Predictors of physical activity-related energy expenditure among overweight and obese middle-aged women in south of Iran: An application of social cognitive theory

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ABSTRACT

Aims: This study aimed to determine the predictors of physical activity (PA) behavior in obese and overweight women in Borazjan district, south of Iran based on social cognitive theory (SCT).

Methods: This cross-sectional descriptive-analytic study was conducted on 398 obese or overweight middle-aged women referring to comprehensive health centers in Borazjan city. Data were analyzed using SPSS software version-22 and descriptive statistics, *t*-test, one-way ANOVA, Pearson correlation analysis and multiple regression analysis.

Results: Based on Pearson correlation analysis, the constructs of SCT including self-efficacy, self-regulation, outcome-expectations and perceived social-support from family and friends were related to physical activity behavior and energy expenditure. The multiple regression model showed self-efficacy and self-regulation were the most important predictors of PA behavior ($R^2 = 0.217$). Self-efficacy predicted PA behavior in both obese and overweight women and self-regulation in obese women and perceived social-support from friends in overweight women, also was predictors.

Conclusion: Considering the results of the study that showed differences in predictive constructs of PA between two groups of overweight and obese women, it can be used to design and develop educational interventions to encourage overweight and obese women to do more PA and enhance their health status throughout a more active lifestyle.

1. Introduction

Nowadays obesity and overweight are one of the major health problems around the world, which is a major risk factor for many chronic diseases and is the sixth cause of the burden of disease all over the world. (Coll et al. (2015); Yaghoobi et al. (2015)) Based on the body mass index, which is the best indicator for overweight and obesity in adults worldwide, people with a BMI[1] of 25–30 and above 30 are overweight and obese, respectively (Ghadiri-Anari et al., 2013; Jafari-Adli et al., 2014). The prevalence of obesity is increasing dramatically throughout the world, in both developed and developing countries (Daniali et al., 2012; Jafari-Adli et al., 2014). According to reports in 2014, more than 1.9 billion (39%) of adults (18 years and over) were overweight around the world, of which more than 600 million (13%) were obese (World Health Organization, 2018). According to statistics, Iran is among the seven most obese countries (Mohammadi Zeidi and Akaberi, 2013).

Although the prevalence of overweight and obesity is high globally, but according to reports in all WHO areas, the prevalence of obesity in women is higher than men (World Health Organization, 2014). In Iran, according to estimates, the prevalence of obesity in women is more than that of men and about 57% of adult women are overweight and obese (Pasha et al., 2014). Obesity is a major contributor to many of the serious diseases, including diabetes, cardiovascular disease, cancers and strokes, and also is associated with a reduction in life expectancy (Hammond and Levine, 2010). Obesity and overweight cause 80% of cases of type-2 diabetes, 55% of cases of high blood pressure and 35% of coronary arteries, and over a million deaths in the world according to the WHO[2] Regional Office for Europe (Kiadaliri et al., 2014).

Obesity has a negative impact on the various aspects of women's lives. According to studies, as a result of certain conditions such as childbirth, infertility, osteoarthritis, breast and endometrial cancer, diabetes and, cardiovascular disease, there is a direct relationship between the body weight and death of women between the ages of 30 and 55 years (Mbochi et al., 2012).

Overall, although obesity, as a health problem and an important risk factor can lead to acute and debilitating illnesses and complications, but based on the evidences, control and treatment of obesity is possible and one of the most important and effective strategies to achieve this goal is to have physical activity (PA) and active lifestyle (World Health Organization, 2016). PA is defined as any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen et al., 1985). Studies have shown that performing adequate PA and replacing these activities with inertia and, subsequently, controlling obesity will significantly reduce the incidence of chronic diseases and their complications (Kann, 2013; Kokkinos, 2012; Wiklund, 2016).

However, the PA status and energy expenditure in individuals, especially those who are obese and overweight, is not very appropriate and participation in PA is not done sufficiently by individuals (Pietiläinen et al., 2008). According to the WHO, one in four people around the world do not have enough PA (World Health Organization, 2017). In Iran, data from three national studies also show that over 80% of people have a sedentary lifestyle (Charkazi et al., 2014) and, nearly a half of women aged over 15 have inactive lifestyle (Tabatabaei et al., 2017). Regarding the importance of the PA in preventing a wide range of diseases, it is well-known that efforts to promote PA in individuals, especially in overweight and obese women, due to the increased prevalence of sedentary lifestyle in this group are becoming a major component of public health policies in the world today (Withall et al., 2011).

Promoting the PA behavior needs a clear picture of determinant factors that influence and predict it (Ardestani et al., 2015). Various studies suggest that PA behavior is influenced by demographic variables and modifiable psychological variables. Using behavior change theories to identify the main factors influencing PA is essential because of the complexity of this behavior. Information about factors that affect PA behavior in middle-aged women with overweight or obesity based on theoretical framework is scarce. In this study, the SCT[3] (Social Cognitive Theory) was used to explain factors related to PA behavior of middle-aged women with overweight or obesity. SCT is one of the most important theories of behavior change that has been widely considered in behavioral health sciences and successfully applied in the design of health interventions (Bandura, 2004). SCT specifies a core set of psychosocial determinants (i.e., self-efficacy, outcome expectations, self-regulation, and social support) for effectively understanding a broad range of health behaviors, including PA (McAuley and Blissmer, 2000; White et al., 2011). According to Bandura, self-efficacy is the pivotal construct within SCT and is suggested to have a direct effect on behavior as well as indirect effects through all other model components (Young et al., 2014). It affects behavior by serving as incentives (positive outcomes) or disincentives (negative outcomes) (Bandura, 2002). Outcome expectations provide the motivation for behavior while self-efficacy provides the confidence to overcome barriers. Individuals are more motivated to engage in behaviors if they believe there will be beneficial consequences (more positive outcomes and fewer negative outcomes) from those behaviors (Reisi et al., 2016).

Social support describes resources provided from interactions with significant others that can influence behavior. These resources can be emotional (e.g. encouragement, praise), instrumental (e.g. equipment, financial), or informational support (e.g. advice, instruction) and they can be provided by various individuals (providers) within one's social network (e.g. friends, family, teachers) (Laird et al., 2016). And self-

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[3] Social Cognitive Theory.

regulation is the ability to monitor behavior in order to achieve goals and can be a useful resource to assist individuals in adopting and maintaining regular behavior (White et al., 2011).

A few studies have attempted to incorporate all SCT construct into models predicting PA behavior. For example, Rovniak et al. (2002) found a longitudinal SCT model incorporating outcome expectations, self-efficacy, and self-regulation with social support acting as a moderator accounted for 55% of the variance in PA (Rovniak et al., 2002).

Considering the importance of promoting PA in middle-aged women with overweight or obesity and with regards to their important role in the family and community, the necessity to determine the effective factors for designing health education programs based on theory is obvious. Because of the lack of researches to assess the individual, behavioral, and environmental factors effect on PA among this vulnerable group, the present study was designed to test the utility of Bandura's social cognitive theory for explaining PA behavior in a sample of middle-aged women with obesity or overweight. This research assessed the power of predicting construct of social cognitive theory to designing PA programs. The results can be used as baseline data to improve PA caused by psychological factors.

2. Methods

This cross-sectional study was conducted between November 2017 to January 2018 on 398 middle-aged women with obesity or overweight who had been referred to the Comprehensive Health Service Centers in Borazjan district, south of Iran. This study funded by deputy of research and was approved by the Ethics Committee of Bushehr University of Medical Sciences (IR.BPUMS.REC.1396.57). At first, women were identified based on initial entry criteria and entered the study by convenience sampling method. Initial entry criteria for participation in the study include age 30 to 59 (According to the national protocol, these people are considered to be middle-aged), non-pregnancy and having a BMI $\geq$ 25 kg/m2 (overweight and obese). After identifying women with criteria for entering the study and before the interview, the interviewer first explained the purpose of the survey and then an informed consent was obtained. Then for women who had proclaimed their consent to participate in the study, demographics, social cognitive theory and PA questionnaire was completed. Of the 451 participants identified based on initial entry criteria and convenience sampling method, 398 women entered the study and completed the questionnaires.

3. Measurement

3.1. Sociodemographic characteristics

Sociodemographic attributes including age, educational level, marital status, occupation, household income, and disease status. Levels of education were categorized into four groups: less than High school, High school diploma, some college/Two-year degree, Four-year degree, Advanced degree.

3.2. Self-efficacy

We assessed self-efficacy by using the Bandura's self-efficacy questionnaire. This questionnaire had 18 items and it is answered by a percentage scale (0–100%) from 0 (cannot do at all) – 100 (highly certain can do) in the given situations. Self-efficacy for PA is calculated by summing the responses for each situation; total scores can range from a minimum of 0 to a maximum of 1800. Cronbach's alpha coefficient of the scale was reported 0.92 for Persian version (Noroozi et al., 2011a,b). The internal consistency (Cronbach's alpha) of this measure was determined as 0.95 in the present study.

3.3. Outcome expectations for exercise-2 scale (OEE-2)

A 13-item questionnaire assessed participants' belief about the outcomes and consequences of performing PA. This scale designed by Resnick (2005) and includes both positive (9 items) and negative (4 items) outcome expectations. Participants were asked how much they agreed or disagreed with each statement with answers ranging between 1 and 5 (from totally disagree to totally agree). Total score of the scale is measured by summing the numerical ratings for each response and dividing by the number of responses. Higher scores reflected strong beliefs that PA would lead to specific outcomes. There was evidence of internal consistency of both the positive outcome expectations and negative outcome expectations, with alpha coefficients of 0.93 and 0.80, respectively. In the present study Cronbach's α coefficients for positive and negative outcome expectations were 0.91 and 0.82, respectively.

3.4. Social support

We used social support scale for exercise behavior designed by Sallis et al. (Sallis et al., 1987). This scale consisting of 20 items that was prepared in 2 stages. 5 items constituted friend support in PA, whereas 15 items constituted family support with 5-point Likert scale. In validated Persian version, Cronbach's α coefficients for the family and friend support were 0.89 and 0.86, respectively (Noroozi et al., 2011a,b). Internal consistency for family and friend support in the present study were 0.93 and 0.93, respectively.

3.5. Self-regulation

The self-regulation questionnaire for PA was consist of 16 items. The questionnaire was designed by Abbasi and colleagues and assessed a set of four-person skills including: self-observation, goal setting and planning to overcome obstacles, receive feedback and reward, and eventually gain social support. At the beginning of this part of the questionnaire, participants were asked to specify the mechanisms used to increase their PA in leisure time by simply remembering their regular PA in the last 4 weeks. Responses were placed on the 5-level Likert scale, and respondents were asked to choose "never" if they did not use a particular mechanism or did not participate in regular PA in the last 4 weeks; otherwise, one of the options "Rarely", "Sometimes", "Most often" and "Everybody". A score of 5 was assigned to "never" option at one end of the Likert range, and score 1 for "Always", which was located at the other end of the answer spectrum. To calculate the total score of each individual, the scores of each of the 16 questions were summed up. Thus, the range of self-regulatory scores was between 16 and 80. Cronbach's alpha coefficient has been reported by the creators of this tool (90%) (Abasi et al., 2016). In this study, the Cronbach's alpha coefficient for this tool was 0.93.

3.6. Physical activity measure

In order to measure physical activity, the 7-day physical activity inventory questionnaire developed by Salis et al., was used. The semi-structured interview method is used to complete this questionnaire. During the interview, the person was asked questions about the PA that had taken place in the last seven days (according to the interview date), and he should mention them, duration (in minutes), severity (in terms of changes in heart rate compare them with walking and running) and type (daily activities or leisure activities). Then, using the toolkit, the energy expenditure during the previous week is calculated. Based on the interview's data, the sleep time, the moderate, severe, and very intense activity reported by the person is combined and is subtracted from the number 24 to obtain a mild activity. Then, in order to get daily activity in one week, the duration of each of the daily activities is combined together. Sleep duration and each of these activities are

multiplied by a constant number. This constant number is 1 for sleep, 1.5 for light activity, 4 for moderate activity, 6 for intense activity, and 10 for vigorous activity. To sum up the amount of energy expenditure, the numbers obtained are combined. The average daily energy expenditure by physical activity (TDEE) from last week will be calculated by dividing the number obtained by 7. The reliability of this tool has been studied in several studies and has a range of 0.34–0.99 (Sallis et al., 1985).

3.7. Data analysis

Descriptive statistics, the mean, standard deviation (SD), and percentage, were used to describe the participants' sociodemographic and study variables. Pearson correlation was performed to describe the relationship between continuous variables. To demonstrate the association between the sociodemographic characteristics, SCT's constructs and TDEE, the one-way ANOVA and two independent sample t-tests were performed. The multiple regression analyses were used to determine of predictive SCT constructs. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 22.0. In all tests, the level of significance was 0.05.

4. Results

4.1. Demographics and physical activity

A total of 398 middle-aged women with obesity or overweight were studied. Their demographic features are shown in Table 1. The mean age of participants was 43.82 years (range: 30–59) with a standard deviation of 8.44 years. The mean of BMI of the subjects was 29.7 ± 3.55. The lowest and highest BMI of participants was 25 and 51.52, respectively. There were 159 women with BMI ≥30 in the obese group and 239 women with BMI ≥25–29.9 in the overweight group. Most of the participants (90.2%) were married and were non-employed

Table 1
Differences between demographic information and TDEE (n = 398).

variables	N (%)	TDEE	t(F)	P-value
BMI			0.272	0.555
Overweight	239 (60.1)	235.42 ± 9.35		
Obese	159 (39.9)	235.97 ± 8.74		
Marital status			1.781	0.006
Married	359 (90.2%)	33.60 ± 1.21		
Not married	39 (9.8%)	34.20 ± 1.86		
Educational level			1.40	0.241
< High school	184 (46.2)	33.60 ± 1.23		
High school diploma	95 (23.8)	33.68 ± 1.55		
Some college/Two-year degree	33 (8.3)	33.38 ± 1.09		
Four-year degree or Advanced degree	86 (21.6)	33.66 ± 1.30		
Husband's educational level			2.61	0.035
< High school	123 (30.9)	33.50 ± 1.16		
High school diploma	136 (34.2)	33.59 ± 1.25		
Some college/Two-year degree	29 (7.3)	33.55 ± 1.38		
Four-year degree or Advanced degree	93 (17.8)	33.82 ± 1.17		
Employment status			0.230	0.042
employed	115 (28.9)	33.88 ± 1.44		
non-employed	283 (71.1)	33.57 ± 1.22		
History of chronic disease			5.107	.067
Yes	115 (28.9)	33.49 ± 1.07		
No	283 (71.1)	33.73 ± 1.37		
Income			1.083	0.356
< 12000000 IR-Rial	138 (33.7)	33.63 ± 1.42		
12000000- 20000000 IR-Rial	127 (31.9)	33.53 ± 1.13		
> 20000000 IR-Rial	133 (33.4)	33.81 ± 1.30		
Smoking			6.56	0.074
Yes	43 (10.8)	34.15 ± 1.92		
No	355 (89.2)	33.6 ± 1.19		

Table 2
Means, Standard Deviations and possible range of SCT Constructs and TDEE.

Variables	Mean ± SD	Scale Range
Outcome expectations	4.38 ± 0.55	1.31–5
Self-regulation	36.18 ± 18.06	16–80
Friend Social support	10.69 ± 6.19	5–25
Family social support	29.52 ± 12.95	15–73
Self-Efficacy	35.50 ± 23.45	0–1800
TDEE	33.66 ± 1.3	Open bound

Table 4
Multiple regression analyses of TDEE (n = 398).

Variables	β	P− value	R²
Self-regulation	0.235	< 0.001	0.217
Self-Efficacy	0.296	< 0.001	
Outcome expectations	0.068	0.197	
Friend Social support	0.093	0.131	
Family social support	0.090	0.158	

(71.1%). The major contributors (46.2%) had lower education than high school, and 28.9% had at least one chronic disease, with the highest incidence of diabetes (8.3%) and then hypertension (7.7%). 10.8% of participants consumed tobacco and more than two third of the participants had less than 20 million IR Rial (≈ 200 USD) monthly household income. TDEE was 33.66 ± 1.3 kcal/kg/d (range 31.5–43.36). This rate in the obese women group was 33.71 ± 1.24 kcal/kg/d and in the overweight group 33.63 ± 1.33 kcal/kg/d.

The results showed that physical activity (TDEE scores) significantly associated with employment status, Husband's education and marital status. Participants who were Employed (t = 2.18, P < 0.029), not married (t = 2.75, P < 0.006) and those whose husbands had a university education (F = 2.61, P < 0.03), showed a higher TDEE than others. Other variables did not achieve statistical significance (Table 1).

The means and standard deviations of SCT constructs related to TDEE were 4.38 (SD = 0.55) for outcome expectations, 36.18 (SD = 18.06) for self-regulation, 10.69 (SD = 6.19) for friend social support, 29.52 (SD = 12.95) for family social support, and 33.50 (SD = 23.45) for self-efficacy are shown in Table 2.

Pearson correlation coefficients of SCT constructs and TDEE are presented in Table 3. There was a significant positive correlation between TDEE and self-efficacy (r = 0.422, p < 0.001), outcome expectations (r = 0.294, p < 0.001), friend social support (r = 0.333, p < 0.001), family social support (r = 0.347, p < 0.001) and self-regulation (r = 0.394, p < 0.001).

To explore the predictor variables of TDEE, all social cognitive theory construct as independent variables and TDEE as the dependent variable, through the stepwise method were entered into the regression model. The results of this analysis are shown in Table 4. It was revealed that self-efficacy (β = 0.296, P = 0.001) and self-regulation (β = 0.235, P = 0.001) were important influences on PA, accounting for 21.7% (R² = 0.217) of the variance.

When overweight and obese women assessed separately, self-efficacy was predictive factor of TDEE in both group (P = 0.001, β = 0.36, P = 0.013, β = 0.22 respectively). In addition, in obese women the self-regulation (P = 0.001, β = 0.31) was the most important predictor and in overweight participants, friends social support (P = 0.002, β = 0.19) was also predictor for the TDEE.

5. Discussion

The prevalence of overweight and obesity has increased substantially in all societies across the globe during last 3 decades and all indications are that this trend is likely to continue unabated in the coming years (Finkelstein et al., 2012). This is a major public health concern because obesity has far reaching negative effects on health. The risk of type-2 diabetes, cardiovascular disease, certain types of cancers, and even mortality are directly linked to the degree of obesity (Wiklund, 2016). Considering that, the obesity is more prevalent in women than men, this group are more at risk for the effects of obesity and should be given more attention.

PA appears to be an important behavior that may prevent weight gain and significantly contribute to enhancing long-term weight loss and reducing health-risks associated with numerous chronic health conditions (Jakicic and Otto, 2005). Unfortunately, despite the importance of PA, according to WHO, one in four people around the world lack PA (World Health Organization, 2017). Results of a national survey in Iran revealed the inactivity rate (with an emphasis on PA in leisure time) in rural and urban people with 15–64 years old was 67.5%, and in men and women 76.3% and 58.8% respectively (Moeini et al., 2011). Therefore, it seems that the design of educational interventions to improve PA in individuals, especially those who are overweight and obese, can be effective in managing their weight and improving their health status (Jakicic and Otto, 2005). Since identification of the most important determinants of this behavior is the first step in designing effective educational interventions, the present study was conducted to determine the predictors of PA behaviors in overweight and obese middle-aged women based on social cognitive theory.

The results of our study showed that in general, PA in women was not favorable, as the average daily energy consumed by physical activity was 33.66 ± 1.3 (range 31.5–43.36). This rate in the obese women group was 33.71 ± 1.24 and in the overweight group 33.63 ± 1.33. Therefore, it seems that the implementation of health interventions to increase the level of PA in these individuals is necessary due to their special conditions that are at risk for a variety of serious chronic diseases such as cardiovascular disease, diabetes and cancers.

According to other results, overweight and obese middle-aged women who were employed, not married and among those who were married, those whose husbands had higher education and university degrees, had more PA than others. In line with the results of this study, in a study in the United States, employed individuals had the higher levels of PA (Kwak et al., 2016). In other studies, there is a positive and significant relationship between being employed and doing PA (Fattahi et al., 2014; Sadrollahi et al., 2016). Overall, it seems that the presence of women outside the home, as well as their presence in different social situations, make it possible to influence issues such as fitness and

Table 3
Correlation matrix of SCT Constructs and TDEE (N = 398).

Variables	Self-Efficacy	Outcome expectations	Self-regulation	friend Social support	Family social support	TDEE
Self-Efficacy	1					
Outcome expectations	**0.532	1				
Self-regulation	**0.537	**0.376	1			
Friend Social support	**0.417	**0.28	**0.686	1		
Family social support	**0.465	**0.281	**0.704	**0.593	1	
TDEE	**0.422	**0.294	**0.394	**0.333	**0.347	1

**Correlation is significant at the 0.001 level (two-tailed).

maintaining self-esteem on their greater participation in PA. On the other hand, being employed can affect the broadening of the circle of people's communication relationships, which can be regarded as an important source of perceived social support for greater participation in sports activities in individuals.

As reported in other studies higher level of husband's education have a positive significant relationship with PA in women (James et al., 2013). It seems that more awareness of the well-educated husbands let them act as a source of information and emotional support. In addition, possibly, due to the higher socioeconomic status, they can provide more welfare opportunities, such as joining a sports club or providing special sports equipment for their wives to do PA. Although women's husbands educational level has a positive relationship with PA in women, being single was also associated with more physical activity, which could be due to the fact that these women are free of certain restrictions, such as time limitation, and they can take more time for doing PA.

As the results of the present study showed, some of these experiences, such as the history of membership in the sports club and possibly subsequent positive experiences and the perceived benefits of PA, have contributed to the greater motivation for these women for fitness and continuing PA.

Analyzing Social Cognitive Theory, our study found significant associations among SCT components. The findings indicated that all SCT constructs were associated with engaging in PA. Our findings support the strong positive relationship between self-efficacy and PA found in previous studies (Bergström et al., 2015; Hartman et al., 2013; White et al., 2011). Being physically active on a regular basis appears to be increasingly difficult. Thus, Beliefs in having the capacity necessary to accomplish the desired goal (self-efficacy Beliefs) make people tackle new and challenging tasks such as initiating and engaging PA (Warner et al., 2014). Therefore, it is useful that through educational interventions, educators promote the women's ability to perform PA and self-efficacy beliefs through 4 main sources of mastery experience, vicarious experience, verbal persuasion and Physiological and affective states that was proposed based on SCT.

Our results showed that outcome expectations were influential for engaging in PA among middle-aged women with Obesity or overweight. PA in those with positive outcome expectations was more. Morrison et al. introduced outcome expectations as a key factor in behavioral changes among persons with multiple sclerosis. In this study, positive outcome expectations for PA were associated with engagement in PA (explaining 12% of the variation in PA engagement) as well as being potential sources of motivation for increasing PA behavior in individuals living with longstanding MS (Morrison and Stuifbergen, 2014). In another study by Soleimani et al. on women with breast cancer, the results showed that improving patients' belief in positive outcomes from PA can be effective in increasing their participation in PA (Soleimani et al., 2016). It seems that for the middle-aged women with overweight or obesity, health education programs in order to enhance positive outcome expectations of PA can positively affect their behavioral motivation and performance in physical activities.

Similar to other studies (King et al., 2008; Kouvonen et al., 2011; Shelton et al., 2011), our results also revealed an association between family and friends' social support and PA. This suggests that any form of encouragement from a person's social network is positively associated with women' PA. Since one of the most important concerns of women especially in eastern culture is their maternal and family responsibilities such as maintenance of children and doing household chores so that they are considered as the most important issues in their lives, it is natural that these issues have a high priority for them. This is a major obstacle to not having enough time to do PA for Housewives. However, having a supportive source, especially the support of spouses in any form (informational, emotional, and instrumental), can reduce the barriers to PA, especially with the support in carrying out activities that are mainly carried out by women in the family, grounds for women's participation in PA programs.

Our finding supports the evidence for a positive relationship between self-regulation and PA (Umstattd et al., 2008). Similar to other studies, self-regulation as a set of psychological and perceptual processes by which individuals work toward the achievement of goals and objectives by keeping them on track and minimizing distractions or impulses, can improve the women's PA. In a study by Umstattd et al. study (Umstattd et al., 2008), self-regulation mediated the relationship between self-efficacy and PA and increase adopting PA. in Peyman et al. (Peyman et al., 2013) and Stadler et al. (Stadler et al., 2009) studies, using self-regulation strategies was effective in improving individual's PA. It seems that, educational intervention through self-regulation strategies have the potential to increase PA in overweight or obese women.

Other results of this study showed that although all SCT structures were related to PA behavior in women, the two self-efficacy and self-regulation constructs in regression model were the strongest predictors of PA behavior in participants of the study. These results have also been reported in other studies (Deidarloo et al., 2012; Solimanian et al., 2014).It seems that self-efficacy and self-regulation as two factors affecting the PA of studied women can well affect their behavior. In the process of self-regulation, women planning and setting goals to depict the beginning and continuation of the PA behavior, then self-efficacy play an important role by the belief in their ability to implementation of the specified program and goals. In fact, based on the results of this study, healthcare providers can design intervention based on self-regulation and goal setting techniques as well as self-efficacy enhancement strategies for PA enhancement programs for overweight and obese middle-aged women that are at the risk of so many chronic diseases and serious health problems.

In the study of obese and overweight women separately, the results of our study showed that although the self-efficacy construct in both groups is an important predictor of PA and daily expenditure of energy, but in addition to self-efficacy, in obese women self-regulation and in overweight women, perceived social support from friends has a predictive role and can affect the involvement of them in PA behaviors. These results can be achieved because obese people are less likely to be in society and social activities due to their dissatisfaction with the appearance and physics of their bodies, and therefore have fewer friends than those with better physics. Therefore, for this group things are more self-reliant, and they can achieve more desirable results by planning and setting goals in life and thereby increasing self-efficacy. While in overweight people this problem is usually lower, and women in this group tend to have more social relationships and friends in the community due to their social activity and being in society. Given the direct impact of friends and peers on each other, overweight women engage in behaviors such as PA due to the requests of their friends and for attracting their satisfaction. These friends can be considered as good encouragers for each other, and this can add to their own beliefs and their ability to exercise PA.

Eventually, according to the results of this study, middle-aged overweight and obese women had poor PA, and energy expenditure due to PA. This situation was associated with poor self-efficacy, outcome expectations, perceived social support from family and friends, and ultimately lack of self-regulation skills. In general, self-regulation and perceived self-efficacy were identified as the most important predictors of PA behavior in overweight and obese middle-aged women. Although self-efficacy in both groups of women was an important and determinant factor, but in this case, in women with overweight, perceived social support by friends and self-regulation in obese women, was also important predictors of PA and energy expenditure due to PA. Therefore, it seems that the design of SCT-based educational interventions, combined with the use of self-efficacy and self-regulation enhancement strategies in obese middle-aged women and self-efficacy and perceived social support by friends in overweight women, have a great potential for empowerment and motivation to participate in PA plans.

Since this study was based on a convenience sample, the findings of

this study may not be generalized to all Iranian middle age women with overweigh or obesity. This was a cross-sectional study, and conclusions about causality cannot be drawn. A longitudinal study that follows the study sample and reassesses their health outcomes at a later time would help to discern the causal effects of SCT components. All measures in this study were self-reports, implying the potential for social desirability and memory bias, especially in the assessment of PA.

Conflicts of interest statement

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.obmed.2019.01.002.

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