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Analysis of Weight Control among Overweight and Obese Iranian Adolescents: Application of the Trans-theoretical Model

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Abstract

Background

The world-wide prevalence of overweight and obesity among children and adolescents has reached an alarming level and become a major health problem in today's world. The aim of this study was to identify the stages and processes of change as well as their relationship with weight control based on a Trans -theoretical Model (TTM) in overweight and obese Iranian adolescents.

Materials and Methods

This cross-sectional study was conducted with participation of 250 overweight and obese adolescents selected through cluster sampling method from March to April, 2016. In order to collect data, a researcher-made questionnaire based on TTM؛ The obtained data were entered into SPSS version 19.0 software.

Results: The majority of participants (80%) were in inactive stages (pre-contemplation, contemplation, and preparation) of change for weight control, while only 20% of them were in active stages (action and maintenance). Also, results showed that a significant difference between stages and processes of change so that individuals' progress across stages of change from pre-contemplation to maintenance increased cognitive and behavioral processes' scores ($p < 0.05$).

Conclusion: The majority of participants (80%) were in inactive stages (pre-contemplation, contemplation, and preparation) of change for weight control, while only 20% of them were in active stages (action and maintenance). Also, results showed that a significant difference between stages and processes of change so that individuals' progress across stages of change from pre-contemplation to maintenance increased cognitive and behavioral processes' scores ($p < 0.05$).

Key Words: Adolescent, Obesity, Overweight, Weight Loss Program.

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1- INTRODUCTION

Developed and developing countries of the world are today faced with significantly increased prevalence of overweight and obesity among their adolescents and children (1). From 1990 to 2010, the prevalence of overweight and obesity increased 2.5% among children and adolescents worldwide. Considering this increase, it is expected for this rate to exceed 9% in 2020 (2). Globalization and technological advances have affected people's lifestyle and led to such status (3, 4). Obesity during childhood and adolescence causes serious medical complications, such as hypertension, dyslipidemia, insulin resistance, and fatty liver disease in adulthood (5).

Obesity at young ages can reduce the life expectancy (6). Obesity during childhood and adulthood is a fast-emerging problem in Iran, so that the highest prevalence of obesity is observed among teenagers. Iran has followed this trend with about 12.2% overweight and 3.9% obese in adolescents (7). Some other studies also showed the increasing prevalence of overweight and obesity in children and adolescents in Iran (8-12). Esmaeili et al. reported prevalence of obesity for male and female adolescents 13.5% and 10.1%, respectively. They also indicated that middle school students had the highest prevalence rate of obesity (13.8%) (13). Health education experts use behavioral models and theories in the design and implementation of interventions to investigate the behavior change (14). Transtheoretical Model (TTM) is one of these models widely used in this field. TTM is an appropriate theoretical model for dealing with weight control interventions and studies (15, 16).

Recently, there has been growing interest in applying the TTM to weight management (17). It has four main constructs, including: stages of change, processes of change, decisional balance, and self-efficacy. Stages of change is the main construct which includes: (1) pre-contemplation; when an individual does not feel the need for change, (2) contemplation; when an individual is thinking about behavior change, (3) preparation; when an individual decides to change or not, (4) action; when an individual takes the steps to change, and (5) maintenance; when an individual tries to keep on the changed behavior. TTM generally proposes the following 10 processes of change to promote health behavior change that is divided into 2 categories; cognitive process and behavioral process, which describe the activities used to continue through the stages of change (18). Cognitive processes are often used in inactive stages and include consciousness raising, dramatic relief, self-re-evaluation, environmental re-evaluation, and social liberation. The behavioral processes mostly used in the active stages include helping relationships, self-liberation, counter conditioning, stimulus control, and reinforcement management.

Other constructs of TTM are decisional balance and self-efficacy. Decisional balance measures the balance between benefits and barriers of change (19). Self-efficacy is the confidence to be active in a difficult situation (20). Since there has been no salient study conducted on overweight and obese Iranian adolescents based on TTM, the present study was conducted to analysis of weight control among overweight and obese adolescents based on TTM in Yazd city, Iran.

2- MATERIALS AND METHODS

2-1. Study design and population

This cross-sectional study was conducted on 250 participants selected through cluster sampling method from March to April, 2016, in Yazd city, Yazd province, the Central of Iran. The participants were selected among overweight and obese male students of

middle schools. The sample size was calculated as 250 by the following formula from a previous study (21):

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where, Zα= 1.96, P=0.90 and d= 0.05.

2-2. Methods

Initially, height, weight, and Body mass index (BMI) percentile were calculated for participants' age and gender. Then, a researcher-made questionnaire based on TTM was administered to collect data that was filled by participants.

2-3. Measuring tools: validity and reliability

Height was measured in standing position with bare foot, shoulders touching the wall, and head in contact with the height gauge (SECA Model 206 Germany, the nearest 0.1cm). Weight was also measured without shoes and in lightly dressed condition by a balanced scale (QF Model 2003 China, the nearest 0.1 kg).
Body mass index, was calculated as weight (kg)/height (m^2). Overweight was defined as a BMI at or above the 85th percentile and below the 95th percentile, while obesity was defined as a BMI more than or equal to the 95th percentile (22).

TTM-based questionnaire was applied which consisted of 3 parts. The first part contained 5 questions to measure demographic characteristics. The second part was aimed to determine stages of change associated with weight control. The third part targeted at measuring processes of change scale. The questionnaire designed based on the stages of change consisted of 5 items: 1) I have had no plan for weight control, and I have never thought about it (precontemplation); 2) I have had no plan for weight control, but I have thought about it (contemplation); 3) I have had no plan for weight control, but I am planning on it for the next month (preparation); 4) I have been controlling my weight for six months (action); and 5) Till now, it is more than six months that I have been controlling my weight (maintenance). Participants were then required to choose the item which matched their condition best. In order to assess the processes of change, individuals under study were asked to respond to 44 questions based on a 4 and 5-point Likert scale; from 1 (Never) to 4 (Always) and from 1 (Completely disagree) to 5 (Completely agree). To examine the questionnaire's validity, it was reviewed by a panel of experts who included 4 health education and promotion specialists, a health psychologist, as well as a nutritionist.

Its content validity was also measured by Content Validity Index (CVI) and Content Validity Ratio (CVR) methods which were approved by respectively 92.4% and 91.2% accuracy. After that, the required modifications recommended by experts were considered. Reliability of the questionnaire was approved by a 2-week interval test-retest (Interclass correlation coefficients = 80%). To evaluate the questions' reliability, internal consistency method was applied which was then approved with Cronbach's alpha coefficient of 0.90.

2-4. Ethical consideration

This study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences and Health Services, Yazd (ID number: 1394.43). A consent form was also given to participants, only the students who returned the consent forms signed by themselves and their parents participated in the study. Furthermore, the students were informed that they had the right to with draw from the study at any time, and were assured of the confidentiality of the study.

2-5. Inclusion criteria

The inclusion criteria of the study were: (1) BMI between the 85th and 95th percentile (22), (2) boys at Middle school level, (3) having signed consent forms.

2-6. Exclusion criteria

In the case of having any metabolic diseases, participants were excluded from the study.

2-7. Data Analyses

The results were analyzed by SPSS software (version19.0). Kolmogorov-Smirnov test was applied to investigate normality of data. Further, ANOVA test was used to compare the scores of change processes with those of change stages Post-hoc was then performed to study the difference within groups. P-values <0.05 were considered as statistically significant.

3-RESULTS

In this study, a total number of 250 overweight and obese male participants with mean age of 14.47±0.87 years were enrolled. It was found that 161 (64.4%) participants were overweight and 89 (35.6%) were obese. Their mean of BMI was also calculated as 25.92±2.79. Participants' descriptive characteristics are shown in (**Table.1**). The distribution analyses of participants across stages of change for weight control showed that 59 participants (23.6%) in pre-contemplation, 142 (56.8%) in contemplation, 19 (7.6%) in preparation, 13 (5.2%) in action, and finally 17 participants (6.8%) were in maintenance stage (**Table.2**). The results of one way ANOVA showed a significant difference between stages of change and cognitive processes ($p < 0.001$), so that in progression across stages of change, the participants' mean scores of cognitive processes followed an increasing trend (**Figure.1**). Post-hoc test results showed that maintenance stage had significantly higher scores than pre-contemplation, contemplation, and preparation stages (**Table.3**).

One way ANOVA test results indicated that there was a significant difference between stages of changes and behavioral processes ($p<0.001$), so that in progression from pre-contemplation to maintenance, participants' mean scores of behavioral processes followed an increasing trend (**Figure.1**). Post-hoc test results showed that maintenance had significantly higher scores than other stages (**Table.3**). In general, according to the obtained results, mean score of cognitive and behavioral processes in active stages was significantly higher than those in inactive stages (**Table.3**).

Table-1: Demographic characteristics of participants.

Variables	Mean ± standard deviation
Age (year)	14.47±.87
BMI (kg/m²)	25.92±2.79
Family size	4.47±0.93
School grade	Number (%)
Grade 1	68 (27.2)
Grade 2	78 (31.2)
Grade 3	104 (41.6)
Weight Classification	Number (%)
Overweight	161(64.4)
Obese	89 (35.6)

Table-2: The distribution of stages of change for weight control.

Stages of change	Frequency	Percent	Cumulative percent
Pre-contemplation	59	23.6	23.6
Contemplation	142	56.8	80.4
Preparation	19	7.6	88
Action	13	5.2	93.2
Maintenance	17	6.8	100.0
Total	250	100.0	-

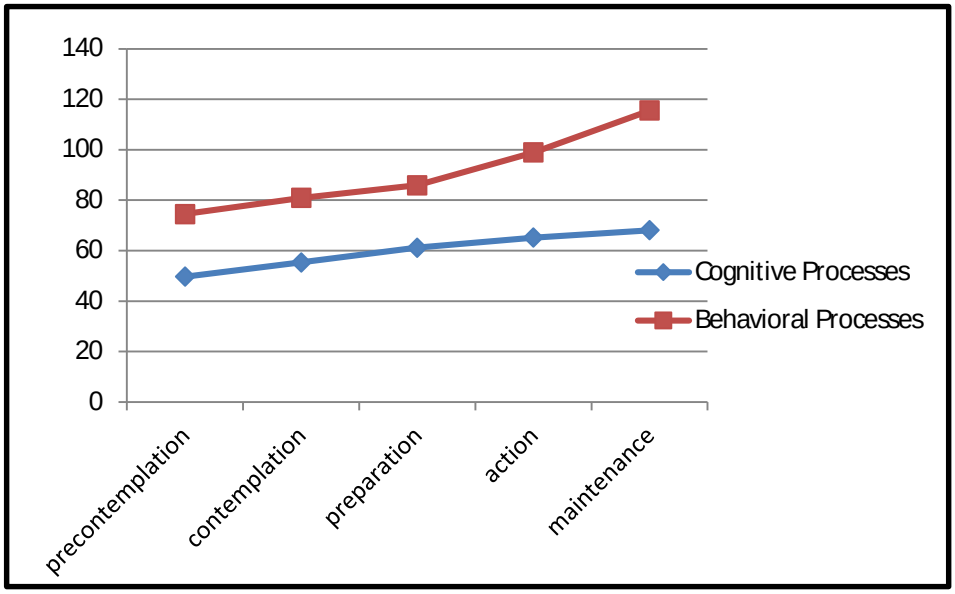

Fig.1: Mean scores of cognitive and behavioral processes for weight control across stages of change.

Table-3: The TTM-Related Variables across the Stages of Change for Weight Control.

TTM variable	PC Mean ± SD	C Mean ± SD	P Mean ± SD	A Mean ± SD	M Mean ± SD	P-value
Consciousness rising	8.38±2.27	9.60±2.49	11.05±1.54	11.92±2.21	11.76±1.95	<0.001
Dramatic Relief	11.67±3.00	13.19±2.70	15.63±1.16	16.07±1.44	18.88±9.44	<0.001
Environmental re-evaluation	10.86±2.30	12.55±2.26	12.63±2.35	14.53±0.96	14.82±1.18	<0.001
Self-reevaluation	18.77±3.50	20 ±2.71	21.84±1.21	22.61±0.76	22.64±1.10	<0.001
Cognitive Processes	49.71±7.85	55.35±7.46	61.15±3.89	65.15±3.10	68.11±10.21	<0.001
Reinforcement	21.03±3.89	23.08±5.11	26.05±1.58	28.76±1.09	33.23±0.97	<0.001
Self -Liberation	13.42±2.41	14.33±2.24	15.57±1.64	18.07±1.32	18.58±1.32	<0.001
Counter Conditioning	18.55±4.35	19.61±3.61	19.89±1.62	22.69±1.88	26.35±1.53	<0.001
Stimulus Control	9.71±3.38	11.27±5.54	12.10±2.13	14±2.12	18.76±1.09	<0.001
Helping Relationships	11.76±3.60	12.57±2.95	12.26±2.80	15.38±1.12	18.64±0.93	<0.001
Behavioral Processes	74.49±10.25	80.88±10.34	85.89±5.06	98.92±3.52	115.59 ±2.59	<0.001

PC: pre-contemplation; C: contemplation; P: preparation; A: action; M: maintenance; SD: standard deviation.

4- DISCUSSION

This study was aimed to identify stages and processes of change and their relation with weight control among overweight and obese adolescents. The analysis of participants' distribution across different stages of change for weight control revealed that 23.6% of them were in pre-contemplation stage, 56.8% in contemplation stage, 7.6% in preparation stage, 5.2% in action stage, and 6.8% in maintenance stage. These results are in agreement with those of previous studies. Mary et al. conducted a study on overweight rural Mexican - American women and found that 60% of them were in pre-contemplation, 26.7% in contemplation, and 13.3% in preparation/action stages (23). Romain and colleagues also reported that 5.9% of participants were in pre-contemplation, 9.7% in contemplation, 46.7% in preparation, 10.4 % in action, and 27.3 % of them were in maintenance stage (24).

In the current study, majority of participants (80%) were in inactive stages of weight control. The high percentage of Iranian adolescents in inactive stages may point out the critical need to facilitate the movement toward active stages of weight control. According to the existing literature, interventions based on stages of change can encourage individuals in inactive stages to move towards the active stages (25). Processes of change are cognitive and behavioral strategies which engage people to bring about the desired change (26). Stages of change emphasize on individuals' change time, while processes of change include a series of activities that emphasize on how people change when they are trying to modify the problematic behavior problem (27). The results of this study showed a significant difference for the mean score of cognitive processes during the stages of weight control change **(Table.3**). Indeed, the mean score of cognitive processes increased with the progress of individuals across stages of change (**Figure.1**). The maximum and minimum scores of cognitive processes were reported for the maintenance and pre-contemplation stages. Romain et al. conducted a study to measure the processes of change for physical activity and exercise among overweight and obese adults using TTM. They found that individuals in active stages used more cognitive processes than those in inactive stage (28). In the following each sub construct of cognitive processes will be analyzed separately. Consciousness raising refers to willingness to achieve news and information about the target behavior (29, 30).

In this study, consciousness raising assessed in relation to weight control. Post hoc Tukey test results showed that people in the pre-contemplation stage used this process less than other stages. These findings are consistent with the nature of pre-contemplation stage, because according to Prochaska's comments, people in this stage are usually reluctant to study, learn, and think about the problem making behavior (31). Dramatic relief process measured the amount of emotional arousal in individuals' with uncontrolled weight. The results showed that the highest dramatic relief process for people was in maintenance stage while the lowest one was in pre-contemplation stage. These findings are supported by other similar studies (32). The process of environmental re-evaluating refers to the positive or negative effects of behaving on people and social environment. People in pre-contemplation stage had the lowest mean score while those in maintenance stage had the highest scores. These results correspond with those reported by Huang and colleagues (33). Self-re-evaluation process is the last cognitive process investigated in this study. This process is considered to promote people from contemplation stage to preparation stage

by methods such as strengthening the self-concept, positive imagination, and introduction of healthy role models (30, 31). Results of this process' analysis showed that the largest increase in mean scores was observed between contemplation and preparation stages. These results correspond with Kim and colleagues' reports (30). These findings seem logical because according to TTM, the self-re-evaluation process is the main strategy to promote people from contemplation to preparation stage (15). In investigating the relationship between behavioral processes and weight control stages of change, the results of the current study showed a significant difference between stages of change and behavioral processes. The mean score of behavioral processes had an increasing trend from inactive to active stages and the difference was significant.

The highest mean scores of behavioral processes were achieved in maintenance stage while the lowest scores were related to pre-contemplation stage. In a research conducted by Hwang et al., behavioral processes were significantly associated with stages of physical activity. In the mentioned study behavioral processes subsequently increased with advancement through stages, so that by progressing through these stages, individuals used behavioral processes more (33) .Behavioral processes were then investigated individually to confirm this matter. Furthermore, results of each behavioral processes structure are investigated separately. In TTM, the self-liberation process includes individual's belief about behavior change and commitment to act on that belief. Individuals in maintenance, action, and preparation stages of change used this process more than other people. Results showed that most mean increases were observed between the preparation and action stages which correspond to the assumptions of TTM. This was due to the fact that self-liberation in this model, process is mentioned as the most important behavioral process to promote people from preparation to action stage (18). Counter conditioning includes substitution of healthier behaviors for unhealthy behaviors and is applied to promote people from action to maintenance stage. The results indicated that there was a maximum average for maintenance stage which is consistent with previous studies (33, 34). In this study, individuals in active stage have used helping relationships more than other stages and there was no significant difference between pre-contemplation, contemplation, and preparation.

This finding represents the importance of social support in weight control more apparently. The reinforcement management process is one of the most important behavioral processes which has the most application in promoting people from action to maintenance stage (29). Tukey post hoc test showed that people in maintenance stage have used this process more than other stages so that this structure was the best predictor of weight control. This emphasized the importance of incentives and reinforcements for weight control. The last behavioral process evaluated in this study was simultaneous control which emphasizes on removal of unpleasant stimuli and addition of favorable stimuli (26).

In the current study, individuals in pre-contemplation and contemplation stages have implemented this process less than other individuals. Furthermore, these people are in inactive stages of behavioral change, so these results seem logical. Findings of similar studies confirm these results (35). Generally, results of this study demonstrated a significant relationship between stages and processes of change. This finding supports the assumptions of TTM model, since based on this model individual at the earliest stages use

processes of change significantly less often than those at the later stages (36). In similar studies, the least application of cognitive and behavioral processes was for individuals in inactive stages (33, 34). These results were consistent with findings of the current research. This may be due to several reasons. People may be unaware of their problematic behavior, or may be discouraged about changing it as a result of past failed attempts. Generally, these people may have no clear plan for behavior change; therefore, they use these processes less than others. According to Velicer et al., individuals who are in inactive stages of change do not have sufficient knowledge about the benefits and advantages of changing their current behavior (26).

4-1. Limitations of the study

The present study has several limitations including lack of relevant specific studies in this field, lack of specific questionnaire to measure the TTM model structures for weight control, and small sample size. The results of this study may not be generalizable to other community settings because of small sample size, thus, a bigger sample size should be used to produce more reliable results.

5- CONCLUSION

Results obtained from this research showed that most obese and overweight Iranian adolescents were in inactive stages of weight control and had no specific plans to control it. Generally, results achieved from individuals' distribution through the weight control change processes and also its relation with change processes can be a good guide for health experts to design effective interventions for weight control in this age group.

6- CONFLICT OF INTEREST

The authors had not any financial or personal relationships with other people or organizations during the study. So there was no conflict of interests in this article.

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