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Development and Psychometric Evaluation of the Exercise Benefits/Barriers Scale

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Initial psychometric evaluation of an instrument to measure perceived benefits of exercise and perceived barriers to exercise was based on the responses of 650 adults and included item analysis, factor analysis, and reliability measures. Factor analysis yielded nine factors, five benefits and four barriers, which explained 64.9% of the variance in the 43-item instrument. Second order factor analysis resulted in a two-factor solution, one a benefits factor and the other a barriers factor. The standardized Cronbach's alpha reliability coefficients were: .952 for the total scale, .953 for the benefits scale, and .886 for the barriers scale. Use of the instrument in research involving perceptions of the benefits of exercise and the barriers to exercise appears warranted.

Increasing evidence supports the positive impact of regular exercise on physical and mental health. While much is yet to be learned concerning the full range of health benefits from exercise, positive effects on a large number of physical and psychological parameters have been reported (Dishman, 1982; Haskell, 1984; Martin & Dubbert, 1982; Mobily, 1982). Because of its relationship to health, the area of physical fitness and exercise is listed as one of fifteen priority areas in which changes are mandated for improvement of the nation's health (U.S. Department of Health, Education, & Welfare, 1979). Of the 11 objectives related to physical fitness, one is to increase the proportion of adults participating in vigorous physical activity from an estimated 35% in 1978 to 60% by 1990 (U.S. Department of Health and Human Services, 1980). Dishman, Sallis, and Orenstein (1985) expressed concern about the ability of the nation to attain the specified objectives, considering the lack of scientific knowledge about the determinants of regular physical activity.

To identify the factors affecting frequency of exercise and other health behaviors, Pender (1982, 1987) proposed the Health Promotion Model. The model, based on social learning theory, identifies cognitive/perceptual factors as major determinants of health-promoting behavior. Two of the cognitive/perceptual determinants in the Health Promotion Model are perceived benefits of health-promoting behavior and perceived barriers to health-promoting behavior. However, in developing a research program to test the model, no instruments were found to measure these factors. While perceived benefits and perceived barriers are identified in the model at a general theoretical level, they should be operationalized at a behavior-specific level to

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maximize their explanatory and predictive potential.

This report describes the development and initial psychometric evaluation of the *Exercise Benefits/Barriers Scale* (EBBS), an instrument to measure perceived benefits of and perceived barriers to exercise. The purpose of the study was to develop and refine the set of items, establish construct validity, and estimate reliability. A summary of the relevant literature precedes discussion of instrument development and refinement.

Perceived Benefits of Exercise

A variety of physical, psychological, and social benefits are identified in the literature as potential outcomes of exercise. Considerable research affirmed the positive effects of exercise on cardiovascular fitness and coronary risk reduction (Clausen, 1976; Fox & Haskell, 1978; Morris, Everitt, Pollard, Chave, & Semmence, 1980; Paffenberger, Hyde, Wing, & Hsieh, 1986). Blood pressure control was cited as a potential benefit of exercise in some studies, but not in others as summarized by Leon and Blackburn (1982).

In a study of individuals in an employee fitness program, Rhodes and Dunwoody (1980) found significant decreases in body weight as a result of program participation. Results also indicated enhanced work performance by program participants who stated they were able to work harder physically and to cope better with job tensions. Program participants also felt more alert, were better able to concentrate, and had an improved outlook on their job and life in general. Increased work capacity also was reported by fitness program participants in a study by Pollack (1979).

Exercise was shown to reduce depression and anxiety (Bahrke & Morgan, 1978; Greist, Klein, Eischens, Gurman, & Morgan, 1979) and to promote feelings of well-being (Pollack, 1979; Blumenthal, Williams, Needels, & Wallace, 1982). Feelings of enjoyment and well-being were motivators for continued participation in a corporate physical fitness program reported by Morgan, Shephard, and Finucane (1984). Folkins and Sime (1981) identified an improved self-concept as an outcome of regular exercise.

Exercise was perceived as a form of relaxation, enjoyment or fun by participants in one corporate fitness program (Rhodes & Dunwoody, 1980). Heinzelman and Bagley (1970) found that the social relationships developed in organized exercise programs were perceived as another value of exercise.

Perceived Barriers to Exercise

Several studies indicated a strong relationship between lack of spouse or family support and continuance in exercise programs (Andrew et al., 1981; Dishman, 1982; Kavanagh, Shephard, Chisholm, Qureshi, & Kennedy, 1979). Inaccessibility of facilities was found by a number of investigators to decrease involvement in physical fitness activities (Andrew & Parker, 1979; Andrew, et al., 1981; Bruce, Frederick, Bruce, & Fisher, 1976; Morgan, 1977). Time constraints due to work or family responsibilities or general time pressures were commonly perceived barriers (Dishman, 1982; Martin & Dubbert, 1982; Oldridge, 1982). Bruce et al. (1976) further identified the cost of exercise programs as a barrier to continued involvement.

Investigators have reported many subjects perceived benefits of exercise and barriers to engaging in exercise. These reports were used as a secondary source of items for the EBBS.

METHOD

Primary identification of possible items to be incorporated in the EBBS was accomplished inductively from an interview study, *Perceptions of Positive and Negative Consequences of Exercise, Weight Control, and Stress Management* (Pender & Pender, 1983). One adult in each of 100 randomly selected households in a midwestern community was interviewed to identify salient beliefs concerning the positive and negative outcomes of controlling weight, managing stress, and exercising regularly. Responses concerning the positive and negative conse-

quences of exercise were evaluated for their appropriateness for inclusion in the initial instrument. Additional items were developed from the review of related literature.

Sample

Responses to the instrument were obtained from a convenience sample of healthy adults recruited individually and in groups from the community at large who met the following criteria: At least 18 years of age; able to read English; capable of engaging in physical activity; and willing to respond to the instrument. Both exercisers and nonexercisers were included in the sample.

A total of 664 adults responded to the instrument. The age range was 18–88 years, with a mean age of 38.7 years. Females comprised 60% of the sample and males comprised 40%. Sixty-eight percent of the sample were currently married, 20% had never been married, and the remaining 12% were widowed, separated, or divorced. Seventy-one percent of the respondents reported full-time employment.

While an attempt was made to include individuals from diverse socioeconomic backgrounds, the sample can best be characterized as middle class. The median level of education was some college; 79% had at least some college with 19% indicating graduate or professional degree. Only 21% of subjects had a high school education or less. The median reorted income was in the $25,000–$34,999 range; 21% of the respondents reported income levels below $20,000 and 23% of the respondents reported income levels over $50,000.

Instrument

A 65-item instrument was constructed initially. Perceived benefits comprised 45 of the items and perceived barriers comprised the remaining 20 items. Benefit items and barrier items were arbitrarily interspersed throughout the instrument to avoid response-set behavior. A 4-point forced-choice Likert format was used to obtain an ordinal measure of the strength of agreement with the item statements. Benefits were scored as *strongly agree* = 4, *agree* = 3, *disagree* = 2, and *strongly disagree* = 1; barriers were reverse scored.

The instrument was examined for content validity by four nurse researchers familiar with the exercise and health promotion literature. Congruence of items with concepts of perceived exercise benefits and barriers was examined and all 65 items were retained for empirical validation.

Procedures

Potential participants were approached in person individually or in groups to facilitate recruitment of the sample size required for factor analysis (Nunnally, 1978). A cover letter explaining the purpose of the study and assuring participants of the confidentiality of their responses was distributed together with the EBBS and a demographic data sheet. Participants were asked to complete the EBBS and the demographic data sheet and return them in the envelope provided. Return of the completed materials implied consent for participation.

Of the 664 returned instruments, 14 were not used because of missing responses to more than three questions resulting in a sample of 650. Returned instruments with one to three items unanswered were retained and the sample median response for the unanswered question was substituted. Item analysis, factor analysis and estimates of reliability (internal consistency and stability) were completed using the SPSS-X statistical package subprograms RELIABILITY, FACTOR, and PEARSON CORR (SPSS, Inc., 1983).

RESULTS

Item Analysis

Serial calculations of corrected item-total correlation coefficients revealed only four items that did not contribute to the internal consistency of either the overall instrument or the hypothesized benefits scale or barriers

scale. Three items were perceived barriers, two concerned exercise as being harmful or causing injury, and the third listed increased appetite as a consequence of exercising. The fourth item was the perceived benefit of weight loss. All four items were deleted. Items retained had item total correlations of .35 or higher on the total instrument and on either the benefits or barriers scale.

Factor Analysis

Principal components factor analysis was performed using Varimax® rotation and Kaiser normalization (Nunnally, 1978; Kim & Mueller, 1978). Factor analysis yielded a 10-factor solution with an explained variance of 62.4%. Six of the factors were composed primarily of perceived benefits and the remaining four factors were composed of perceived barriers. Two items conceptualized as barriers, exercise as boring activity and exercise as stressful activity, loaded predominantly on benefits and were deleted. One additional perceived barrier, concern about muscle soreness, loaded below a level of .40 and also was deleted.

High item-intercorrelations were observed among many of the remaining items. Because of the intercorrelations, it was determined that items could be deleted to decrease item redundancy and increase efficiency. Items that had intercorrelations with one or more items of at least .60 were evaluated for possible deletion on the basis of strength of factor loading, corrected item-total correlation, and effects on reliability of the instrument. Fifteen perceived benefits items were identified as redundant and were deleted.

Factor analysis of the resulting 43-item instrument yielded a nine-factor solution with an explained variance of 64.9%, as shown in Table 1. As shown in Tables 2 and 3, benefits loaded on five factors and barriers loaded on four factors. There were no cross-loadings of items between benefits and barriers. All items loaded at .45 or higher.

As can be seen in Table 2, benefits loaded on Factors 1, 2, 3, 5, and 7. Factor 1 is a life enhancement factor; this is the strongest factor. Items loading on this factor include improvement of disposition, ability to sleep better, decreased fatigue, increased mental alertness, ability to carry out normal activities without tiredness, improved quality of work, and improved overall body functioning. Factor 2 is a physical performance factor and includes the following items: Increased muscle strength, higher levels of physical fitness, improved muscle tone, improved cardiovascular functioning, increased stamina, improved flexibility, improved physical endurance, improved self-concept, and improvement in the way the body looks. Factor 3, a psychological outlook factor, includes items pertaining to enjoyment of exercise, decrease in stress and tension, improvement in mental health, sense of personal accomplishment, relaxed feelings, and improvement in feelings of well-being. Social interaction items such as having contact with friends, meeting people, exercise as good entertainment, and increased acceptance by others characterize Factor 5. Preventive health items, prevention of heart attacks, prevention of high blood pressure, and longer life, characterize Factor 7.

The barriers, as shown in Table 3, are Factors 4, 6, 8, and 9. Factor 4 is an exercise milieu factor and includes the following items: Places to exercise are too far away, exercise is too embarrassing, exercising costs too much, facilities have inconvenient schedules, people in exercise clothes look funny, and places to exercise are too few in number. Time expenditure items such as time taken from family responsibilities, time taken from family relationships, or too much time taken characterize Factor 6. Factor 8 contains physical exertion items such as exercise is tiring, exercise is fatiguing, and exercise is hard work. Family discouragement describes the two items on Factor 9, lack of encouragement from spouse and lack of encouragement from family.

Principal components extraction with oblique rotation was performed to generate a factor correlation matrix for second-order factor analysis. Second-order factor analysis was completed using principal components extraction and Varimax® rotation of the factor correlation matrix (Child, 1970). Two factors were extracted, one a benefits factor and the

Table 1. Eigenvalues, Percent Variance Explained, and Cumulative Percent Variance Explained by Nine Factors on the Exercise Benefits/Barriers Scale (*N* = 650)

Factor	Factor Label	Eigenvalue	%Variance Explained	Cumulative %
1	Life Enhancement	14.968	34.8	34.8
2	Physical Performance	3.268	7.6	42.4
3	Psychological Outlook	2.116	4.9	47.3
4	Exercise Milieu	1.539	3.6	50.4
5	Social Interaction	1.349	3.1	54.0
6	Time Expenditure	1.290	3.0	57.0
7	Preventive Health	1.207	2.8	59.9
8	Physical Exertion	1.143	2.7	62.5
9	Family Encouragement	1.025	2.4	64.9

Table 2. Factor Loadings of Benefits Items and Benefits Factor Structure of the EBBS (*N* = 650)

Items	Factors 1	2	3	5	7
Disposition improved	.608		.471		
Sleep better	.640				
Fatigue decreased	.604				
Self-concept improved	.457	.451			
Mental alertness increased	.647				
Normal activities carried out without tiredness	.643				
Quality of work improved	.685				
Overall body functioning improved	.564				
Muscle strength increased		.617			
Physical fitness level higher		.693			
Muscle tone improved		.762			
Cardiovascular functioning improved		.646			
Stamina increased	.489	.557			
Flexibility improved	.519	.534			
Physical endurance improved	.517	.547			
Way body looks improved		.586			
Enjoy exercise			.638		
Stress and tension decreased			.763		
Mental health improved			.759		
Gives sense of personal accomplishment			.571		
Feel relaxed			.610		
Feelings of well-being improved			.524		
Have contact with friends				.764	
Meet people				.801	
Good entertainment				.641	
Acceptance by others increased				.546	
Prevent heart attacks					.802
Prevent high blood pressure					.753
Live longer					.571

Table 3. Factor Loadings of Barriers Items and Barriers Factor Structure of the EBBS (N = 650).

Items	Factors 4	6	8	9
Places to exercise too far away	.738			
Too embarrassed to exercise	.478			
Costs too much to exercise	.643			
Inconvenient facility schedules	.587			
People in exercise clothes look funny	.483			
Too few places to exercise	.714			
Too much time from family relationships		.796		
Too much time from family responsibilities		.797		
Takes too much of my time		.727		
Exercise is tiring			.819	
Exercise is fatiguing			.825	
Exercise is hard work			.525	
Spouse not encouraging				.838
Family not encouraging				.848

other a barriers factor, with 47.4% of the variance explained. This supports the conceptualization of the instrument as measuring two phenomena, perceived benefits of exercise and perceived barriers to exercise. Second-order factor analysis factor loadings appear in Table 4.

Reliability

Cronbach's alpha was calculated as a measure of internal consistency for the final 43-item instrument; a standardized alpha of .952 was obtained. The 29-item benefits scale had a standardized alpha of .953 and the 14-item barriers scale had a standardized alpha of .866. It is important to note that these reliabilities could be somewhat spurious because of the maximizing of item-total correlations and the deletion of 22 items in the process of instrument refinement. Further evaluation of internal consistency will be done as the instrument is used in subsequent research efforts.

Test-retest reliability measures were obtained on a sample of 63 individuals recruited from the community; the test-retest interval was 2 weeks. Correlation coefficients were .889 for the 43-item instrument in its entirety, .893 for the 29-item benefits scale and .772 for the 14-item barriers scale.

Scoring

When the instrument is used as a whole, the possible range of scores is 43 to 172. Evaluation of the scores of the 650 individuals responding to the EBBS showed scores ranging from 90–172 with a median score of 129. The possible range of scores on the benefits scale is 29–116. Actual scores ranged from 51–116 with a median of 87. On the barriers scale, the possible range of scores is 14–56. Actual scores ranged from 22–56 with a median of 41.

Histograms of the distributions of scores on the total instrument and the barriers scale are fairly symmetrical within the range of scores used. The benefits scale histogram appeared to be slightly positively skewed. Tests for the significance of the skewness of the distributions revealed that the distributions for the total instrument and the benefits scale were significantly positively skewed at the .05 level while the distribution for the barriers scale was not significantly skewed. This finding is not unexpected given the health and

Table 4. Factor Loadings of First Order Factors on Benefits and Benefits Factors Obtained in Second Order Factor Analysis of the EBBS (N = 650)

First Order Factors		Second Order Factor Loadings	
Number	Label	Factor 1 Benefits	Factor 2 Barriers
1	Life Enhancement	.696	
2	Physical Performance	.726	
3	Psychological Outlook	.625	
5	Social Interaction	.564	
7	Preventive Health	.659	
4	Exercise Milieu		.668
6	Time Expenditure		.768
8	Physical Exertion		.655
9	Family Encouragement		.597

education emphases on the benefits of exercise.

DISCUSSION

Previous research has focused primarily on measurement of actual physiological or psychological benefits of exercise with little attention to fundamental psychosocial processes underlying exercise behavior. Development of appropriate instrumentation is a first step in evaluating the role of cognition and perception as mediating factors in habitual exercise as suggested by the Health Promotion Model (Pender, 1982, 1987).

The EBBS measures perceived benefits of exercise and perceived barriers to exercise. While perceptions influence behavior, the relationship of perceived benefits and barriers to real benefits and barriers remains an issue for future research.

It is interesting to note that the EBBS retains items relating to almost all of the perceptions of exercise benefits and barriers identified in the literature. One notable exception is the perception of body weight reduction as a benefit as identified by Rhodes and Dunwoody (1980); this item was lost in the early stages of item analysis. A revised item presenting weight control as a benefit of exercise may need to be incorporated in future testing of the instrument.

The EBBS can be used in its entirety as an exercise benefits/barriers scale, or the benefits and barriers scales can be used separately. If used in its entirety, the higher the overall score, the more positively the individual perceives the benefits of exercise in relation to barriers to exercise. Perceived benefits and barriers were purposely placed in the same instrument to avoid response-set. A correlation coefficient of .557 between the two scales indicates a moderate degree of relationship. However, the exercise benefits and nature of the relationship between the exercise barriers scales is yet to be determined. The responses to the scales may be additive or multiplicative with a more positive response to perceived barriers enhancing perceived benefits in some way. If the benefits and barriers scales are found to be useful in explaining exercise behavior, the nature of their interrelationship will be investigated.

While an attempt was made to obtain as heterogeneous a sample as possible for instrument evaluation, most of the study participants were middle to upper income, working white adults with at least some college education. Further psychometric evaluation as well as cross-cultural validation is planned as data are obtained on samples from a wider socioeconomic and educational base.

The EBBS appears to possess sufficient reliability and validity to warrant its use by

researchers evaluating the effects of perceived benefits of exercise and barriers to exercise on exercise behavior, describing exercise perceptions of various populations, or evaluating the results of interventions aimed at modifying perceptions of exercise. Evaluation of convergent and discriminant validity of the EBBS should be undertaken when appropriate measures with established reliability and validity are identified.

Nurses working in areas of health promotion will be assisting individuals to acquire and maintain exercise behavior as the nation works toward increasing the proportion of adults engaging in exercise (U.S. Department of Health and Human Services, 1980). If research demonstrates that perceptions of exercise benefits and barriers influence behavior, the EBBS can be useful to nurses clinically in evaluating exercise perceptions and the impact of interventions to change them.

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