

BRIEF COMMUNICATION

Psychometric Properties of the Self-Perception Profile for Children in Children with Chronic Illness

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Abstract

Objective: The Self-Perception Profile for Children (SPPC) is a commonly used measure of self-concept in children, but little research has examined its psychometric properties in children newly-diagnosed with chronic illness. **Method:** Confirmatory factor analysis and examination of reliability and convergent and discriminant validity of the SPPC was conducted in 31 children newly-diagnosed with asthma, diabetes, epilepsy, food allergy, or juvenile arthritis. **Results:** The unidimensionality of each domain of the SPPC was confirmed, internal reliability was robust ($\alpha=.83-.95$), and inter-domain polychoric correlations ranged from weak to strong ($\rho=.05-.85$) Convergent validity was demonstrated with measures of global self-concept and domains of quality of life. The Global Self-worth domain showed discriminant validity between children with and without comorbid mental disorder. **Conclusions:** Findings extend the psychometric properties of the SPPC as a valid and reliable scale in children newly-diagnosed with chronic illness.

Key Words: chronic disease, confirmatory factor analysis, measurement, self-concept, validity

Résumé

Objectif: Le Profil d'auto-perception pour enfants (PAPE) sert habituellement à mesurer le concept de soi des enfants, mais peu de recherche a examiné ses propriétés psychométriques chez les enfants ayant récemment reçu un diagnostic de maladie chronique. **Méthode:** L'analyse factorielle confirmatoire ainsi que l'examen de la fiabilité et de la validité convergente et discriminante du PAPE ont été menés auprès de 31 enfants ayant récemment reçu un diagnostic d'asthme, de diabète, d'épilepsie, d'allergie alimentaire ou d'arthrite juvénile. **Résultats:** L'unidimensionnalité de chaque domaine du PAPE a été confirmée, la fiabilité interne était robuste ($\alpha = 0,83$ à $0,95$), et les corrélations polychoriques inter-domaines allaient de faibles à fortes ($\rho = 0,05$ à $0,85$). La validité convergente était démontrée par des mesures du concept de soi général et des domaines de qualité de vie. Le domaine général du concept de soi montrait une validité discriminante entre les enfants avec et sans un trouble mental comorbide. **Conclusions:** Les résultats confirment que les propriétés psychométriques du PAPE en font une échelle valide et fiable pour les enfants ayant récemment reçu un diagnostic de maladie chronique.

Mots clés: maladie chronique, analyse factorielle confirmatoire, mesure, concept de soi, validité

The Self-Perception Profile for Children (SPPC) is one of the most commonly used scales to measure self-concept in children (Harter, 2012). This widespread use by researchers and clinicians can be attributable to its extensive psychometric evaluations in several child populations (Harter, 2012; Muris, Meesters, & Fijen, 2003). However, little research has been conducted in children with chronic illness such as diabetes and epilepsy. One study replicated the factor structure of the SPPC in children with spina bifida,

finding that it demonstrated partial measurement invariance in comparison to healthy controls (Thill et al., 2003).

Research confirming the psychometric properties of the SPPC in children with chronic illness is important to ensure that hypothesized domains of self-concept are measured as intended, facilitating valid across-group comparisons and providing confidence to researchers and clinicians that inferences are unbiased (Gregorich, 2006). Because children

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with chronic illness represent a large proportion of the population (van der Lee, Mokkink, Grootenhuis, Heymans, & Offringa, 2007), inaccurate assessment of their self-concept could have implications for individual treatment decisions. This is especially pertinent early in the illness course when there may be uncertainty in prognosis, prescribing/titrating new treatments, and adapting to having a chronic illness relatively early in life (Ferro, Gorter, & Boyle, 2015). This study aimed to replicate the unidimensionality and examine the reliability and validity of the SPPC domains in a sample of children newly-diagnosed with a chronic illness. We hypothesized that the unidimensionality of the SPPC domains would be confirmed and that it would be able to discriminate between children with a chronic illness with and without a comorbid mental disorder.

Methods

Sample

Fifty-six children aged 6-16 years newly-diagnosed with one of asthma, diabetes, epilepsy, food allergy, or juvenile arthritis were recruited from outpatient clinics at two children's tertiary centres in Canada. Analyses were restricted to children aged 11-16 years ($n=31$), as these children self-reported the SPPC. Children had a mean age of 13.5 (SD 1.6) years and 52% were male. The mean illness duration was 1.9 (SD 1.7) months. Most parents (74%) were in a partnered relationship, 74% graduated university/college, and 65% had household incomes of $\geq \$75,000$. Parents and children completed telephone interviews and mail questionnaires at baseline and again six months later. All participants provided informed consent/assent. The study received ethical approval from all relevant research ethics boards.

Measures

The 36-item SPPC is a self-reported scale designed to assess children's perceptions of their competence, or self-concept, in six different domains: Scholastic Competence, Social Acceptance, Athletic Competence, Physical Appearance, Behavioral Conduct, and, Global Self-worth (Harter, 2012). Each item contains one positive and one negative description of a specific skill. Respondents are asked to choose which statement best describes them and then select whether the chosen statement was "Really true for me" or "Sort of true for me". Domain scores are the mean of the item scores with higher scores indicating more positive self-concept. The SPPC is validated for children aged 8-15 years and its initial development demonstrated strong psychometric properties (Harter, 2012).

Four items from the General Self-image domain of the Self-Description Questionnaire (SDQ) were used to assess child global self-concept (Ferro & Boyle, 2013b; Marsh, 1988). The items are rated using a five-point Likert scale, with scores indicating better self-concept. The scale has

been validated by Statistics Canada and used in a number of epidemiological studies in Canada, including the National Longitudinal Survey of Children and Youth. It demonstrated adequate internal consistency in this sample ($\alpha=.82$).

Child quality of life was measured using the self-reported KIDSCREEN-27 (Ravens-Sieberer et al., 2007). It measures quality of life across five domains: Physical Well-being, Psychological Well-being, Autonomy & Parent Relations, Social Support & Peers, and, School Environment. Item responses are based on a five-point Likert scale and T-scores for each domain are computed, whereby higher scores indicate better quality of life. It is valid and reliable in children aged 8-18 years (Ravens-Sieberer et al., 2007). Internal consistency for each domain from in this sample was adequate ($\alpha=.70-.90$).

Mental disorder was measured using the child-reported and psychometrically robust Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID) to determine if children met DSM-IV diagnostic criteria for the following disorders: major depressive, separation anxiety, social or specific phobia, generalized anxiety, attention-deficit hyperactivity, oppositional defiant, or conduct (Sheehan et al., 2010).

Analysis

Confirmatory factor analysis (CFA; maximum likelihood estimation) was used to determine the goodness-of-fit for the SPPC domains. Determination of model fit was based on five fit indices: χ^2 goodness-of-fit, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). Adequate fit was defined using the following cutoffs: $\chi^2 p \geq 0.05$, $CFI \geq 0.90$, $TLI \geq 0.90$, $RMSEA \leq 0.08$, and $SRMR \leq 0.08$ (Schreiber, Nora, Stage, Barlow, & King, 2006). Following previously published guidelines, if ≥ 3 fit indices met the specified threshold, fit was deemed adequate (Ferro & Boyle, 2013a, 2013b). Due to strong arguments against using the RMSEA in models with small degrees of freedom and small sample sizes in which the RMSEA can be artificially large, we include, but not consider it in decisions regarding model fit (Kenny, Kaniskan, & McCoach, 2015). Mean domain scores were compared over time and to normative data ($n=577$) using paired and independent samples t-tests, respectively. Convergent validity of the SPPC was examined using Spearman correlations with the SDQ and KIDSCREEN-27. Discriminant validity between children with and without comorbid mental disorder was examined using the Wilcoxon signed-rank test.

Monte Carlo simulations were used to ensure this study was adequately powered to estimate the unidimensionality of the SPPC domains (Wolf, Harrington, Clark, & Miller, 2013). In the first simulation (10,000 replications), we specified standardized factor loadings of .80. Under these

conditions, statistical power was estimated to be, $1-\beta=.87$. Then, we conducted CFA for each SPPC domain and used these values to estimate statistical power in subsequent simulations. With our data, statistical power was between .78 and .87. Having established that our exploratory study was adequately powered, we used bootstrapping (1,000 replications) to minimize potential bias associated with sampling error (Efron & Tibshirani, 1986). Data were analyzed using SAS 9.2 and Mplus 6.11.

Results

Each SPPC domain demonstrated adequate fit to the data according to the predefined criteria (Table 1). Factor loadings ranged from moderate (.40) to strong (.97). The SPPC demonstrated excellent internal consistency, with a low of $\alpha=.83$ for Behavioral Conduct and a high of $\alpha=.95$ for Athletic Competence.

Mean scores for each SPPC domain are shown in Table 2. There were no significant differences between baseline and six-month SPPC scores. Only Behavioral Conduct was found to be significantly different compared to normative controls (3.3 vs. 3.0; $p=.007$). Intra-domain polychoric correlations over time were strong, .62–.94 (Table 3).

Convergent validity of the SPPC was demonstrated with medium-sized correlations with related measures. SDQ: General Self-image—SPPC Global Self-worth ($\rho=.73$; $p<.001$); KIDSCREEN-27: School Environment—SPPC Scholastic Competence ($\rho=0.36$; $p=.048$), Social Support & Peers—SPPC Social Competence ($\rho=.48$; $p=.007$), Physical Well-being—SPPC Athletic Competence ($\rho=.30$; $p=0.097$); Physical Well-being—SPPC Physical Appearance ($\rho=.26$; $p=.166$), and Psychological Well-being—SPPC Behavioral Conduct ($\rho=.56$; $p=.001$). The Global Self-worth domain discriminated between children with chronic illness and comorbid mental disorders ($n=6$) and those with a chronic condition only ($n=25$), $z=-2.78$; $p=.005$.

Discussion

Findings replicated the unidimensionality of the SPPC domains and provided evidence supporting their internal reliability and convergent and discriminant validity in children with chronic illness. The magnitudes of parameter estimates and domain correlations were similar to other reports that sampled children in the general population (Harter, 2012; Muris et al., 2003) and those with chronic illnesses (Thill et al., 2003; Veerman, ten Brink, Straathof, & Treffers, 1996).

Despite evidence suggesting children with chronic illness have lower self-concept compared to healthy controls (Ferro & Boyle, 2013c, 2015), findings showed no significant declines compared to population norms. Indeed, our sample had higher scores for Behavioral Conduct. It has been suggested that such absence of differences may be due to

different social reference groups; conscious distortion; unconscious denial; confusion of the real and ideal self; or, healthy adjustment to self-standards (Harter, 1999). Exaggerated preconceived notions of the negative experience of having a chronic illness may have framed children's references in evaluating their own self-concepts at baseline. This frame of reference may have continued during the six-month follow-up, resulting in scores similar to population norms.

Our findings have three relevant limitations: 1) Our sample size was small; 2) We were not able to account for inter-domain correlations in the CFA. This limitation is tempered given that our CFA parameter estimates were similar to previous reports. Because domain scores are based on mean item scores, comparisons across samples are unaffected; and, 3) Similar to previous samples validating the SPPC, our sample included generally affluent Caucasian families.

Conclusion

Findings extend the psychometric properties of the SPPC as a valid and reliable measure of self-concept in children newly-diagnosed with chronic illnesses. Replication of these findings is encouraged in larger samples of children with chronic illness.

Acknowledgements / Conflicts of Interest

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References

- Efron, B., & Tibshirani, R. (1986). Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. *Stat Sci*, *1*(1), 54-77.
- Ferro, M. A., & Boyle, M. H. (2013a). Brief report: testing measurement invariance and differences in self-concept between adolescents with and without physical illness or developmental disability. *J Adolesc*, *36*(5), 947-951.
- Ferro, M. A., & Boyle, M. H. (2013b). Longitudinal invariance of measurement and structure of global self-concept: a population-based study examining trajectories among adolescents with and without chronic illness. *J Pediatr Psychol*, *38*(4), 425-437.
- Ferro, M. A., & Boyle, M. H. (2013c). Self-concept among children and adolescents with a chronic illness: a meta-analytic review. *Health Psychol*, *32*(8), 839-848.
- Ferro, M. A., & Boyle, M. H. (2015). The impact of chronic physical illness, maternal depressive symptoms, family functioning, and self-esteem on symptoms of anxiety and depression in children. *J Abnorm Child Psychol*, *43*(1), 177-187.

Table 1. Bootstrapped factor solution for the Self-Perception Profile for Children

Factor (α reliability) / Item	Baseline		
	Factor Loading	Residual Variance	R ²
Scholastic Competence (.88): $\chi^2=15.02$, CFI=0.930, TLI=0.841, RMSEA=0.149 [0.104, 0.185], SRMR=0.072			
1. Some kids feel that they are very good at their school work	.73	.47	.53
7. Some kids feel like they are just as smart as other kids their age	.87	.25	.75
13. Some kids are pretty slow in finishing their school work	.62	.62	.38
19. Some kids often forget what they learn	.40	.39	.16
25. Some kids do very well at their classwork	.78	.40	.60
31. Some kids have trouble figuring out the answers in school	.84	.29	.71
Social Competence (.91): $\chi^2=10.76$, CFI=0.983, TLI=0.903, RMSEA=0.081 [0.000, 0.128], SRMR=0.046			
2. Some kids find it hard to make friends	.74	.45	.55
8. Some kids know how to make classmates like them	.83	.32	.68
14. Some kids don't have the social skills to make friends	.97	.06	.94
20. Some kids understand how to get peers to accept them	.76	.42	.58
26. Some kids wish they knew how to make more friends	.69	.67	.48
32. Some kids know how to become popular	.72	.48	.52
Athletic Competence (.95): $\chi^2=10.32$, CFI=0.991, TLI=0.936, RMSEA=0.070 [0.000, 0.120], SRMR=0.024			
3. Some kids do very well at all kinds of sports	.92	.15	.85
9. Some kids wish they could be a lot better at sports	.87	.24	.76
15. Some kids think they could do well at just about any new sports activity they haven't tried before	.87	.24	.76
21. Some kids feel that they are better than others their age at sports	.87	.24	.76
27. In games and sports some kids usually watch instead of play	.89	.30	.79
33. Some kids don't do well at new outdoor games	.92	.15	.85
Physical Appearance (.92): $\chi^2=10.80$, CFI=0.983, TLI=0.907, RMSEA=0.082 [0.000, 0.129], SRMR=0.046			
4. Some kids are happy with the way they look	.92	.16	.85
10. Some kids are happy with their height and weight	.61	.44	.39
16. Some kids wish their body was different	.79	.38	.63
22. Some kids wish their physical appearance (how they look) was different	.77	.40	.60
28. Some kids wish something about their face or hair looked different	.84	.30	.70
34. Some kids think that they are good looking	.82	.34	.67
Behavioral Conduct (.83): $\chi^2=11.45$, CFI=0.942, TLI=0.877, RMSEA=0.095 [0.000, 0.139], SRMR=0.066			
5. Some kids often do not like the way they behave	.62	.62	.38
11. Some kids usually do the right thing	.79	.37	.63
17. Some kids usually act the way they know they are supposed to	.81	.35	.65
23. Some kids usually get in trouble because of things they do	.55	.70	.30
29. Some kids do things they know they shouldn't do	.67	.56	.44
35. Some kids behave themselves very well	.58	.27	.34
			continued

Table 1. Continued			
Factor (α reliability) / Item	Baseline		
	Factor Loading	Residual Variance	R ²
Global Self-worth (.85): $\chi^2=11.50$, CFI=0.960, TLI=0.847, RMSEA=0.096 [0.000, 0.140], SRMR=0.055			
6. Some kids are often unhappy with themselves	.71	.50	.50
12. Some kids don't like the way they are leading their life	.63	.60	.40
18. Some kids are happy with themselves as a person	.92	.15	.85
24. Some kids like the kind of person they are	.56	.69	.31
30. Some kids are very happy being the way they are	.80	.36	.64
36. Some kids are not very happy with the way they do a lot of things	.68	.33	.46
All goodness-of-fit χ^2 values were not statistically significant at $p<0.05$ with degrees of freedom, $df=9$. Standardized factor loadings and residual variances are shown. Standard errors for standardized estimates are not computed when bootstrapping methods are used.			

Table 2. Comparisons of Self-concept						
	Baseline	Six Months	Population Norms	Baseline vs. Six Months	Baseline vs. Norms	Six Months vs. Norms
Scholastic competence	3.1 (0.7)	3.1 (0.7)	3.0 (0.6)	-0.59 (.562)	0.89 (.371)	0.90 (.371)
Social competence	2.9 (0.8)	3.1 (0.7)	3.1 (0.7)	-1.35 (.189)	-1.54 (.125)	0.00 (.999)
Athletic competence	2.7 (0.9)	2.9 (0.9)	3.0 (0.7)	-1.13 (.268)	-1.83 (.077)	-0.76 (.446)
Physical appearance	3.0 (0.8)	2.9 (0.8)	3.0 (0.7)	0.18 (.862)	0.00 (.999)	-0.77 (.442)
Behavioral conduct	3.3 (0.6)	3.3 (0.6)	3.0 (0.6)	-0.07 (.946)	2.72 (.007)	2.72 (.007)
Global self-worth	3.2 (0.6)	3.2 (0.8)	3.2 (0.6)	-0.29 (.773)	0.00 (.999)	0.00 (.999)
Scores on the SPPC are reported as mean (standard deviation). Group comparisons are reported as t (p-value).						

Table 3. Polychoric correlation matrix of factors from the self-perception profile for children						
Six months						
Baseline	Scholastic competence	Social competence	Athletic competence	Physical appearance	Behavioural conduct	Global self-worth
Scholastic competence	.62***	.25	.28	.42*	.26	.24
Social competence	.35*	.75***	.62***	.75***	.40*	.72***
Athletic competence	.37*	.24	.94***	.69***	.28	.75***
Physical appearance	.53***	.49***	.56***	.86***	.43**	.79***
Behavioural conduct	.22	.44**	.03	.05	.70***	.59***
Global self-worth	.59***	.69***	.46**	.88***	.37*	.72***
* $p<.05$; ** $p<.01$; *** $p<.001$. Correlations on the diagonal (bold) are the intra-domain correlations between baseline and six months. Correlations below and above the diagonal are the inter-domain correlations at baseline and six months, respectively.						

- Ferro, M. A., Gorter, J. W., & Boyle, M. H. (2015). Trajectories of depressive symptoms during the transition to young adulthood: the role of chronic illness. *J Affect Disord*, *174*(2015), 594-601.
- Gregorich, S. E. (2006). Do self-report instruments allow meaningful comparisons across diverse population groups? Testing measurement invariance using the confirmatory factor analysis framework. *Med Care*, *44*(11 Suppl 3), S78-94.
- Harter, S. (1999). *The construction of the self: A developmental perspective*. New York: The Guildford Press.
- Harter, S. (2012). *Self-Perception Profile for Children: Manual and Questionnaires (Grades 3-8)*. Denver: University of Denver.
- Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research*, *44*(3), 486-507.
- Marsh, H. W. (1988). *Self-Description Questionnaire-I*. San Antonio: Psychological Corporation.
- Muris, P., Meesters, C., & Fijen, P. (2003). The Self-Perception Profile for Children: further evidence for its factor structure, reliability, and validity. *Person Individ Diff*, *35*(8), 1791-1802.
- Ravens-Sieberer, U., Auquier, P., Erhart, M., Gosch, A., Rajmil, L., Bruil, J.,...European, K. G. (2007). The KIDSCREEN-27 quality of life measure for children and adolescents: psychometric results from a cross-cultural survey in 13 European countries. *Qual Life Res*, *16*(8), 1347-1356.
- Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: a review. *J Educ Res*, *99*(6), 323-337.
- Sheehan, D. V., Sheehan, K. H., Shytle, R. D., Janavs, J., Bannon, Y., Rogers, J. E.,...Wilkinson, B. (2010). Reliability and validity of the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID). *J Clin Psychiatry*, *71*(3), 313-326.
- Thill, A. D., Holmbeck, G. N., Bryant, F. B., Nelson, C., Skocic, A., & Uli, N. (2003). Assessing the factorial invariance of Harter's self-concept measures: comparing preadolescents with and without spina bifida using child, parent, and teacher report. *J Pers Assess*, *81*(2), 111-122.
- van der Lee, J. H., Mokkink, L. B., Grootenhuis, M. A., Heymans, H. S., & Offringa, M. (2007). Definitions and measurement of chronic health conditions in childhood: a systematic review. *JAMA*, *297*(24), 2741-2751.
- Veerman, J. W., ten Brink, L. T., Straathof, M. A., & Treffers, P. D. (1996). Measuring children's self-concept with a Dutch version of the "self-perception profile for children": factorial validity and invariance across a nonclinic and a clinic group. *J Pers Assess*, *67*(1), 142-154.
- Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models: an evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement*, *73*(6), 913-934.