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The Factor Structure of the Problem Solving Inventory

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Heppner and Petersen (1982) derived a three-dimensional structure for the items of the Problem Solving Inventory using principal components analysis. D'Zurilla and Maydeu-Olivares (1995) pointed out the lack of any clear link of the scales of the Problem Solving Inventory (PSI) to social problem-solving theory, which impairs the interpretation of any empirical results obtained with the use of this inventory. To address this issue, we used maximum likelihood factor analysis to investigate the dimensional structure of this inventory. We found that an unrestricted three-dimensional model adequately fit this data but did not match Heppner and Petersen's structure, nor could it be interpreted substantively. Neither four- nor five-dimensional models could be interpreted regardless of the rotation procedure used.

Although a two-factor model did not fit the data adequately either, a careful content analysis of the PSI items revealed only two interpretable clusters of items in this inventory, measuring problem-solving self-efficacy and problem solving skills, respectively. In addition, there is also a heterogeneous cluster of items responsible for the residual third dimension appearing in Heppner and Petersen's as well as in the current analyses. Using a theory-guided item-selection procedure we constructed two new PSI scales measuring the two interpretable constructs. The items composing these scales are shown to fit an independent clusters two-dimensional solution.

Keyword: SPSI, personal problem solving, interpersonal problem solving, counseling

Over the past 20 years, counseling and clinical psychologists have devoted a considerable amount of research to investigate how subjects solve their real-life problems (D'Zurilla, 1986; Heppner & Hillerbrand, 1991; Nezu, Nezu & Perri, 1989; Poon, Rubin & Wilson, 1989; Sinnott, 1989; Sternberg & Wagner, 1986; Tisdelle & St. Lawrence, 1986). Most research efforts have focused on the relationships between problem-solving abilities and psychological and behavioral adjustment (see D'Zurilla, 1986; Heppner & Hillenbrand, 1991; Nezu et al., 1989). In general, the results of these studies supported the view that problem solving is indeed an important factor in psychological adjustment. Yet, because of the lack of convincing evidence for the construct validity of the measures many studies have been viewed with skepticism (Butler & Meichenbaum, 1981; D'Zurilla, 1986; Tisdelle & St. Lawrence, 1986; Yoman & Edelstein, 1993).

One of the most widely used instruments for assessing problem solving in counseling, medical, and educational settings is the Problem Solving Inventory (PSI: Heppner & Petersen, 1982; Heppner, 1988). According to its authors, the PSI measures three constructs:

1) *Problem Solving Confidence*, representing the person's believe and trust in their own problem-solving abilities,
2) *Approach-Avoidance Style*, defined as the person's general tendency to approach or avoid social problem solving, and
3) *Personal Control*, representing the extent to which individuals believe they are in control of their emotions and behavior while solving real-life problems.

Recently, however, D'Zurilla and Maydeu-Olivares (1995) noted that the construct validity of the PSI is questionable because these constructs are not directly related to any existing model or theory of how subjects solve real-life problems – which makes it extremely difficult to interpret properly the empirical studies performed with this inventory.

The Problem Solving Inventory consists of 35 6-point Likert-type items, of which only 32 items are actually scored. These items were selected from an initial pool of 50 items generated by Heppner and Petersen as indicators of the five stages that appeared in D'Zurilla and Goldfried's (1971) problem-solving model: general orientation, problem definition, generation of alternatives, decision making, and evaluation. After applying principal components analysis to those 50 items, Heppner and Petersen (1982), based on the inspection of the eigenvalues obtained, concluded that a three-dimensional solution was most appropriate for the 50-item set. The 32 items that showed a component loading greater than .3 on the orthogonally rotated (varimax) pattern matrix make up the actual PSI. Three scale scores and a global score can be computed from the items of the PSI. The three scales correspond to the items that were most highly loaded by each of the three extracted principal components. The three scales have been labeled (Heppner, 1988, pp. 1–2): (1) *Problem Solving Confidence* (PSC: 11 items), (2) *Approach-Avoidance Style* (AAS: 16 items), and (3) *Personal Control* (PC: 5 items). This dimensional structure has been quite successfully replicated in other studies that only analyzed the 32 scored PSI items (although the third dimension, Personal Control, does not seem to replicate well across samples; see Heppner, 1988, pp. 7–9). Furthermore, the scales of the PSI have been shown to have adequate reliability and convergent and discriminant validity (see Dixon, Heppner & Anderson, 1991; Elliot, Godshall, Herrick, Witty & Spruell, 1991; Elliot, Godshall, Shrout & Witty, 1990; Heppner, 1988; Heppner & Petersen, 1982; Larson, Piersel, Imao & Allen, 1990; MacNair & Elliot, 1992).

The original theoretical model of D'Zurilla and Goldfried's (1971), used by Heppner and Petersen (1982) to generate the PSI items, was subsequently modified by D'Zurilla and associates (D'Zurilla & Nezu, 1982, 1990; D'Zurilla, 1986; D'Zurilla & Maydeu-Olivares, 1995; Maydeu-Olivares & D'Zurilla, 1996) into a problem-solving model with two major components: 1) *problem orientation* and 2) *problem solving proper*. The problem-orientation component focuses on metacognitive processes that reflect the person's general awareness and appraisals of everyday problems, as well as his or her own problem-solving ability or efficacy. The problem-solving proper component of the model focuses on four specific, goal-directed tasks that enable a person to solve a particular problem successfully:

1) problem definition and formulation,
2) generation of alternative solutions,
3) decision making, and
4) solution implementation and verification (i. e., evaluation of solution outcome).

Each of the above tasks is viewed as a complex learned skill that is probably based on several underlying abilities. It is also assumed that the relations among these skilled tasks are interactive, i. e., problem solving is a dynamic process involving reciprocal relations among these different skills.

D'Zurilla and Nezu (1990) constructed a self-report inventory, the Social Problem Solving Inventory (SPSI), explicitly designed to match this theoretical model. Maydeu-Olivares and D'Zurilla (1995, 1996) used two different factor-analytic procedures to conclude that the items of the SPSI actually measure two different kinds of problem orientation (positive and negative) and three different kinds of problem-solving styles (a rational or adaptive style, an impulsive/careless style, and an avoidance style). On the basis of these results, D'Zurilla, Nezu and Maydeu-Olivares (1996) constructed a revised SPSI (named SPSI-R) to assess these five dimensions.

Thus, although the PSI and the SPSI may be regarded as independent attempts to map essentially the same theoretical model into an assessment instrument, the results of the dimensionality analyses performed on these two instruments are quite different, since the components of the PSI as defined by Heppner and Petersen (1982) are not directly related to the factors that Maydeu-Olivares and D'Zurilla (1995, 1996) found when analyzing a set of items generated according to a revised version of the same theoretical model.

This lack of agreement between the theoretical model used to generate the PSI (D'Zurilla & Goldfried's model) and the PSI scales derived by Heppner and Petersen (1982) – along with some methodological concerns about the analyses performed to derive these scales – led us to explore the factor structure of the PSI. One of our concerns was the fact that although Heppner (1988, p. 9) reports that the PSI scales are significantly correlated (around .40 with about 3000 subjects), he did not performed an oblique rotation of the principal components structure. Instead, the assignment of the items to the scales was based on an orthogonal solution (i. e., the items were assigned to the scales assuming that the factors were uncorrelated). An oblique rotation might have suggested a different grouping of the PSI items. Also, Heppner and Petersen (1982) used principal components analysis to derive the PSI scales. We were interested in determining whether similar results would be obtained if a more statistically sound method, such as maximum likelihood factor analysis, was used instead of principal component analysis.

Study 1

Method

Subjects

A pooled sample of 415 undergraduate college students enrolled in the introductory psychology course at the State University of New York at Stony Brook was used: 295 students were assessed in the spring, and 120 students were assessed in the fall.

Measures

Problem Solving Inventory. The PSI (Heppner & Petersen, 1982; Heppner, 1988) is a 35-item, 6-point Likert-type self-report scale intended to measure the person's perception or appraisal of his or her problem-solving capabilities. Three scale scores and a global score can be obtained from the 32 scored items of this inventory. The three scales are: (1) *Problem Solving Confidence* (PSC: 11 items), (2) *Approach-Avoidance Style* (AAS: 16 items), and (3) *Personal Control* (PC: 5 items). Two forms of this inventory exist (Forms A and B); we used Form B (Heppner, 1988) in this study.

Procedure

Since the PSI consists of six-point Likert-type items, there is a choice between analyzing them as if they were on an interval scale via maximum likelihood estimation, or analyzing them as ordinal variables via the categorical methodology of Muthén (1984). We have used both methodologies in the past to analyze the SPSI (Maydeu-Olivares & D'Zurilla, 1995, 1996), which consists of five-point Likert-type items. Both methodologies were also applied to analyze the PSI items, and not surprisingly the results obtained are almost identical. We report here only those results obtained using maximum likelihood factor analysis on the inter-item correlation matrix since it is a simpler and somewhat more robust method (see Muthén, 1993). Therefore, the results of these studies should be compared with those of Maydeu-Olivares and D'Zurilla (1996).

Assessing the goodness of fit of a model is a multifaceted and controversial issue (Tanaka, 1993); therefore, we used several different indices to select the most appropriate model for these data (see Bentler, 1990; Bollen, 1989; Bollen & Long, 1993; McDonald & Marsh, 1990). Because the models to be fitted here are only approximations to reality, they will be rejected by the χ^2 test statistic at a conventional α level if a large enough sample is used; conversely, they will be accepted if a small enough sample is used (Browne & Cudeck, 1993). Thus, in addition to χ^2, we also used the following indices to assess goodness of fit: the Root Mean Squared Error of Approximation (RMSEA; Steiger, 1990), the Root Mean Squared Residual (RMSR; Jöreskog & Sörbom, 1993), and the Adjusted Goodness-of-Fit Index (AGFI; Jöreskog & Sörbom, 1993). An adequate to good fit is suggested by RMSEA and RMSR values approaching .05; for the AGFI index, values between .80 and 1.00 indicate adequate to good fit.

Results

We first tested Heppner and Petersen's (1982) model by fitting a confirmatory three-factor model in which each of the PSI items was loaded solely by its corresponding factor. This model fitted the data rather poorly, χ^2 (461) = 1338.58, $p < .001$, RMSEA = .068, p (RMSEA < .05) < .001, RMSR = .075, AGFI = .79. To see if a better fitting model could be obtained for these data, we fitted an unrestricted factor model in which each item could be loaded by all three factors. This is because if an unrestricted

Table 1. Pattern matrix of factor loadings of an unrestricted factor model of the PSI after an oblique rotation.

Scale	Item	factor 1	factor 2	factor 3
PSC	5	.36765	.24899	
PSC	10	.47536		
PSC	11	.46964		.20087
PSC	12	.44287		
PSC	19	.61374		
PSC	23	.58603		
PSC	24	.62225		
PSC	27	.71720		
PSC	33	.46809		
PSC	34	.50952		.30147
PSC	35	.30734	.30698	
AAS	1		.32402	.20080
AAS	2	.21533	.29054	.27007
AAS	4		.28108	.33785
AAS	6		.46026	
AAS	7		.63257	
AAS	8		.53381	
AAS	13	−.27271	.63133	
AAS	15		.31897	.47083
AAS	16		.47163	
AAS	17	−.32356		.65560
AAS	18		.63895	
AAS	20		.51977	
AAS	21			.44575
AAS	28	.30129		
AAS	30		.28138	.30245
AAS	31		.42890	.21235
PC	3	.44315		.37087
PC	14			.52044
PC	25	.29171	−.26839	.47291
PC	26	.32315		.47667
PC	32	.32454	−.22130	.45847

Note: N = 405. All factor loadings <.2 have not been printed. PSC = Problem Solving Confidence; AAS = Approach-Avoidance Style; PC = Personal Control

(exploratory) three-factor model does not fit the data satisfactorily, then no restricted (confirmatory) three-factor model will fit the data better than the unrestricted model. This unrestricted model fitted these data much better than the confirmatory model, χ^2 (403) = 837.09, $p < .001$, RMSEA = .051, p (RMSEA < .05) = .360, RMSR = .042, AGFI = .886. In fact, except for the χ^2 test, all other goodness-of-fit indices suggests that this model fits the data adequately. Unfortunately, despite using an array of different rotation procedures, this model did not yield an interpretable solution. For instance, in Table 1 we present the pattern matrix of factor loadings of this unrestricted model after being rotated using an oblimin criterion (see McDonald, 1985). The correlations between the PSC factor and the AAS and PC factors were found to be .28 and .35, respectively, whereas the correlation between the AAS the PC factors was found to be .29. As can be seen in Table 1, maximum-likelihood factor analysis does not recover the prescribed structure of the PSI since (a) although the PSC items form approximately an independent cluster, (b) all PC items are loaded most highly by its corresponding factor but most items show non-ignorable loadings on other factors, and (c) the AAS items are not clustered together. Furthermore, we are unable to interpret substantively the pattern matrix reported in Table 1.

In an attempt to find a better fitting model, we also estimated unrestricted four- and five-factor models to these data. Of course, these models yielded a better fit to the data, but like the three-factor model, they did not yield an independent clusters solutions, nor could they be interpreted, regardless of the rotation procedure used. An unrestricted two-factor model did not fit the data adequately, χ^2 (433) = 1292.945, $p < .001$, RMSEA = .060, p (RMSEA < .05) = < .001, RMSR = .063, AGFI = .756.

Discussion

Heppner (1988, p. 10) addressed the issue of the lack of match between the theoretical model used to generate the items and the dimensions obtained when analyzing the data by principal components stating that

> "[...] the results of analyses with the PSI suggest that underlying dimensions cut across the stages."

Using maximum-likelihood factor analysis, we have been unable to recover the three clusters of items composing the PSI scales. Furthermore, we have not been able to find any independent clusters solution in three, four or five dimensions that yielded at least an approximate fit to these data. In particular, a five-factor model did not match at all the five dimensions found by Maydeu-Olivares and D'Zurilla (1996) when factor analyzing the SPSI, using the same factor analytic procedure.

Since the first condition that a problem-solving measure must satisfy in order to ensure its construct validity is that its items be a representative sample of the domain being measured (D'Zurilla & Maydeu-Olivares, 1995: p. 413), we examined how well the items of the PSI match the D'Zurilla and Goldfried (1971) model from which they were drawn, and how they can be interpreted in light of the revised social problem-solving model of D'Zurilla and associates (D'Zurilla & Nezu, 1982, 1990; D'Zurilla, 1986; D'Zurilla & Maydeu-Olivares, 1995; Maydeu-Olivares & D'Zurilla, 1996).

After carefully examining the content of the PSI items, we have concluded that the labels assigned by Heppner and Petersen (1982) to the sets of items identified in their principal components analysis are not an adequate representation of the content of the items. For example, none of the items in the approach-avoidance style scale refer specifically to the avoidance of problems or to problem-solving behavior. Instead, some of them describe the careful, systematic application of problem-solving techniques, while others describe the impulsive or careless application of these techniques. Similarly, none of the items in the personal-control scale actually *describes* personal-control beliefs; instead, they all refer to disruptive or inhibitive responses that include negative affectivity and maladaptive coping attempts. In fact, two of the PSI scales – problem-solving confidence (PSC) and approach-avoidance style (AAS) – correspond closely to the problem-orientation and problem-solving proper components of the revised social-problem-solving model described by D'Zurilla and Nezu (D'Zurilla, 1986; D'Zurilla & Nezu, 1982). Ten out of the eleven problem-solving confidence items tap primarily problem-solving efficacy expectancies (i.e., the belief that one is capable of solving problems effectively), which are an important part of the problem-orientation component of the D'Zurilla and Nezu model. All of the approach-avoidance items ask subjects to report the extent to which they efficiently and effectively apply one of the four problem-solving techniques that comprise the problem-solving proper component of the model (e.g., problem definition and formulation, generation of alternative solutions, etc.), although it does not appear that a deliberate attempt was made to ensure that all four of these skills would be adequately represented.

In summary, in light of social problem-solving theory, we believe that only two dimensions can be extracted from the PSI items: *problem-solving self-efficacy* and *problem solving skills*. The items loaded by the first of these dimensions would roughly correspond to the items included in Heppner and Petersen's PSC scale and those loaded by the second dimension in the AAS scale. However, because the PSI items are so heterogeneous, no two-dimensional solution may adequately fit these data. When, while searching for a better fitting model, a three-dimensional model is obtained, the third dimension seems to be a residual dimension consisting of the items that do not fit in the two major dimensions. Heppner and Petersen's third component, called very inappropriately "personal control," is uninterpretable in terms of any social problem-solving model and therefore lacks construct validity: Its use cannot be recommended. It was thus deemed necessary to revise the PSI scales by selecting the core items in each scale that would better tap the two major dimensions of the PSI, namely, problem-solving self-efficacy and problem solving skills. A careful inspection of the contents of the PSI items suggested that the items that most closely match the construct of problem-solving self-efficacy are items {3, 10, 11, 19, 23, 24, 27}, whereas the items that most closely match the construct of problem solving skills are items {1, 6, 7, 15, 16, 18, 20, 29, 31}. (The content of these items is included as an Appendix to this article.) We will refer to these sets of items as PSI-PSSE and PSI-PSS, respectively. Notice that all PSI-PSSE items but item 3 also belong to the original PSC scale of the PSI, whereas all PSI-PSS items but item 29 also belong to the original AAS scale of the PSI. Item 3 was included by Heppner and Petersen (1982) into the PC scale, whereas item 29 was left as a filler item.

We performed additional analyses to examine the reliability and validity of the theory-based PSI scales. In order to assess the construct validity of these scales, we fitted a two-dimensional factor model to these data, since according to social problem-solving theory, the items composing these scales should fit a two-dimensional model. We also examined the relationships between the original and the newly developed PSI scales and measures of optimism, pessimism, and hopelessness, as well as with other measures of social problem solving. We chose measures of optimism, pessimism, and hopelessness because they are important indicators of adaptation in a college student population from which the subjects were drawn (Dunkel-Schetter & Lobel, 1990).

Study 2

Method

Subjects

The same data presented in Study 1 was re-analyzed here.

Measures

All subjects were administered the Problem Solving Inventory (PSI: Heppner & Petersen, 1982; Heppner, 1988). In addition, the 120 students assessed in the fall were also administered (1) the Social Problem Solving Inventory–Revised (SPSI-R: D'Zurilla, Nezu & Maydeu-Olivares, 1997), (2) the Life Orientation Test (LOT: Scheier & Carver, 1985), (3) the Hopelessness Scale (HS: Beck, Weissman, Lester & Trexler, 1974), and (4) the Optimism and Pessimism Scale (OPS: Dember, Martin, Hummer, Howe & Melton, 1989). The latter measures were administered to assess whether reducing the number of items of the PSC and AAS scales to achieve unidimensionality and to increase theoretical interpretability actually resulted in decreased predictions.

Problem Solving Inventory (PSI: Heppner, 1988; Heppner & Petersen, 1982) was described above.

Social Problem Solving Inventory-Revised. The SPSI-R (D'Zurilla, Nezu & Maydeu-Olivares, 1997; D'Zurilla & Nezu, 1990) is a 52-item, multidimensional, Likert-type self-report measure based on the prescriptive model of social problem solving developed by D'Zurilla and associates (D'Zurilla, 1986; D'Zurilla & Nezu, 1982; D'Zurilla & Goldfried, 1971). The SPSI-R consists of 5 scales, each measuring a distinct unidimensional construct: Positive Problem Orientation (PPO: 5 items), Negative Problem Orientation (NPO: 10 items), Problem Solving Skills (PSS: 20 items), Impulsivity/Carelessness Style (ICS: 10 items), and Avoidance Style (AS: 7 items).

The PPO scale reflects an adaptive, facilitative problem-solving cognitive "set" (e. g., challenge appraisals, problem-solving efficacy expectancies, positive outcome expectancies, etc.), whereas the NPO scale assesses maladaptive or disruptive cognitive processes and emotional states (e. g., threat appraisals, problem-solving inefficacy expectancies, negative outcome expectancies, low frustration tolerance, etc.). The PSS scale taps an adaptive problem-solving coping style that may be defined as the deliberate, systematic, and efficient application of effective problem-solving principles and techniques. The ICS scale, on the other hand, taps a maladaptive

problem-solving style that may be described as hurried, impulsive, inefficient, and careless. Finally, the AS scale taps another maladaptive problem-solving style characterized by procrastination, passivity, and dependency.

Life Orientation Test. The LOT is a measure of generalized outcome expectancies developed by Scheier and Carver (1985). It consists of eight 5-point Likert-type items and has been consistently found to be two dimensional (Chang, D'Zurilla & Maydeu-Olivares, 1994; Marshall, Wortman, Kusulas, Hervig, & Vickers, 1992). In this study, following Chang et al. (1994) we used two scales LOTOPT and LOTPES consisting of the LOT items that measure optimism and pessimism, defined as positive and negative generalized outcome expectancies, respectively.

Hopelessness Scale. The HS is a unidimensional measure of hopelessness or negative expectancies developed by Beck et al. (1974). It consists of 20 dichotomous items of which 11 are worded negatively (negative expectancies) and 9 positively (positive expectancies). The test is keyed such that higher scores indicate greater pessimism or "hopelessness."

Optimism and Pessimism Scale. Dember et al. (1989) developed the OPS to measure optimism and pessimism in the broadest sense of the terms. Optimism was defined as a bias in perceptions and expectancies in favor of the positive features of life, while pessimism was defined as a negative bias. The OPS consists of 56 Likert-type items, 18 of which reflect optimism and another 18 reflect pessimism. The remaining 20 items are filler items. In this paper, we used two unidimensional OPS scales developed by Chang et al. (1994) to match as closely as possible the constructs of positive and negative outcome expectancies, respectively. These scales will be referred to as OPSOPT and OPSPES.

Adequate reliability and validity has been reported for all these measures. For example, the internal consistency of the SPSI-R scales ranges from .80 to .94 (D'Zurilla, Nezu & Maydeu-Olivares, 1997). The internal consistency of the LOTOPS, LOTPES, HS, OPSOPT and OPSPES is .76, .86, .95, .71, and .86, respectively (Chang et al., 1994).

Procedure

We fitted a confirmatory two-factor model to the items identified previously in which each of the PSI items was loaded solely by its corresponding factor and the factors were correlated. As before, maximum likelihood estimation on the inter-item correlation matrix was used.

Results

Although the χ^2 test rejects the model, the other goodness of fit indices clearly indicate that this model fits the data adequately, $\chi^2(103) = 210.10, p < .001$, RMSEA = .050, p (RMSEA < .05) = .48, RMSR = .050, AGFI = .92. The resulting matrix of factor loading is presented in Table 2. As expected, these two factors are significantly correlated ($r = .527$). Since the two-independent clusters solution shown in Table 2 fits the data adequately, each of the new PSI scales will fit adequately a unidimensional model.

In Table 3 we present the means, standard deviations, reliability estimates, and intercorrelations among the original PSI scales and the new PSI scales. As expected, the PSI-PSSE and the PSI-PSS scales correlate very highly with the PSC and AAS scales, –.93 and –.92, respectively. Given these high correlations, it would be expected that in most practical applications the substantive results will not be changed if the PSI-PSSE and PSI-PSS scales are used in place of the original PSC and AAS scales. Since the magnitude of coefficient α depends on the number of items (McDonald, in press), and since the new PSI scales are shorter than the original PSI scales, the new scales show a slightly lower coefficient α than the original scales. However, when a scale can be shown to be unidimensional, like the

Table 2. Matrix of factor loadings of a two-dimensional confirmatory model applied to the set of PSI-PSSE and PSI-PSS items.

Item	PSSE	PSS
3	0.505	0
10	0.574	0
11	0.477	0
19	0.604	0
23	0.628	0
24	0.635	0
27	0.717	0
1	0	0.494
6	0	0.469
7	0	0.554
15	0	0.558
16	0	0.482
18	0	0.731
20	0	0.539
29	0	0.466
31	0	0.628

Note: $N = 405$. PSSE = Problem Solving Self-Efficacy; PSS = Problem Solving Skills. The standard errors were all within .040 and .060. The correlation between the PSSE and PSS factors is 0.527 with a standard error of 0.048.

Table 3. Means, standard deviations, internal consistency estimates, and intercorrelations among the newly developed PSI scales and the original PSI scales.

	PSI-PSSE	PSI-PSS	PSC	AAS	PC	PSI
PSI-PSSE		0.42	–0.93	–0.46	–0.59	–0.77
PSI-PSS			–0.47	–0.92	–0.50	–0.80
PSC				0.50	0.53	0.80
AAS					0.49	0.89
PC						0.73
$\bar{x}$	31.00	39.04	27.61	46.69	18.25	92.55
std	5.69	7.19	7.90	11.93	5.14	20.68
α	79	0.79	0.82	0.84	0.75	0.90
items	7	9	11	16	5	32

Notes: $N = 405$. All correlations are significant ($p < .01$). New PSI scales: PSI-PSSE = Problem Solving Self-Efficacy; PSI-PSS = Problem Solving Skills. Original PSI scales: PSC = Problem Solving Confidence; AAS = Approach-Avoidance Style; PC = Personal Control; PSI = PSC + AAS + PC.

Table 4. Correlations between the PSI and measures of social problem solving, and optimism and pessimism.

	PSI-PSSE	PSI-PSS	PSC	AAS
PSS	0.31	0.60	–0.38	–0.63
PPO	0.61	0.41	–0.62	–0.42
NPO	–0.69	–0.47	0.66	0.44
AS	–0.46	–0.44	0.45	0.43
ICS	–0.33	–0.71	0.37	0.74
LOTOPS	0.41	0.21	–0.37	–0.22
LOTPES	–0.49	–0.24	0.46	0.29
HS	–0.50	–0.35	0.49	0.38
OPSOPT	0.38	0.29	–0.39	–0.27
OPSPES	–0.49	–0.24	0.46	0.28

Notes: $N = 111$. All correlations are significant ($p < .05$). New PSI scales: PSI-PSSE = Problem Solving Self-Efficacy; PSI-PSS = Problem Solving Skills. Original PSI scales: PSC = Problem Solving Confidence; AAS = Approach-Avoidance Style. SPSI-R scales: RPS = Rational Problem Solving Style; PPO = Positive Problem Orientation; NPO = Negative Problem Orientation; AS = Avoidance Style; ICS = Impulsivity/ Carelessness Style. LOTOPT = Life Orientation Test-Optimism index; LOTPES = Life Orientation Test-Pessimism index; HS = Hopelessness Scale; OPSOPT = Optimism and Pessimism Scale/Generalized Outcome Expectancies-Optimism index; OPSPES = Optimism and Pessimism Scale/Generalized Outcome Expectancies-Pessimism index.

new PSI scales, coefficient omega provides a better lower bound to the reliability of these scales (McDonald, in press; see also McDonald, 1985: pp. 214–222). The reliability of the PSI-PSSE and PSI-PSS scales as estimated by coefficient omega is .82 and .83, respectively, so that no substantial decrement in reliability is obtained by using the new PSI scales.

The reason for the negative correlation between the new PSI scales and the original PSI scales is that in our analyses we recoded all PSI items so that higher scores indicate a higher standing on the variable being measured. In its original scoring, the PSI scales correlated negatively with concurrent measures, for instance, with perceived problem-solving skills (Heppner, 1988) or with the SPSI-R (D'Zurilla, Nezu & Maydeu-Olivares, 1996), while they correlated positively with measures of general psychopathology.

In Table 4 we include the correlations between PSI scales and several external variables (the SPSI-R scales, the optimism and pessimism indices of the LOT and OPS, and the Helplessness Scale). As expected, a comparison of the correlations between the PSI-PSSE and the external variables and those between the PSC scale and the external variables shows that the differences are very small and certainly not significant. A similar result is observed when comparing the correlations between the PSI-PSS and the external variables and the AAS and the external variables.

As predicted by the social problem-solving model, this table also reveals that the PSI-PSSE correlates most highly with the problem-solving orientation scales of the SPSI-R (i.e., PPO and NPO, r = .61 and –.69, respectively). This scale is also a good predictor of pessimism and of avoidant behavior (all correlations are > .45). Similarly, the PSI-PSS scale is most highly correlated with the problem solving skills and the impulsivity/carelessness scales of the SPSI-R (r = .60 and –.71, respectively).

Discussion and Conclusions

Only two underlying dimensions are readily interpretable in the PSI using social problem-solving theory (D'Zurilla, 1986; D'Zurilla & Maydeu-Olivares, 1995; Maydeu-Olivares & D'Zurilla, 1996). These dimensions roughly correspond to the "Problem-Solving Confidence" and "Approach-Avoidance Style" scales described by Heppner and Petersen (1982). However, using social problem-solving theory, more appropriate labels for these dimensions are *problem-solving self-efficacy*, and *problem solving skills*. These dimensions are consistent with the revised versions of the theoretical model used to generate the items (e.g., D'Zurilla, 1986), as well as with recent empirical research based on this model (Maydeu-Olivares & D'Zurilla, 1995, 1996).

Using a theory-guided item-selection procedure we constructed two new PSI scales to measure these two dimensions of the PSI. We refer to these new

scales as Problem-Solving Self-Efficacy (PSI-PSSE), and Problem Solving Skills (PSI-PSS). These new PSI scales are very highly correlated with two of Heppner and Petersen's (1982) scales, the "Problem Solving Confidence" and "Approach-Avoidance Style" scales. Thus, the relationships between the new PSI scales and external variables should be similar to those observed between the corresponding original PSI scales and external variables. However, the psychometric properties of the new PSI scales are greatly improved over those of the original scales:

- they measure unidimensional constructs,
- these constructs are directly related to existing social problem-solving theories,
- their number of items has been reduced while maintaining the same reliability than the original scales,
- the direction of their relationships with external variables is more intuitive (i.e., they correlate positively with concurrent measures while negatively with measures of psychopathology).

In closing, the moderately high correlations in Table 4 between the two new PSI scales and certain SPSI-R scales require some brief discussion. As these correlations indicate, the new PSI-PSSE scale is measuring a construct that is very similar to the constructs measured by the PPO and NPO scales of the SPSI-R. Similarly, the new PSI-PSS scale measures a construct that is very similar to the constructs measured by the RPS and ICS scales of the SPSI-R. However, the correlations between these measures are not so high as to suggest that these constructs are identical, or that these PSI scales and the SPSI-R scales are redundant. Problem-solving self-efficacy, as measured by the PSI-PSSE, is only one component of the two-dimensional problem-orientation concept measured by the PPO and NPO scales of the SPSI-R. Other aspects of problem orientation include challenge and threat appraisals, problem-solving outcome expectancies, and frustration tolerance (Chang & D'Zurilla, 1996; Maydeu-Olivares & D'Zurilla, 1996). The PSI-PSS scale assesses both constructive and dysfunctional problem-solving behaviors, whereas the RPS and ICS scales of the SPSI-R are separate measures of constructive and dysfunctional problem-solving dimensions. Thus, the PSI-PSSE scale would be used when an investigator is interested in a specific measure of problem-solving self-efficacy rather than a broader measure of positive or negative problem orientation. In addition, the PSI-PSS would be used when an investigator is interested in a brief, single measure of constructive and dysfunctional problem-solving behaviors rather than separate measures of constructive problem-solving skills and impulsive-careless problem solving.

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Appendix

Problem Solving Inventory items, form B (PSI: Heppner, 1988) composing the new social problem-solving scales described in this article. Their enumeration corresponds to that of the original PSI.

Problem Solving Self-Efficacy (PSI-PSSE)

3. When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.
10. I have the ability to solve most problems even though initially no solution is immediately apparent.
11. Many of the problems I face are too complex for me to solve.
19. When I make plans to solve a problem, I am almost certain that I can make them work.
23. Given enough time and effort, I believe I can solve most problems that confront me.
24. When faced with a novel situation, I have confidence that I can handle problems that may arise.
27. I trust my ability to solve new and difficult problems.

Problem Solving Skills (PSI-PSS)

1. When a solution to a problem has failed, I do not examine why it didn't work.
6. After following a course of action to solve a problem, I compare the actual outcome with the one I had anticipated.
7. When I have a problem, I think of as many possible ways to handle it as I can until I can't come up with any more ideas.
15. When considering solutions to a problem, I do not take the time to assess the potential success of each alternative.
16. When confronted with a problem, I stop and think about it before deciding on a next step.
18. When making a decision, I compare alternatives and weigh the consequences of one against the other.
20. I try to predict the result of a particular course of action.
29. When thinking of ways to handle a problem, I seldom combine ideas from various alternatives to arrive at a workable solution.
31. When confronted with a problem, I usually first survey the situation to determine the relevant information.