



ADAPTATION STUDY OF THE PROBLEM SOLVING INVENTORY ON THE ROMANIAN POPULATION

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Abstract

The Problem Solving Inventory (PSI; Heppner & Petersen, 1982) is a widely used measure that assesses one's perceived problem-solving ability, behavior and attitude; it is used in the United States, Romania and other countries. The study analyses from an experimental point of view the PSI on a Romanian sample, and also establishes its psychometric parameters. Data were collected from four samples (ns=422, 223 women; 199 men). Results of the confirmatory factor analysis on the current sample supported the model proposed by the authors of the instrument. The data provided support for the PSI and enhances the generalizability of some of the previous findings based on the U.S., Mexican, and South African samples. Also, this study provides information that promotes our knowledge about the efficacy of problem-solving constructs.

Keywords: problem-solving, confirmatory factor analysis, Romanian sample, PSI

Introduction

Starting with 1982 the Problem Solving Inventory (PSI) (Heppner & Peterson, 1982) was used in approximately 130 studies with various results with regard to its validity. A survey of the relevant literature (full text articles or

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abstracts) within the most important international data bases would show that there is low interest for this instrument in Europe and especially in Eastern Europe.

In the last 30 years, problem solving skills have been linked to a large number of clinical and health psychology variables, such as distress and depression (e.g., suicidal ideation). Furthermore, psychological counseling and educational psychology have benefited from new research directions in which problem solving instruments were used, including the PSI (Heppner, 2000, p. 591). Furthermore, problem solving skills (and their assessment) have been linked to a series of behavioral, cognitive and affective aspects (Heppner & Peterson, 1982; Heppner, Baumgardner, Larson, & Petty, 1988; Corey, 1996; Watson, & Tharp, 1997; DeJoung, & Berg, 1998; McMullin, 1999; Roşeanu, 2012). Relevant studies sustain that problem-solving appraisal is important for specialists in the field of pedagogy and psychology or researchers in general. Heppner and Baker (1997) sustain that the problem-solving theme has a great range of applicability for practitioners who are interested in increasing the efficiency of a large range of people (children, adolescents, adults and the elderly).

Huang and Flores (2011) show that the PSI has acceptable internal consistency for Mexican American High School Students. Most studies have been implemented for European American college students, and also for African American college students, South African college students, Turkish college students, French-speaking Canadian adults, and even on Chinese adolescents. On the other hand Heppner, Pretorius, Wei, Lee, and Wang (2002) consider that the PSI has a good internal consistency regardless of the culture in which the instrument has been used.

Huang and Flores (2011) used a Confirmatory Factor Analysis (CFA) which sustained the initial model proposed by Heppner and Peterson (1982). The obtained results sustain the cultural validity of PSI scores with Mexican Americans which suggests the possibility of generalization of these results to other cultures.

Several studies support the PSI's validity (e.g., Heppner & Peterson, 1982; Rath, Langenbahn, Simon, Sherr, Fletcher, & Diller, 2004; Salami & Aremu, 2006; Huang & Flores, 2011) especially the three factor model and a general score of the PSI. The first information with regard to discriminant validity have been presented by Heppner & Peterson (1982, pp. 71-72) who

reported correlations between the PSI factors and verbal and quantitative intelligence measures of the SCAT.

Beccaria and Machin (2010) studied the structural validity of the PSI using CFA and the relationship between the PSI's subscales with Positive and Negative Affect, Depression and Anxiety. Their results were consistent to a large extent with those previously obtained by Heppner, Witty, and Dixon (2004) without modification to the original structure. The results presented by Beccaria and Machin (2010) indicate good predictive validity, this also sustaining the structural validity of the PSI.

Lucas (2004) argued for the necessity for studies to clarify the problem of diversity (e.g., race, ethnicity, gender, and social class etc.). In view of these recommendations, in the study implemented in Romania, we aim to experimentally analyze the PSI, taking into account the cultural specificity of a post-communist country. Furthermore, Salami and Aremu (2006, p. 142) indicate that age, gender, ecological background, personal defects, innate and congenital factors, psycholinguistic problems, physical and cultural factors, and school environments are significant factors influencing students' study habits.

In the current study first we will evaluate the degree to which the PSI shows adequate internal consistency and reliability in the case of western Romanian population. Second, the factor structure of the PSI with Romanian high school student sample would support the use of the three factors of the PSI (i.e., Problem-Solving Confidence, Approach-Avoidance Style, and Personal Control; Heppner, 2000) and a general problem-solving factor (the PSI total score). We expect the results to sustain the PSI as an instrument that may be reliably used for the Romanian population.

Method

Participants

A sample of 422 participants, 223 women (aged 23.17 years; SD= 5.25) and 199 men (aged 22.33 years; SD= 4.84), was included in at least one aspect of the study. The participants were evaluated in groups of roughly 10-15 participants. The participants were informed that they have to fill in questionnaires related to personal perspective, emotions etc. All 422

participants filled in at least the PSI and they were included in the factor-analytic phase of the study.

Description of the instrument

The PSI is a 35 item instrument that measures the individual's beliefs regarding their general reaction to personal problems in their everyday lives. In fact, the PSI measures the evaluative awareness of one's problem solving abilities, and not actual problem solving skills. The instrument is composed of three subscales: problem solving confidence, approach-avoidance style, and personal control. A single score may be calculated as a general index of problem solving perception. The respondent uses a 6 point Likert scale (from 1 - "strongly agree" to 6 - "strongly disagree") to indicate the extent to he agrees with each item.

Procedure

Exploratory factor analysis vs. Confirmatory factor analysis

The PSI was analysed in the first phase by using the main components analysis (PCA). Consequently, in order to increase the interpretability of the data, direct oblimin solution was used, but also the rotated factor solution (Varimax; according to the study published by Heppner & Peterson, 1982, pp. 68-69). In the second phase, the structuring of the PSI factors was examined by using the AMOS structural equation modeling software. This procedure allowed the testing of the hypothesis according to which the solution with one factor would be the appropriate model for the inter relations between the PSI and its subscales.

Results and discussion

A principal components factor analysis was performed in order to identify the number of latent dimensions measured by the items of the scale. The KMO (.870) and Bartlett's Test [$\chi^2(595) = 4568.261$; $p < .01$] coefficients were within the accepted range; all items showed adequate extraction coefficients (Table 1).

Table 1. Communalities

Items	Extraction	Items	Extraction
psi1	.690	psi19	.596
psi2	.527	psi20	.635
psi3	.525	psi21	.532
psi4	.614	psi22	.610
psi5	.559	psi23	.541
psi6	.499	psi24	.611
psi7	.544	psi25	.507
psi8	.447	psi26	.521
psi9	.522	psi27	.638
psi10	.408	psi28	.607
psi11	.550	psi29	.642
psi12	.511	psi30	.649
psi13	.681	psi31	.587
psi14	.576	psi32	.572
psi15	.586	psi33	.621
psi16	.616	psi34	.495
psi17	.707	psi35	.531
psi18	.660		

Note: Extraction Method: Principal Component Analysis

The analysis yielded nine factors explaining 57.46% of common variance (Table 2). The scree plot however indicated a factor solution that contained fewer factors (Fig. 1).

Table 2. Total variance explained*

Comp.	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.765	22.187	22.187	3.254	9.298	9.298
2	2.962	8.463	30.650	3.063	8.752	18.050
3	2.127	6.078	36.727	2.558	7.308	25.358
4	1.611	4.602	41.330	2.230	6.372	31.731
5	1.316	3.761	45.091	2.010	5.744	37.475
6	1.180	3.371	48.462	1.941	5.545	43.019
7	1.090	3.115	51.577	1.898	5.423	48.443
8	1.048	2.993	54.570	1.836	5.246	53.689
9	1.020	2.916	57.486	1.329	3.797	57.486
10	.936	2.674	60.160			

Note: Extraction Method: Principal Component Analysis

*Table only partially reproduced

In order to identify the exact number factors we used the parallel factor analysis procedure. This is considered a most reliable method for determining the exact number of factors (Lance, Butts, & Michels, 2006). This analysis is possible in SPSS using a syntax offered by O'Connor, (2000).

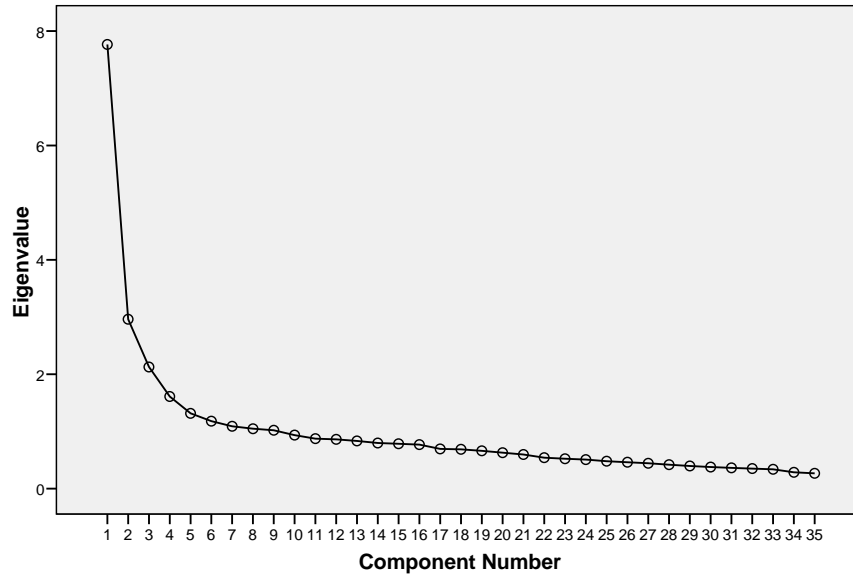


Figure 1. Scree plot for the PSI factor analysis

The parallel factor analysis indicated a three-factor solution (Table 3). The authors of the scale also suggest a similar solution (Heppner & Petersen, 1982) however they based this suggestion on the observations of the scree plot.

Root	Eigenvalues
1	7.177
2	2.343
3	1.553
4	.984

Next, we ran another principal components factor analysis in which we specified the extraction of three factors. The results show that these principal components explain 36.72% of the total variance (Table 4).

Table 4. Total variance explained – three factor solution

Comp.	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.765	22.187	22.187	5.073	14.495	14.495
2	2.962	8.463	30.650	3.896	11.132	25.628
3	2.127	6.078	36.727	3.885	11.100	36.727

Note: Extraction Method: Principal Component Analysis

*Table only partially reproduced

Using a varimax rotation and applying the rule of retaining only those factor loadings above .3, the three factors were identified contained 14, 11, and 9 items (Table 5). The three factors obtained by the authors of the scale contained 11, 16, and 5 items; an initial discrepancy between these two results is observed. Also, in our analysis item 22 did not load significantly on any factor, thus it was dropped from the scale.

Table 5. Rotated component matrix

	Component		
	1	2	3
psi19	.664		
psi27	.620		-.327
psi7	.607		
psi24	.594		-.376
psi10	.583		
psi5	.570		
psi23	.568		
psi12	.528		
psi35	.527		
psi31	.503	-.382	
psi28	.498		
psi33	.482		
psi20	.453		
psi8	.417		.306
psi22			
psi17		.720	
psi15		.603	.362
psi13		.571	
psi16	.424	-.550	

Table 5. Rotated component matrix - *continued*

	1	2	3
psi18	.472	-.535	
psi4		.497	
psi29		.484	
psi6	.423	-.461	
psi30		.454	
psi1		.380	
psi2		.326	
psi32			.650
psi25			.649
psi11			.627
psi34			.613
psi21		.311	.594
psi3			.588
psi26		.342	.517
psi14		.348	.475
psi9			.307

Note: Extraction Method: Principal Component Analysis; Rotation Method; Varimax with Kaiser Normalization

The first identified factor coincided with the factor named “*problem solving confidence*” by the authors of the scale. It is composed of items that have a common theme that indicates the confidence one has in solving their problems. This factor and explains 14.49% of variance (eigenvalue 5.07) being composed of items such as: “When I make plans to solve a problem, I am almost certain that I can make them work”. The Cronbach's Alpha calculated for this subscale was .839 (n=14).

The second factor coincided with the factor named by the authors “*personal control*”. It contains items that evaluate the common theme of impulse-control. It explains 11.13% of variance (eigenvalue 3.89) and is composed of items such as: “I generally go with the first good idea that comes to my mind”. The Cronbach's Alpha calculated for this subscale was .782 (n=11).

The third factor coincided with the last factor identified by the authors and was named “*approach-avoidance style*”. It is composed of items that have as a central theme whether an individual approaches or avoids different problem-solving activities. This factor explains 11.10% of variance (eigenvalue 3.88) and is composed of items such as: “Sometimes I feel so emotionally

charged that I am not able see too many aspects to solve my problem”. The Cronbach's Alpha calculated for this subscale was .803 (n=9).

Our results were similar with those of the authors of the scale. The same three factors were identified by the factor analysis, however, the number of items that constitute each factor was different, and some items loaded on different factors.

In order to evaluate the validity of the three factor structure of the PSI we ran an exploratory factor analysis. Our results indicate that the proposed model is adequate (Table 6 fit indices; Table 7 regression weights). The structural model is presented in Fig. 2.

Table 6. Main model fit indices for the proposed model

(CMIN/DF)	GFI	RMR	Standardized RMR	RMSEA
3.049	.808	.091	.071	.07

All items have significantly high loading coefficients on their respective factors (Table 7). In addition, the three factors show high loading coefficients on the general factor.

Table 7. Regression Weights

			Estimate	S.E.	C.R.	P
Factor 1	<---	General factor	1.000			
Factor 3	<---	General factor	-1.518	.205	-7.414	***
Factor 2	<---	General factor	-2.030	.267	-7.591	***
psi35	<---	Factor 1	.813	.086	9.402	***
psi33	<---	Factor 1	.690	.090	7.705	***
psi31	<---	Factor 1	.950	.099	9.582	***
psi28	<---	Factor 1	.846	.103	8.186	***
psi27	<---	Factor 1	.973	.096	10.093	***
psi24	<---	Factor 1	1.082	.101	10.740	***
psi23	<---	Factor 1	.848	.087	9.699	***
psi20	<---	Factor 1	.823	.098	8.419	***
psi12	<---	Factor 1	.699	.088	7.929	***
psi10	<---	Factor 1	1.103	.109	10.147	***
psi8	<---	Factor 1	.677	.108	6.295	***
psi7	<---	Factor 1	1.090	.106	10.262	***
psi5	<---	Factor 1	.879	.091	9.627	***

Table 7. Regression Weights

			Estimate	S.E.	C.R.	P
psi19	<---	Factor 1	1.000			
psi17	<---	Factor 2	1.000			
psi1	<---	Factor 2	.633	.091	6.987	***
psi2	<---	Factor 2	.554	.086	6.429	***
psi4	<---	Factor 2	.585	.080	7.330	***
psi6	<---	Factor 2	-.579	.066	-8.791	***
psi13	<---	Factor 2	.679	.073	9.262	***
psi15	<---	Factor 2	.941	.079	11.900	***
psi16	<---	Factor 2	-.589	.059	-9.944	***
psi18	<---	Factor 2	-.679	.064	-10.619	***
psi29	<---	Factor 2	.594	.069	8.589	***
psi30	<---	Factor 2	.547	.072	7.654	***
psi32	<---	Factor 3	1.000			
psi3	<---	Factor 3	.920	.099	9.314	***
psi9	<---	Factor 3	.389	.081	4.793	***
psi11	<---	Factor 3	.956	.095	10.067	***
psi14	<---	Factor 3	.797	.090	8.854	***
psi21	<---	Factor 3	.977	.092	10.645	***
psi25	<---	Factor 3	.845	.086	9.876	***
psi26	<---	Factor 3	.991	.097	10.204	***
psi34	<---	Factor 3	.962	.095	10.157	***

Note: *** $p < .001$

Our results indicate that the three model proposed by Heppner and Peterson (1982) in which three sub factors constitute a general problem solving factor is adequate. Thus we can conclude that the three identified factors represent distinct components of problem solving.

In summary, our validation study of the PSI for the Romanian population yielded an instrument that is composed of 34 items that group in three factors which in turn load on a general factor. These results only partially correspond to those obtained by the authors of the scale. The identified factors are identical with those suggested by the authors; however, their composition is somewhat different. For the Romanian version, the *problem solving confidence* factor is composed of the items: 19, 27, 7, 24, 10, 5, 23, 12, 35, 31, 28, 33, 20, 8; the *personal control* factor is composed of the items: 17, 15, 13, 16, 18, 4,

29, 6, 30, 1, 2; the *approach-avoidance style* factor is composed of the items: 32, 25, 11, 34, 21, 3, 26, 14, 9. The three sub factors may be considered to compose a general problem solving factor.

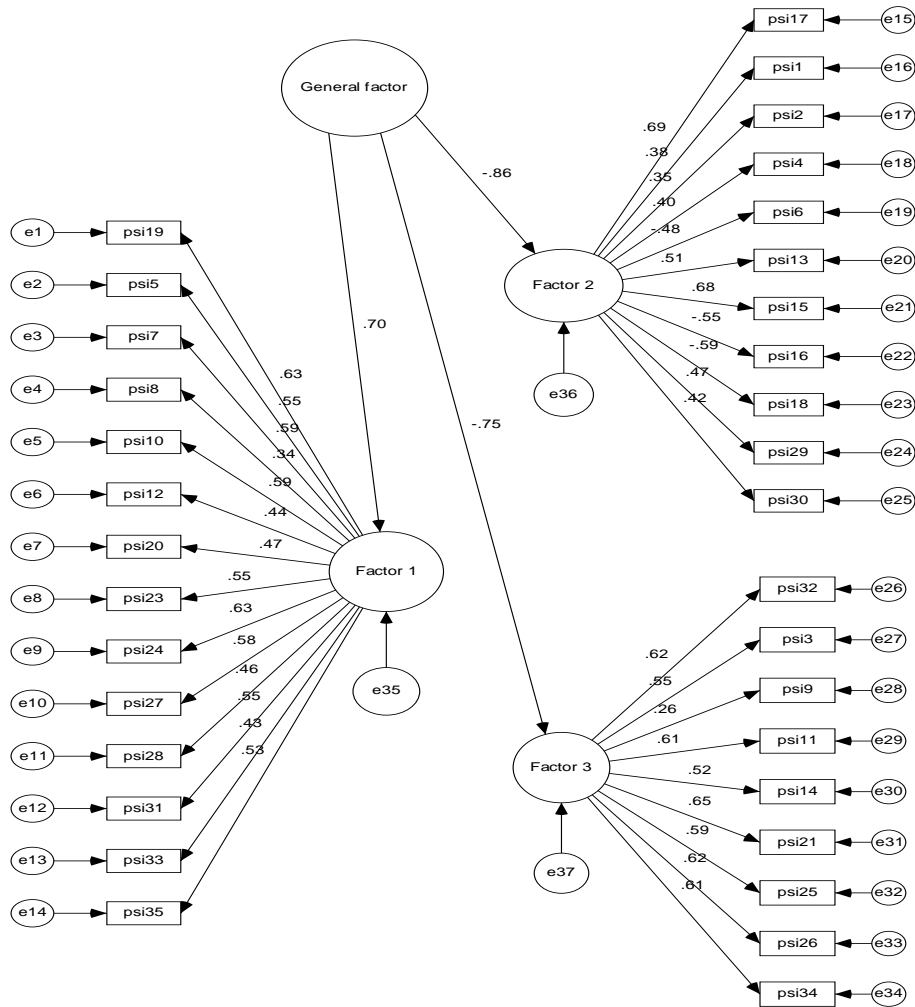


Figure 2. The structural model for the PSI

Conclusions

In this study we adapted the Problem Solving Inventory (Heppner & Petersen, 1982) for the Romanian population. Our results indicated the same three factors identified by the authors of the instrument. Also, a general problem solving factor was revealed. Several differences within the factor loadings were observed between the two studies. Based on the results of the exploratory and confirmatory factor analyses and on the internal consistency coefficients as well we can conclude that the PSI is adequate to be used in clinical settings.

References

- Beccaria, G., & Machin, M. A. (2010). *Examining the validity of the problem solving inventory in Australia*. In: 27th International Congress of Applied Psychology, 11-16 July 2010, Melbourne, Australia.
- Corey, G. (1996). *Theory and practice of counseling and psychotherapy (fifth edition)*. Pacific Grove, CA: Brooks/Cole Publishing Company.
- DeJoung, P., & Berg, I. K. (1998). *Interviewing for Solutions*. Pacific Grove, CA: Brooks/Cole Publishing Company.
- Heppner, P. P. (2000). Problem-Solving Inventory. In K. Corcoran & J. Fischer (Eds.), *Measures for Clinical Practice. Third Edition. Volume 2 Adults* (pp. 591-594). New York: The Free Press.
- Heppner, P. P., & Petersen, C. H. (1982). The Development and Implications of a Personal Problem-Solving Inventory. *Journal of Counseling Psychology*, 29(1), 66-75.
- Heppner, P. P., & Baker, C. E. (1997). Applications of the Problem-Solving Inventory. *Measurement and Evaluation in Counseling and Development*, 29(1), 229-241.
- Heppner, P. P., Baumgardner, A. H., Larson, L. M., & Petty, R. E. (1988). The utility of problem solving training that emphasizes self-management principles. *Counseling Psychology Quarterly*, 1, 129-143.
- Heppner, P. P., Pretorius, T. B., Wei, M., Lee, D., & Wang, Y. (2002). Examining the generalizability of problem-solving appraisal in Black South Africans. *Journal of Counseling Psychology*, 49, 484-498.

- Heppner, P. P., Witty, T. E., & Dixon, W. A. (2004). Problem-solving appraisal and human adjustment: A review of 20 years of research using the Problem Solving Inventory. *The Counseling Psychologist, 32*, 344-428.
- Huang, Y. P., & Flores, L. Y. (2011). Exploring the Validity of the Problem-Solving Inventory with Mexican American High School Students. *Journal of Career Assessment, 19*(4), 431-441.
- Lance, C. E., Butts, M. M., & Michels, L. C. (2006). The sources of four commonly reported cutoff criteria: What did they really say? *Organizational Research Methods, 9*(2), 202-220.
- Lucas, M. (2004). Problem-solving appraisal in counseling and with different populations. *The Counseling Psychologist, 32*, 450-459.
- McMullin, R. E. (1999). *The new handbook of cognitive therapy techniques*. New York: W. W. Norton & Company.
- O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instrumentation, and Computers, 32*, 396-402.
- Rath, J. F., Langenbahn, D. M., Simon, D., Sherr, R. L., Fletcher, J., & Diller, L. (2004). The construct of problem solving in higher-level neuropsychological assessment and rehabilitation. *Archives of Clinical Neuropsychology, 19*, 613-635.
- Roşeanu, G. (2012). Temporal dimensions and social problem solving. *International Journal of Education and Psychology in the Community, 2*(1), 79-92.
- Salami, S. O., & Aremu, A. O. (2006). Relationship between Problem-Solving Ability and Study Behaviour among School-Going Adolescents in Southwestern Nigeria. *Electronic Journal of Research in Educational Psychology, 4*(8), 139-154.
- Watson, D. L., & Tharp, R. G. (1997). *Self-directed behavior: self-modification for personal adjustment (Seventh edition)*. Pacific Grove, CA: Brooks/Cole Publishing Company.

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