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Validation of a Short Form of the Greek Version of the Decisional Balance Scale in the Exercise Domain.

Validación de la Versión Griega de la Escala Abreviada de Equilibrio Decisional en el Campo del Ejercicio Físico.

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Abstract

Although the Decisional Balance Scale (DBS) for exercise has been established to have sound psychometric properties, the factorial structure of this instrument has not been examined in other European countries. The purpose of this study was to test a short version of the decisional balance scale for exercise in Greek adults. The DBS was administered to 158 (61.2%) women and 100 (38.8%) men. An exploratory factor analysis yielded a positive (pros) factor and a negative (cons) factor. The results from confirmatory factor analysis indicated that the two-factor structure was the best fit for the DBS when it was used with Greek adults. The alpha coefficients were .84 for the positive factor and .81 for the negative factor. The findings are similar to those of the English original, and suggest that the revised DBS can be used in exercise and activity research with Greek adults. However, to expand the usefulness of this instrument across cultures, the DBS should continue to be tested with other Greek populations and settings.

Resumen

La escala del equilibrio decisional (DBS) presenta unas sólidas propiedades psicométricas, no obstante la estructura factorial de dicho instrumento no se ha examinado en otros países europeos. Este estudio tiene como objetivo probar una versión corta de la escala decisional sobre ejercicio a una muestra de adultos griegos. La DBS revisada se administró a 158 (61.2%) participantes mujeres y 100 (38.8%) hombres. El análisis factorial exploratorio mostró la presencia de dos factores, uno positivo (los pros) y uno negativo (los contras). Los resultados del análisis factorial confirmatorio indicaron que la mejor solución factorial para la versión griega de la escala DBS se componía de una doble estructura. Los coeficientes alpha fueron de .84 para el factor positivo y de .81 para el factor negativo. Los hallazgos de este estudio fueron similares a los de la versión original, indicando que la revisada DBS es adecuada para utilizarse en investigaciones sobre la actividad física y el ejercicio con participantes griegos adultos. No obstante para poder extender el uso de este instrumento en diferentes culturas, la DBS debería continuar a ser probada a diferentes poblaciones griegas y distintos contextos.

Key words: validation, decisional balance scale.

Palabras clave: validación, escala del equilibrio decisional.

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Introduction

Numerous research studies have demonstrated that regular physical activity has both physiological and psychological benefits. Specifically, among adults, regular physical activity has been associated with a reduced incidence of coronary heart diseases, hypertension, non-insulin dependent (type 2) diabetes, osteoporosis, colon cancer, and possibly breast cancer as well as with increasing self-esteem and self-efficacy and decreasing depression (Bouchard, Shephard, & Stephens, 1994; Frontera, Dawson, & Slovik, 1999; Martinsen & Stephens, 1994; U. S. Department of Health and Human Services, 1996). Considering all of these physiological and psychological benefits, one would expect that individuals would participate in physical activity programs regularly. However, epidemiological evidence suggests that most individuals remain physically inactive. Specifically, half of the adult population of the U.S. reported little or no participation in any physical activity program, whereas only 10% engaged in vigorous activity three or more times per week (Crespo, Keteyian, Heath, & Sempos, 1996). In Europe, physical activity levels among children and adults also show a steep decline (Martinez-Gonzalez et al., 2001; Steptoe et al., 1997).

Various intervention programs applied to increase physical activity levels among children and adults have met limited success (Buxton, Wyse, & Mercer, 1996). Existing research indicates that nearly half of those who begin a new exercise program will quit within six months (Dishman, 1988). According to Dishman (1990), researchers need to identify the different transitions an individual may experience while participating in a physical activity program. A first step in intervention development, therefore, is to measure and identify the transitions and motivational factors that contribute to behavior change among individuals.

One theoretical approach for promoting and maintaining regular physical activity among individuals is the transtheoretical model or stages of change model (TTM), which depicts behavior change as a process that involves progression through a series of stages (Prochaska & DiClemente, 1983). This model has integrated both new insights into the process of behavior change and proven concepts from other models to provide a more comprehensive overview of behavioral change than other psychosocial models. According to the TTM, individuals move through five stages of change: from pre-contemplation (not intending to make changes), to contemplation (considering a change), to preparation (making small changes), to action (actively engaging in the new behavior), to maintenance (sustaining the change over time). In addition, associated with the movement through the stages of change and related processes are a set of cognitive constructs such as self-efficacy and decisional balance.

The decisional balance is based on the theoretical model of decision making (Janis & Mann, 1977). This psychological construct focuses on the perceived advantages (pros) and disadvantages (cons) of a behavior. According to the TTM (Prochaska & Velicer, 1997), individuals will be motivated to adopt a new behavior if they perceive that the pros are greater than the cons of that particular behavior. In theory, the cons outweigh the pros in the pre-contemplation stage. However, as the individual undergoes the stages of contemplation and preparation, the salience of the pros increase and the cons decrease, with the pros eventually overweighing the cons in the action and maintenance stages (Prochaska & Velicer, 1997).

The scale mostly used in the studies testing the decisional balance construct in exercise and activity settings is the Decisional Balance Scale (DBS; Velicer, DiClemente, Prochaska, & Brandenburg, 1985). The original scale had 24 items and was developed to measure the positive (pros) and negative (cons) aspects of exercise behavior (pros and cons). Pros of exercise and physical activity include improved aerobic capacity, muscular strength, and self-esteem. On the other hand, cons of exercise include physical discomfort, cost, and taking time away from other activities. Later, the original DBS was reduced from 24 to 16 items by Marcus, Rakowski and Rossi (1992). The 16-item scale included two subscales, one representing the advantages of exercise (pros, 10 items) and the other indicating the disadvantages of exercise (cons, 6 items).

Despite the widespread testing and application of the TTM in exercise and activity behavior, relatively little research has been conducted to validate its major constructs. Plotnikoff, Blanchard, Hotz, and Rhodes (2001) tested the decisional balance scale through a series of factor analyses. An exploratory factor analysis showed that the two subscales, pros and cons, accounted for 49.6% of the variance. The pros of exercise accounted for 28.2% of the total variance, with item loadings ranging from .50 to .84 (eigenvalue = 2.8) whereas the cons accounted for 21.4% of the total variance, with item loadings ranging from .45 to .77 (eigenvalue = 2.1). The Cronbach's a coefficients for the pros and cons subscales were .79 and .71, respectively. Furthermore, the longitudinal factorial invariance of the scale was established through confirmatory factor analytic procedures. More specifically, the factor structure of the pros and cons subscales was examined using a longitudinal model with three time periods. The results of these analyses indicated that the factor structure of the DBS remained stable across time.

The DBS has been used primarily to English speaking countries and an important question is whether the findings of those studies can be generalized to other populations or cultures. Although an instrument might have established sound psychometric properties in one population, it is necessary to evaluate its validity and reliability with others (Gauvin & Russell, 1993). To date, no factorial data, or psychometric properties of the DBS are available in the Greek language, hence prompting the present study. Therefore, the aims of the current study were: (a) to examine the factorial structure of a Greek short version of the DBS and (b) to determine its internal consistency.

Method

Participants

Participants were 258 adults from a suburban area in Athens, Greece. The sample comprised 158 (61.2%) women and 100 (31.8%) men ranging in age from 19 to 66 years (mean age = 32.9 years). Participation was voluntary. The majority of participants (58%) did not have some post-school education (e.g., university or technical university degree). Forty-seven percent were in full-time employment, 12% were in part-time employment, 19% were students and the remainders were either retired, unemployed or reported their occupation status as “other”.

Measures

Two measures were used to gather data: A demographic form that asked participants to self-report their sex, age, employment status, educational level, physical activity participation, and health status, and the DBS. Decisional balance for exercise and activity was assessed with a short form of the DBS. The factor structure of the 11-item version of the DBS was demonstrated in an exploratory study with an adult population (Kontogianni, Karteroliotis, & Kontogianni, 2003).

First, the original DBS which included 16 items (Marcus, et al., 1992), was translated into Greek, followed by a standardized back-translation procedure described in the literature (Hambleton & Kanjee, 1995). Specifically, the original DBS was translated to Greek by three specialists in sport and exercise psychology and sent to two bilingual translators (Greek-English), who translated it back to English. Finally, Kontogianni and colleagues (2003) compared the back-translated version of the DBS to the original English version of the questionnaire, in order to examine if there were any differences between the original version and the translated version. This back-translation procedure was repeated until the two versions were identical.

The DBS was then administered to 450 adults (aged 19-70 years) for the examination of its factorial validity. Two techniques of factor extraction, Kaiser’s criterion and Cattell’s scree test (1966) were used for the determination of the number of factors to be retained. Principal axis factoring (PAF) revealed the presence of two factors with eigenvalues exceeding 1.0 and an inspection of the scree plot revealed a clear break after the second component. Factor 1 (pros) accounted for 28.1% of the variance of the model and included seven items. Factor 2 (cons) accounted for 19.5% of the total variance and consisted of four items. The factor loadings of the items ranged from .52 to .72. Five items (i.e., 2, 7, 8, 11, 12) were deleted because of cross factor loadings. Finally, reliability analysis indicted that the two factors were internally consistent. Specifically, results showed that the internal consistency reliabilities for the pros and cons subscales were .84 and .82, respectively (Kontogianni et al., 2003).

The items of the DBS are assessed by 5-point response options ranging from 1 (not at all important) to 5 (extremely important). Examples of pro items include “Regular exercise would help me have a more positive outlook on life” and “I would sleep more soundly if I exercised regularly”. Examples of con items include “Regular exercise would take too much of my time" and "I think I would be too tired to do my daily work after exercising". The DBS-Pros score was the sum of the positive items, and the DBS-Cons score was the sum of the negative items.

Data Analysis

An exploratory factor analysis (EFA) was first conducted using the Statistical Package for Social Sciences (SPSS) for Windows version 14.0. EFA specifies certain hypotheses about the data and identifies latent constructs underlying measured variables (Preacher & MacCallum, 2003; Schutz & Gessaroli, 1993). The extraction method employed was principal axis factor followed by varimax rotation. The number of factors to retain in both analyses was accomplished by various approaches. These included the proportion of variance explained by the extracted factors. Specifically, only the factors that account for meaningful proportion of variance were retained. Furthermore, only factors with eigenvalues exceeding Kaiser's criterion (1.0) were retained. Finally, items were retained on the basis of the clustering of their factor loadings. Specifically, an item was considered to be salient with a factor if its factor loading exceeded .40 (Kim & Mueller, 1978).

A confirmatory factor analysis (CFA) was also performed to test the extent to which the factor structure of the DBS obtained in EFA could be replicated. The CFA was based on the assumption that the models found in the EFA for the DBS provided the best fit to the data. Three models were tested. Model 1 was a null model, which was based on the assumption that all the items were independent. The second model (Model 2) to be evaluated was a unidimensional model that assumed that the 11 items of the DBS were indicators of a single latent factor. Model 3 tested the hypothesis that the scale specified an orthogonal two-factor model in which the two factors were uncorrelated. These two factors were constrained to be orthogonal, reflecting the original hypothesis that variations in positive and negative aspects of behavior are largely independent of one another.

The present study employed the AMOS 6.0 statistical software (Arbuckle, 2005) to evaluate the CFA fit of the alternative models to the DBS data. CFA was performed using FIML estimation for missing data. The FIML estimation assumes that responses are missing at random and is more likely to produce less biased results than listwise deletion, pairwise deletion, or means imputation (Wothke, 2000).

Assessment of model fit was based on both absolute and comparative/incremental fit indices (Kellway, 1999). Absolute indices include the chi-square test, the root mean square error of approximation (RMSEA), as well as the goodness of fit index (GFI; Joreskog & Sorbom, 1996). RMSEA values smaller than .05 are indicative of close fit, values smaller than .08 are indicative of fair fit and values of .10 are demonstrating a marginal fit (Browne & Cudeck, 1993; Steiger, 1990). The GFI is analogous to the R^2 value in multiple regressions, with values ranging from 0 (poor fit) to 1.0 (perfect fit).

Comparative/incremental fit indices include the nonnormed fit index (NNFI; Tucker & Lewis, 1973) as well as the comparative fit index (CFI; Bentler, 1990). NNFI and CFI values approximating 1.0 indicate perfect fit, whereas values below .90 indicate a need to respecify the model. In recent years, there has been concern that values for fit indexes of .90 are too low and that higher values such as .95 should be used (Hu & Bentler, 1999). However, these stringent criteria have recently been debated (Marsh, Hau, & Wen, 2004). Finally, the Akaine Information Criterion (AIC) was used in this study to evaluate model fit. The AIC is used to compare two or more models with smaller values representing a better fit of the hypothesized model (Hu & Bentler, 1995).

To test the internal consistency, the following indices were estimated for the revised scale: (a) range of item means, inter-item correlations, and item-total correlations, and (b) Cronbach's alpha coefficient. For an acceptable internal consistency the Cronbach's alpha coefficient should exceed .70 (Tabachnick & Fidell, 1996).

Results

The data obtained were first subjected to exploratory factor analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett Test of Sphericity (BTS) were conducted on the data prior to factor extraction to ensure that the characteristics of the data set were suitable for the EFA to be conducted. KMO analysis yielded an index of .85. The measure of sampling adequacy (anti-image correlation matrix) for the 11 items of the BTS was highly significant ($\chi^2 = 977.13$, df = 55, $p < 0.001$), indicating that the data satisfied the psychometric criteria for the factor analysis to be performed based on data distribution characteristics. The revised Decisional Balance Scale items were then subjected to a factor analysis using a principal axis extraction method that yielded two factors with eigenvalues of 1.0 or greater. Factor 1 (pros) accounted for 31.2% of the total variance of the model and included seven items with item factor loadings ranging from .52 to .73. Theses items represent the possible benefits of initiating physical activity. Factor 2 (cons) accounted for 16.2% of the variance and consisted of four items, which theoretically represent the possible losses of initiating physical activity. The item factor loadings of the second factor ranged from .65 to .76. Table 1 presents the factor coefficients and the communalities for each of the items. The communalities of the pros factor items ranged from .28 to .54, and of the cons factor from .45 to .58.

Table 1. Factor Loadings, Communalities, Eigenvalues, Proportion of Variance, and Cumulative Variance of the Pros and Cons Subscales

DBS items	Factor Loadings		Communalities
	Pros	Cons	
Item 1	**.63**	-.13	.42
Item 3	**.73**	-.04	.54
Item 4	**.69**	-.01	.47
Item 5	**.61**	-.18	.41
Item 6	**.72**	-.10	.53
Item 7	**.69**	-.09	.48
Item 9	**.52**	-.11	.28
Item 2	-.15	**.65**	.45
Item 8	-.12	**.72**	.53
Item 10	-.02	**.76**	.58
Item 11	-.10	**.72**	.53
Eigenvalues	3.96	2.26	
Proportion of variance (%)	31.17	16.16	
Cumulative variance (%)	31.17	47.33	

Table 2 reports the results of the confirmatory factor analyses (goodness-of-fit indices for the null model and competing alternative models). Overall, analyses showed that the orthogonal two-factor model ($\chi^2_{(44)}$ = 96.57, GFI = .93, NNFI = .93, CFI = .94, RMSEA = .068, and AIC = 140.57) represented the best fit when compared to the unidimensional model ($\chi^2_{(44)}$ = 377.98, GFI = .75, NNFI = .56, CFI = .65, RMSEA = .172, and AIC = 421.98). As shown, chi-square values decreased significantly between the one-factor and orthogonal two-factor model, indicating that the orthogonal two-factor model provided a significant improvement in fit over the unidimensional model. Similarly, decreasing AIC values indicated that the fit of the orthogonal two-factor model was better than the fit of the one-factor model even after accounting for increased model complexity, and the increase in GFI, NNFI, and CFI and decrease in RMSEA values provide additional evidence that the orthogonal two-factor model best represents the data.

The standardized item loadings and squared multiple correlations estimated in the maximum likelihood analysis of the orthogonal two-factor model are presented in Table 3. Examination of the item loadings of the two-factor model indicates that all the DBS items were statistically significant at the .05 level, ranging from .52 to .76.

Table 2. Goodness-of-Fit Indices for all CFA Models

Model	df	χ^2	RMSEA	GFI	NNFI	CFI	AIC
Model 1 (Null model)	55	994.55	----	.47	----	----	1016.55
Model 1 (One factor model)	44	377.98	.172	.75	.56	.65	421.98
Model 2 (Orthogonal two-factor model)	44	96.57	.068	.93	.93	.94	140.57

Furthermore, inspection of the square multiple correlations (R^2), which provide a direct index of performance of each factor, revealed strong evidence for the factorial validity of the hypothesized orthogonal two-factor structure. These values range from 0 to 1, with large R^2 represent the proportion of variance explained in each item by its corresponding factor. As shown in Table 3, all R^2 values were relatively high indicating that all items were strongly loaded on their designated factors.

Table 3. Standardized Item Loadings, and R^2 of the Pros and Cons Subscales

DBS items	Standardized Item Loadings	R^2
Item 1	.64	.41
Item 3	.73	.54
Item 4	.68	.46
Item 5	.62	.39
Item 6	.73	.53
Item 7	.70	.48
Item 9	.52	.27
Item 2	.66	.43
Item 8	.73	.54
Item 10	.76	.58
Item 11	.72	.52

N = 258
$\chi 2$ (df_{44}) = 96.57

Reliability analysis indicated that the two subscales of DBS were internally consistent. Specifically, the inter-factor correlations as well as the item-factor correlations indicated that both factors were internally consistent (see Table 4). Furthermore, the Cronbach's alpha coefficients for the both pros and cons were acceptable (.84 and .81, respectively).

Table 4. Internal Consistency Indices (Mean, Minimum Value, Maximum Value)
for the 11-item Decisional Balance Scale

Decisional Balance Scale	Item means (Min-Max)	Item variances (Min-Max)	Inter-item correlations (Min-Max)	Inter-total correlations (Min-Max)
Pros	3.18 (2.91-3.43)	1.32 (1.18-1.57	.57 (.38-.80)	.40 (.48-.66)
Cons	2.34 (2.21-2.46)	1.32 (1.21-1.39)	.68 (.59-.76)	.63 (.59-.66)

Discussion

The study aimed at validating a short form of the DBS in the exercise domain. The DBS was shown to have a satisfactory factorial validity and internal consistency in a Greek adult population. Exploratory and confirmatory analyses were performed to establish the factorial validity of the short version of DBS. The results of both exploratory and confirmatory factor analyses indicated that the two-factor structure of DBS is a valid instrument composed of two factors, the Pros and Cons of exercise behavior. The exploratory factor analysis revealed a strong two-factor solution. Furthermore, results from the confirmatory factor analysis support the two-factor structure underlying the DBS proposed by Marcus et al. (1992). All goodness-of-fit indices of the two-factor model (GFI, NNFI, and CFI) exceeded the cut-off criteria of .90. According to Marsh et al. (2004), a number of researchers have incorporated Hu and Bentler's guidelines of .95 or higher without sufficient attention to their limitations. According to them, "Hu and Bentler (1999) never suggest that their new guidelines should be interpreted as universal golden rules, absolute cutoff values or highly rigid criteria that were universally appropriate" (p. 322). Finally, with regard to the reliability of the short version of DBS, examination of the Cronbach's alpha coefficient showed that scores of the DBS were reliable.

The findings of this study are consistent with both previous research (Marcus et al., 1992; Nigg & Courneya, 1998; Plotnikoff et al., 2001) and theory (Prochaska & DiClemente, 1983; Prochaska & Velicer, 1997; Prochaska et al., 1994), and the findings suggest that assessing decisional balance in line with the TTM propositions more fully explain exercise behavior.

The existence of a shortened version of the decisional balance scale can help researchers to test TTM and other social cognitive theoretical models to exercise behavior, and practitioners to design effective interventions for the promotion of involvement in physical activities. More specifically, the shortened version of the DBS is more appropriate for lengthy and expensive population-based research designs.

Several limitations may restrict the broader application if this study. The sample of this study was selected from only a suburban area of Athens. Therefore caution must be used when generalizing these findings to adults in other areas. Also, replication of this investigation with different populations and settings and with a larger sample size could strengthen conclusions regarding the validity of the scale.

In sum, the short version of DBS represents a new instrument that shows acceptable factorial validity and internal consistency. Although additional research is needed to further the knowledge of its psychometric properties, the scale is considered as a useful tool for researchers interested in studying social-cognitive models related to exercise behavior.

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Appendix

Short Form of the Greek Version of the Decisional Balance Scale in the Exercise Domain

Read carefully the following items and indicate how important each statement is with respect to your decision to exercise or not to exercise in your leisure time. Please answer using the following 5-point scale:

1 = Not at all important
2 = A little bit important
3 = Moderately important
4 = Quite important
5 = Extremely important

1. I would have more energy for my family and friends if I exercised regularly. ❑

2. I think I would be too tired to do my daily work after exercising. ❑

3. I would feel more confident if I exercised regularly. ❑

4. I would sleep more soundly if I exercised regularly. ❑

5. I would feel good about myself if I kept my commitment to exercise regularly. ❑

6. It would be easier for me to perform routine physical tasks if I exercised regularly. ❑

7. I would feel less stressed if I exercised regularly. ❑

8. Regular exercise would take too much of my time. ❑

9. Regular exercise would help me have a more positive outlook on life. ❑

10. I would have less time for my family and friends if I exercised regularly. ❑

11. At the end of the day, I am too exhausted to exercise. ❑