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Validation of the Physical Self-Perception Profile (PSPP) in a Sample of Depressed Danish Psychiatric Patients: Applying Factor Analyses

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Abstract

This study investigated the factor structure, validity, and internal reliability of the Physical Self-Perception Profile (PSPP) in Danish depressed patients. The mediating role of self-esteem in physical self-perceptions and negative affect relationship were examined. A sample of 96 Danish psychiatric patients completed the PSPP, the Rosenberg Self-Esteem Scale, the Beck Depression Inventory and the Hamilton Anxiety Rating Scale. The Danish version of the PSPP showed high internal consistency. Applying the exploratory and confirmatory factor analyses provided support for the PSPP to be used with depressed patients. The data were more consistent with the four-factor model than with a combined three-factor model. PSPP significantly discriminated between healthy subjects (n=46) and patients ($p<0.005$). A path analysis indicated the role of Physical Self-Worth as a mediator between the PSPP sub-domains and self-esteem and depression. The strong content validity and construct validity confirmed the PSPP application to depressed patients.

Key words: Physical self-perception, Self-esteem, Depression, Factor analysis, Path analysis

Introduction

Self-esteem is probably the most widely accepted indicator of emotional health and well-being [1]. Self-esteem is defined as an individual's positive or negative attitude toward the self as a totality and a measure of one's sense of self-worth based on perceived successes and achievements, as well as a perception of how much one is valued by others. Global self-esteem consists of four sub-domains, including academic, social, cognitive and physical self-esteem. Moreover, with the advent of multidimensional models, it is possible to measure all these different domains [2].

One dimension that has consistently emerged as being closely related to global ratings of self-esteem is the perception of the physical self [3]. In the physical domain, self-esteem is conceived as an important psychological outcome, correlate and predictor of physical activity behaviour [4,5]. Self-esteem is viewed as an important contributor to overarching, global perceptions of self-worth in multidimensional and hierarchical models of self-esteem [6]. Physical self-perception has consistently demonstrated moderately significant positive correlations with global self-esteem across the lifespan [7], and is potentially an influential factor on physical activity behaviour patterns [8]. It has been suggested that physical self-perceptions, as sensitive measures of real perceptual changes in the self [7,9], can be improved through participation in physical activity. Broadly speaking, Improvements in specific physical self-perceptions can be generalised into physical self-worth. In turn, physical self-worth is related to global self-esteem. Finally, increased global self-esteem can lead to a reduction of depression and anxiety [10,11].

Research on physical self-perception has been promoted by the development of assessment tools such as Harter's Self-Perceptions Profile for Adults [12], the Physical Self-Perception Profile (PSPP) [13,14], and the Physical Self-Description Questionnaire (PSDQ) [15].

The PSPP was developed to examine physical self-perceptions [13]. It represents a great contribution to the area of self-concept measurement. Using factor analysis extensively in the development of PSPP, Fox [14] found good support for high test-retest reliability of its subscales (*r* ranging from 0.81 to 0.88) and high internal consistency (α ranging from 0.81 to 0.92). This instrument has been widely reported on in the

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social, psychological, and sport psychology literature and has been translated into several languages, showing construct validity for different cultures [16, 17, 18, 19]. It has been featured in many published studies, and has been used effectively with a range of populations from college age through middle-age, for both males and females. The reliability and validity of the PSPP have been investigated in different populations and it is regarded as a well-established, reliable, and well-validated instrument.

From a clinical perspective, low self-esteem frequently accompanies psychiatric disorders and symptoms such as clinical depression, trait anxiety, neuroses, suicidal ideation, a sense of hopelessness, lack of assertiveness and personality disorders [20, 21, 7, 22]. Furthermore, there is evidence for an inverse relationship between level of self-esteem and severity of depression and anxiety in psychiatric outpatients and inpatients [18 , 23, 24].

The limited literature on the topic has indicated that hospitalised, clinically depressed patients show an increase in their initially low self-esteem, with decreases in depression, when participating in physical exercise interventions [24, 25, 26]. Because low self-esteem is often associated with low physical self-perception scores, there is particular interest in the exercise literature regarding the nature of the interaction between physical self-perceptions and affective states, including clinical depression [4, 27].

The physical self perception (PSP) variables, which have been identified as most susceptible to change through exercise, are physical conditioning, physical strength and physical self-worth. Body attractiveness, in contrast, appears to be the sub-domain least affected by exercise [7]. The application of these models, i.e., the relationship between exercise and PSP, has also been supported in clinical populations [13, 7, 11, 18, 28, 27]. However, there are few studies with strong methodology which have investigated the associations between exercise, self-esteem and negative affect [24, 25, 29]. While PSPs are more closely related to changes due to exercise than to global self-esteem measures, there is evidence that PSPs are directly linked to mental well-being, and so the effects of exercise on PSPs are likely to be of practical and clinical importance [7, 22].

However, not much research has been conducted that examines PSP and clinical populations with low self-esteem [4, 18]; therefore, more studies are required to investigate changes in emotional adjustment, reductions in depression, as well as increases in self-perception, self-esteem and life satisfaction. Fox [7] stated that clinical criteria associated with self-esteem or PSP levels have not been developed as yet, so it remains difficult to attach practical significance to self-esteem change scores. To date, few studies have examined the equivalence of the factor structure of the Fox and Corbin model across clinical population.

Taking into consideration the aforementioned points, this study aims to: (1) investigate the psychometric characteristics of the Danish version of the PSPP as applied to a clinically depressed population, to establish its factor structure and internal reliability and to test for discriminant validity when compared with normal adults; and (2) to investigate associations of the five sub-domains of PSP with global self-esteem, depression and anxiety to see if they are applicable to samples of depressed Danish psychiatric patients.

Method

Participants

Participants were 44 healthy adults (10 male, 22.7%, and 34 female, 77.3%) and 96 Danish psychiatric patients (28 male, 29.2%, and 68 female, 70.8%) from the DEMO trial [30] framework, who were recruited for the study at Bispebjerg Hospital, Copenhagen, Denmark. Patients were included if they fulfilled diagnostic criteria for mild or moderate depression, based on ICD-10 diagnostic criteria [31] (F32.0, F32.1, F33.0 and F33.1). Patients were evaluated by a psychiatrist. Overall, they had elevated depression scores on the BDI (94.8% >20, M = 23.19). Their ages ranged from 21 to 55 years (M = 38.2 ± 17). In clinical sample, 92.7% were Caucasian (n = 89), with the remaining 7.3% categorised as another ethnic origin (n = 7). In the healthy sample, 41(93%) were Caucasian and 3(6, 8) others.

Instruments

The PSPP was the main assessment tool administered in this study. Based on Harter's [2] work and Shavelson, Hubner and Stanton's [32] multidimensional self-concept model, consistent with Rosenberg's approach, Fox and Corbin [13] suggested a multidimensional and hierarchical model of PSP, postulating that global self-esteem is at the apex of the hierarchy, followed by a more general dimension of Physical Self-Worth (PSW) at the domain level, and four sub-domains; namely, Sport Competence (Sport), Physical Strength (Strength), Physical Conditioning (Condition), and Bodily Attractiveness (Body) at the sub-domain levels. These sub-domains were regarded as changeable aspects of the self [4] (see Figure 1).

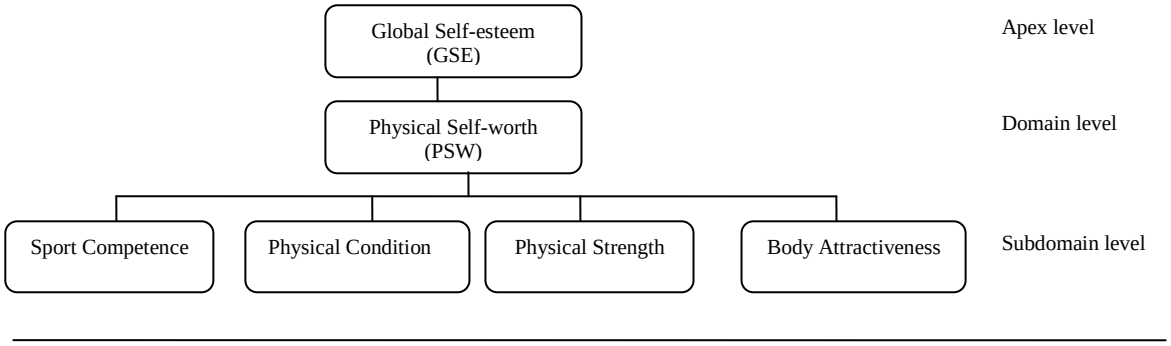


Figure 1: Hierarchal model of Physical Self-Perception Profile in physical domain adopted from Fox and Corbin (1989)

The PSPP is an instrument with 30 questions comprising five 6-item subscales. Each item has a four-point structured-alternative format. Fox [14] explained that this format was chosen to avoid the common problem of collecting socially desirable responses [14, 7]. Four of the subscales are designed to assess perceptions within specific sub-domains of the physical self: Sports Competence (SPORT), Physical Condition (CONDITION), Bodily Attractiveness (BODY) and Physical Strength (STRENGTH). A separate subscale is designed to measure general overall Physical Self - Worth (PSW). Scores range from 6 to 24 on each subscale, with high scores representing positive perceptions. Half of the items are worded in the negative direction.

Other psychometric tools used in the current study included the Danish versions of the Rosenberg Self-Esteem scale (SES), the Beck Depression Inventory and the Hamilton Anxiety Rating Scale. However, the PSPP is the only assessment tool that had not been translated into Danish. Therefore, back-translation techniques [33] were employed to develop a language-specific version of the PSPP. The PSPP was translated into Danish from the original English version by a research assistant (with a Master's degree), followed by a back-translation procedure into English by an independent bilingual expert who is a native English speaker. Finally, the back-translated version was compared with the original English version to check for accuracy and correct meaning. Three experts in psychiatry, sport psychology and medicine (two authors of this article) eliminated the incompatibilities and ambiguous words, resulting in further translation and re-translation, which was repeated until the versions were interchangeable.

Procedure

The data of the current cross-sectional study were collected as a part of the DEMO trial [30]. Recruitment and assignment of participants to research groups was a continuing process within the DEMO study, so that every patient who met the eligibility criteria joined the DEMO project, throughout the duration of the current study. Four months after the DEMO study began, we started the current study, and from 165 depressed participants identified by the DEMO staff, 96 patients in addition to 44 healthy consented upon the current study. The procedures of the study were explained to the DEMO participants and those who agreed to participate signed a consent form. Subsequently, the PSPP, SES, HAMA and BDI questionnaires were administered to the participants. A research assistant was available to provide instructions concerning how to complete the questionnaires.

Statistical analyses

Descriptive statistics and Pearson correlations with significance at the 0.05 level were used to calculate inter-item reliability of PSPP constructs. These are presented in Table 1.

To determine whether Fox and Corbin's model [13] is applicable to depressed Danish psychiatric patients, we used exploratory and confirmatory factor analyses. We applied exploratory factor analysis (EFA) to identify latent factors that explain the covariation among the PSPP constructs and the degree to which the variables are related to the factors. To assess how well the model fits the observed data, we used goodness-of-fit indices which included: (1) Chi-square (χ^2); the non-significant χ^2, established by its degrees of freedom, indicates how well the model fits the data; (2) the chi-square-degrees of freedom relative likelihood ratio (χ^2_{GoF} / df) which is not effected by

Table 1
Descriptive, reliability and discriminant validity statistics for PSPP subscales, Self-esteem, Depression and Anxiety scales

	Depressed(n=96)			Healthy (n=44)			Discriminant validity	
Scale	**M**	**SD**	**α**	**M**	**SD**	**α**	**Wilks' λ**	**F**
SPORT	10.29	3.44	0.87	14.64	3.38	0.57	0.75	44.82**
BODY	10.88	3.88	0.86	14.89	3.23	0.66	0.80	44.82**
STRENGTH	12.05	3.53	0.86	14.92	3.04	0.60	0.87	19.80**
CONDITION	9.95	3.10	0.81	13.79	2.63	0.32	0.74	46.45**
PSW	9.68	3.05	0.78	14.46	3.24	0.68	0.67	65.93**
SES	23.19	2.67	0.22	24.72	3.85	0.36	0.94	7.74**
BDI	29.74	7.39	0.80	2.64	3.18	0.79	0.22	194.20**
HAM.A	14.78	5.54	0.59	2.13	1.81	0.35	0.41	485.98**

SPORT= perceived sport competence; BODY = perceived body attractive; STRENGTH = perceived strength; CONDITION = perceived condition competence; PSW = physical self-worth; SES = global self-esteem; BDI = depression; HAM.A = Anxiety.
**P<0.01

sample size, but is based on the number of fixed model parameters [34], χ^2_{GoF} / *df* less than 2 indicates an acceptable fit of the proposed model; (3) Bentler's Comparative Fit Index (CFI) compares the improvement of the fit of a model over a more restricted model, which ranging from 0 to 1.0, with values closer to 1.0, indicates a better fit; (4) The root mean square error of approximation (RMSEA) which corrects for a model's complexity, its value of .00 and an associated 90% confidence interval (CI) indicate that the model exactly fits the data; and (5) The Standardized Root Mean Square Residual (SRMR) index is based on covariance residuals, with smaller values indicating better fit (0.00) indicates perfect fit[35].

Confirmatory Factor Analyses (CFA) were used to confirm that the hypothesised factor structure provides a good fit for the data, and to test individual parameters and the initial four-factor model [13] as a whole, which was identified in the EFA. Using the STATISTICA 7 (Statsoft, 2005) program to analyse the variance-covariance matrices for each sample, the researchers drew on a maximum likelihood procedure. Along with information about the significance of individual parameters, such as pattern coefficients and factor intercorrelations, CFA provides overall goodness-of-fit tests of the match between the theoretical factor structure and the data. We tested some additional indices in the CFA. The goodness of fit index (GFI); the Adjusted Goodness-of-Fit Index (AGFI) adjusts for the number of parameters (the fewer the better); The Normed Fit Index (NFI) [36] and the Non-normed Fit Index (NNFI) are incremental fit indices that test the proportionate improvement in fit. Values for the GFI, AGFI, NFI and NNFI are scaled to be between 0 and 1, with a minimum criterion of 0.90 as indicative of a relatively well-fitting model [35].

To measure the reliability of the PSPP, we used Cronbach's alpha (α) formula measuring how well the set of items measures the latent construct. To discriminate between depressed patients and healthy subjects, and to know on which variables they differ, discriminant function analysis and one-way ANOVA were employed.

Additionally, a path analysis (PA) was included to search for associations among PSPP subscales and self-worth, self-esteem, depression and anxiety, as the relations are described in the Van de Vliet et al. [28] model. The PA was analysed using the LISREL 8.52 (2002) program. To test the mediating role of variables (e.g., PSW) in the relationship between the PSPs and depression, the direct and indirect effects of first-order and partial correlations were calculated on one or more latent variables, with coefficients describing the strength of these relationships. The correlation matrix served as a database for the path analysis, and maximum likelihood was used as the method of estimation (see Table 2). To examine the hierarchical structure of the PSPP, partial correlation coefficients, controlling for physical self-worth and self-esteem among the PSPP subscales, depression and anxiety, were tested. For the sake of brevity, the associated table is not depicted in this paper.

Results

Descriptive statistics and internal consistency

The descriptive statistics concerning the variables are presented in Table 1. It appears as if patients had high levels of depression as measured by the BDI (94.8% > 20, *M* = 23.19) and low levels of self-esteem, as measured by the Rosenberg Self-

esteem Scale (SES), with most patients scoring around 20-25 (M = 23.19). Their anxiety was measured by the HAMA, and the mean score was less than 17 (M = 14.78), which is categorised as low to mild. The means of all the subscales of the PSPP were between 9.65 and 12.05, demonstrating a low physical self-perception.

Table 2: Associations between physical self-perceptions, self-esteem and negative moods in Danish psychiatric patients based on Pearson correlation coefficients

	(1) SPORT	**(2)** CONDITION	**(3)** BODY	**(4)** STRENGTH	**(5)** PSW	**(6)** SES	**(7)** HAM.A
(1) SPORT							
(2) COND	.57**						
(3) BODY	.38**	.58**					
(4) STRENGTH	.36**	.35**	.23*				
(5) PSW	.50**	.70**	.67**	.60**			
(6) SES	.26**	.22*	.29**	.18*	.41**		
(7) HAM.A	.100	.051	.085	-.014	.066	.088	
(8) BDI	-.22*	-.29**	-.44**	-.27**	-.34**	-.18*	.26**

** p< 0.01; * p< 0.05 (1-tailed). SPORT = perceived sport competence; CONDITION = perceived condition competence; BODY = perceived body attractive; STRENGTH = perceived strength; PSW = physical self-worth; RSE = global self-esteem; BDI = depression; HAM.A = Anxiety

Correlations among the PSPP subscales were fairly consistent with our expectations. In particular, the strong correlations with the PSW as a superordinate domain factor (r = 0.50 to r = 0.70, p < 0.01), on the one hand, and the correlations between PSW and depression (r = -0.34, p < 0.01), on the other hand, demonstrated the robust mediating role of PSW [14, 26, 13, 18, 28]. The present research contradicted the previous ones only in the RSE. None of the PSPP subscales were significantly correlated with self-esteem. Even the association between PSW and RSE didn't reach significance (r = -0.10). However, these correlations were extinguished when the effects of PSW were removed in a second partial correlation. Accordingly, the associations between SPORT, CONDITION, BODY, STRENGTH with self-esteem (r = 0.02,-0.04, -0.12,-0.14, respectively) and SPORT, CONDITION, STRENGTH with depression (r = -0.06, -0.08, -0.09, respectively) became non-significant when the effect of PSW was removed. However, the association between BODY attractiveness and depression remained significant (r = -.0.30, p = 0.001).

To see how the associations between physical self-perception with depression and anxiety could be influenced by global self-esteem, partial correlations were also computed, controlling for self-esteem. The correlations between SPORT (r = -0.22, p < 0.05), CONDITION (r = -0.28, p = 0.01), BODY (r = -0.43, p < 0.0005), STRENGTH (r = -0.25, p = 0.007) and PSW (r = -0.33, p < 0.001) with depression still remained significant.

Exploratory factor analysis

The PSW subscale, as a measure of global self-perception of the underlying sub-domains (e.g. SPORT, CONDITION, BODY and STRENGTH), was eliminated from the analyses because of its spurious loading across the factors, as earlier EFAs conducted by Fox indicated [14]. Therefore, our application of EFA indicated a four-factor structure model. As a prerequisite, a Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's test of sphericity based on the correlation matrix were computed (KMO = .836; Bartlett's Test: Approx. Chi-Square = 1135.78; df = 276, p <.0005) and showed a good fit for factor analysis. The extraction method was Principal Components Analysis (PCA) using varimax rotation with Kaiser Normalisation converging in 5 iterations. Four components were extracted. Examining the anti-image correlation matrix in which there is a KMO statistic for each individual variable, we kept the four factors in the model, with coefficients ranging from 0.68 to 0.90. The criteria for retaining factors were based on Kaiser's criterion, with unrotated eigenvalues of approximately 1.0 or greater, and a scree test. The analysis revealed 4 components which were extracted (for more detail see Table 3).

Compared with Fox's PSPP four sub-domains, the current analysis for items in a 4-factor extracted model indicated some discrepancies. Items 2, 12, 17, 19, 23 and 27 loaded on more than one factor. Particularly, items 2, 12, and 17 were loaded more

highly on SPORT than on CONDITION.

Table 3: Exploratory Factor Analysis (EFA): Principal components factor loading for PSPP items of depressed samples

Subscales	Item			Factor			
		Mean	S.D	1	2	3	4
SPORT	1	1.81	.82	.81			
	2	1.38	.58	.53			
	6	1.48	.65	.69			
	11	1.84	.78	.79			
	12	1.41	.62	.56			
	16	1.56	.68	.81			
	17	1.99	.82	.50			
	21	1.96	.85	.70			
	26	1.61	.72	.67			
BODY	3	2.01	.96		. 87		
	8	1.72	.84		.73		
	13	2.00	1.02		.73		
	18	1.95	.84		.72		
	23	1.46	.61		.50		
	28	1.76	.77		.78		
STRENGTH	4	2.15	.89			.80	
	9	1.98	.77			.85	
	14	2.19	.88			.60	
	19	1.68	.58			.60	
	24	1.85	.73			.83	
	29	2.00	.64			.70	
CONDITION	7	1.80	.86				.81
	22	1.89	.86				.73
	27	1.46	.63				.58
Rotation Sums of Squared loadings			Total	5, 3.8, 3.6, 2.5			
			% of Variance	20.7, 15.7, 14.9, 10.4			
			Cumulative%	20.7, 36.4, 51.3, 61.6			

Confirmatory factor analysis

The results of the CFA for a 4-factor model are summarised in Table 4.The chi-square test (χ^2_{GoF}) for the 4-factor model was 409.48 with 246 degrees of freedom, which was statistically significant ($p < .001$). The χ^2_{GoF} / *df* of 1.66 indicated acceptable fit of the proposed model. Examining the other fit indices, and according to the correlated subscales, the CFI was 0.84, and the SRMR was 0.10, both indicating acceptable model fit. The RMSEA was 0.08 (CI = 0.07 to 0.10), which is well above the cut-off for good model fit. The GFI was 0.72 and its variant AGFI was 0.65. Finally, the incremental fit indices of NFI and NNFI were 0.68 and 0.81, respectively. As all the above indices are scaled to be between 0 and 1, with larger numbers indicating a better fit and with a minimum criterion of 0.90, there is combined evidence concerning how well the current model fits the data.

Since the results of the EFA using the 4-factor extracted model demonstrated some conflict with Fox's PSPP four sub-domains, a model of three-factors was also applied. In this second model, two different subscales, SPORT and CONDITION, emerged as a new combined factor namely COND-SPORT. The results of the CFA for the PSPP three-factor model are presented in Table 4.

The CFA outcomes on the 3-factor model revealed that the chi-square test (χ^2_{GoF}=464.25, *df* = 246) was statistically significant ($p < .001$). Furthermore, the χ^2_{GoF} / *df* of 1.86 indicated an acceptable fit of the proposed model to data. Other fit indices, including the CFI (0.78) and the SRMR (0.11), indicated acceptable model fit. The RMSEA of 0.10 (CI = 0.89 to 0.11), GFI (0.72), AGFI (0.65) as well as the NFI and NNFI (0.63, 0.76, respectively) revealed a good fit for the 3-factor model with the data.

Comparing the results for these two models indicated that although both models displayed acceptable fit with the data, the data were more

consistent with the 4-factor model.

differences were found for both groups (chi square = 227.88, df=8, p<0.0005).

Table 4 :
Confirmatory Factor Analysis (CFA) statistics for PSPP 4-Factors (left column), PSPP 3-Factors (right column)

PSPP Four Factors				**PSPP Three Factors**			
Subscale	Items	Factor loadings	T-values	Subscale	Items	Factor loadings	T-values
SPORT	1	0.70	11.00		1	0.55	6.64
	6	0.74	13.15		2	0.42	7.44
	11	0.76	13.98	COND-	6	0.44	6.77
	16	0.88	24.34	SPORT	7	0.35	3.70
	21	0.65	9.29		11	0.59	7.88
	26	0.65	9.41		12	0.45	7.46
STRENGTH	4	0.71	11.34		16	0.54	8.63
	9	0.79	15.07		17	0.50	5.93
	14	0.56	6.85		21	0.56	6.51
	19	0.63	8.54		22	0.31	3.28
	24	0.84	18.26		26	0.42	5.60
	29	0.64	8.64		27	0.42	6.64
BODY	3	0.77	14.28		4	0.64	7.173
	8	0.68	10.25		9	0.61	8.241
	13	0.69	10.66	STRENGTH	14	0.50	5.305
	18	0.77	14.33		19	0.37	6.072
	23	0.70	10.84		24	0.61	8.925
	28	0.70	10.70		29	0.40	6.135
CONDITION	2	0.81	17.25	BODY	3	0.76	8.29
	7	0.51	5.76		8	0.56	6.54
	12	0.78	15.36		13	0.72	7.09
	17	0.59	7.45		18	0.65	7.89
	27	0.42	4.34		23	0.41	6.73
	22	0.74	12.99		28	0.54	7.00
χ^2_{GoF}		409.475		464.252			
df		246		249			
χ^2 GoF / *df*		1.66		1.86			
P-level		0.000		0.000			
RMSR		0.101		0.111			
RMSEA (Lower-upper CI)		0.086 (0.070 and 0.101)		0.103 (89% and %117)			
CFI		0.835		0.783			
GFI		0.716		0.681			
AGFI		0.654		0.616			
NFI		0.677		0.634			
NNFI		0.813		0.757			

To have high reliability with different populations, because we translated it into Danish and used it in a clinical population, its reliability was determined. The internal consistency and reliability of the PSPP was good, as indicated by Cronbach's alpha coefficients (α ranged from 0.81 to 0.87).

Discriminant analysis

Discriminant validity at the level of patients vs. the normal population has been shown by a few studies [18]. Discriminant function analysis was used in our study to test the ability of the PSPP to statistically separate the healthy and depression groups. As shown in Table1, significant overall

One -way ANOVA revealed that both samples were significantly different on each predicted variable. A canonical R correlation of 0.91 was obtained. When function scores were used to classify subjects as depressed or in normal health, the function correctly classified 95 out of 96 as depressed and 39 out of 44 subjects categorized as healthy. Overall, the classification was done with 99.3% precision. In the structure matrix, the pooled within-group correlation coefficients indicate that PSW (-0.32) subscale best discriminates among the groups, whereas Strength (-0.18) and RSE (-0.11) improve the differentiation slightly. The criterion validity and the strength of the association provide

the PSPP with strong content validity and construct validity.

Path Analysis

Fox and Corbin's 4-factor model [13] was validated on the Danish clinical data set using confirmatory factor analysis; thus, in this third phase of the analyses, a path analysis was applied to search for direct and indirect paths from PSP sub-domains to self-esteem, depression and anxiety. Although the Fox model has stimulated research in physical self-perception, it still needs to be tested in the clinical area.

Self-esteem has been regarded as a mediator between physical self-perceptions and affect [37, 5, 3]. On the other hand, it is suggested that independent from self-esteem, physical self-perceptions through PSW produce a direct effect on mental well-being [3, 4], clinical depression and/or anxiety [18, 28]. In this regard, and based on the work by Harter [36], Sonstroem and Potts [38], Van de Vliet et al. [28] recently investigated a new model of physical self-perception and negative affect on psychiatric patients.

To provide more evidence for the connection between physical self-perceptions and mood disorders, we replicated a path analysis with our data, using a model that consists of the Van de Vliet model [28] with Fox's four subscales of the PSPP (Figure 2). Path analyses were conducted separately for directions from PSP sub-domains to depression and anxiety. Hence, for the directional effects, we analysed the unidirectional effects from perceptions of Sport, Condition, Body attractiveness, and Strength, to (a) physical self-worth and self-esteem, and (b) depression and anxiety separately.

The inter-correlations are reported in table 2 for the measured variables. Figure 3 depicts the results of the conceptual path diagram for physical self-perceptions, self-esteem and depression. The bottom middle section of the figure shows the fit indices used to evaluate the adequacy of this model. With a Normal Theory Weighted Least Squares χ^2 of 15.19 and $p = 0.056$, there is high probability that this model fits the population (i.e., models with $p > 0.05$ are more likely to fit the population).

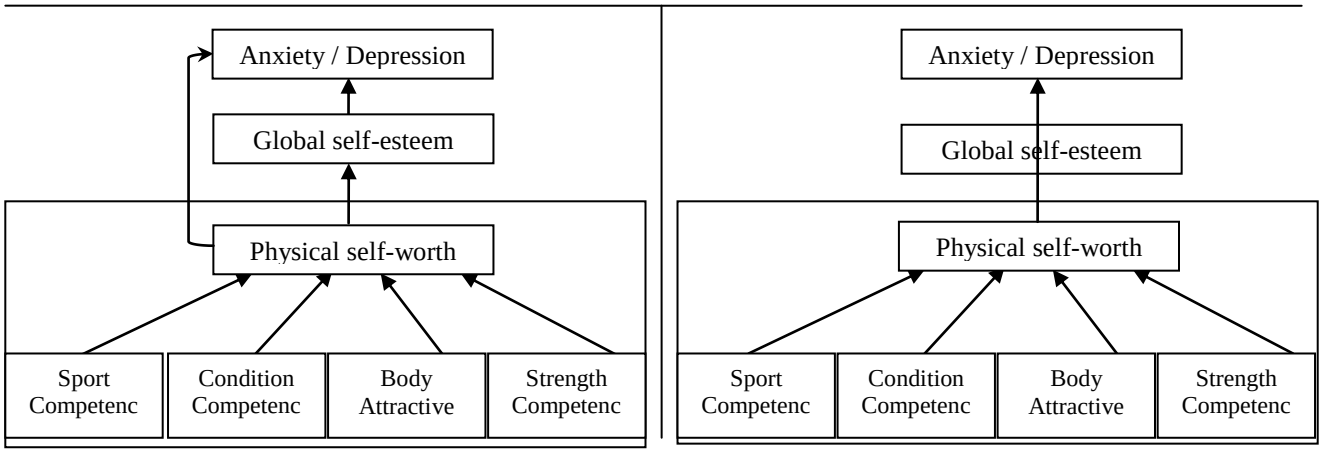
Further measures of fit were examined for all indices measuring the relative amount of variance and covariance accounted for by the model [13]. The comparative fit index (CFI = 0.97) compares the model with a null model, which assumes that the variables are uncorrelated. As the GFI approaches 0.96, the fit improves. This model appeared to fit well enough, with the GFI and CFI both greater than 0.90. Additional indices also indicate that the model fits the data appropriately: the appropriacy of Fit index adjusted for degree of freedom (AGFI) was 0.85; RMSEA = 0.099 (90% CI, 0.0 to 0.17; *P*-Value = 0.13); SRMR = 0.05.

The same analysis was done for the model with four paths from PSP sub-domains to anxiety. Model of fit statistics confirmed the model fit to the data, as $\chi^2 = 4.16$, $df = 8$, $p = 0.84$, CFI = 1.00, and the RMSEA was 0.000, with 90% CI (0.00, 0.07, *P*-Value for test of Close Fit was 0.91). Further support for the fit of the model can be seen in the SRMR (0.026), GFI (0.99), and AGFI (0.96) indices, indicating that the model fits well. However, none of the hypothesised paths from PSW (0.04) and self-esteem (0.07) to anxiety was significant.

To explain the direct and indirect effects among the variables, equations in the structural portion of the model (diagram in Figure 3) specify the hypothesised relationships among latent variables. In the model depicted in Figure 2, it is hypothesised that physical self-worth mediates the effects of the four specific sub-domains of physical self-perception on global self-esteem and depression. As Figure 3 reveals, the path coefficients from all variables (i.e., CONDITION, BODY and STRENGTH) to PWS are significant with the exception of one, from SPORT to PWS ($p > 0.05$). As is shown, the highest effect is for STRENGTH and there is a weaker effect for CONDITION to PSW (0.38 and 0.34, respectively). Moreover, the path coefficient is significant from PSW to RSE ($p < 0.05$). The direction from PSW to depression is also significant (0.32). With both direct and indirect effects, PWS fully mediates the impact of physical self-perception sub-domains on self-esteem and depression. However, the path coefficient from self-esteem to depression was not significant ($\alpha = 0.05$, $t = -0.49$).

From among the total and indirect effects on the model, the direct effect accounts for (1) paths of SPORT, CONDITION, BODY and STRENGTH to PSW, (2) then from PSW to self-esteem, (3) depression and (4) anxiety. The coefficients describing the strength of the unidirectional relationships were significant for the pathways from the physical self-perceptions of CONDITION, BODY and STRENGTH to PSW (0.34, 0.37 and 0.38 respectively). The exception was for SPORT, which indicated a low coefficient of 0.03. The path from PWS as a predictor variable to self-esteem (0.41) and depression (-0.34) was also significant.

Figure 2: Conceptual Diagram for Paths on hierarchal model of Physical Self-Perception subscales to depression and anxiety (after Van de Vliet et al., 2002: 311-312)



Path analyses permit us to estimate indirect relationships from all four physical self-perception sub-domains mediated by PWS and self-esteem variables in the analysis as well as direct associations. They are not directly defined in the conceptual model and are formed based on the correlations [34]. Hence, the non-significant coefficients for indirect relationships from CONDITION, BODY and STRENGTH (0.14, 0.15 and 0.15, respectively) and the lowest one from SPORT to self-esteem (0.01) are considerable. The weak direct effect from self-esteem to depression (-0.05) demonstrates that independent from self-esteem, the physical self-perceptions through PSW produce an inverse effect (-0.34) on clinical depression [28]. None of the indirect or total paths from physical self-perceptions through physical self-worth to anxiety were significant.

These results partially confirm the hypothesis suggested for the role of physical self-worth as a mediator between the physical self-perception sub-domain and negative affect [28], except for depression.

Discussion

Low self-esteem is a major feature of clinical depression, and it is assumed that people with low self-esteem may develop psychiatric disorders such as depression. On the other hand, low self-esteem is often associated with low physical self-perceptions, and the valid assessment of self-esteem in psychiatric patients has significant clinical implications. However, few research studies have been conducted on physical and global self-perceptions in depressed populations [18, 28, 10]; thus, the present study was conducted to test such relationships in depressed patients.

The first goal of this study was to validate the Danish version of the PSPP; thus, we examined the validity and reliability of its factor structure in a representative clinical sample. The scale's internal consistency and reliability were strong (α = ranged from 0.81 to 0.87). The PSPP also shows adequate discriminant validity to discriminate patients with depression from healthy group. The partial correlations among the PSPP, global self-esteem and depression revealed the hierarchical structure of the PSPP. Except for body attractiveness competence [7], all other PSPP subscales became non-significant in terms of their correlations with self-esteem and depression, when the effect of PSW was removed. In addition, this strong inverse direction from body attractiveness to depression was explored in a secondary path analysis. Fox [14] reported that body attractiveness is not closely associated with activity involvement levels and has negative associations with dieting behaviour in one of his research samples.

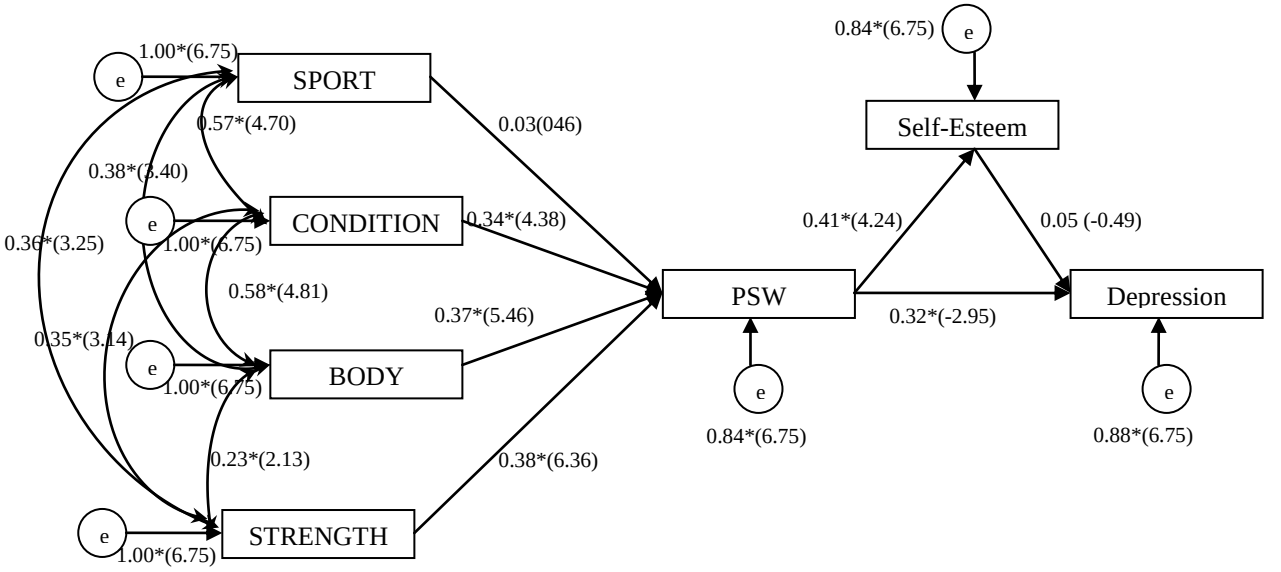
Numerous investigations have indicated a strong inverse correlation between level of self-esteem and level of depression, more specifically suggesting that low self-esteem is an accompanying factor of depression [24, 6, 28]. Regarding the nature of the interaction between physical self-perceptions and affective states [13, 4, 27], we examined the mediating role of self-esteem between physical self-perceptions and depression. The associations were still significant for depression. This confirms that the PSPP subscales, independent of self-esteem, directly affect the depression as well. Additionally, no significant associations between PSPP sub-domains and anxiety were observed even with the partial correlations.

Consistent with Fox's [14] findings, the results of our EFA analysis indicated that four factors emerged, with all significant factor loadings ranging from .50 to .87. However, the application

of factor analysis to our study exhibited some cross loading among factors, such that six items were loadable on more than one factor, and three items from CONDITION loaded on the SPORT subscale. Additionally, the CFA indicated that both the three-factor and four-factor models fit the data adequately; however, the data were more consistent with the four-factor model.

One limitation, which we dealt with, was the sample size. The total sample size was below the minimum suggested sample size of 200 (based on findings from meta-analyses). The findings were limited by sample selection in that the majority of the participants were female.

Figure 3: Model depicting the hypothesised associations among physical self-perception sub-domains, self-esteem and depression among Danish depressed samples. Coefficients and *t*-values in parentheses are provided for the significant paths. The circled "e" indicates the disturbance term associated with each endogenous variable of the path analysis model.



Chi-square= 15.19, df=8, α=0.056, RMSEA=0.099, *p<.05

Several explanations can account for this finding. Cross-cultural and language differences may have precluded distinguishing precisely the differences between exercise and sport. Moreover, because of less engagement in physical activity, sedentary depressed people may not be able to differentiate between distinctive aspects of physical activity, exercise and sport.

With respect to the secondary aim of the study, we applied a path analysis to examine the associations among *PSP* subscales, PSW, self-esteem, depression and anxiety. The hypothesised model suggests that physical self-perceptions of sport, strength, body attractiveness and condition competence influence self-esteem through physical self-worth, and these variables directly and indirectly influence negative moods; the data fit this model. Three of the hypothesised paths to depression were statistically significant. The only path not significant was from sport competence. Path analysis revealed, however, that the direct effect of physical self-perception on mood disorders was greater than its indirect effect through self-esteem.

The low number of male participants (n = 29) precluded the factor analysis being done based on gender differences. The model should be re-tested with a larger sample size of both males and females.

The findings of this study have indicated that the Danish version of the PSPP is appropriate for use with clinically depressed people to assess their perceptions of the physical domain, as the results provide evidence for its reliability and validity. And finally, the results support the functioning of PSW as a generalised outcome of perceptions in the four sub-domains and as a mediator between the sub-domains and global self-esteem and depression.

Perspectives

The present study provides an evaluation of the PSPP, a psychometric measure of the physical self-perception construct in the physical domain, using a sample of depressed Danish psychiatric patients. Although originally the validity of the PSPP was established for college-age students [13], according

to our findings, it is possible to administer the PSPP to a non-physically active population such as clinically depressed people. However, we recommend that researchers in the domain of exercise psychology modify and develop a shorter version of the PSPP. Some items of the instrument may need to be revised and perhaps omitted in order to maintain similar meanings for a non-healthy population (i.e., individuals with mood disorders). Generally, clinically depressed people are sedentary and may be reluctant to participate in sports activities; therefore, there is particularly a need to replace the SPORT competence items with a new subscale.

People who are in poor physical condition, such as those people who have been diagnosed with mood disorders, are more likely to benefit from exercise participation; thus, the greatest improvements in self-esteem and self-perception can occur in this group. This has implications for professionals in exercise work.

Further longitudinal research is needed to examine the development of physical self-perceptions across broader clinical samples compared with non-clinical samples. The use of a longitudinal research design would help to clarify factors that influence depressed people's self-perceptions and help to reveal the impact of these perceptions on other outcomes. This will provide important evidence for the relationship between exercise, PSPs and depression, but in order to determine whether a causal relationship exists between exercise and changes in depression, clinical trials that manipulate exercise and examine change in self perceptions, self-esteem and depression scores over time are also needed.

The results of the present study suggest that the PSPP model holds for clinically depressed out-patients. There is enough evidence for the effect of exercise on aspects of PSPs, other than self-esteem, and they are directly linked to mental well-being [7].

We plan to use the PSPP to assess the long-term effects of different forms of exercise on self-perceptions, self-esteem and depression at intervention and follow-up in the clinical setting.

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