Determinants of physical activity in women with multiple sclerosis based on theory of planned behavior

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Abstract

Background: In recent decades, the scientific evidence has demonstrated that regular physical activity (PA) provides abundant physiological and psychological benefits in people with multiple sclerosis (MS). However, most persons with MS are physically inactive. This study examined determinants of PA based on the theory of planned behavior (TPB) among women with MS.

Method: Participants (178) completed measures included Godin Leisure-Time Exercise and TPB questionnaires. Descriptive statistics and hierarchical linear regression were analyzed using IBM SPSS.

Result: Most participants were homemaker and the mean age was 34.2 years. The mean of PA was 11.6 ± 7.9 and only 10% of participants had sufficient amount of PA. The result of hierarchical linear regression indicated that attitude (β = 0.27; P < 0.05), subjective norm (β = 0.18; P < 0.05), and perceived behavioral control (β = 0.44; P < 0.05) explained 58% variance in exercise intention. Intention (β = 0.20; P < 0.05) and other variables explained 18% variance in PA.

Conclusion: Our findings indicate that constructs of TPB could be used in behavioral interventions by health-care providers for increasing PA among women with MS.

Keywords: Multiple sclerosis, physical activity, theory of planned behavior

Introduction

Multiple sclerosis (MS) is the most common neurological disorder in central nervous system (CNS).[1] The immune system attacks myelin of CNS and causes inflammation, demyelination, and lesions.[2] This chronic disease affects young adults and the prevalence ratio is 2 or 3 times more among women than men.[3]

This process results in a wide range of symptoms depended on areas of affected nerve fibers including blurred vision, double vision, balance disorder, spasticity, dysfunction of cognition, and mobility disability.[4] The patients with MS also suffer from pain, fatigue, depression, and muscle weakness.[5] Patients reduce their activities due to increase in these symptoms and subsequently decrease in their quality of life (HRQOL).[6,7] There is abundant evidence supporting physical activity (PA) has considerable benefits for improving fatigue, balance, coordination, and health-related quality of life.[8–10] Moreover, PA in people can prevent increased risk of comorbid illness such as cardiovascular diseases, obesity, type 2 diabetes, cancer, arthritis, osteoporosis, depression, and fatigue.[5,11,12] Researchers recommended that exercise behavior should be considered as the most effective nonpharmacological approach in MS patients.[16–18] Despite the benefits of PA, the existing evidence indicates the most of people with MS do not engage in sufficient amounts of PA.[19–21] This highlights the importance of finding effective ways to increase participation in PA.
of identifying effective factors for changing behavior and increasing PA. Theoretical frameworks can help to identify key factors that promote behaviors as well as can inform development of effective behavioral interventions. The theory of planned behavior (TPB) as theoretical frameworks has been widely applied in many fields and in various populations. TPB proposes that a person’s intention to perform a behavior is the immediate determinant of that behavior. Intention is influenced by three main constructs involving attitude toward the behavior, subjective norms (SNs), and perceived behavioral control (PBC). Attitude reflects a person’s positive or negative evaluation of performing a behavior. SN refers to perception whether important others approve or disapprove of the behavior and whether important others perform the behavior. PBC reflects controllability of the behavior and ability to perform behavior. Several studies were performed for examining associations between PA and construction of TPB in cancer survivors. Ahmad et al. examined predictors of exercise using TPB in sarcopenic elderly. Saber et al. identified determinants of PA based on the TPB in the housewives. However, to our knowledge, there is no research that has been examined relationship between PA and variables based on TPB in people with MS. Therefore, it motivated us to conduct this study to investigate determinants of PA based on TPB in women with MS. Understanding variables from TPB that are associated with PA provides specific information for promoting PA among people with MS. This information could be targeted in behavioral interventions and clinical care by health-care providers such as health educators, physicians, and nurses.

**Methods**

**Participants and procedures**

This cross-sectional study was conducted between September 2018 and April 2019. Participants were recruited from MS clinics of two hospitals affiliated to the Tehran University of Medical Sciences (TUMS) in Tehran, Iran. The sample size was calculated based on 10 subjects for each observed variables. In this study, there were 18 observed variables and finally the total sample size was considered 200 samples.

The first individual was screened based on inclusion criteria and then a member of the research team described the research and its procedures.

The inclusion criteria were (a) definite diagnosis of MS, (b) relapse-free in the past 30 days, (c) age of 18–65 years, (d) Expanded Disability Status Scale (EDSS) < 4, and (e) willingness to complete the questionnaire. EDSS was checked by neurologists in MS clinics.

Ultimately, 200 participants signed a written informed consent and then completed the questionnaires in MS clinics. After eliminating incomplete questionnaires, 178 samples were included.

**Measures**

PA was measured using the Godin Leisure-Time Exercise Questionnaire (GLTEQ) which is a self-reported scale with two parts. We used only the first part in this study which includes three items which measure the frequency of strenuous, and moderate and mild exercise for more than 15 min during a typical week. The frequencies of strenuous, moderate, and mild activities are multiplied by 9, 5, and 3 metabolic equivalents, respectively, and summed into a total score. There is evidence for the validity of this measure in persons with MS.

**Theory of planned behavior**

The TPB questionnaires were measured using standard items recommended by Ajzen as well as previous studies. The items focused on regular PA based on guideline in MS, 3 times per week for 20 min or more in each time.

Attitude was assessed using instrumental attitude and affective attitude. The main phrase was “For me, exercising regularly is ….” Instrumental attitude was measured by three items that were rated on a 7-point bipolar adjective scale (unimportant/important, harmful/beneficial, useful/useless). Written descriptors were extremely (points 1 and 7), quite (points 2 and 6), and slightly (points 3 and 5). The affective attitude component was measured by two items. Each item was rated on a 7-point bipolar adjective scale (stressful/relaxing, unenjoyable (tiring)/enjoyable). Internal consistencies (φ) for the instrumental and affective attitude scales were 0.86 and 0.85, respectively.

SN was assessed by four items on a 7-point scale (1 = strongly disagree to 7 = strongly agree). The three items that measured injunctive norm were “Most people who are important to me would … exercise regularly” (approve–encourage–supportive). One item assessed descriptive norm “Most people who are important to me will be doing exercise program in the next month.” Internal consistency (φ) for four items was 0.77.

PBC was measured by four items on 7-point scale (strongly disagree to strongly agree): (a) “I confident that I could exercise regularly,” (b) “for me regular exercise would be easy,” (c) “regular exercise completely up to me,” and (d) “regular exercise is completely under my control.” Cronbach’s alpha coefficients were 0.915.

Intention was assessed using three items based on 7-point scale (strongly disagree to strongly agree): (a) “I intend to participate in regular PA,” (b) “I plan to participate in regular PA,” and (c) “I try to participate in regular PA.” Cronbach’s alpha coefficient for this scale was 0.9.

**Statistical analysis**

The statistical analyses were conducted using IBM SPSS Statistics version 21. Differences in PA levels and TPB constructs based on demographic variables were examined using independent sample t-test. Bivariate correlations were performed using Pearson
correlation coefficients to determine associations between demographic, medical, TPB, and PA variables.

We conducted hierarchical linear regression analyses to examine key determinants of PA and intention. Only significant correlations were entered into the regression analysis. The first we performed hierarchical linear regression analysis; when PA was dependent variable, we entered intention, PBC in step 1, SN, attitude in step 2. For the second analysis, when intention was dependent variable, we entered PBC, SN, and attitude variables. The variance inflation factor was used to test for multi-collinearity.

**Ethical consideration**

This project was approved by the ethics committee of TUMS (IR. TUMS.REC.1395.2280).

**Results**

Most participants were married (60.1%), and 61.8% of women were homemaker. Most sample had university degree (68.5%) and 98% had relapsing remitting MS (RRMS). The mean age was 34.2 years (SD = 8.4) and the mean duration of disease was 7.6 years (SD = 5.1). The mean BMI was 23.49 (SD = 4.37), and 33.7% of women had BMI ≥ 25. The median EDSS was 2.

The descriptive statistics for PA and the TPB variables as well as differences are reported in Table 1. The bivariate correlations among continues variables are presented in Table 2. The TPB constructs were significantly correlated with each other and with PA (\( p < 0.001 \)). The correlations between PA with components of TPB were moderate in magnitude. PA had the strongest significant correlations with intention and attitude (\( r = 0.36 \)). Exercise intention had the strongest significant correlations with PBC (\( r = 0.71 \)). Results of the first hierarchical linear regression analysis are reported in Table 3. Based on this analysis, the final model included exercise intention as significant predictor of GLTEQ scores. These variables explained 18% variance in PA. Results of the second multiple linear regression analysis are presented in Table 4. In this regression analysis, the key determinants of exercise intention were PBC, attitude, and SN. These variables explained 58% variance in exercise intention. The values for variance inflation factor did not indicate the presence of multicollinearity.

**Discussion**

The purpose of this cross-sectional study was to examine determinants of PA based on TPB in women with MS.

The preliminary results of our study indicated that only 10% women with MS were physically active. This result is consistent with a recent study that reported the majority of persons with MS are not meeting PA guidelines while there is remarkable evidence about the benefit of PA\(^{[19]}\). Our findings demonstrated which only intention was key determinant of PA. According with the tenets of TPB, intention is one of the main determinants of behavior.\(^{[20],[30]}\) In addition, we observed the statistically significant association between attitude with PA intention. In current study, attitude toward exercise reflected both instrumental attitude and affective attitude. Instrumental attitude is defined by people’s beliefs about positive or negative outcomes of performing the behavior and affective attitude consists of emotional response toward a behavior. This result is in line, in part, with previous research by Kasser et al.\(^{[40]}\) which reported perceived benefits of exercise as key predictor of PA in people with MS. Similar with our findings, other studies founded instrumental attitude and affective attitude are important predictors of exercise intention.\(^{[30],[31]}\) Therefore, this finding suggests that attitude toward exercise is an important factor for increasing PA in individuals with MS and should be considered in behavioral interventions by health-care providers.

The other results demonstrated that PBC had the strongest effect on exercise intention. This finding in line with other research reported PBC is the main determinant of intention.\(^{[31],[32]}\)

We expected that PBC would have both direct and indirect relationships with physical activity but PBC had only the indirect effect with PA through intention. This result has been

| Variables (n) | Attitude | SN | PBC | Intention | PA |
|--------------|----------|----|-----|-----------|----|
| Married (107) | 28.5 (5.6) | 23.2 (4.6) | 21.3 (6.2) | 17.3 (3.8) | 11.1 (7.1) |
| Single (71) | 29.0 (5.4) | 23.2 (3.8) | 22.3 (6.1) | 17.5 (4) | 12.4 (9) |
| P | 0.5 | 0.99 | 0.28 | 0.73 | 0.28 |
| Homemaker (110) | 28.2 (5.7) | 22.8 (4.6) | 21.6 (6.4) | 17.3 (4.0) | 10.9 (7.4) |
| Employed (68) | 29.5 (5.0) | 23.8 (3.8) | 22.0 (5.9) | 17.5 (3.5) | 12.8 (8.6) |
| P | 0.11 | 0.16 | 0.67 | 0.72 | 0.10 |
| University (122) | 29 (5.4) | 23.6 (3.9) | 21.8 (6.2) | 17.6 (3.6) | 11.9 (8.5) |
| Diploma and lower (56) | 28 (5.7) | 22.2 (5.0) | 21.5 (6.1) | 17.0 (4.5) | 10.9 (8.5) |
| P | 0.30 | 0.07 | 0.74 | 0.38 | 0.4 |
| Total mean | 28.7 (5.5) | 23.2 (4.3) | 21.7 (6.2) | 17.4 (3.8) | 11.6 (7.9) |
| Range | 5-35 | 4-28 | 4-28 | 3-21 | 0-119 |

PBC: Perceived behavior control; PA: physical activity, SN: subjective norm
Table 2: Correlations for the theory of planned behavior and demographic variables

| Variables                           | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
|------------------------------------|----|----|----|----|----|----|----|----|
| Physical activity                  |    |    |    |    |    |    |    |    |
| Attitude                           | 0.36* |    |    |    |    |    |    |    |
| Subjective norm                    | 0.27* | 0.45* |    |    |    |    |    |    |
| Perceived behavioral control       | 0.31* | 0.67* | 0.46* |    |    |    |    |    |
| Intention                          | 0.36* | 0.65* | 0.51* | 0.71* |    |    |    |    |
| Age                                | −0.10 | 0.03 | 0.02 | −0.14 | −0.07 |    |    |    |
| Diseases duration                  | −0.08 | −0.06 | 0.04 | −0.09 | −0.04 | 0.47* |    |    |
| BMI                                | 0.02 | 0.06 | 0.05 | 0.03 | 0.31* | −0.05 |    |    |

*P<0.001. BMI: Body mass index

Table 3: Hierarchical linear regression model

| Variables                           | β  | R²  |
|------------------------------------|----|-----|
| Physical activity                  |    |     |
| Attitude                           | 0.58 | 0.20 | 0.28* | 14% |
| Subjective norm                    | 0.13 | 0.13 | 0.10  |     |
| Perceived behavioral control       | 0.29 | 0.14 | 0.20* | 18% |
| Intention                          | 0.02 | 0.13 | 0.01  | 18% |
| Perceived behavioral control       | 0.35 | 0.21 | 0.17  |     |
| Subjective norm                    | 0.23 | 0.19 | 0.08  |     |

*β=unstandardized coefficient of regression; SE=standard error; *P<0.001

Table 4: Multiple linear regression

| Variables                           | β  | R²  |
|------------------------------------|----|-----|
| Physical activity                  |    |     |
| Attitude                           | 0.28 | 0.04 | 0.44* | 0.58 |
| Subjective norm                    | 0.21 | 0.06 | 0.18* |     |
| Perceived behavioral control       | 0.19 | 0.05 | 0.27* |     |

*β=Standardized coefficient of regression; SE=standard error; *P<0.001

To promote PBC, exercise barriers and their solutions should be identified. People are motivated to do physical activity when they feel that the behavior is under their control. In current research, SN had a statistically significant relationship with intention. One previous study founded SN as an important factor, but some researcher reported SN as a weak predictor. This result suggests that enlisting important others to support and encourage to participate in exercise behavior could play important role for increasing PA in individual with MS. For example, physicians could encourage and prescribe appropriate exercise in these persons and follow-up such as medicine. Overall, regression analysis indicated that the TPB constructs explained 58% and 18% of the variance in intention and PA, respectively. This finding is in line with previous studies in inactive people with MS that explained 10–17% variance in PA. Moreover, exercise intention was strongly associated with PBC, attitude, and SN. Our finding indicated only intention was associated with PA. These data provided the new information that constructs of TPB could be used in behavioral interventions by health-care providers for increasing PA among women with MS.

Conclusion

Our results demonstrated that majority of women with MS had insufficient amount of PA. Moreover, exercise intention was strongly associated with PBC, attitude, and SN. Our finding indicated only intention was associated with PA. These data provided the new information that constructs of TPB could be used in behavioral interventions by health-care providers for increasing PA among women with MS.

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Conflicts of interest

There are no conflicts of interest.

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