# Using of social cognitive theory: predictors of physical activity among women with diabetes type 2

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## Abstract

Physical activity is a complex behavior and its determinants are different in various groups. Due to the chronic nature of type 2 diabetes, treatment Adherence requires lifestyle changes that are difficult for many people to adopt and maintain it. This study aimed to determine predictive structure of social cognitive theory on physical active among women with type 2 diabetes. This study was cross sectional -correlative that were randomly selected 300 people with type 2 diabetes by multi-stage cluster sampling method. Tools for data collection, a questionnaire was consistent with social cognitive theory constructs and IPAQ that had been used in the scientific sources and texts. Reliability and validity was determined for use in this study in a pilot study. Data were analyzed by using analysis of variance and regression testes. The results showed the structure of social cognitive theory, Self-regulation (P=0.001), Social Support (P=0.001), and self-efficacy (P=0.005), had the significant effect on the Physical activity among the research sample. According to the results, the self-regulation, self-efficacy and social support were important influences on the physical activity and they must be considerate in designing and implementing of educational interventions.

**Keywords:** Diabetes mellitus, Physical activity, Social Cognitive Theory, Woman

## Introduction

Physical activity is part of a healthy lifestyle [1] and a complex behavior, with different determinants in various groups [2]. Diabetes type 2 used to be considered an adult disease, today; it affects younger age groups, young adults, and even teenagers, with over 800,000 adolescent victims [3]. In 2010 approximately 285 million people worldwide were estimated to be affected by diabetes [4], and a rise to 439 million people is expected by 2030 [5], primarily due to obesity and sedentary lifestyle [6]. Given the growth in the elderly population of Iran, and the rapidly increasing trend of this disease, this country is considered one of the Middle-Eastern countries affected by this problem [4]. The positive role of exercise and physical activity in people's health and in prevention and control of many disease complications, including diabetes has been confirmed [7]. Regular physical activity is one of the most important factors in becoming healthy and

preserving health, and has been considered as one of the 15 behavior change priorities in promotion of health. Positive behavior change can significantly reduce risk associated with chronic diseases [8]. It is estimated that lack of physical activity causes 1.9 million deaths and loss of 19 million Disability Adjusted Life per Year (DALYs) globally [9]. Inactivity doubles the risk of cardiovascular diseases in people. Yet, inactivity, particularly among women with type 2 diabetes is very high due to the prevalence of obesity. A very high proportion of women with type 2 diabetes in this society are inactive during their leisure time, and even most of their household activities are light or very light [10].

Health researchers and professionals suggest social-cognitive theories and models to determine the pattern of acceptance and persistent personal behavior and factors associated with these changes for effective intervention in health promoting behaviors including physical activity [11].

In last few decades, experimental research has been conducted in the field of biological, environmental, social, and psychological factors which are effective in adjusting and maintaining physical activity in the public and the people with chronic diseases. They showed that changeable and unchangeable factors are effective in adopting and maintaining physical activity. Change-resistant factors include age, gender, and race, and change-flexible factors are access to environmental facilities, stress, and cognitive-social processes, which are the target factors in clinical and experimental interventions. In many cases, these factors are considered as a problem and motivational factor in decisions to adopt physical activity [12].

The Social Cognitive Theory (SCT) attempts to introduce behavior predictors as well as principles on which behavior is formed, and also how to motivate, guide, and enable people to adapt to health promoting behaviors, and reduce inability in them [13]. According to SCT, effective factors in intervention are self-efficacy, self-efficacy of overcoming obstacles, outcome expectations, outcome values, self-regulation, behavioral capabilities (knowledge and skills), emotional adjustment, modeling, environment, and understanding of situation [13,14]. In SCT, human behavior is explained in two-way and dynamic interactions of personal, environmental, and behavioral factors. Hence, physical activity behavior is considered in a dynamic and interactive system.

Various studies have shown that different personal factors including demographic parameters, attitude, and beliefs, and social and environmental factors affect performing physical activity [15], and directly and indirectly predict physical activity [4, 8, and 16]. Martin Jeans et al., in a study in 2011, aimed to determine the power of SCT constructs in predicting physical activity and to provide a structural model in a sample of 160 patients with spinal injury concluded that self-regulation construct directly predicted performing physical activity in these patients, and self-efficacy and outcome expectations described physical activity indirectly through self-regulation [17].

Given that self-care behaviors in diabetes, as physical activity is deeply rooted in cultural values and beliefs, thus, interventions must be suited to the society [11]. Also, considering high prevalence of diabetes in the population, and the financial and psycho-social costs imposed on the person, family, and the community [4], this study was conducted to determine predicting constructs of SCT in adopting physical activity in women with type 2 diabetes, so that an effective educational intervention can be designed and implemented accordingly.

## Method

This was a correlative sectional study in which type 2 diabetic women were selected from the population covered by diabetes units in Mashhad city health centers**.** Subjects were selected in two-stage cluster sampling. In the first stage, 3 out of 5 health centers in Mashhad were randomly chosen (by drawing lots), and in the second stage, from diabetes units in health centers, 6 were randomly considered, and based on the population density in each cluster, and study inclusion and exclusion criteria**,** study samples were randomly chosen from their records. After telephone contacts, they were invited to attend at a certain time to complete the questionnaires if they wished. The sample size required for this study, according to the results of similar studies, given correlation coefficient of self-efficacy with physical activity (r=0.16) (which is the key construct in SCT) with 95% confidence and power of 80% was determined 300 people [4]. Questionnaires were completed in researcher's structured interviews with participants lasting 15-20 minutes each. The study inclusion criteria were type 2 diabetes based on patients' records, age between 35 and 65 years, no diabetes complications, desire to participate, literacy, performing physical activity, and no insulin therapy. Non-Iranian nationals and patients with duration of diabetes less than 6 months were excluded from the study. Data collection tool was a questionnaire based on SCT constructs used in foreign studies. To localize the questionnaire to adapt to socio-cultural Iranian society, questionnaires were translated into Persian and back to English by two experts separately, and their validity and reliability were examined. Tools used in the study were the short form of International Physical Activity Questionnaire, demographic questionnaire (patients' records were used to complete some of its questions) including hemoglycolized hemoglobin level in the last 3 months, and the related questionnaire to SCT constructs with sections on awareness with 11 4-option questions (0-20), self-regulation with two goal setting questionnaires with 6 questions (6-30), planning with 4 questions (4-16), self-efficacy in overcoming barriers with 10 questions (10-50), self-efficacy 4 questions (4-20), outcome expectations 4 questions (4-20), modeling 10 questions (10-50), 10-question short form of depression assessment with one question added by experts to assess anxiety (11-440), social support 10 questions (10-50), environmental understanding 7 questions (7-35), physical environment 8 questions (0-8), evaluated participants' opinions on items in each section. Questions in all questionnaires (except depression form and planning that were based on Likert 4-point style) were scored based on the 5-point Likert style from totally disagree to totally agree (with score of 1-5). The physical activity questionnaire, with 7 questions assesses level of physical activity according to intensity of activity (severe, moderate, and light), and duration of activity based on hours and minutes during the day and in the past one week. Using Metabolic Equivalent of (MET) level of consumed energy in terms of intensity of activity is determined [18]. The validity and reliability of this questionnaire have been determined in studies in the country [19] and abroad [20]. Content validity of relevant questionnaires to SCT constructs was determined by utilizing experts' opinions, and calculation of Content Validity Ratio (CVR). Cronbach' alpha was calculated to determine internal consistency of questionnaires, in a pilot study on 90 women with type 2 diabetes. In addition, to find external reliability, correlation coefficient was calculated in a test-retest with interval of 10 days on 15 women with diabetes. Cronbach's alpha and correlation coefficient were found for awareness questionnaire 0.89 (r=0.84), goal setting 0.92 (r=0.71), social support 0.91 (r=0.86), outcome expectations 0.72 (r=0.65), modeling 0.87 (r=0.75), environmental understanding 0.76 (r=0.83), self-efficacy 0.96 (r=0.77), practical planning 0.91 (r=0.69), depression short form 0.75 (r=0.94), and self-efficacy of overcoming obstacles 0.78 (r=0.74) respectively. The data collected were

analyzed with SPSS-11.5 software, and after determining frequency distribution of parameters using Kolmogrov-Smirnov test, independent t-test, one-way variance analysis, chi-squared, Pearson-Spearman correlation and regression tests were used to analyze relationship between parameters.

## Results

The results showed the mean age of participants 52.49±7.12 years, the mean body mass index 30±4.17, and the mean level of hemoglycolized hemoglobin 7.67±1.68, and the median of diabetes duration 48 months. Most participants were high school dropouts (79%), were mostly housewives (95.3%), with hemoglycolized hemoglobin level 7% and higher, which is considered inadequate control of diabetes in clinical terms. Majority of subjects (65%) introduced their doctors or nurses as source of obtaining information about their disease (Table 1).

**Table 1** *The frequency distribution of demographic parameters in study subjects (n=300)*

| | | n | % |
|---|---|---|---|
| Education level | Literacy | 49 | 16.3 |
| | Elementary | 127 | 42.3 |
| | Middle school | 55 | 18.3 |
| | High school diploma | 58 | 19.3 |
| | University education | 11 | 3.7 |
| Employment status | Housewife | 286 | 95.3 |
| | Employed | 14 | 4.7 |
| Marital status | Married | 262 | 87.3 |
| | Widowed | 30 | 10 |
| | Separated | 8 | 2.7 |
| Home ownership status | Private | 237 | 79 |
| | Rental | 63 | 21 |
| Type of house | House | 181 | 60.3 |
| | Apartment | 119 | 39.7 |
| Income level | < 4700000 Rials | 92 | 43.6 |
| | ≥4700000 Rials | 119 | 56.4 |
| Body mass index | < 25 | 34 | 11.3 |
| | 25-30 | 125 | 41.7 |
| | Over 30 | 141 | 47 |
| Hemoglycolized hemoglobin level | < 7% | 119 | 39.7 |
| | ≥ 7% | 162 | 54 |
| Preferred information source | Diabetes specialist and nurse | 197 | 65 |
| | Others | 103 | 35 |

Pearson correlation results showed parameters of age (P=0.032, r=0.124), body mass index (P=0.042, r=0.118) hemoglycolized hemoglobin (P=0.02, r=0.139) had a significant and inverse correlation with women's physical activity, and level of physical activity decreased with increasing levels of these parameters. Pearson correlation coefficient showed a positive and significant correlation between physical activity and construct of self-regulation (r=0.534), self-efficacy of overcoming obstacles (r=0.429), modeling (r=0.462), and social support (r=0.457), but emotional adjustment (r=-0.214) had a significantly negative correlation with physical activity (P<0.001). Spearman coefficient results showed a significantly positive correlation (P<0.001) between physical activity and construct of environmental understanding (r=0.266), physical environment (r=0.204), self-efficacy (r=0.537), outcome expectations (r=0.211), and awareness (r=0.371).

Based on linear regression analysis, constructs of self-regulation, social support, and self-efficacy predicted 27.9% of physical activity

performance variance, but constructs of self-efficacy of overcoming obstacles, outcome expectations, modeling, emotional adjustment, environmental understanding, and physical environment were not significant predictors of physical activity (Table 2).

**Table 2** *Regression analysis of social cognitive theory constructs in predicting physical activity in study subjects*

| | Standard beta | F | P-value |
|---|---|---|---|
| Self-regulation | 0.247 | 3.875 | <0.001 |
| Social support | 0.216 | 3.66 | <0.001 |
| Self-efficacy | 0.176 | 2.80 | <0.005 |

$R^2$=0.279

General Linear Model results showed body mass index, education level, hemoglycolized hemoglobin, and constructs of self-regulation, perceived social support, and self-efficacy predicted 39.6% of physical activity performance variance in study subjects. In this model, of the demographic parameters, only hemoglycolized hemoglobin could significantly predict physical activity (Table 3).

**Table 3** *General linear model results in effects of demographic variables and social cognitive theory constructs on physical activity in study subjects*

| | F | P-value |
|---|---|---|
| Self-regulation | 18.76 | <0.001 |
| Social support | 14.05 | <0.001 |
| Self-efficacy | 13.63 | <0.001 |
| Hemoglycolized hemoglobin | 6.84 | 0.009 |
| Body mass index | 3.07 | 0.081 |
| Education level | 2.88 | 0.091 |

$R^2$=0.396

## Discussion

The results of the study showed that of the Social Cognitive Theory constructs, self-regulation, social support, and self-efficacy were the strongest physical activity predictors in study subjects.

In line with the findings of this study, Plotnikoff, in a study with the aim to determine Social Cognitive Theory constructs to explain physical activity in a sample of 1717 adults with diabetes, found SCT constructs predicted 59% of physical activity variance in type 2 diabetics [21]. The difference between the current and Plotnikoff studies is probably due to the large sample size in the latter study. Dunlop in a study with application of social cognitive theory in explaining influencing factors on physical activity found SCT constructs predicted 41% of physical activity variance. Dunlop also showed environmental, traffic, and social support factors were important predictors of physical activity in MS patients [16]. Dunlop study was conducted on a small sample size of both sexes, and percentage of variance calculated for SCT constructs predicting physical activity was higher than that found in this study. This was probably due to the peculiarities associated with MS (since MS patients are faced with movement problems). Physical environment factors like traffic, self-efficacy in overcoming obstacles, and outcome expectations constructs had a high predicting power in Dunlop's study, but these constructs were insignificant physical activity predictors in the present study. In Resnick study conducted on healthy adults, SCT constructs predicted 40% of physical activity variance in study subjects [22]. The difference in variance calculated between the current and Resnick's study was probably due to the health status of the participants, including chronic nature and problems of the disease, and daily management of the diabetes compared to the healthy status of Resnick's participants. The results of Norouzi et al. study confirms this, which showed perceived health status was an important predictor of physical activity in women with type 2 diabetes in health promotion model [8].

Self-regulation was the strongest predictor of physical activity in all SCT constructs, which was similar to the results obtained in Anderson's study that investigated social cognitive predictors of physical activity in adults in Virginia [23]. In a study by Amistad et al., self-regulation was again the strongest physical activity predictor in adults [24]. In this respect, Bandura emphasizes that utilization of self-regulation strategies is necessary for aiming and planning regular physical activity [25].

As in Plotnikoff [21] and Anderson et al. [23] studies, perceived social support was another predictor of participants' physical activity in the present study. In Plotnikoff study, social support was a direct determining factor of physical activity in diabetic patients, and in Anderson et al. study, family social support had both direct and indirect effect on physical activity, and its indirect effect on behavior was through self-efficacy and self-regulation strategies. In a study by Tulloch social and physical environment were indirect predictors of physical activity through self-efficacy and outcome expectations [26]. As opposed to the results of the present study, in another study, perceived social support was not correlated with physical activity [27]. In Norouzi et al. study, social support did not predict physical activity of women with type 2 diabetes [8]. The difference between the results of these studies and the present study is probably due to personal, social, and cultural differences in the study subjects. Social environment that includes attitudes of the family, friends, peers, and health workers, and having an exercise partner are aspects that influence compliance with physical exercise behavior.

Encouragement of people by their families, friends, and health workers is a potential determinant in following exercise programs and physical activities [28]. The present study also emphasizes its importance in physical behavior of women with type 2 diabetes.

The same as findings of the present study, Bonner's results also showed Self-Efficacy predicted intention of physical activity in type 2 diabetics [29]. In Norouzi et al. study conducted in relation to physical activity determinants based on health promotion model in diabetic women [8], and also in Didarloo et al. study on physical activity determinants based on developed rational action theory in women with type 2 diabetes [4], self-efficacy was an important predictor of physical activity in study subjects. Self-efficacy is the person's confidence in the ability to carry out minor aspects of behavior. For example, a person's belief in the ability to perform walking exercise at moderate intensity for 30 minutes is important in behavior adoption [30]. Lee et al. in a study aiming to apply the theory of self-efficacy of overcoming psychological obstacles to increase physical activity in the elderly, revealed that self-efficacy in exercise has a strong correlation with the amount of physical activity in the elderly [30].

In this study, biological and personal factors including age, education, household income, and hemoglycolized hemoglobin and body mass index, only hemoglycolized hemoglobin affected physical activity. Conversely, a cross-sectional study showed household income and education, in addition to psychological factors, influenced adults' physical activity, as well[28]. In a similar study to the present one, the results indicated that age and education level did not have a significant effect on physical activity [8]. However, in Didarloo et al. study, opposite results to those of the present study was

reported, and in demographic parameters investigated, education significantly affected physical activity in women with type 2 diabetes [4]. According to the findings of the present study, since most participants had similar education and age, these parameters were probably not predictors of physical activity in study subjects. In the present study, despite a significant and inverse correlation between body mass index and physical activity (indicating lower activity of people with higher body mass index), this parameter did not significantly affect physical activity, in the final regression model, which disagrees with Norouzi et al. results that showed body mass index indirectly through self-efficacy affected physical activity of women with type 2 diabetes [8]. In the present study, since most participants had moderate to high body mass indices, BMI was not a predictor of physical activity.

In the present study, hemoglycolized hemoglobin was a predictor of physical activity, but in similar studies, the importance of this parameter on physical activity was not investigated [4,8]. In this respect, Doosti et al., in a phenomenological study, stated that knowing laboratory test results were effective (based on participants' statements) in increasing motivation to continue self-care behaviors including physical activity [31]. Considering that in diabetic patient care program, special attention is paid to level of hemoglycolized hemoglobin to assess and control blood glucose by the patient (and doctors and nurses in diabetic units recommend patients to maintain it at a proper level to protect against complications and consequences of diabetes), accordingly, the reason for this being a determining factor in physical activity could be associated with this issue.

Although the findings of the present study provided a complete description of physical activity determinants according to Social Cognitive Theory, and attempts were made to consider different aspects (personal, cognitive, behavioral, and environmental) associated with physical activity in study subjects, there were some limitations, too; 1) Non-generalizability to male patients with type 2 diabetes or other population groups, 2) Self-reporting physical activity, 3) Limitations associated with tools used which consisted of a large number of SCT construct questionnaires that made answering somewhat difficult. This was realized in the pilot study and the researcher tried to reduce this limitation through structured interviews. However, this study had some strong points that were not observed in other studies, including random collection of data from diabetes units in health centers in Mashhad, which naturally eliminated volunteer bias, and increased generalizability of the study population.

## Conclusion

Based on the results of this study, self-regulation, self-efficacy and social support are the important factors in predicting physical activity that can influence adoption of and compliance with an active lifestyle. Given the nature of this aspect of healthy lifestyle that is a complex behavior, in design and implementation of interventions to change inactive lifestyle, it is necessary for health promotion professionals to take into account a series of personal, cognitive, and environmental factors.

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**Contributions**

Study design: NP
Data collection and analysis: MM, HE, AT
Manuscript preparation: MM, AT

**Conflict of interest**

"The authors declare that they have no competing interests."

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