: *paired t-test was performed in order to compare hope before and after intervention

The Relationship between Hope and BMI at the Beginning of the Study

Using bivariate correlation, we found that there was no significant relationship between hope and BMI ($P=0.381$, $r=-0.09$); however, there was a significant but weak relationship between agency and BMI ($P=0.04$, $r=-0.21$).

The Relationship between Hope and Physical Activity at the Beginning of the Study

A bivariate correlation test showed that there was a significant relationship between total hope score ($P=0.023$, $r=0.24$) and its pathways component ($P=0.009$, $r=0.275$) and physical activity.

Comparison between the Two Groups in Terms of BMI

Repeated measures ANOVA was used to compare BMI in the two groups at 3 times during the study (beginning, middle, and end of the study). The results showed that BMI has significantly decreased ($P=0.000$) but there were no significant differences between the two groups in terms of BMI reduction ($P=0.905$) (Table 2). In addition, double comparison shows that there is a significant difference in BMI between times 1 and 2 as well as 1 and 3 ($P=0.000$), but not between times 2 and 3 ($P=0.565$) (Figure 2).

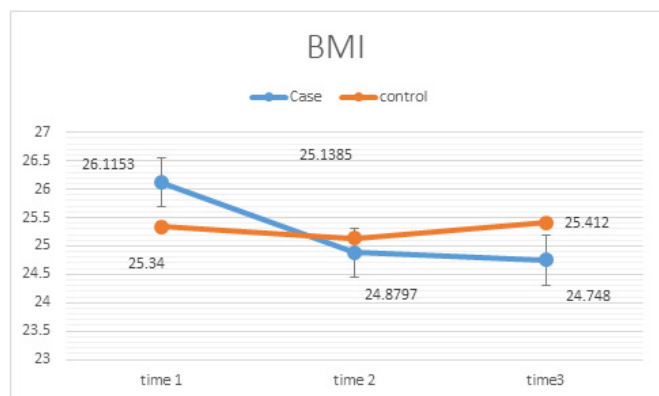


Figure 2: Comparison between the two groups in terms of BMI

Model 1 was constructed using repeated measures ANCOVA and was adjusted for baseline BMI. Model 2 was also based ANCOVA but was adjusted for baseline BMI, total hope score at the beginning of the study, and the demographic and socio-economic variables shown in Table 1. The models showed that there is a statistically significant difference between the two groups in terms of average change in BMI (model 1: $P=0.000$ and model 2: $P=0.001$); in both models, baseline BMI was effective on the final BMI.

In model 2, the only variables which had a significant effect were BMI ($P=0.002$) and total hope score at the beginning of the study ($P=0.010$). In this model, the change in BMI over time was also significant ($P=0.035$). Comparison of BMI using the independent t-test showed no significant differences between the two groups at any point in the study (Table 4).

Comparison between the Two Groups in terms of Hope

Repeated measures ANOVA was used to compare the two groups at 3 times (beginning, middle, and end of the study), which showed that there was a significant difference between the two groups in terms of change in hope ($P=0.012$). However, the average hope score did not differ significantly between these 3 times in general ($P=0.915$). In addition, the significance of time \times group interaction showed that within the groups, the mean difference over time was the same (Table 4) (Figure 3).

Table 4: Comparison between the two groups in terms of hope

		F	p	η^2
Model 1 (repeated measures ANOVA)	time	0.011	0.915	0
	time \times group	6.672	0.011	0.07
	group	6.549	0.012	0.069
Model 2 (comparing hope at times 1 and 2, adjusted for hope at time 1)	adjusted model 1	9.557	0.18	0
		4.575	0.035	0.05
		15.282	0	0.149
(comparing hope at times 2 and 3, adjusted for hope at time 2)	adjusted model 2	7.758	0.001	0.151
		6.645	0.012	0.071
		3.286	0.073	0.036

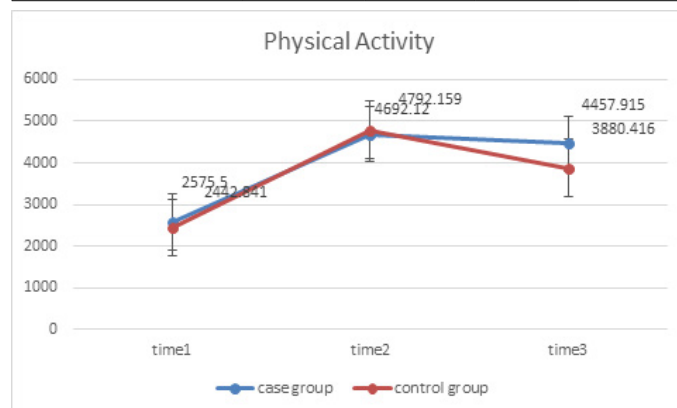


Figure 3: Comparison between the two groups in terms of hope

According to the univariate test (pre-test and post-test analysis with the help of ANCOVA and adjusting the baseline value of hope between times 1 and 2), the mean hope score in the training group increased significantly ($P=0.000$). Details of this comparison are given in the table below. The results of the same test for times 2 and 3 (adjusting for hope score at time 2) showed that the change in hope in the second quarter was significant ($P=0.001$), but the difference between the two groups in terms of change was not significant ($P=0.07$). Using an independent t-test for comparison of means between times 2 and 3, a significant relationship was found between the two groups in terms of total hope score (time 2: $P=0.000$, time 3: $P=0.005$) as well as agency and pathways scores. At the beginning of the study, none of the socioeconomic variable appeared to affect total hope score ($P>0.1$). Only the relationship between hope and physical activity was statistically significant ($P=0.04$).

Comparison between the Two Groups in Terms of Physical Activity

Repeated measures ANOVA was used to compare the two groups at 3 times, which showed no significant differences between the two groups in terms of change in physical activity ($P=0.622$); however, BMI was significantly different ($P=0.000$). We observed no significant differences between times 2 and 3 in terms of BMI ($P=0.522$) (Figure 4).

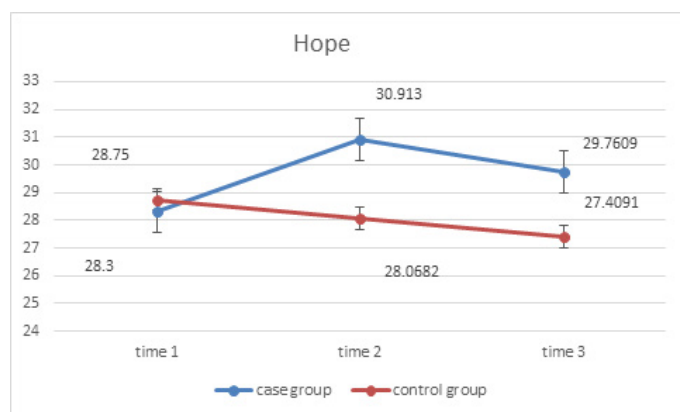


Figure 4: Comparison between the two groups in terms of physical activity

DISCUSSION

Given the high prevalence of obesity and overweight, their undesirable physical and psychological consequences throughout life, and the possible role of hope in following recommendations for dieting and physical activity, the present study was designed and conducted to determine the effect of hope training on physical activity and BMI in adolescents with overweight and obesity. The results showed that subjects who received hope training had significantly higher total hope scores after training and 3 months later; however, this difference decreased 6 months later and was no longer statistically significant. On the other hand, the difference in the pathways score was significant after training and remained so 3 and 6 months later.

The level of hope in the trained group increased significantly after training. Physical activity in both groups increased significantly in the evaluations 3 months and 6 months later, but the difference between groups was not significant. Adjusting for the baseline value, BMI decreased significantly in both groups, with a greater decrease observed in the first 3 months. The decrease in BMI in the intervention group was significantly greater than the control group, with a greater difference seen in the first 3 months.

The level of hope had a significant direct relationship with changes in physical activity ($r=0.25$, $P=0.017$). Also, changes in the level of hope had a significant direct relationship with changes in BMI; a greater increase in hope was associated with a greater decrease in BMI ($r=0.43$, $P=0.000$).

In this research, therapeutic interventions were performed at school for obese and overweight adolescents. It appears that where the interventions were staged likely contributed to their success. Previous studies also mention school as a favorable environment for obesity and overweight interventions in adolescents for several reasons. Compulsory education up to sec-

ondary school ensures that a high percentage of adolescents go to school. Adolescents also consume between one-third and one-half of their daily food in the school environment. At the same time, school-related physical activity makes schools suitable places to provide prevention and treatment for obesity in adolescents. Also, due to the constant presence of adolescents at school, lifestyle change interventions at schools have good continuity. Finally, the presence of trained professionals in schools means these interventions can be easily provided in the school environment. In this study, school health officials and caregivers closely cooperated with the researchers and made it possible to hold regular meetings.

The results of the present study show that the hope training intervention for overweight and obese students, along with dietary and physical activity recommendations, increased the level of hope and possibly adherence to a proper diet. Even though the difference in physical activity was not significantly different between the two groups, hope training led to a significant difference in BMI between the two groups during the 6-month study period. Given the nature of treatments for obesity and overweight which require long-term adherence to a proper diet and a physical activity regimen, hope seems to be a prerequisite for success in following recommendations, overcoming obstacles, and resisting the temptation to overeat.

Snyder conceptualized hope as a structure consisting of two components: 1 the ability to design paths to goals in spite of existing obstacles, and 2 having motivation to travel and cross these paths. Based on Snyder's definition, hope means selecting the right goals and trying to achieve these goals based on a predetermined plan while considering the necessary solutions to overcome possible obstacles or use alternative routes. Motivation and belief in one's ability are necessary for reaching goals despite difficulties. Therefore, adolescents were taught how to set realistic goals in the hope training sessions. Also, they learned creative thinking for finding paths to their goals while anticipating possible obstacles and using problem-solving skills to overcome these obstacles. Hope training also included instruction on positive thinking and motivation using cognitive-behavioral techniques such as positive self-talk, choosing appropriate patterns, and recognizing and using their abilities to achieve goals.

One of the most important strengths of this study is the fact that training sessions were done as workshops with the active participation of adolescents and the use of various role-playing and audio-visual methods, which led to better learning outcomes. The results showed that the level of hope (total hope score) of adolescents in the intervention group is significantly different from that of the control group after training and 3 months later. However, this difference had diminished 6 months later and was no longer statistically significant; at the same time, the difference in the pathway's subscale remained significant even after 6 months. These observations indicate the need for reminder sessions to maintain hope in adolescents.

We found that the level of hope in the intervention group had significantly increased after training. This finding confirms previous studies showing hope to be a situational characteristic rather than a natural changeable one. In a workplace study,

Lutans et al. showed that 2-hour online training could increase participants' level of hope. Also, a pilot intervention study in the general population to strengthen hope showed that training for 8 weeks strengthened the motivational component of hope in individuals. Depression and anxiety also decreased compared to the control group.

Greater weight loss in the intervention group and the relationship between changes in hope and a decrease in BMI indicate the importance of hope in weight management interventions. These findings are consistent with studies on the importance of appropriate goal setting and appropriate behavioral planning in weight loss interventions. In a study entitled "Weight Loss Targeting and Weight Loss Action Plan 2012," weight gain prevention was considered as the goal with the aim of gaining more insight into this process, identifying cognitive predictors of success, and examining them as predictive factors for changing behaviors related to weight, diet and physical activity. In this cross-sectional study, 510 overweight adults completed an online questionnaire that assessed the following: Targeting to prevent weight gain, behavioral targeting for diet and physical activity, planning for change in these factors, and cognitive social communication. Linear regression analysis was used to analyze the data. The results showed that in 80% of subjects, the first goal is to prevent weight gain, followed by behavioral goal setting for diet and physical activity, and practical planning. The researchers concluded that goal setting is very important in the weight management process.

Previous research has shown that motivation is a very important factor in successful obesity interventions. In studies on the causes of treatment discontinuation in obesity interventions in adolescents, both from subjects' own point of view and from the perspective of therapists, one of the effective factors has been the lack of motivation or insufficient motivation. For example, Brennan et al. examined the barriers reported by overweight and obese adolescents and their parents to participating in weight management interventions. Of the 56 adolescents participating in the study, 57% did not complete the intervention; lack of motivation or insufficient motivation were among the important causes of discontinuation, as reported by families.

As motivation is one of the components of hope, the results of the present study on the relationship between hope, physical activity, and the rate of weight loss confirm previous studies. The direct and significant relationship between changes in hope score, changes in physical activity, and BMI observed in this study are in line with previous studies. Although these studies have been cross sectional and did not include interventions to increase hope, their results suggest the importance of hope and interventions to improve hope in achieving health goals and greater weight loss.

A study by Nothor et al. in the United States found that the relationship between hope and the use of behavioral strategies related to nutrition and physical activity was consistent in 178 adults. In this cross-sectional study, hope was measured using a total hope score in addition to 2 subscales (agency and pathways), similar to our study. Diet and physical activity were measured on 2 and 5 subscales, respectively. The results showed that there was a significant relationship between the overall

hope score and the agency and pathways scores ($P < 0.05$). The pathways subscale was significantly correlated with strategies related to physical activity and diet; greater hope predicted better adherence to behavioral strategies (physical activity and dieting). The researchers concluded that measuring hope in weight loss interventions and taking the necessary measures to increase it can be effective in the follow-up stage of obesity and overweight treatment.

In a study by Kelsey et al. entitled "Obesity, Hope and Health," the relationship between hope and BMI as well as between hope and self-reported health was measured in 434 women. The study was part of a community-based intervention project to improve weight, health, and hope in low-income women in North Carolina. The results showed that higher levels of hope had a positive relationship with reported health and a negative relationship with BMI. The researchers suggested that the hope construct should be given more attention in weight loss studies.

Our findings are also consistent with the results of a 2012 paper entitled "The Relationship Between a Change in Hope and a Change in Physical Activity in a Child Weight Loss Program," conducted in 67 children aged 7-17. In this study, which is similar to our study in terms of intervention and participants' age, hope and physical activity were measured using a self-report questionnaire. Hope was measured using CHS and physical activity was measured using IPAQ. The weight loss program was performed in two groups with family-based behavioral interventions and a 10 week group program. The results showed that the change in hope was significantly associated with a change in physical activity during the treatment period, although an intervention was performed to increase hope. The researchers concluded that due to the positive relationship between hope and increased physical activity, more research should be done on adding specific interventions to increase hope in obesity treatment interventions.

The results of the present study suggest that the inclusion of hope-enhancing interventions in weight management programs for patients with chronic diseases can improve the therapeutic outcomes of the interventions in addition to increasing hope. For example, in children and adolescents with diabetes, boosting hope through creating motivation for maintaining or starting programs to achieve better health (e.g., sugar control or dieting) may contribute to more effective control of diabetes.

Most studies on hope interventions have been performed in adults in relation to stress, depression, or anxiety, but the impact of hope in achieving health outcomes in children with chronic diseases has only been studied in few works. In 1996, Lewis and Claire conducted the first study of this kind in adolescents with sickle cell anemia. Their study showed that hope was negatively associated with anxiety. In another study, Berg et al. examined 48 children aged 8-12 with asthma to study the association between hope with steroid therapy. The use of steroid spray therapy regimens was also evaluated. The researchers found that hope is an important predictor of adherence to therapy.

In this study, along with nutrition and physical activity recommendations, hope training intervention for overweight and

obese students increased their hope and led to a significant decrease in BMI. The study has some strengths such as 1-addressing the issue of obesity and overweight in adolescents, which is one of the general health problems, 2-performing interventions to strengthen hope for overweight and obese adolescents in school by conducting educational workshops and having a control group, as well as 3-6 month follow-up.

However, the present study has some limitations, including measuring physical activity using a questionnaire. We suggest that observation or more objective tools be used in future studies to measure physical activity. Also, longer period of time for follow-up, larger sample sizes, and sampling from several schools can provide more generalizable results.

CONCLUSION

Obesity is a public health problem whose treatment requires effective goal setting, maintaining motivation, and continuous effort. The results of the present study show the effects of hope-based intervention on increasing hope and achieving results in weight loss interventions in overweight and obese adolescents. The relationship between hope, physical activity, and BMI also shows the importance of paying attention to hope and performing the necessary interventions to increase hope in weight management programs. According to our results, changes in the level of hope had a direct and significant relationship with changes in physical activity and BMI. Therefore, increasing hope can be suggested as a way to increase the therapeutic effects of obesity-related interventions in adolescents.

ACKNOWLEDGEMENT

None

CONFLICT OF INTEREST

None

REFERENCES

1. Abarca-Gómez L, Abdeen ZA, Hamid ZA, Abu-Rmeileh NM (2017) Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *The Lancet* 390(10113): 2627-2642.
2. Simmonds M, Llewellyn A, Owen CG, Woolacott N (2016) Predicting adult obesity from childhood obesity: A systematic review and meta-analysis. *Obesity Reviews* 17(2): 95-107.
3. Dukhi N (2019) Over nutrition in children and adolescents.
4. Ruiz LD, Zuelch ML, Dimitratos SM, Scherr RE (2020) Adolescent obesity: Diet quality, psychosocial health, and cardiometabolic risk factors. *Nutrients* 12(1): 43.
5. Reinehr T (2018) Long-term effects of adolescent obesity: Time to act. *Nat Reviews Endo* 14(3): 183-8.
6. Sagar R, Gupta T (2018) Psychological aspects of obesity in children and adolescents. *Ind J Pedia*. 85(7): 554-559.
7. Bharti B, Malhi P (2021) Psychiatric comorbidities in adolescents with obesity: A wake-up call for life course and multisectoral interventions. *Ind J Pedia* 2021: 1-2.
8. Comorbidities S (2018) Adolescent obesity and comorbidity: Eating disorders and obesity in children and adolescents. 2018: 47.
9. Mansori K, Khateri S, Moradi Y, Khazaei Z, Mirzaei H, et al. (2019) Prevalence of obesity and overweight in Iranian children aged less than 5 years: A systematic review and meta-analysis. *Korean J Pediatr* 62(6): 206-212.
10. Di Cesare M, Sorić M, Bovet P, Miranda JJ, Bhutta Z, et al. (2019) The epidemiological burden of obesity in childhood: A worldwide epidemic requiring urgent action. *BMC Medicine* 17(1): 212.

1. Abarca-Gómez L, Abdeen ZA, Hamid ZA, Abu-Rmeileh