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Psychometric Properties of the Developed Theory of Planned Behavior Questionnaire about Physical Activity of Military Personnel's Wives in Tehran

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Abstract

Aim: Physical inactivity, as the leading risk factor for death, is more common among women than men. Despite the effective role of extended Theory of Planned Behavior (TPB) with planning to promote exercise behavior, there is no Iranian standard scale in this regard. This research evaluated psychometric characteristics of the expanded TPB-based questionnaire regarding to the physical activity of military staff's spouses in Tehran.

Methods: Content, face, construct validity and reliability (internal consistency and stability) of this scale was assessed. A cross-sectional survey was conducted among 200 women, who were living in organizational houses, in Tehran, Iran in 2014, in order to do exploratory factor analysis (EFA).The participants were chosen with multi-stage cluster random sampling. EFA was performed applying the principal component analysis and Varimax rotation. Data were analyzed using SPSS. v16.

Findings: Content validity index, content validity ratio and impact score of the extended TPB scale were 0.8-0.97, 0.78-0.98 and 4.5-4.8, respectively. An eight-factor structure was extracted as a result of the EFA and accounted for 76.33% of the variance. The calculated KMO was 0.72 and the Bartlett's test of sphericity was significant ($P<0.001$). Eight constructs consisted of behavior, affective attitude, subjective norms, perceived behavioral control, coping planning, instrumental attitude, intention and action planning. Cronbach's alpha value (0.83-0.97) and the intraclass correlation coefficient (0.63-0.91) demonstrated satisfying reliability for the subscales.

Conclusion: Validity and reliability of the first developed TPB-directed scale with planning about women's exercise perceptions and behavior in Iran was appraised and approved in this study. This instrument can be utilized by other health researchers.

Keywords: Exercise, Planning, Physical activity, Psychometrics, Theory of Planned Behavior

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Introduction

Physical inactivity is more common among women than men. Regular physical activity (PA) can improve women's health and prevent many diseases [1]. Almost 50% of women are insufficiently active in the Eastern Mediterranean Region [2]. In Iran, 79.2% of 25-34 year old women are inactive [3]. Only 31.3% of women in Tehran are physically active (with minimum 10 minute activity in their leisure time) [4]. The research priorities of the military medical sciences university in Tehran highlight inactivity in women of military families.

Given the intricacy of PA, it is required to apply behavior change theories in determining both effective factors on action and relations between them as well as the key elements of interventions [5]. The Theory of Planned Behavior (TPB) [6] is a parsimonious model that has been used for a broad range of behaviors [7], particularly PA [8]. TPB proposes that the proximal determinant of behavior or intention [8] is influenced by attitudes toward the behavior, subjective norms and perceived behavioral control [9]. TPB has been found to explain 41-46% and 24-36% of the variance in PA intention and behavior, respectively [10]. However, individuals with a high motivation to improve their health-enhancing behavior (e.g. PA) do not always succeed in accomplishing such desired changes [11], which is called intention–behavior gap [12]. For instance, Ahmadi and colleagues' research reported that their TPB-driven intervention, in spite of a significant increase in the intention mean, had no impact on PA [13]. This may be due to the point that participants held intentions to act, but subsequently failed to enact those intentions [14]. Planning can bridge such discrepancy in exercise behavior and result in better outcomes [9, 15]. Planning is a prospective self-regulatory strategy, a mental simulation of linking concrete responses to future situations [16]. Action plans refer to the detailed specification of when, where and how to act in accordance with intention [14]. Coping planning can help a person to overcome obstacles and to cope with difficulties by anticipating personal risky situations and plan coping responses in detail [16]. According to a research, two planning constructs had a synergistic effect on PA behavior [14].

To our best knowledge, there was no valid and reliable questionnaire for measuring women's exercise behavior based on the developed TPB with planning structures in Iran. Moreover, no international research has applied all constructs of the extended TPB in designing a questionnaire in this topic [16]. Moreover, no culturally appropriate scale exists with regard to Iranian women's PA. Then, constructing a comprehensive instrument can assist to conduct

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diverse health research about aforesaid issue. Besides, no study has been conducted on PA of women living in organizational houses in Iran. Women in military families can play important role in promoting active lifestyle in their family and society [17]. In addition, occupational achievement of military forces is dependent to living in healthy families [18]. Therefore, we implemented this study for many reasons; (a) high prevalence of inactivity in military staff's wives; (b) influential contribution of the expanded TPB with planning to raise and sustain exercise behavior and the absence of a standard scale in this field in Iran; and (c) lack of the theory-driven research to determine the active lifestyle of the aforesaid target group. This study was intended to assess the validity and reliability of the developed TPB questionnaire with action and coping planning in women residing in institutional houses about PA behavior in Tehran.

Methods

The Questionnaire

An item pool was extracted from literature about the TPB and planning [8, 9, 16, 19-23] Ghazanfari and associates' study was very helpful in this regard [24]. Francis and colleagues' manual was applied to construct the scale. In TPB, each predictor may be measured directly; for example, by asking respondents about their overall attitude, or indirectly; for instance, by asking respondents about their specific behavioral beliefs and their outcomes [25]. The items of extended questionnaire and response formats are presented in Table 1.

Translation and Cultural Adaptation

Banville et al. method was utilized to cross culturally translate of this scale [26]. Two independent bilingual health researchers translated the original scale to Persian. Blind to the original form, the other two investigators translated Persian questionnaire in English. Ultimately, an expert team (the translators, researchers and psychometric assessment specialists) revised all the translation and cultural adaptation proceedings. Agreement regarding to semantic, idiomatic and conceptual equivalence was achieved and a final version of the instrument was prepared [27].

Content Validity

A ten-member panel including health and physical education specialists evaluated the developed TPB questionnaire qualitatively, in terms of grammar, wording, item allocation and scaling. Two quantitative indicators were measured: the content validity index (CVI) and content validity ratio (CVR). CVI appraised the relevance, simplicity and clarity of the items in the scale. In order to compute CVI, a Likert-type ordinal scale was applied with four

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possible responses (1 = not relevant, simple and clear to 4 = very relevant, simple and clear). CVI was estimated as the proportion of the number of the items that received a rating of three or four by the expert team to the number of all items [28]. Polite and Beck advised 0.8 for the acceptable lower limit of CVI [29]. CVR identified the necessity of an item in an instrument [30]. For estimating this indicator the panel members rated each item as necessary, useful but not necessary, or not necessary [28].

Table 1: The Items and Response Categories of the Developed Scale Extracted from Theory of Planned Behavior and Action and Coping Planning Literature

Item Pools	**Response Categories**
1. Performing PA* would be.....	Very useful- useful- neither useful nor harmful- harmful- very harmful
2. Performing PA* would be.....	Very valuable… very valueless
3. Performing PA* would be.....	Very wise… very unwise
4. Performing PA* would be.....	Very boring… very pleasurable
5. Performing PA* would be.....	Very stressful… very relaxing
6. I would feel illness if I don't PA*	Strongly disagree… strongly agree
7. People who are important to me think I should perform PA*	Strongly agree… strongly disagree
8. People who are important to me wanting me to perform PA*	Strongly agree… strongly disagree
9. The most of important others for me perform PA*	Strongly agree… strongly disagree
10. I am confident, I can perform PA*	Strongly disagree… strongly agree
11. For me to perform PA* is easy	Strongly disagree… strongly agree
12. Performing PA* isn't up to me	Strongly disagree… strongly agree
13. How likely is it possible that you would make a decision to perform PA* in the next week?	Very likely… very unlikely
14. I intend to perform PA* in the next week	Very likely… very unlikely
15. I expect to perform PA* in the next week	Very likely… very unlikely
16. How many days a week do you regularly perform of moderate PA?	0, 1, 2, 3, 4, 5, 6, 7
17. How many minutes a week do you regularly perform of moderate PA?	..... Minutes
18. Performing PA* is the integral part of my life	Completely true… completely untrue
19. I have made a plan regarding when I perform PA	Completely true… completely untrue
20. I have made a plan regarding where I perform PA	Completely true… completely untrue
21. I have made a plan regarding how I perform PA	Completely true… completely untrue
22. I have made a plan regarding how to cope with possible setbacks	Completely untrue… completely true
23. I have made a plan regarding when I have to pay extra attention to prevent lapses	Completely untrue… completely true
24. I have made a plan regarding what factors help me to be physically active	Completely untrue… completely true

* Physical activity: 30 minutes of moderate-intensity activity at least five days per week

Face Validity

In the qualitative stage, ten military personnel's wives were asked to appraise the scale and display if they felt the difficulty, irrelevancy and obscurity in answering to the items. Item impact method was utilized to demonstrate the percentage of women who recognized the item important or quite important. The items with an impact score (frequency × importance) equal to or more than 1.5 were regarded

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appropriate [28].

Construct Validity

In 2014, a cross-sectional research was accomplished on women (military staff's spouses), who were living in institutional townships, in Tehran, Iran. The sample size of exploratory factor analysis (EFA) was considered 200. Guilford recommended a minimum sample size of 200 for consistent factor recovery [31]. Participants were selected by random multi-stage cluster sampling. That is, we allocated randomly two townships among the list of Tehran's organizational townships. Afterwards, we assigned randomly a number of the constructions (formed of several homes) via the inventory of constructions in above-mentioned townships. Eventually, a number of homes were randomly chosen from the list of homes in the selected buildings.

The inclusion criteria were: 18-64 year old women, being literate, wish to take part, not presently being examined by other researchers and no history of chronic diseases, mental and disabling disorders. The exclusion criteria consisted of having medical contraindications for doing PA. Data were gathered by ZGH. We administered the EFA exerting the principal component analysis (PCA) and oblique rotation. As the correlation between factors was less than 0.3, Varimax rotation with Kaiser Normalization was applied. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test were computed. The KMO value over 0.7 was cosidered satisfactory for factor analysis. The eigenvalue greater than one and factor loading equal to or more than 0.4 were used to identify the best structure [28].

Reliability

We assessed the internal consistency and stability (test–retest reliability) of the instrument by Cronbach's alpha coefficient (0.7 or above) and the intraclass correlation coefficient [28] (ICC <0.4 shows poor to fair, 0.41–0.6 moderate, 0.61–0.8 good and >0.8 excellent agreement) [32]. Thirty women filled out the questionnaire two times with a two-week interval.

Physical Activity Measure

The target behavior of current survey was chosen basis on WHO recommendation, which says 18–64 year old individuals should perform at least 150 minutes of moderate-intensity PA throughout the week (5 day per week, minimum 30 minutes daily) [33]. We measured exercise behavior by means of the expanded TPB scale (table 1) and also the short form of the International Physical Activity Questionnaire (IPAQ). The IPAQ has become the most widely used PA questionnaire. The validity and

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reliability of this tool were confirmed in diverse research [34] such as the current study (ICC=0.85). The IPAQ records the activity of four intensity levels: (a) vigorous; (b) moderate; (c) walking; and (d) sitting. There are three levels of PA to categorize populations: low, moderate and high [35]. A trained interviewer collected the IPAQ data.

Statistical Analysis

The data were analyzed by SPSS. v16, using the Cronbach's alpha, intraclass correlation coefficient and principal component analysis with Varimax rotation. P<0.05 was considered significant.

Ethical issues

The Ethics Committee of Tarbiat Modares University verified this research. All women signed an informed consent form.

Results

Content Validity

The qualitative findings were appropriate. The CVI (0.8-0.97) and CVR (0.78-0.98) indicated a satisfactory result for the total scale items.

Face Validity

The participants declared that they had no problems in reading and understanding the items. The impact score was 4.5-4.8 for the total scale.

Construct Validity

Totally, 97% of participants were insufficiently active or inactive. Demographic variables and PA rate, level and intensity of women were presented in Table 2.

The estimated KMO was 0.72 and the Bartlett's test of sphericity was significant (P<0.001).

PCA with Varimax rotation resulted in eight-factor solution that explained 76.33% of the variance. These factors were labeled in terms of the underlying constructs, which were pertained to the items: behavior, affective attitude (the extent to which the behavior is seen as pleasurable) [36], subjective norms, perceived behavioral control, coping planning, instrumental attitude (the extent to which the behavior is seen as useful) [36], intention and action planning. The EFA results are indicated in Table 3.

Reliability

The Cronbach's alpha was 0.83-0.97 for the subscales (Table 4). The ICC (0.63-0.91) was good to excellent for constructs of this scale (Table 4).

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Table 2: Demographic Characteristics and Physical Activity Rate, Level and Intensity of the Exploratory Factor Analysis Participants (n = 200)

Variable	Mean (SD)	N (%)
Age (years)	30.58 (5.43)	
Education		
Primary		0 (0)
Secondary		94 (47)
Higher		106 (53)
Education of husband		
Primary		0 (0)
Secondary		57 (28.5)
Higher		143 (71.5)
Occupation		
Housewife		156 (78)
Employed		44 (22)
Number of children	2.18 (0.72)	
Number of family members	4.2 (0.74)	
Physical activity		
Day (s) a week	0.82 (1.06)	
Minutes a week	24.6 (31.93)	
Inactive (0 Minutes a week)		91 (45.5)
Less active (<150 Minutes a week)		103 (51.5)
Active (≥150 Minutes a week)		6 (3)
Low*		193 (96.5)
Moderate **		5 (2.5)
High ***		2 (1)

* Low: Those individuals who were not meeting criteria for categories, moderate or higher are regarded to have a 'low' PA level
** Moderate: 5 or more days of any combination of walking, moderate or vigorous intensity activities, attaining a minimum total PA of at least 600 MET-minutes/week
*** High: vigorous-intensity activity on at least 3 days attaining a minimum total PA of at least 1500 MET-minutes/week or 7 or more days of any combination of walking, moderate or vigorous intensity activities attaining a minimum total PA of at least 3000 MET-minutes/week

Table 3: Factor Structure of the Extended Theory of Planned Behavior Scale Extracted from Principal Component Analysis*

Factor** **Item**	**Beh**	**AA**	**SN**	**PBC**	**CP**	**IA**	**In**	**AP**
	Factor Loading							
Minutes	0.98							
Days	0.98							
My life	0.97							
Relaxing		0.91						
Pleasurable		0.9						
Illness		0.86						
Want			0.93					
Do			0.9					
Think			0.84					
Easy				0.91				
Confident				0.87				
Up to me				0.8				
Lapses					0.87			
Factors					0.82			
Setbacks					0.78			
Valuable						0.83		
Wisely						0.76		
Useful						0.74		
Intend							0.83	
Howlikely							0.78	
Expect							0.74	
How								0.8
Where								0.79
When								0.72
Eigenvalue	3.72	2.92	2.6	2.4	1.94	1.74	1.69	1.28
Explained variance (%)	12.44	10.61	10.43	9.79	9.11	8.12	8.01	7.78

* Factor loadings equal or more than 0.4 were noted as acceptable
** Abbreviations: AA, Affective Attitude; AP, Action Planning; Beh, Behavior; CP, Coping Planning; IA, Instrumental Attitude; In, Intention; PBC, Perceived Behavioral Control; SN, Subjective Norms.

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Table 4: Reliability of the Developed Theory of Planned Behavior Scale and Constructs

Construct*	Cronbach's Alpha	ICC
IA	0.88	0.71
AA	0.94	0.85
SN	0.97	0.91
PBC	0.83	0.63
In	0.86	0.68
AP	0.97	0.91
CP	0.97	0.91
Beh	0.83	0.63
Total	0.90	0.77

* Abbreviations: AA, Affective Attitude; AP, Action Planning; Beh, Behavior; CP, Coping Planning; IA, Instrumental Attitude; In, Intention; PBC, Perceived Behavioral Control; SN, Subjective Norms.

Discussion and Conclusions

Considering the fact that valid and reliable questionnaires are required to design and evaluate theory-driven health education interventions [37], this research was the first to report the psychometric characteristics of the developed TPB scale with the action and coping planning in women's PA in Iran. In sum, our findings confirmed both validity and reliability of this scale. This result was consistent with Sniehotta and colleagues' research about physical exercise [12, 16]. Ajzen suggests the TPB is open for further extension with additional constructs [6]. As the present study showed that TPB can be extended to the action and coping planning. Content validity of the instrument was satisfactory with regard to the expert panel views. Considering the results of face validity, participants felt this scale was addressing the issues which were important. EFA confirmed construct validity of the expanded questionnaire and no item was removed. It may be because this instrument was validated in former stages. Exploratory approach led to eight-factor structure, including behavior, affective attitude, subjective norms, perceived behavioral control, coping planning, instrumental attitude, intention and action planning. These constructs explained 76.33% of the variance. Similarly, Pakpour and Saffari in their EFA study found six factors (attitude, subjective norms, perceived behavioral control, intention, action and coping planning) [38]. However, obtained six-factor structure may be due to different under- study behavior (tooth brushing) and population (adolescents). Also, a three-factor solution (intention, action and coping planning) emerged as a result of Sniehotta and associates' factor analysis and accounted for more than 70% of the observed variance. All factor loadings were greater than 0.61 [16]. Although, only three constructs were analyzed in the mentioned research.

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According to Francis and colleagues' [25], each predictor of intention comprised of two sub constructs (attitude: affective and instrumental; subjective norms: descriptive and injunctive; perceived behavioral control: controllability and self-efficacy). As expected attitude was drawn out with two subscales, but the other constructs were loaded as single factors and expected sub constructs were not appeared individually. This result may be due to apply only direct method of constructing the developed scale. This finding was compatible to Ghazanfari and colleagues' EFA [24]. It is likely to apply only direct method of constructing the scale by these findings. Since employing the indirect procedure as well as direct measures, can be conducive to constitute more items for each construct, they will result in extracting two sub constructs. As we know, EFA is often used early in the process of scale development and construct validation, whereas confirmatory factor analysis (CFA) is used in the later phases when the underlying structure has been established on prior empirical and theoretical grounds [39]. Accordingly, we conducted a CFA study, on another sample of the target group. The results of the aforesaid research are described in detail in another article [40]. The internal consistency analysis of this questionnaire yielded to proper alpha value. Accordance to Ajzen to secure reliable, internally consistent measures, it is necessary to select the appropriate items in the formative stages of the investigation [36]. Moreover, the test–retest reliability of the expanded TPB scale indicated well to excellent stability.

The present study approved the content, face, construct validity and reliability of the extended TPB scale. This instrument can be utilized by other health researchers and can fill an important gap in measuring exercise perceptions and behavior based on the extended TPB with planning in target women. Also, this survey displayed only 3% of women (military staff's spouses) were sufficiently active. Thus, it was needed to investigate the exercise behavior of this target group.

It should be noted that this research had some limitations: First, only the direct method was applied to construct TPB. Second, PA was measured through self-reported scales. Participants might underestimate or overestimate their exercise behavior. However, the obtained results of these questionnaires were similar. Third, the investigation of women lived in Tehran's organizational houses might limit generalization of the results to entire military personnel’s wives. Hence, further research is required with respect to larger samples. Moreover, it is recommended to fulfill a path analysis survey in order to examine planning as a mediator of the intention-behavior relation and identify predictors of exercise behavior based on the

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extended TPB model in the aforesaid women.

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Conflict of Interest

The authors declare no conflict of interest in this study.

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