

Original Article

The Effect of Transtheoretical Model-Based Education and Follow-up on Providing Overweight Women with Exercise Behavior

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Abstract

Background: Taking preventive measures for overweight individuals who are at risk of developing obesity is an important practice in terms of public health.

Aims: This study aimed at assessing the effect of a TTM-based education and follow-up on building exercise behavior in overweight women.

Methodology: This pretest-posttest, controlled, semi-experimental study was conducted to investigate the effect of a Transtheoretical Model (TTM) education and follow-up on building exercise behavior in overweight women. The study population consisted of women aged between 20 and 45 who were registered at Sukrupasa Family Healthcare Center and the study sample included 110 overweight (BMI=25-29.9) women, 55 in the experimental group and 55 in the control group, who presented to the center for some reason. The women in the experimental group were given, by way of home visits, an “Education Program” (10 weeks), which was constructed in line with the Transtheoretical Model according to the women’s stages of change, with a follow-up period of 6 months.

Results: The difference between the stages of change measured at pretest and posttest was found significant in the experimental group ($p<0.001$) and 78.1% of the women were able to make improvements in their exercise behavior. After the education and follow-up, the women’s overall mean scores of processes of change, self-efficacy and decisional balance scales for exercise increased and the differences between the groups were found significant. The mean number of daily steps of the experimental group increased while their BMIs decreased ($p<0.001$).

Conclusion: The Transtheoretical Model-based education and follow-up given to overweight women was found to be effective in building their exercise behavior. In view of these results, we can suggest that personal or group educations based on TTM should be provided to this so-called pre-obese group especially by nurses working in primary care in order to prevent obesity.

Keywords: Exercise behavior, Overweight, Nursing, Transtheoretical Model, Women

Introduction

Overweight followed by obesity is one of the major health problems of developed and developing countries today and its prevalence is gradually increasing. According to the data of the World Health Organization (WHO), there were approximately 1.9 billion overweight and approximately 600 million obese adults in the world in 2014 (WHO 2016). Studies have reported that the prevalence of obesity has

increased by 44% in the last 12 years in our country (Satman & TURDEP, 2010). It has also been reported that the prevalence of obesity ranges between 24.6% and 61% in women in Turkey, almost double compared to that of men (Kozan et al., 2007).

Obesity is a major health problem that sets the stage for the emergence of a variety of diseases and adversely affects the length and quality of life if not prevented. Therefore, taking protective

measures is very important (Vatansev & Cakmakci, 2010). For this purpose, protective measures should target overweight people (pre-obese, BMI=25-29.9) who are not obese but have the risk of developing obesity. Since inadequate physical activity is one of the two major causes of obesity, increasing physical activity is a strategy preferred in public healthcare activities for the prevention of obesity (Erci, 2009).

Studies assessing physical activity habits show that physical activity has not yet become a life style in our country (TR Ministry of Health, 2004). Therefore, the society should be informed, motivated and encouraged towards acquiring regular and more active exercising habits and studies in this area should be broadened (TR Ministry of Health, 2010). The habit of regular exercising protects people from obesity and chronic diseases for a long time and in this way decreases the negative effects of a sedentary life, and at the same time enables weight loss and maintenance of a healthy weight (Vatansev & Cakmakci, 2010; Erkol & Khorshid, 2004).

The Transtheoretical Model (TTM) is widely used today to improve the process of health behavior change and to achieve the most effective health behavior change. TTM devices interventions that match to each individual's stage of change and is used as a guideline to facilitate behavior change (Shinitzky & Kub, 2001).

This model has been evidenced to be extremely effective in many health behaviors and particularly in adherence to exercise (Greene et al., 1999; Velicer et al., 1999; Ay & Temel, 2008). TTM states that to facilitate change, interventions that are most suitable for an individual's stage of change should be used (Erol & Erdogan, 2007). Studies have shown that intervention made to an individual's stage of change is the most effective way to enhance behavior change. TTM-based educational interventions have been found to be effective on various groups including overweight women in a number of countries (Woods et al., 2002; Kirk et al., 2003; Dallow & Anderson, 2003; Kirk et al., 2010).

A review of the studies made in Turkey showed that there were not any interventional studies based on TTM aiming at building exercise behavior in overweight people. We think that TTM-based interventions are important in

building exercise behavior and in this way prevent obesity in overweight women.

Aim

This study aimed at assessing the effect of a TTM-based education and follow-up on building exercise behavior in overweight women.

Study Hypotheses

H1. TTM-based education and follow-up enables the women in the experimental group to progress in their stages of exercise behavior change.

H2. TTM-based education and follow-up improves the mean process of change, self-efficacy and decisional balance for exercise scores of the women in the experimental group.

Methods

Research Design and Participants

This study is a pretest-posttest, controlled and semi-experimental study. It was conducted at Sukrupasa Family Healthcare Center (FHC) in Erzurum between January 2011 and January 2013. The study population consisted of overweight women (BMI=25-29.9) aged between 20 and 45 who lived in the Sukrupasa FHC region and the study sample included 110 women, 55 in the experimental group and 55 in the control group, selected by way of a power analysis who presented to the FHC for some reason and met the inclusion criteria. From the population, women were included in the sample group through improbable randomization. Individuals were included in the experimental and control groups in sequence, one to each of the groups. Women who were graduates of at least primary school, who were not pregnant and who did not have any physical or mental disability to prevent them from performing physical activity were included in the sample.

Data Collection Tools

Personal Information Questionnaire

It was prepared by the investigator and consisted of questions on socio-demographic information such as age and marital status of the women.

Brief Questionnaire for Stages of Exercise Change

It was developed by Marcus et al. (1992a) and was adapted to the Turkish society by Ay and Temel (2008). The Kappa index validity of the Brief Questionnaire for Stages of Exercise Change was found to be 0.81 (n=60). The

questionnaire consists of five questions to reveal the individual's stage of change. These stages of change are precontemplation, contemplation, preparation, action, and maintenance (Marcus, Rossi, Selby, Niaura, Abrams 1992).

Processes of Change Scale for Exercise

It was developed by Marcus et al. (1992b) to determine how experiences affect the exercising habits of people and was adapted to the Turkish society by Ay and Temel (2008). The Cronbach's Alpha coefficient was found to be 0.95 for the entire scale and 0.91 for cognitive processes and 0.93 for behavioral processes as its sub-dimensions. The processes of change scale for exercise is a 5-point Likert-type scale consisting of 28 items.

Self-Efficacy Scale for Exercise

The scale was developed by Marcus et al. (1992a) to assess the perceived exercise self-efficacy beliefs of individuals in controlling their exercising behavior in various situations and was adapted to the Turkish society by Ay and Temel (2008). The overall Cronbach's Alpha coefficient of the scale was found to be 0.90. This Likert-type scale consists of six items that are scored from 1 to 5.

Decisional Balance Scale for Exercise

It was developed by Marcus et al. (1992c) to reveal the cognitive and motivational factors in making decisions about exercise behavior. In 2007, it was adapted to the Turkish society by Ay and Temel (2008). It is a 5-point Likert-type scale with two sub-dimensions, namely perceived pros of exercising and perceived cons of exercising. The Cronbach's Alpha coefficient of the scale was found to be 0.86, with 0.87 for perceived pros and 0.70 for perceived cons. The overall score of the scale is obtained by subtracting the total score of perceived cons from the total score of perceived pros. (Marcus et al., 1992, Transtheoretical Model).

Data Collection Methods

Data were collected by the investigator by way of home visits between 07.11.2011 and 31.08.2012. The data of the experimental group were collected before the education (pretest), immediately after the conclusion of the education (second test) and 6 months after the education (posttest). The data of the control group were collected at baseline and month 6. Pedometers were provided to the women at baseline to

measure their activity statuses. Their activity statuses were determined by taking the average of their number of steps in the last seven days in their pedometers during the time when their pretest and posttest data were collected. The tallness and weight measurements of the women were performed by the investigator at Sukrupasa FHC.

Nursing Intervention

The women in the experimental group were administered an education program (10 weeks) and a follow-up (6 months) that were prepared according to their stages of change. No educational intervention was attempted for the control group. The duration, number and contents of the education given to the women in the experimental group were decided on according to their stages of change. At least five educations were given to the women at the stage of precontemplation, at least four to those at the stage of contemplation, at least three to those at the stage of preparation, at least two to those at the stage of action and at least one to those at the stage of maintenance.

The ten-week educational intervention was administered every other week and each education lasted 30-45 minutes on the average. By administering the TTM-specific questionnaires and scales to the women before each education, their stages of exercise change and processes of change were determined. The educations given were specific to these predetermined stages and processes (Ay, 2008). After the completion of their education, the women were followed up for a period of 6 months to see their behavior changes. The women were phoned 3 times by the investigator to answer their questions and to motivate them for taking action. They were also questioned as to how many steps they took, whether they followed the CD and how many kilos they lost. Each phone conversation took about 10-12 minutes.

Educational Materials

Exercise Education Brochure

They were prepared separately by the investigator specific to each of the stages of change. The women in the experimental group were given a brochure specific to their stage immediately after they were given education relating to that stage.

Exercise CD

The CD consisted of three sections, beginning, medium and advance level exercises, totaling to 72 minutes to help the subjects work out at home provided that they did not have any health problems to prevent them from exercising. It included movements to warm up and cool down, losing weight with the help of objects such as a plastic bottle, chair and pillow at home, becoming fit, weight lifting and movements to improve the strength of the heart and respiration system. The CD was given to the experimental group women who were in the preparation, action and maintenance stages.

Data Analysis

The data were statistically analyzed using a statistical package program (SPSS 10.0). The data were analyzed using t-test, McNemar test, one-way ANOVA and χ^2 test.

Ethical considerations

Official permissions were obtained from the relevant institutions to initiate the study. Volunteerism was required in the women included in the study. The education and exercise brochures given to the women in the experimental group were also given to the women in the control group after the administration of posttests.

Results

There was no significant difference between the women in the experimental and control groups in terms of their socio-demographic characteristics ($p>0.05$) and their TTMS scores were similar with no significant difference between the groups ($p>0.05$).

While the percentage of the women in the experimental group who were in the action (7.3%) and maintenance (1.8%) stages was 9.1% at their pretest measurements, this percentage went up to 54.5% at their posttest measurements. A statistically significant difference was found in the experimental group between pretest and posttest with respect to their stages of change ($p<0.001$); no such difference was found in the control group ($p>0.05$) (Table 1). There was progression in 43 women in the experimental group (78.1%) in their stages of change, but no progression in 12 of them (21.9%). When the women were compared with respect to their stages of exercise change at posttest, the

difference between the groups was significant in favor of the experimental group ($p<0.001$).

The mean scores of Processes of Change Scale for Exercise and Self-Efficacy Scale of the women in the experimental group were low at pretest, but showed improvements with repeating tests and the difference between the measurements was statistically significant ($p<0.001$).

Their mean overall scores of Decisional Balance Scale for Exercise and mean scores of perceived pros of exercise showed improvements through repeated tests, demonstrating a statistically significant difference between them ($p<0.001$). The mean score of perceived cons of the scale decreased with repeating tests and a statistically significant difference was found ($p<0.05$) (Table 2). The mean score of the processes of exercise change of the control group was low at pretest, it increased at posttest and the difference between the measurements was significant ($p<0.001$). The mean scores of the self-efficacy scale for exercise and decisional balance for exercise scale remained unchanged in this group and the difference was not significant ($p>0.05$).

The mean scores of the experimental group were higher in all scales compared to the control group and the difference between the groups was significant ($p<0.001$) (Table 3). The mean scores of the women in the experimental group increased in all scales as they progressed from the precontemplation stage to the maintenance stage and the difference was statistically significant (Table 4). The mean number of daily steps of the women in the experimental group increased at posttest and the difference was significant ($p<0.001$). The BMI values decreased in the experimental group at posttest and there was a significant difference between the groups ($p<0.001$) (Table 5).

Discussion

The difference between the pretest and posttest measurements of the experimental group with respect to their stage of exercise change was statistically significant ($p<0.001$) and while the percentage of the women who were at the precontemplation stage was 23.6% and of those at the contemplation stage 41.5% at pretest, the percentage of those at the precontemplation stage dropped to 5.5% and of those at the contemplation stage to 14.5% at posttest (Table 1).

Table 1. Women's Pre and post-test comparison of Exercise Stages of Change.

Groups	Change Steps	Pre-Test		Post- Test	
		Number	Percent	Number	Percent
Experimental group	Precontemplation	13	23.6	3	5.5
	Contemplation	23	41.8	8	14.5
	Preparation	14	25.5	14	25.5
	Action	4	7.3	23	41.8
	Maintenance	1	1.8	7	12.7
	Total	55	100.0	55	100.0
	Test* and Significant			P=0.000	
Control group	Precontemplation	15	27.3	14	25.5
	Contemplation	22	40.0	22	40.0
	Preparation	13	23.6	14	25.5
	Action	4	7.3	3	5.5
	Maintenance	1	1.8	2	3.6
	Total	55	100.0	55	100.0
	Test* ve Significant			P=0.174	

*Mc Nemar

Table 2. Comparison of the Mean TTMS Scores of the Experimental Group by their Measurements

Scales	Pre-test Mean \pm SD	Second Test Mean \pm SD	PostTest Mean \pm SD	Test and Significant	
Processes of change	71.09 \pm 16.99	101.63 \pm 18.37	100.98 \pm 16.63	F=55.61	P=0.000
Experiential	37.20 \pm 7.99	46.43 \pm 6.25	48.65 \pm 6.83	F=40.65	P=0.000
Behavioral	33.89 \pm 9.63	49.30 \pm 8.27	52.32 \pm 11.04	F=56.94	P=0.000
Total	71.09 \pm 16.99	101.63 \pm 18.37	100.98 \pm 16.63	F=55.61	P=0.000
Self-efficacy	14.32 \pm 4.15	20.47 \pm 3.57	21.56 \pm 4.46	F=50.27	P=0.000
Decisional balance	2.05 \pm 4.95	4.70 \pm 3.70	6.40 \pm 3.14	F=16.57	P= 0.000
Pros	16.32 \pm .58	16.49 \pm 1.83	17.21 \pm 1.22	F=3.21	P= 0.043
Cons	14.27 \pm 3.23	11.78 \pm 2.72	10.81 \pm 2.84	F=20.16	P= 0.000
Total	2.05 \pm 4.91	4.70 \pm 3.70	6.40 \pm 3.14	F=16.57	P= 0.000

Table 3. Comparison of the Mean TTM Scale Scores of Groups at Posttest

Scales	<u>Experimental Group</u>	<u>Control Group</u>	Test and Significant	
	Mean ±SD	Mean ±SD		
Processes of change Scale	100.98±16.63	72.00±17.26	t=8.964	p=0.000
Experiential Processes	48.65±6.83	37.29±7.23	t=8.467	p=0.000
Behavioral Processes	52.32±11.04	34.70±10.64	t=8.518	p=0.000
Total	100.98±16.63	72.00±17.26	t=8.964	p=0.000
Self-efficacy Scale	21.56±4.46	13.98± 4.69	t=8.679	p=0.000
Decisional balance Scale	6.40±3.14	1.10±4.92	t=6.717	p=0.000
Pros	17.21±1.22	15.20±3.55	t= 3.979	p=0.000
Cons	10.81±2.84	14.09±3.36	t=-5.502	p=0.000
Total	6.40±3.14	1.10±4.92	t=6.717	p=0.000

Table 4. Comparison of the Mean TTM Scale Scores of the Experimental Group at Posttest by their Stages of Exercise Change

	<u>Precontemp</u>	<u>Contemp.</u>	<u>Preparation</u>	<u>Action</u>	<u>Maintenance</u>	Test and significant
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Processes of change Scale	68.66±10.26	81.00±6.78	93.07±5.88	109.78±6.36	124.57±5.56	F=78.108 p=0.000
Experiential Processes	37.33±4.61	40.12±2.99	45.78±3.51	51.91±3.24	58.28±2.92	F=44.962 p=0.000
Behavioral Processes	31.33±7.57	40.87±5.59	47.28±6.05	57.86±6.03	66.28±5.52	F=33.420 p=0.000
Self-efficacy Scale	14.66±2.30	16.37±2.32	19.64±3.56	23.95±2.51	26.42±1.61	F=23.991 p=0.000
Decisional balance Scale	4.00±2.00	4.12±2.94	5.14±4.05	7.86±2.07	7.71±1.60	F=4.539 p=0.003
Pros.	17.66±1.52	16.62±0.91	16.92±1.20	17.34±1.22	17.85±1.34	F=1.332 p=0.271
Cons.	13.66±0.57	12.50±3.16	11.78±3.88	9.47±1.64	10.14±1.06	F=3.918 p=0.008

Table 5. Comparison of the Mean Number of Daily Steps and BMI Values of the Groups according to the Pretest and Posttest Measurements

	Measurements	Experimental	Control	Test and Significant	
Step Number	Pre- test	8153.81±1790.87	8029.63±1179.51	t= 0.429	p=0.668
	Post- test	12552.90±3731.50	8190.72±1154.81	t= 8.282	p=0.000
BMI	Pre-test	27.63±1.62	27.93±1.52	t= 0.997	p=0.321
	Post- test	26.00±1.80	27.92±1.51	t= 6.028	p=0.000

In the study of Ay and Temel (2008) where they assessed adherence to exercise in TTM, the percentage of those who were at the precontemplation stage was 22.6% and of those at the contemplation stage 30.2% at pretest and the percentage of those at the precontemplation stage dropped to 5.7% and of those at the contemplation stage to 11.3% at posttest. While 26.4% of the subjects were at the preparation stage at pretest, this percentage increased to 30.2% at posttest.

The percentage of the subjects at the action stage was 11.3% and of those at the maintenance stage 9.4% at pretest and these percentages increased at posttest. The percentage of those at the action stage went up to 35.8% and of those at the maintenance stage to 17%, which made the percentage of those who were active (action and maintenance) rise to 52.8%. The results of their study are similar to the results of our study. In a study made on diabetic individuals, 83% of those who received exercise consultancy made a progress in the stages of change and only 17% had no change in their stages (Kirk et al., 2003). In the randomized controlled study of Kirk et al. (2001), 82% of the experimental group that received TTM-based exercise consultancy made a progress in their stages of exercise change. It has been reported in another study that TTM-based educational intervention is an effective method in improving the stages of change of inactive young persons (Woods et al., 2002).

TTM-based educations provided to various groups have been reported to enable progression in the stages of exercise change. According to the results obtained in our study, the percentage of those who were active was 9% at pretest, which went up to 54.5% at posttest, and 78.1% of the women showed change in the direction of progress, with 21.9% showing no changes in their stages. We can say that the TTM-based education was effective in the progresses made by the women in the experimental group in their

stages of exercise change. This result confirms the hypothesis that “TTM-based education and follow-up enables women to progress in their stages of exercise behavior change”.

It was reported in the study of Ay and Temel (2008) that the mean overall score of the processes of exercise change of those in the experimental group increased at posttest compared to pretest. In the randomized controlled study of Dallow and Anderson (2003) they conducted based on TTM on sedentary obese women, they found a positive progress in the processes of change of the women in the experimental group after the intervention. We also found in our study that as the women in the experimental group made progression between the stages of change, their processes of change also improved (Table 4). These results we obtained show similarities to those of other studies.

The self-efficacy scores of the experimental group in our study increased at the posttest measurements as they progressed from the precontemplation stage to the maintenance stage. It was also found in the study of Kim (2007) that perceived self-efficacy increased as progress was made from the precontemplation stage to the maintenance stage. Many other domestic and foreign studies confirm that perceived self-efficacy increases as progress is made from the precontemplation stage to the maintenance stage (Ay & Temel, 2008; Dallow & Anderson 2003; Kirk et al., 2010; Robinson et al., 2008; Sarkin et al., 2001; Micoogullari et al., 2010; Plow et al., 2011). It is stated in the literature that in exercise behavior change, the self-efficacy of individuals at the precontemplation stage is low and self-efficacy increases progressively in those who are at more advance stages of change (Prochaska & Marcus, 1993). The results obtained in the present study are similar to the results of that study and the data in the literature. We think that

the education and follow-up provided was effective in increasing the mean self-efficacy scale for exercise scores of the experimental group at posttest as compared to those of the control group.

The Decisional Balance Scale for Exercise score of the experimental group was higher than that of the control group in our study (Table 3). The mean overall score of the scale increased at posttest in the experimental group as they progressed from the precontemplation stage to the maintenance stage. Their perceived cons scores decreased and perceived pros scores remained the same as they progressed from the precontemplation stage to the maintenance stage (Table 4). Sarkin et al. (2001) found in their study that the perceived pros scores of the subjects increased and their perceived cons scores decreased as they progressed from the precontemplation stage to the contemplation and preparation stages. Many other studies have also confirmed that perceived pros scores increase and perceived cons scores decrease as subjects achieve progression (Ay & Temel, 2008; Kahn et al., 2002). The results of our study show that the women in the experimental group were, in fact, aware of the benefits of exercise at all stages, but they became more aware of the cons of failing to exercise as they progressed between the stages. We think that the education and follow-up provided to the experimental group was effective in improving their decisional balance for exercise scores more than those in the control group. The results of this study confirms the hypothesis that “TTM-based education and follow-up improves the mean process of change, self-efficacy and decisional balance for exercise scores of women”. The mean number of daily steps of the experimental group showed an increase at posttest compared to pretest and the difference was found significant in favor of the experimental group ($p < 0.001$) (Table 5). Dallow and Anderson (2003) found in their study that daily energy expenditure increased in the experimental group after a 24-week physical activity intervention and that TTM-based interventions were effective in increasing physical activity in obese women. A study made abroad has found that follow-ups of 3-6 months increase the rate of physical activity by 50% (Vandelanotte et al., 2007). It was found at the end of the present study that the percentage of those who were active increased from 9% at pretest to 54.5% at posttest. The fact that the

mean number of daily steps at posttest measurements was higher in the experimental group supports this result and shows that the education and follow-up provided was effective.

The BMIs of the experimental group decreased at posttest compared to pretest. A study made on overweight and obese people has reported that TTM-based interventions enable at least 2 kilos of weight loss in these groups (Tuah et al., 2012). The results of our study show that the mean number of daily steps increases as progress is made through the stages of exercise change after education and follow-up.

Conclusion

The TTM-based education and follow-up resulted in a progress in the women's stages of exercise behavior change at the end of this study. It also increased the mean process of change, self-efficacy and decisional balance for exercise scores of the women. Therefore, the study hypotheses were verified. Moreover, the increase in the mean number of daily steps of the women in the experimental group, the decrease in their BMIs and the increase in their engagement in active exercising objectively support that the education and follow-up provided was effective.

In view of these results, we can suggest that personal or group educations based on TTM should be provided to this so-called pre-obese group especially by nurses working in primary care in order to prevent obesity and researchers who work in this field should follow up the effects of behavior change interventions for longer terms (12-24 months).

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