

# Effects of a Theory Based Intervention on Physical Activity Among Female Employees: A Quasi-Experimental Study

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## Abstract

**Background:** Regular physical activity has been highlighted as an important factor in decreasing about 25 factors harmful to health, such as obesity, diabetes, heart failure, depression and osteoporosis. Female office workers, because of the long hours they stay seated in their workplace, are seriously threatened by immobility. The Theory of Planned Behavior has been successfully used several times to predict PA behavior. The TPB studies also have identified perceived behavioral control as the key determinant of walking intentions.

**Objectives:** The present study aims to assess the effectiveness of an intervention based on TPB to improve attitude, perceived behavioral control, Subjective norms, behavioral intention and PA behavior among female office workers.

**Materials and Methods:** The present study is an interventional, quasi-experimental study. Participants were 95 female office workers of the Tehran University that divided randomly in two case and control groups. Using the theory of planned behavior questionnaire and the International physical activity questionnaire, the participants were evaluated before the training and three months after that. The training was provided in the form of four 90-minute training sessions and some electronic messages sent through office automation system once every two weeks.

**Results:** The intervention increased PBC, attitudes, intentions and objectively measured PA behavior. The effects of the intervention on intentions and behavior were mediated by PBC.

**Conclusions:** The present study has provided some of the data toward understanding determinants of physical activity behavior in female office workers. Specifically, the results suggest that interventions designed to promote physical activity in this population should focus on the development of PBC as well as positive attitude toward PA.

**Keywords:** Office Workers, Physical Activity, Behavior Control, Walking

## 1. Background

Mortality rates due to heart disease and cancer are falling, owing to better and earlier treatment, but morbidity rates continue to rise as do risk factors such as obesity, diabetes and hypertension. The causes of this increased morbidity are predominantly unhealthy lifestyles: smoking, unhealthy diets and physical inactivity. There is now convincing evidence that people who are physically active live longer and have lower morbidity (1). It is logical to link the increasing obesity rates in developing countries with a progressive introduction of factors associated with obesity in developed societies, such as sedentary lifestyle and consumption of high fat and fast foods (2). Obesity is associated with numerous health risks, including an elevated risk of diabetes (3), heart failure (4), and depression (5). Consequently, it has been argued that obesity is now the second largest modifiable cause of preventable death (6).

To alleviate these health risks in obese adults, physical activity has been recommended (7).

### 1.1. Theory of Planned Behavior

The theory of planned behavior (TPB) is a model generated from the theory of reasoned action (TRA) (8), which assumes that the specific behavior is determined by intention to perform it (9). The model extended the TRA by supplementing the perceived behavioral control (PBC) because TRA experiences difficulty in explaining behaviors in which a person does not have volitional control over it. Armitage and Conner made an excellent review on TPB (10). Basically, there are three antecedents of behavioral intention, which are attitude, subjective norm and PBC (11).

Meta-analytic reviews (12, 13) have demonstrated that the TPB (14, 15) can be used to understand the psychosocial determinants of physical activity behaviors and, therefore, can provide a foundation for intervention design to

increase physical activity. The TPB is an important social cognitive model that aims to explain variance in intentional behavior. The theory hypothesizes that an individual's overtly stated intention to act is the most proximal predictor of behavior. Intention is a function of personal, social, and control perceptions regarding the target behavior (16). There are several reasons why the TPB is a promising theory on which to base interventions to alter health-related behavior. Firstly, it can be used to predict and explain any behavior in terms of a few constructs. Secondly, it has been frequently used to study a variety of health behaviors, and is probably the social cognition model that is most commonly used in health psychology. Thirdly, meta-analytic reviews of the TPB have provided empirical support in terms of its capacity to predict many health behaviors. The TPB has also been successfully used several times to predict walking behavior. The TPB studies have identified perceived behavioral control as the key determinant of walking intentions (17).

With respect to the influence of PBC on intention, Ajzen (1991) states that: 'The relative importance of attitude, subjective norm, and perceived behavioral control in the prediction of intention is expected to vary across behaviors and situations. That is, in situations where (for example) attitudes are strong, or where normative influences are powerful, PBC may be a less predictive means of intentions. Thus, Ajzen argues that the magnitude of the PBC-intention relationship is dependent upon the type of behavior and the nature of the situation (15).

In Iran, some studies have been carried out on the application of the TPB in educational interventions in order to promote physical activity among different social groups; however, these studies have been rarely carried out on female office workers. According to one of these studies (18), conducted on female students, the intention to do physical activities has a significant relationship with constructs of attitude and subjective norms. Therefore, educational programs based on changes in attitude, such as the group discussion, and educational sessions for people influencing the individual, such as family, friends and classmates, can contribute to the improvement of physical activity among female students. Another study (19), conducted among adolescents, showed that the TPB can predict the main part of the variance of physical activities behavior among school students. The results of this study suggest that the Theory of Planned Behavior with a focus on the perceived behavioral control can produce favorable outcomes. The results of another study (20), in which an educational intervention was carried out among school students, using the TPB, showed a significant difference in the constructs of the TPB and an increase in physical activity behavior among the students in the intervention group

after the completion of the educational program; this indicates the positive effects of the educational program. Also, another study (21), carried out among the employees of medical centers in Kerman, Iran, indicated that the educational intervention, based on the TPB in the field of physical activity, had a positive effect on the awareness and behavioral intention of people under study, but had no effect on their performance.

## 2. Objectives

Therefore, we designed an intervention based on TPB to assess its effectiveness to improve attitude, perceived behavioral control, Subjective norms, behavioral intention and PA behavior among female office workers.

## 3. Materials and Methods

The present research is an interventional, quasi-experimental study carried out in 2014 in the framework of pretest-posttest on 95 female office workers of the University of Tehran. This study examines the effect of an educational program based on the Theory of Planned Behavior on determinants of PA behavior among the female office workers.

### 3.1. Sample and Setting

As noted above, in this study, the research population included female office workers from the University of Tehran, who were selected through a call at this university. The questionnaires of the research were then filled out by them. The questionnaire was designed based on the TPB, and some questions about demographic characteristics were answered by the participants as well. The amount of their physical activity was measured through the International physical activity questionnaire (IPAQ) and then the required information was collected.

The sample size was estimated using the results of a study (22) and using the Pocock method to compare ratios ( $\alpha = 5\%$  and  $\beta = 20\%$ ), and with an expectation of a 10% reduction in the sample, we needed at least 40 people in each group. Following the call for participation in the study, 114 people of female office workers of the University of Tehran expressed interest for participation in the study. According to The inclusion and exclusion criteria 108 people were randomly divided in two case and control groups (54 person in each group). The inclusion criteria were that participants must be between the ages of 18 - 60 years, and be employee of Tehran University. Exclusion criteria were unwillingness to participate in the research and disability diseases.

Before the intervention, case and control groups were compared in terms of background factors such as age, gender, education, record of physical activities, occupational and family status; as can be seen in Table 1, no significant difference was seen in this regard between the two groups. However, the number of participants, because of their unwillingness to continue and absence in the next stages, was reduced to 95 people, with 50 people in the case group and 45 people in the control group.

**Table 1.** The Demographic Characteristics of the Research Population<sup>a</sup>

Variable	Case	Control	P Value
Age	40.94 ± 6.77	39.04 ± 7.22	0.192
Educational Degree	3.88 ± 1.20	3.71 ± 0.99	0.456
Year of employment	16.20 ± 6.24	14.47 ± 5.07	0.139
Body Mass Index	25.54 ± 3.47	25.51 ± 3.30	0.967
Number of children	0.78 ± 0.86	0.76 ± 0.88	0.892
Marital status (Married)	31 (68)	32 (64)	0.618

<sup>a</sup>Values are expressed as mean ± SD or No. (%).

It should be noted that all research subjects were informed about the procedure for conducting the study, the confidentiality of the information and the objectives of the plan, and all of them decided to participate in it with complete satisfaction. The ethics committee of Tarbiat Modares University approved this study.

At the beginning of the present study, the questionnaires were filled out by all participants and the collected information was analyzed through SPSS software, Version 21.

With regard to the information collected in the first stage, and considering the constructs of the TPB, the educational intervention for the case group was carried out in two weeks in four 90-minute sessions. The educational sessions were in the form of speeches, group work, brainstorming and problem-solving. Some obstacles to participation in physical activities were discussed and some solutions were suggested by participants through group work and brainstorming.

Then some educational messages were sent to the participants through office automation system every two weeks, for a period of three months. After this period, the questionnaires were once again filled out and the information was analyzed. The statistical Wilcoxon test was used to compare the mean scores of groups before and after educational intervention, and to compare the mean scores in two groups, the statistical Mann-Whitney test was employed.

### 3.2. Instruments

According to the world health organization definition, the minimum amount of physical activity to protect health is 30 minutes a day, 5 days a week (23); this definition was taken into consideration in the questionnaires wherever questions were raised about physical activity.

The data gathering instruments in this study was composed of three parts; the data information was collected through self-report.

The first part included demographic information. It contained eight questions about personal information, and examined information such as age, height and weight, education, kind and years of employment, marital status and the record of participation in physical activities.

### 3.3. Measures of the Theory of Planned Behavior

The second part covered questions about the constructs of the model. To measure the constructs of the TPB model, using similar studies (24, 25), questionnaires in the form of Likert scale questionnaire, with a seven-point answering scale, were designed for the questions concerning attitude, subjective norms, perceived behavioral control and behavioral intention. The content validity and construct of the designed questionnaires were evaluated and approved by groups of specialists in this field of study. Also, to measure the reliability of the questionnaires, a preliminary study was carried out on 30 university employees and the reliability of questionnaires was approved using Cronbach's alpha test, as follows:

Attitude was measured by seven questions (alpha coefficient = 0.94); for example, "participation in regular physical activities for me ..." It was measured through a seven-choice scale, from (1: useless) to (7: useful), in which a higher score indicated a stronger attitude regarding participation in physical activities.

Subjective norms was measured by three questions (alpha coefficient = 0.77); for example, "people who are important to me think that I should exercise regularly", measured by a seven-choice scale from (1: disagree) to (7: agree). A higher score signified subjective norms that more strongly encourage physical activities.

Perceived behavioral control was measured through 4 questions (alpha coefficient = 0.89); for example, "How much control do you believe you have over participation in physical activities for at least 30 minutes each day, 5 day a week?" measured by a seven-choice scale from (1: uncontrollable) to (7: fully controllable). A higher score showed a stronger behavioral control concerning participation in physical activities.

### 3.4. Measurement of Physical Activity Behavior

The third part was related to the questions from the International physical activity questionnaire. This questionnaire contains questions about moderate and high intensity activities and walking during the previous week. This questionnaire was proposed in 1998 by world health organization and center for disease control for the age group of 15 - 69 (26), and its validity and reliability have been approved in several studies (21, 27-30). It measures physical activities in the last seven days, and based on the final score the intensity of the activities can be determined in the last seven days. Activities such as aerobics, high-speed cycling, mountain climbing and basketball, requiring more than 6 calories per minute, are considered high intensity physical activities, and activities such as volleyball, badminton and cleaning, which consume 3-6 calories per minute, are regarded as moderate intensity activities. However, activities lasting less than ten minutes were eliminated.

The total energy consumed in all the activities in the last seven days is measured using the IPAQ Directions. If the sum total of the energy consumed by individual in one week is less than 600 met/min/week, it will be classified in the weak category; when it is between 600 and 3000 met/min/week, it will be classified in the medium category, and the sum total of more than 3000 met/min/week is classified as severe category (31).

At the beginning of the present study, the questionnaires were filled out by all participants and the collected information was analyzed through SPSS software, Version 21. The statistical Wilcoxon test was used to compare the mean scores of groups before and after educational intervention, and to compare the mean scores in two groups, the statistical Mann-Whitney test was employed.

### 3.5. Educational Program

The educational sessions were as follows:

First session: Getting familiar with the objectives of the educational program, attracting attention to educational programs and the role of physical activities on physical and mental health.

Second session: Emphasis on the construct of attitude, the adverse consequences of immobility on mental, psychological, social and physical status of people and the diseases resulting from sedentary life.

Third session: Emphasis on the construct of perceived behavioral control, how to overcome the obstacles to physical activities, and the amount of physical activities at different ages.

Fourth session: Emphasis on the construct of behavioral intention, the effect of physical activities on health and the benefits of physical activities.

### 3.6. Persuasive Messages

As already mentioned some educational messages were sent to the participants through office automation system every two weeks, for a period of three months. Public health advocates often use persuasive messages as one strategy to motivate people to adopt healthy behaviors or modify unhealthy ones. In accordance with this objective, researchers have sought to take advantage of the important interplay between theory and practice in designing effective health communication strategies. Development of belief-targeted messages involves the selection of statements that ultimately affect the beliefs that serve as the foundation for attitudes, subjective norms, and perceived behavioral control held by the group targeted to receive the communication. According to the theory of planned behavior, only the 5 to 8 of the wide range of modal salient beliefs that people hold are considered to influence attitudes, subjective norms, and perceived behavioral control (32). Thus the key to changing attitudes, subjective norms, and/or perceived behavioral control is to change the modal salient behavioral, normative, and control beliefs underlying these constructs (33).

## 4. Results

Before the intervention, case and control groups were compared in terms of background factors such as age, gender, education, record of physical activities, occupational and family status; no significant difference was seen in this regard between the two groups. Some of their demographic characteristics are included in Table 1.

98% of the subjects of the present study were older than 30, and 84% of them had received university education. In terms of occupational status, most of them had permanent employment. Also 66% of them were married, with 30% having no children.

Based on the body mass index (BMI), 40% of the participants were overweight and 15% were considered obese; adults, based on BMI, are divided into healthy (18.5 - 25), overweight (25 - 30) and obese (more than 30) groups (34). Therefore, about 55% of the people in the research population were either overweight or obese ( $BMI \geq 25$ ), which can be a negative consequence of insufficient mobility.

According to the findings, case and control groups had identical characteristics before the educational intervention, and the changes following educational intervention have been the result of the educational intervention.

Table 2 shows the scores of attitude, subjective norms, perceived behavioral control, behavioral intention and the physical activity behavior before and after educational intervention in the case and control groups. As is evident, except for the subjective norms, other constructs have shown

a significant increase in the case group after the educational intervention.

**Table 2.** Statistical Indexes of the Constructs of the Theory of Planned Behavior before and After the Educational Intervention in the Case and Control Groups<sup>a</sup>

Variable/Group	Before	After	P Value
<b>Attitude</b>			
Case	41.26 (7.12)	43.64 (6.05)	0.003
Control	39.49 (7.12)	39.31 (8.86)	0.829
<b>Subjective Norms</b>			
Case	18.12 (3.78)	18.30 (3.37)	0.636
Control	17.80 (3.72)	18.20 (3.62)	0.408
<b>Perceived behavioral control</b>			
Case	15.52 (6.5)	18.40 (5.95)	0.000
Control	15.58 (6.27)	15.44 (6.14)	0.490
<b>Intention</b>			
Case	6.54 (3.96)	8.72 (3.99)	0.000
Control	6.18 (3.95)	6.80 (4.32)	0.273
<b>Physical activity</b>			
Case	513.96 (410.05)	624.42 (359.94)	0.004
Control	461.72 (439.5)	419.96 (354.03)	0.265

<sup>a</sup>Values are expressed as mean (SD).

Table 3 shows the amount of participation in physical activities and the consumed energy in the case and control groups before and after the intervention. It should be noted that none of the participants took part in high intensity physical activities and their physical activities were mainly walking and physical activities with moderate intensity.

As can be seen in Table 3, the average moderate intensity activity of the case group has increased slightly, which was not significant. However, the walking activity and the consumed energy of the case group had a significant increase compared to those of the control group.

Table 4 shows the frequency and the percentage of individuals in the two groups depending on whether they have done more or less than 150 minutes per week of walking. As already said, according to the WHO definition, the least amount of physical activity to protect health is 30 minutes a day, 5 days a week. Thus, before the intervention, only 22% of the members of the case group walked for 150 minutes or more per week, which increased to around 46% after the educational intervention.

## 5. Discussion

Analysis showed that all TPB construct scores except subjective norms differed between case group and control group after intervention. In the other words the results of the present study show that planned educational intervention in physical activities has influenced the attitude, perceived behavioral control, behavioral intention and the PA behavior of individuals in the case group; however, it did not have a noticeable effect on the subjective norms of the individuals in this group. The results suggest that people who was in case group reported more positive attitudes and stronger intentions than those in control group.

In the present study, training has improved attitude toward physical activity compared to the stage before the training and people in the case group possessed higher attitude scores toward physical activity compared to who was in control group. This suggests that individual attitude is an important precursor to engaging in PA behavior. On the other hand, those with a poor attitude toward PA would be inhibitory for initiating and continuing to engage in PA. It means the attitude toward physical activity has a significant effect on their performance and participation in physical activities.

The intervention also resulted in an increase in PBC and it can be said this increase in the PBC of individuals can result in an increase in their participation in physical activities. Attitude and PBC mediated the effects of the intervention on intentions to PA behavior. It may be that individuals have the greatest commitment to perform a behavior when they hold favorable beliefs about the behavior and they believe that they can successfully perform the behavior. In other words, individuals like performing behaviors that they find easy. Since perceived behavioral control depends on the presence or absence of facilitators or obstacles to performing a behavior, these facilitators and obstacles in society should be evaluated and solutions should be suggested to remove the obstacles.

Subjective Norms in the present study showed no significant increase; therefore, in the present study, no important role can be assigned to them in improving physical activities among participants. Some studies have shown that subjective norms have a minor role in predicting the behavioral intention of the adults in the TPB model (35), which is in agreement with the findings of the present study. Also, another study shows that the important role of subjective norms in behavioral intention can decrease with an increase in age. In teenagers who are under peer pressure or are influenced by their parents (or others), subjective norms act as strong predictors of physical behavioral intention (8). In a study conducted by Mok and Lee on high school students in Hong Kong, the most important

**Table 3.** Physical Activity Indexes in Two Case and Control Groups Before and After the Educational Intervention<sup>a</sup>

Variable/Group	Before	P Value	After	P Value
<b>Walking Time</b>		0.557		0.000
Case	101.20 (70.90)		131.40 (70.15)	
Control	88.33 (69.00)		81.20 (56.64)	
<b>Moderate Intensity Activities Time</b>		0.369		
Case	45.00 (80.94)		47.70 (75.08)	0.108
Control	42.56 (103.01)		38.00 (86.27)	
<b>Consumed Energy</b>		0.502		
Case	513.96 (410.05)		624.42 (359.94)	0.001
Control	461.72 (439.57)		419.96 (354.03)	

<sup>a</sup>Values are expressed as mean (SD).

**Table 4.** Frequency and Percentage of Individuals in Terms of the Time Devoted to Walking in the Two Groups Before and After the Intervention<sup>a</sup>

Group/Stage	Case		Control		P Value
	< 150 Min/Week	≥ 150 Min/Week	< 150 Min	≥ 150 Min/Week	
<b>Before</b>	39 (78)	11 (22)	37 (82)	8 (18)	0.609
<b>After</b>	27 (54)	23 (46)	36 (80)	9 (20)	0.008
<b>P value</b>	0.000	0.000	1.000	1.000	

<sup>a</sup>Values are expressed as No. (%).

impacts on predicting behavioral intention in doing physical activities were associated with PBC in the first place, and subjective norms in the second place; attitude showed a minor effect (11); these results are somehow in accordance with those of the present study. Since the aforesaid study was carried out on high school students and also because of the age difference between participants in that study and those of the present study, the role of families and acquaintances, especially teachers, in influencing the behavioral intention of individuals can be justified. However, some different results of this research with other studies may be related to diverse socio-cultural characteristics in different population groups.

A number of studies have shown that the participation of individuals in physical activities increases with an improvement in individual attitude, social influences and self-efficiency (36, 37). In the study by Evans et al. the training offered through educational packages to the employees of the orthopedic ward and physiotherapists had a positive effect on their ideas about health, and caused an increase in their physical activities and improvements in their lifestyles (38); the results of these studies are in accord with the findings of the present study.

Van der Bij et al. in their review study, entitled effec-

tiveness of physical activity interventions for older adults, have examined 38 studies with 57 types of various educational interventions in physical activities. The results of this study indicated that educational programs have a positive effect on increasing the amount of physical activity; however, this effect is short-lived and minimal, and no lasting and permanent behavioral changes have been seen (39).

The studies of Martin et al. (40) and Armitage (24) revealed the positive effect of PBC on participating in physical activities. The results of the present study reveal an increase in PBC of the case group and its positive effect on participation in physical activities after the completion of educational programs. Therefore, it seems that educational programs to improve PBC of office workers regarding participation in physical activities can have a positive effect on improving physical activities among them. No significant difference was seen between the case and control groups regarding performance and participation in physical activities before the intervention; however, as the results imply, the present study shows that the physical activities of the participants in the case group improved after implementing the educational program.

A research shows that among the determinants of

physical activities are the obstacles that individuals face in performing these behaviors (41). In contrast, ability to overcome obstacles to physical activities has a positive and significant relationship with increased participation in physical activities (42); also participation in physical activity is positively correlated with having access to convenient play spaces, sports equipment, and transportation to sports or fitness programs (43). Individuals are encouraged to do healthy behaviors, like physical activities, and carry them out in spite of problems, when they feel they can control that behavior (44).

Henderson et al. demonstrated in their studies that lack of time, lack of interest, and shortage of facilities and funds are among the obstacles to the participation of women in recreational and physical activities (45).

In a study on the factors discouraging women from participation in physical activities, Jackson and Searle showed that women face more obstacles in participating in physical activities compared to men. They identified some factors which discourage women from participating in sports activities: lack of a companion in sports activities, family commitments, shortage of information, shyness, insufficiency of transportation services and physical inability (46). Henderson et al. demonstrated that one of the reasons curbing physical activities is insufficient information given to people; people are usually unaware of the services offered and the services for physical activities (45). Moreover, in studying the factors mediating between the intention and the behavior of physical activity, Rhodes and Dickau showed that PBC, self-efficiency, planning, extroversion, habit and environmental proximity to the recreation can be regarded as moderators between the intention and the physical activity behavior (47). Parra-Medina et al. found that people's physical activity behavior is strongly influenced by their ability to perform physical activity, their attitude toward physical activity, their peers/family physical activity behaviors, and their beliefs about the presence of factors that facilitate or impede physical activity (48). However, in addition to the aforementioned factors, cultural and social factors are among the important factors which have a deep effect on decrease of participation of women in physical activities in Iran.

### 5.1. Limitations of the Study

Several limitations of this research should be noted. First, because of employment of participants in the office environment, they don't have enough time to participate in training courses, therefore cooperation with this study was difficult for them. Second, this study has some inherent biases because the respondents were self-selected and self-reported their attitude, intention, belief, physical activity status, demographic, height and weight data.

Since under-report of these measures are possible, providing correct results from self-report questionnaires, particularly international physical activity questionnaire, which requires a correct perception of the participants of mild, moderate and severe physical activity, was associated with difficulties.

Finally, other important behavioral and psycho-social factors, not identified, that could influence physical activity in women might be missing.

### 5.2. Conclusions

We have reported a theory-based intervention, which has tested the efficacy of an extended TPB as a framework for use within a health behavior change context. TPB has been generally supported as a framework for developing and testing such interventions.

With regard to the side effects of immobility, Increasing individuals' sense of personal control over aspects of their walking and Physical Activity behavior, leading to an increase in an intention to walk more, encouraged them to actually walk more. According to the present study, TPB, especially the construct of PBC, can have a major impact of the behavioral intention and physical activity behavior. Therefore, these factors should be seriously considered in the educational plannings.

### Supplementary Material

Supplementary material(s) is available [here](#).

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### Footnotes

**Authors' Contribution:** Study concept and design: Masoud Shafieinia, Alireza Hidarnia; acquisition of data: Masoud Shafieinia; analysis and interpretation of data: Masoud Shafieinia; drafting of the manuscript: Masoud Shafieinia; critical revision of the manuscript for important intellectual content: Masoud Shafieinia, Reza Rajabi, Alireza Hidarnia; statistical analysis: Anoushirvan Kazemnejad; administrative, technical, and material support:

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