



Development of the Exercise Self-efficacy Scale for Indian Older Adults

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Abstract

Exercise self-efficacy is one of the most important factors that influences older people's exercise behaviour. In India, it was reported that less than half of older people residing in urban areas engage in exercise regularly and lack of perception was alleged to be a major reason. This study was designed to develop and examine the psychometric properties of the Exercise Self-efficacy Scale for Indian Older Adults (ESES).

An instrument development design was used, and convenient sampling was employed to recruit 402 Indian older adults to participate in this study. The five steps of the instrument development process included identifying the exercise self-efficacy concept, generating the items, determining the format, reviewing the items by experts, and testing for validity and reliability. The ESES is a 30-item, 4 -point Likert Scale. It comprises six dimensions: lack of motivation, lack of support, health condition, time barriers, lack of facilities, and environmental barriers. The new scale demonstrates an acceptable content validity index and construct validity. Its criterion-related validity in line with the Physical Activity Questionnaire developed by Voorrips and colleagues was also reported. The ESES developed in this study can be used as research and clinical tools to measure exercise self-efficacy of Indian older adults.

Keyword: Keywords: Scale development, Exercise self-efficacy scale, Indian older adults

1. INTRODUCTION

In India the size of the elderly population, i.e. persons above the age of 60 years is fast growing although it constituted only 7.4% of the total population at the turn of the new millennium. Both the share and size of the elderly population are increasing over time. From 5.6% in 1961, it is projected to rise to 12.4% of population by the year 2026. (*Situation Analysis of the Elderly in India, Central Statistics Office, MSPI, India; June 2011*) India's population ages 60 and older is projected to increase dramatically over the next four decades, from 8 percent in 2010 to 19 percent in 2050, according to the United Nations Population Division. By mid-century, this age group is expected to encompass 323 million people, a number greater than the total U.S. population in 2012. [*Scommegna P. India's Aging Population, Population Reference Bureau, Today's Research on Aging, No. 25; March 2012* (<http://www.prb.org/pdf12/TodaysResearchAging25.pdf>)] India therefore has one of the largest older adult populations in the world. With an increase in older adults, there is also a significant increase in chronic diseases, degenerative illness, and co-morbidities. In India, a national survey showed that The proportion of elderly men and women physically mobile declined from about 94% in the age group 60 – 64 years to about 72% for men and 63 to 65% for women of age 80 or more. (*Situation Analysis of the Elderly in India, Central Statistics Office, MSPI, India; June 2011*). Chronic diseases contribute to disability, dependence, and diminished quality of life among older adults and ultimately increase health and long-term care costs.

The National Health scenario enormously depends upon Physical activity, an independent risk factor for various chronic diseases and conditions (King, 2001). The linkage between exercise, the prevention of chronic disease, and health promotion is also well established (Francis, 1999; Ruchlin and Lachs, 1999; Zhang, 2004). Exercise is a type of intended, planned, or structured physical activity. It involves repetitive bodily movement that improves or maintains one or more of the components of physical fitness (American College of Sports Medicine, 2001). Aging can be slowed down or resisted by



exercises. (Fiatarone and Garnett, 1997). In the elderly exercise can improve functional independence and quality of life (Ellingson and Conn, 2000).

Self Efficacy reporting can be used in identifying trends and hurdles in the continuation of exercises and the way the elderly look at their health perspective (Pender et al., 2002), and it is defined as people's judgments of their capabilities to execute a certain level of performance (Bandura, 1986). Exercise self-efficacy refers to the judgment of an individual's capabilities to exercise with moderate intensity three or more times a week regularly in the face of identified obstacles to participation (McAuley et al., 2003). It has been identified as one of the primary psychological variables impacting exercise behavior among older adults (Glenn, 2002; Allison and Keller, 2004). However, an appropriate instrument needs to be developed for specific conditions, for a variety of developmental levels, and in the client's native languages before an educational intervention can be implemented and studied (McDermott and Palchanes, 1992; McAuley et al., 1999). Bandura (1997) suggested that perceived efficacy should be measured against levels of task demands that represent gradations of challenges or impediments to successful performance. Perceived exercise self-efficacy is usually assessed in terms of beliefs that one can mobilize the effort needed to perform exercise in the face of various impediments such as fatigue, dysphoric mood, time constraints, competing conditions, and unfavorable environmental conditions (Bandura, 2005).

From the literature, several self-efficacy measures have been used in exercise research (Bandura, 1997; U.S. Cancer Prevent Research Center, 2005).

However, the target populations for the majority of existing exercise self-efficacy scales were not older adults, and the items in existing exercise self-efficacy scales developed for Western people may not address the challenges and barriers to exercise in Indian older adults. For example, in Indian culture, the role of family is critically important; the sense of self is much more interconnected with others, especially the significant family members (National Chronic Care Consortium, 2005). Thus, lack of previous exercise experience and concern about socially desirable performance can also influence their perceived ability when participating in exercise. Therefore, a culturally sensitive, reliable, and valid instrument is needed to measure exercise self-efficacy among Indian older adults. The objectives of this study were to develop an instrument to measure exercise self-efficacy among Indian older adults and to conduct a psychometric evaluation of the newly developed exercise self-efficacy instrument in terms of validity and reliability.

2. MATERIALS AND METHODS

Study Design and Sample

The methodological study was employed to develop the Exercise Self-efficacy Scale (ESES) for older Indian adults. The study was divided into two phases: (1) development and pre-testing of the instrument and (2) evaluation of the psychometric properties of the ESES. Phase I is composed of the identification of the construct and content of ESES, generation of item pool, determination of content validity, determination of clarity and readability, and pre-testing for determination reliability. Phase II comprised reliability testing for stability and internal consistency, and testing for construct and criterion-related validity. The target population was Indian older adults living in one of the five cities around, namely, Ahmednagar, Sangamner, Shirdi, Nashik, and Aurangabad district.

Convenient sampling was employed for both phases. In phase, I, 15 Indian older adults were purposively employed by the inclusion criteria for an in-depth interview and the determination of clarity and readability of the ESES. For the pre-testing of the ESES, 108 older Indian participants were selected. In phase II, 50 Indian older adults were selected to test the stability of the ESES, 402 Indian older adults were recruited to test internal consistency reliability, and 64 Indian older adults were purposively sampled to test for criterion-related validity.

Instruments

1. The Demographic Data Form was developed by the researchers to gather the personal data of the participants. It was a self-report form on gender, age, level of education, working situation, personal income, and exercise behavior.
2. The Mini-Mental State Examination (MMSE) is a screening tool for assessing cognitive impairment (Folstein et al., 1975). The MMSE examines five areas of cognitive function: orientation, registration, attention and calculation, recall, and language, and praxis. Correct answers are summed, score ranges from 0-30. At a cut-score of 23/24, impairment has been classified into three levels: 24-30 (no impairment), 18-23 (mild impairment), and 0-17 (severe impairment). The internal consistency reliability of MMSE was reported as .96. It was translated into Marathi



3. The Physical Activity Questionnaire (PAQ) developed by Voorrips and colleagues contained domains of household activities, sports/exercise activities, and leisure time activities (Voorrips et al., 1991). Stability reliability of PAQ with a time interval of 20 days was .89. The Spearman's correlation coefficients between the PAQ and the two reference methods, physical activity recall and use of a pedometer, were 0.78 and 0.72, respectively (Voorrips et al., 1991). This study utilized only the sports/exercise activity sub-scale including type of activity, frequency, and duration of activity to test the criterion-related validity of the newly-developed ESES scale.
4. Interview guidelines developed by the researchers were used to explore older adults' exercise behaviors and situations that inhibit their actions. It contained open-ended questions in which the participants were asked to express how they define exercise, who or what may affect their participation in exercise and what are the barriers that inhibit them from participating in exercise.

Data collection

The study was approved by the Research Ethics Review Committee of Pravara Institute of Medical Sciences-Deemed University, Loni. Participants were provided with a detailed explanation of the study and promised confidentiality before signing the study informed consent.

Phase I: Development and pre-testing of the instrument

Step 1, identification of construct and content of the ESES, was conducted via an intensive review and in-depth interview with 15 Indian older adults to identify the forms of challenges and barriers to exercise which the Indian older adults are faced with and generate the item pool. Thirty -eight items were generated and tested for clarity and readability with the same 15 Indian older adults. The ESES was revised based on comments and suggestions from 5 experts and Indian older adults.

Phase II: Evaluation of the psychometric properties

Internal consistency and stability reliability tests were conducted with 402 Indian older adults who met the inclusion criteria. For stability reliability, a 3-week interval was used to distribute the 1st and 2nd ESES. To evaluate the criterion-related validity of the ESES, both ESES and the sports/exercise sub-scale of PAQ were distributed to 64 older Indian adults.

Data Analysis

Phase I: Development and pre-testing of the instrument

For item pool development, content analysis was used to classify the items based on the results from the in-depth interviews. The content validity was analyzed by using inter-rater agreement and the index of content validity (CVI). A CVI of 0.80 was acceptable. Cohen's Kappa was used to test inter-rater reliability in determining the valence (positive or negative) of each descriptor. A coefficient value of 0.80 or higher was acceptable. Item analysis was used to confirm the reliability of the ESES with the criteria: (1) inter-item correlation matrix between 0.30 and 0.70, (2) a corrected item-total correlation coefficient greater than 0.30, and (3) alpha estimate for internal consistency if an item was deleted. Pearson's product-moment correlation was calculated to determine item-total, item-subscale, and subscale-subscale correlations. Additionally, Cronbach's alpha coefficient and Spearman's rank correlation coefficient were calculated to identify the internal consistency and stability reliability of ESES. For internal consistency reliability, Cronbach's alpha coefficient above 0.70 was considered satisfactory for the new scale. An explanatory factor analysis with principal component, and orthogonal rotation was used to explore the number of factors for determining the dimensions underlying the set of items of ESES. Eigenvalues greater than 1 and screen-tests were considered to address the number of factors. Criterion-related validity was analyzed by using Spearman's rank correlation to examine the relationship between the scores of ESES and the sports/exercise sub-scale of PAQ.

3. RESULTS

Phase 1: Development of the ESES

Construct and content of exercise self-efficacy were identified from a literature review and in-depth interviews with older Indian adults. The comprehensive literature review defines exercise self-efficacy as the judgment of an individual's ability to perform exercise. Exercise self-efficacy for Indian older



adults means the judgment of the Indian older adults' capability to exercise with moderate intensity three or more times a week regularly in the face of identified obstacles to participation. The in-depth interview of 15 Indian older adults provided more specific information from the perspective of Indian older adults on factors influencing exercise participation. Seven factors influencing participation in exercise were identified, including time conflict, health conditions, environmental barriers, lack of support, lack of facilities, lack of motivation, and economic constraints. The first draft of ESES comprised 40 items, a 5-point Likert-type scale ranging from "not at all confident" to "completely confident".

Phase 2: Testing Psychometric Properties

The content validity of the ESES yielded a CVI of .87. According to the item analysis guidelines, 5 items were deleted, 2 items were added and some items were combined. Thus, the revised ESES scale comprised 36 items. To ascertain clarity and readability, the English version of the 36-item ESES was translated into the Indian version, and a back translation technique was performed. The researcher translated the original English version of the 36-item ESES into Indian, and then a bilingual person who is an English language teacher in the Foreign Language Department of Shenyang Medical College back-translated the Indian version into the English version. The two English versions were compared by both the researchers and the back translator to identify the flaws in the Indian version. Then, the Indian version of ESES was tested for clarity and readability with 15 Indian older adults and the readability and clarity were confirmed. However, 2 items were added from the comments of the participants. In addition, the 5-point scale structure was too difficult to differentiate the answer. Then, a 38-item ESES scale with a 4-point rating scale was tested for reliability. The reliability of the ESES was tested. The Cronbach's alpha of the total scale was determined. The item-item correlation ranged from 0.533-0.752 and 8 items with inter-item correlation higher than 0.70 were deleted. Then the internal consistency reliability was tested with the 30-item ESES. The overall Cronbach's alpha coefficient was 0.97.

To determine the construct validity of ESES, explanatory factor analysis with the principle component was conducted. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were conducted to test the sampling adequacy and identity matrix, respectively. The KMO measure of sampling adequacy was .97, and Bartlett's test of sphericity was large and significant ($\chi^2=.8787.94$, $p=.000$). This means that the variables were correlated high enough to provide a reasonable basis for factor analysis. The results of the explanatory factor analysis indicated that all of the 31 items loaded in six components together accounted for 69.61% of the total variance. Factor pattern and factor loading for the ESES are presented in Table 1.

Factor 1 consisted of six items of confidence in conducting exercise regularly even when lacking in motivation: under lots of stress, feeling gloomy or depressed or anxious, goal is not achieved, recovering from an injury, exercise is too heavy, and recovering from chronic illness. Factor 2 contained eight items of confidence in conducting exercise regularly although there was no support from family members, friends, and others. Those 8 items included: no exercise instructor, no one to encourage, someone made fun of them, discontinuation of partner, dislike of family members, inability to access exercise equipment, having to pay for exercise fee, and exercising on your own. Factor 3 is comprised of seven items: have a chronic illness, exercise causes pain or muscle ache, recovering from injury, get sick, exhaustion, recovering from chronic illness, and exercise is too heavy. These items presented the perception of Indian older adults on their ability to perform exercise even though they had some health problems or chronic illnesses. Factor 4 consisted of five items, namely, time conflicts: could not fit between exercise schedule and free time, lots of work, someone visiting at home, busy with housework, and more interesting activities of appointments. This factor was the perception of older Indian adults on their ability to exercise even if there were time conflicts. Factor 5 included three items: no sports suits or shoes, a closed gymnasium, and inaccessibility to exercise equipment. These items represented facilities to promote the exercise behavior of older Indian adults. Factor 6, environmental barriers, contained two items that represented the feeling of Indian older adults on their capability to act on exercise without environmental support, i.e., no spacious place and bad weather.

No.	ESES items	Factors					
		1	2	3	4	5	6
	Lack of motivation						
1	under lots of stress	.76					



2	feel gloomy depressed or anxious	.73					
3	the goal is not achieved	.67					
4	recover from an injury	.54					
5	exercise is too heavy	.51					
6	recover from chronic illness	.43					
Lack of support							
7	no exercise instructor		.65				
8	no one to encourage		.64				
9	someone made fun of		.64				
10	discontinuation of partner		.62				
11	dislike of family members		.59				
12	cannot access to exercise equipment		.56				
13	have to pay for exercise fee		.49				
14	exercise on your own		.43				
Health condition							
15	have chronic illness			.70			
16	exercise causes pain or muscle aches			.67			
17	recover from injury			.65			
18	get sick			.59			
19	exhausted			.57			
20	recover from chronic illness			.54			
21	too heavy			.48			
Time Conflict							
22	could not fit between exercise schedule and free time				.67		
23	lots of work				.65		
24	someone visits at home				.61		
25	busy with housework				.54		
26	more interesting activities of appointment				.47		
Lack of facility							
27	no sports suits or shoes					.80	
28	closed gymnasium					.58	
29	cannot access to exercise equipment					.48	
Environmental barriers							
30	no spacious place						.56
31	bad weather						.51
Eigenvalue		5.88	4.56	4.23	2.68	2.36	1.19
% of variance		19.56	15.20	14.09	8.94	7.86	3.96
Cumulative % of variance		19.56	34.76	48.85	57.79	65.65	69.61

The criterion-related validity was tested and is shown in Table 2. According to the magnitude of correlation suggested by Cohen, the ESES strongly correlated with the sports/exercise sub-scale of the

New scale		Concurrent validity measure
		Sport/exercise sub-scale of PAQ
ESES		0.59**
** p<.01		

Physical Activity Questionnaire (PAQ) ($p=.59$).

Table 2. Spearman's rank correlation coefficient of the 30-item exercise self-efficacy and sport/exercise sub-scale of PAQ.

4. DISCUSSION



The ESES was developed to capture the judgment of the Indian older adults' ability to exercise with moderate intensity three or more times a week regularly in the face of identified obstacles to participate. The scale addressed impediments and challenges of exercise perceived by older Indian adults which were derived from in-depth interviews. Those obstacles included lack of motivation, lack of support, health conditions, time conflict, lack of facilities, and environmental barriers. It was found that obstacles found in the newly -developed scale were similar to the existing measures. However, the differences between the existing scales and the newly-developed scale were the obstacles of lack of facilities from the community and lack of support. Since this study was conducted with older Indian adults residing in an urban area where there were not enough public facilities and more crowded than in rural areas, the lack of facilities provided by the public community might be considered a significant factor in promoting exercise. Additionally, support from significant others such as family, friends, or neighbours was considered as a factor in encouraging Indian older adults to participate in exercise since they are more likely to depend on others, especially their family members. In terms of the format of ESES, the 5-Likert-type scale was modified to 4-point responses because it was easier and more practical for older Indian adults due to the difficulty of differentiating between very confident and completely confident.

Compared to other exercise self-efficacy scales developed based on the self-efficacy theory of Bandura, the Exercise Self-efficacy Scale of Bandura (Bandura, 2005), the Exercise Self-efficacy Scale of Resnick and Jenkin (Resnick and Jenkins, 2000), the proposed ESES may be more suitable for Indian older adults since it focuses on obstacles of exercise in the context of Indian older adults.

The psychometric properties of the ESES were well demonstrated in this study. The CVI and the Cohen's Kappa were acceptable due to the triangulation of data from the literature review, in-depth interviews, and expert review. Moreover, a back translation technique was conducted to verify for content validity of the Indian version of the ESES. The Indian version was examined for clarity, readability, and appropriateness of length of the scale by Indian older adults. Construct validity of the newly developed scale was considered satisfactory. Regarding the components of each factor, Factor 1 "Lack of motivation" and Factor 3 "Health condition" addressed having chronic illness, negative emotional feelings, and previous experiences of exercise impacting on confidence of Indian older adults to do exercise; most Indian older adults live with chronic illnesses (Spector, 1992). Unsurprisingly, physical and psychological health conditions were seen as major obstacles for older Indian adults since the decline in health status affected the perception of strength of exercise of an individual.

Factor 2, "Lack of support" and Factor 5, "Lack of facility" reflected interpersonal relationships influencing the perceived capability of older Indian adults to perform exercise. Support and facilities provided by the community and family and all sources of support such as instrumental or economic, emotional, and informational support were perceived by Indian older adults as essential factors influencing exercise performance. It can be explained that the role of family and community is critically important in Indian culture and the sense of self is much more interconnected with others, especially the significant family members (National Chronic Care Consortium, 2005). Factor 4, "Time conflict" included conflicts among housework activities, other activities, and exercise. This is partly due to older Indian adults having more responsibilities even after their retirement, engaging in housework such as looking after grandchildren, cleaning the house, and cooking food. This makes them busy and with little or no time to participate in exercise.

Factor 6, "Environmental barrier" included bad weather and only a few areas for exercise. During the wintertime in India, it is very cold with lots of snow, therefore, older people have to keep themselves warm to prevent sickness. Moreover, some communities in India are overcrowded with buildings, and the public parks are far away from the communities. Furthermore, most older adults prefer to exercise near their home or in their community. Therefore, it is difficult for older Indian adults who would like to exercise to do so outdoors. The reliability estimate of the ESES revealed the reliable scale. For the internal consistency reliability of the ESES, this was highly reliable for a new scale.

However, all of the coefficient values were falling in the .90s, and this threatened the redundancy of items in the scale (DeVillis, 1991). Further research is needed to test the reliability of the ESES with different groups of samples. Additionally, the deletion of items is needed to be considered. Besides internal consistency, the stability of the ESES was confirmed. This indicated that this scale is reliable enough to measure exercise self-efficacy of Indian older adults in different time intervals.

The concurrent criterion-related validity of the new scale was supported in this study. The ESES was strongly correlated with the sports/exercise sub-scale of PAQ, suggesting that the ESES related to some degree of exercise performance among older Indian adults. This may be because exercise self-efficacy can be enhanced by exercise participation (Li et al., 2001) and exercise self-efficacy is a



significant predictor of exercise behavior (McAuley et al., 2002). Since about half of the participants (51.6%) in this study exercise regularly, the concurrent criterion-related validity was confirmed. However, exercise behavior should be considered to verify the evidence for the predictive validity of ESES. Therefore, further study is needed to confirm the predictive validity of the ESES. Also, the more standard measure of exercise behavior will help to reinsure the criterion-related validity of ESES.

5. CONCLUSION

An appropriate instrument developed to measure the exercise self-efficacy of older Indian adults is needed before the educational intervention can be implemented to promote the exercise behavior of this specific group of elders. The 30-item 4-point Likert Exercise Self-Efficacy Scale for Indian older adults was developed and tested for validity and reliability. It can be used by healthcare personnel to classify Indian older adults into low and high self-efficacy groups to establish the appropriate intervention program to enhance exercise self-efficacy. Additionally, it is useful for measuring the effectiveness of an intervention program in terms of promoting exercise self-efficacy among older Indian adults.

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