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Psychometric Evaluation of the Social Problem-Solving Inventory- Revised among Overweight or Obese Adults

Jing Wang, PhD, MPH, MSN, RN [Assistant Professor],

Department of Nursing Systems, University of Texas Health Science Center at Houston School of Nursing, 6901 Bertner Ave, SON Room 614, Houston, TX 77030, Jing.wang@uth.tmc.edu

Judith T. Matthews, PhD, MPH, RN [Research Assistant Professor],

University of Pittsburgh School of Nursing; Associate Director, Gerontology Program, University of Pittsburgh University Center for Social and Urban Research, 3343 Forbes Ave, Room 200, Pittsburgh, PA 15260, jtmatt@pitt.edu

Susan M. Sereika, PhD [Professor],

University of Pittsburgh School of Nursing and Graduate School of Public Health; Director, Center for Research and Evaluation at the University of Pittsburgh School of Nursing. 360 Victoria Building, 3500 Victoria St, Pittsburgh, PA 15261, ssereika@pitt.edu

Eileen A. Chasens, DSN, RN [Assistant Professor],

University of Pittsburgh School of Nursing, 415 Victoria Building, 3500 Victoria St, Pittsburgh, PA 15261, chasense@pitt.edu

Linda J. Ewing, PhD, RN, FAHA [Assistant Professor], and

University of Pittsburgh School of Medicine, 3811 O'Hara St, Pittsburgh, PA, 15213, ewinglj@upmc.edu

Lora E. Burke, PhD, MPH, FAHA, FAAN [Professor]

University of Pittsburgh School of Nursing and Graduate School of Public Health., 415 Victoria Building, 3500 Victoria St, Pittsburgh, PA 15261, lbu100@pitt.edu

Abstract

Problem solving is a key component of weight loss programs. The Social Problem Solving Inventory-Revised (SPSI-R) has not been evaluated in weight loss studies. The purpose of this study was to evaluate the psychometrics of the SPSI-R. Cronbach's alpha (.95 for total score; .67 – .92 for subscales) confirmed internal consistency reliability. The SPSI-R score was significantly associated ($p < .05$) with decreased eating barriers and binge eating, increased self-efficacy in following a cholesterol-lowering diet, consumption of fewer calories and fat grams, more frequent exercise, lower psychological distress, and higher mental quality of life; all suggesting concurrent validity with other instruments used in weight loss studies. However, confirmatory factor analysis of the hypothesized 5-factor structure did not fit the data well ($\chi^2=350$, $p < .001$).

Keywords

Problem Solving; Behavior therapy; Weight loss; Psychometrics

Significant efforts to weight loss treatment were devoted, however, the prevalence of overweight and obesity among U.S adults continues to be 66% (Flegal, Carroll, Ogden, & Curtin, 2010). While the efficacy of standardized behavior therapy (SBT) in achieving weight loss was demonstrated in several trials (Wadden, Crerand, & Brock, 2005; Wing, 2004), improving SBT could result in better weight loss outcomes for the short- and long-term. Therefore, an evaluation of the components of the behavioral strategies, e.g. social problem solving, used in SBT has the potential of leading to a more effective intervention.

Social problem solving is a key behavioral strategy that is traditionally included in behavioral weight loss programs (Wing, 2004). Most of the research on social problem solving is based on the social problem-solving model developed and refined by D’Zurilla and colleagues (D’Zurilla & Nezu, 2007). Problem solving is defined as a self-directed cognitive-behavioral process used when an individual attempts to find an effective solution to problems. This cognitive-behavioral process makes available a variety of potentially effective solutions for a particular problem, and increases the probability of selecting the most effective solution from among the various alternatives. Social problem solving comprises two partially independent components: problem-solving orientation and problem-solving styles. Problem-solving orientation reflected individuals’ understanding of the problem and their own abilities to solve the problem. Problem-solving style refers to a person’s activity to try to find effective solutions to the problems. Social problem solving specifically includes five components: positive problem orientation, negative problem orientation, rational problem-solving style, impulsivity/carelessness style, and avoidance style. The term *social problem solving* is widely used in clinical and health psychology to emphasize that the problem solving occurs in a natural social environment (D’Zurilla & Nezu, 2007).

In summary, it is important to evaluate the effect of social problem solving ability in order to maximize the intervention effect on weight loss; however, it is impossible to evaluate its effect without an accurate measure. The SPSI-R has been tested only in small samples of obesity population (Murawski, 2009; Perri et al., 2001). However, no previous study has examined the psychometric properties of the SPSI-R among weight loss study participants. To address this gap, the purpose of this study is to explore the internal consistency reliability, construct validity, concurrent validity of the SPSI-R in a weight loss study population.

Methods

This study comprises a psychometric analysis of the SPSI-R using baseline data from the Self-Monitoring and Recording using Technology (SMART) weight loss trial. The SMART Trial was a three-group randomized clinical trial testing the efficacy of three different self-monitoring approaches on weight loss during a 24-month standard behavioral intervention (Burke et al., 2009).

Social problem solving was measured by the SPSI-R (D'Zurilla & Nezu, 1990), a 52-item instrument with five response choices ranging (scored) from 0 to 4, representing “not at all true of me” to “extremely true of me”. The SPSI-R asks respondents how they think, feel, and act when faced with problems in everyday living. This instrument has five scales: positive problem orientation (PPO) -5 items, rational problem-solving style (RPS) -20 items, negative problem orientation (NPO) - 10 items, impulsivity/carelessness style (ICS) -10 items, and avoidance style (AS) - 7 items. The RPS scale has four subscales: problem definition and formulation, generation of alternative solutions, decision making, solution implementation and verification. The SPSI-R has high internal consistency reliability for both the total score and the five scale scores, Cronbach's alpha ranged from .69 to .95 for scales, .95 for the total score and good test-retest reliability over three weeks ($r = .69$ to $.91$ for scale scores; r ranges from $.89$ to $.93$ for the total score in different samples) (D'Zurilla & Nezu, 1990).

Factors that are potential barriers to healthy eating were measured by the Barriers to Healthy Eating Scale. It has good test-retest reliability ($r = .89$), internal consistency reliability (Cronbach's alpha = $.86$), and predictive validity with weight loss at 6 months ($r = .28$) in an earlier study (Burke, Kim, & Music, 2004), the Cronbach's alpha in this study was $.87$.

Self-efficacy in following a cholesterol-lowering diet was measured by the Cholesterol-Lowering Diet Self-Efficacy-Short Form scale (Burke, Dunbar-Jacob, Sereika, & Ewart, 2003). The Cronbach's alpha estimate of internal consistency reliability was $.95$ (Burke et al., 2006). The Cronbach's alpha was $.94$ in this study.

Binge-eating behavior was measured by the Eating Habits Checklist (Gormally, Black, Daston, & Rardin, 1982). Higher scores indicate more severe binge-eating behaviors (Gormally, Black, Daston, & Rardin, 1982).

Food and beverage intake were measured by two 24-hour, unannounced dietary recalls, which were conducted on one weekday and one weekend or leisure day, guided by the Nutrition Data System for Research software program (Burke et al., 2009).

Physical activity level was assessed using the Modified Activity Questionnaire (Kriska & Caspersen, 1997), which estimates the average MET-hours spent on total physical activity in the past week (Kriska et al., 1990; Schulz, Harper, Smith, Kriska, & Ravussin, 1994).

Perceived stress was measured by the Perceived Stress Scale (PSS). Cronbach's alpha was $.84$ over 2 days and $.86$ in 6 weeks, and the test-retest was $.85$ over 2 days and $.55$ in 6 weeks in previous studies conducted among college students (Cohen, Kamarck, & Mermelstein, 1983). The Cronbach's alpha was $.89$ in the parent study.

Mental well-being was measured by the mental component of the SF-36 Version 2 (SF-36v2). The SF-36v2 has good internal consistency reliability with Cronbach's alphas of $.93$ for the mental component scores (Ware, 2000). We used Cronbach's alpha to describe the internal consistency reliability of the SPSI-R. Confirmatory factor analysis was conducted in Mplus (Version 5.21, Los Angeles, CA: Muthén & Muthén) using weighted least squares means and variance adjusted (WLSMV) estimation to examine the construct

validity of the SPSI-R in the study. We used correlation and simple linear regression to examine the concurrent validity of social problem solving in relation to barriers to healthy eating, cholesterol-lowering self-efficacy, binge eating, stress, psychological well-being, and diet and exercise behaviors. Goodness-of-fit of the five-factor structure was assessed using the recommended fit indices including chi-square, Root-Mean-Square Error of Approximation (RMSEA), and Comparative Fit Index.

Results

Sociodemographic characteristics of the sample are described in Table 1. Participants were predominantly White (78%), female (85%), middle-aged (mean age = 46.8 years old), and overweight or obese (mean BMI of 34 kg/m²).

Internal consistency reliability

The SPSI-R demonstrated good internal consistency reliability. The Cronbach's alpha and mean inter-item correlation were .95 and .29 for SPSI-R total, .67 and .30 for positive problem orientation, .92 and .54 for negative problem orientation, .92 and .38 for rational problem solving style, .87 and .40 for impulsiveness/careless style, and .86 and .47 for avoidance style subscale.

Concurrent validity

The concurrent validity of SPSI-R was demonstrated by its negative association with barriers to healthy eating ($r = -.31, p < .01$) and binge eating ($r = -.24, p < .01$), as well as its positive association with self-efficacy for following a cholesterol-lowering diet ($r = .22, p < .01$). Additionally, the SPSI-R total score was significantly correlated with baseline health behaviors and outcomes among the weight loss study participants, which included consumption of fewer calories ($r = -.19$) and fat grams ($r = -.17$), more frequent exercise ($r = .19$), lower perceived psychological distress ($r = -.48$), and higher mental quality of life ($r = .40$), $p < .05$.

Construct validity

The RMSEA of .09, had shown inadequate goodness of fit, where the results should be close to .06 or less (Hu & Bentler, 1999). Moreover, we did not find adequate goodness-of-fit using the chi-square statistics ($\chi^2(112) = 350, p < .001$), estimated using WSLMV approach in Mplus. The Comparative Fit Index was .89, which was close, but not large enough, as .90 is needed to demonstrate an adequate structural validity (Hu & Bentler, 1999). Further examination of the modification indices suggests that two RPS items had higher factor loadings in the four other scales, one NGO item had higher factor loadings for ICS, same with one PPO item for RPS and AS, and one ICS item for PPO and RPS. The estimated correlation matrix of the five latent variables is presented in Table 2. Through further exploration of the correlations among five scales, we found significant correlations among all scales; PPO scale had stronger correlations with RPS, while NGO scale had stronger correlations with ICS and AS scales.

Principal axis factoring was conducted to follow up analysis for the poor-fitting CFA model (Schmitt, 2011), with Kaiser-Meyer-Olkin = 0.897, and Bartlett's test of sphericity, $p < .001$. There are 10 factors with eigenvalue > 1 , explaining a total of 65% of the variance. Most of the factors had an eigenvalue of 1–2.5, only one factor has 15.1, and another has 5.8. Factor loadings with values of greater than .3 loaded in five factors only, while the majority loaded in the first factor, with the second most loaded in the 2nd factor, which often had negative factor loadings. Promax oblique rotation was then applied. The majority of NGO (9/10) items and one PPO item loaded in factor one, 10 RPS items loaded in factor two, six AS items loaded in factor three along with one RPS item and one PPO item, six RPS items loaded in factor 5, a majority of ICS items loaded in two other factors, and one RPS and one PPO item loaded in factor seven, several PPO and RPS items loaded in factor 8, several PPO and AS items loaded together, and some NGO and ICS items loaded in factor 10. Since this is exploratory post hoc investigation, the resulting new model would need to be confirmed in a future study.

Discussion

This is the first study to evaluate the psychometric properties of the SPSI-R in a sample of overweight and obese adults. We found high internal consistency reliability for both the total score and five subscales of the SPSI-R. The scale shows high internal consistency reliability in assessing social problem solving in weight loss participants, which was consistent with the reports by the developers of this tool indicating that the tool is good for males and females aged 13 years or older (D'Zurilla & Nezu, 1990).

Our results on concurrent validity show that the SPSI-R appears to be a promising tool to predict health behaviors and outcomes. However, we used only baseline information to examine the concurrent validity instead of predictive validity. Again, with all groups in this study receiving SBT that included a problem-solving component, we were not able to perform predictive analysis examining the correlations between changes in SPSI-R with changes in health behaviors and outcomes at follow up. Locus of control, optimism, and outcome expectancy are constructs that overlap with problem-solving processes (D'Zurilla & Nezu, 1990). In our analysis, SPSI-R showed high concurrent validity with significant correlations between the SPSI-R total score and measures of perceived barriers to healthy eating, binge eating, and self-efficacy in following a cholesterol-lowering diet (D'Zurilla & Nezu, 1990).

Confirmatory factor analysis has shown a poor goodness of fit through the examination of the five-factor structure, while the results from the confirmatory factor analysis results performed by the developers in two independent samples of college students indicated good to adequate fit. We have a relative small sample of only 210 participants and with 52 items in the factor analysis. Our further exploration of the scale with a principal axis factor analysis with promax oblique rotation revealed that some items from different latent variables loaded together or some latent variables loaded into different factors than what was originally hypothesized. Thus, further work in a larger sample is needed to confirm the five-factor structure of the SPSI-R. Another limitation of this study is that our sample is comprised mainly of fairly well educated, Caucasian females; future validation studies

should include a sample that includes more males and individuals from a more diverse educational and ethnic background. Moreover, research examining test-retest reliability and predictive validity in a controlled condition is warranted.

In conclusion, we found the SPSI-R to a promising tool to predict health behaviors and outcomes, however, factor structure of social problem-solving ability in the adult overweight or obese population is to be further investigated. However, future work is needed to confirm the factor structure in this population.

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References

- Burke LE, Dunbar-Jacob J, Sereika S, Ewart CK. Development and testing of the Cholesterol-Lowering Diet Self-Efficacy Scale. *European Journal of Cardiovascular Nursing*. 2003; 2(4):265–273. [PubMed: 14667482]
- Burke LE, Kim Y, Music E. The Barriers to Healthy Eating scale: Psychometric report. *Annals of Behavioral Medicine*. 2004; 27(Suppl):S101.
- Burke LE, Styn MA, Glanz K, Ewing LJ, Elci OU, Conroy MB, Sevick MA. SMART trial: A randomized clinical trial of self-monitoring in behavioral weight management—design and baseline findings. *Contemporary Clinical Trials*. 2009; 30:540–551. PMID: PMC2860431. doi. [PubMed: 19665588]
- Burke LE, Styn MA, Steenkiste AR, Music E, Warziski M, Choo J, Choo J. A randomized clinical trial testing treatment preference and two dietary options in behavioral weight management: preliminary results of the impact of diet at 6 months—PREFER study. *Obesity*. 2006; 14(11):2007–2017. [PubMed: 17135618]
- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *Journal of Health & Social Behavior*. 1983; 24(4):385–396. [PubMed: 6668417]
- D'Zurilla TJ, Nezu AM. Development and preliminary evaluation of the Social Problem-Solving Inventory. *Psychological Assessment*. 1990; 2(2):156–163.
- D'Zurilla, TJ.; Nezu, AM. *Problem-solving therapy: a positive approach to clinical intervention*. 3rd ed.. New York: Springer Publishing Company; 2007.
- Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and Trends in Obesity Among US Adults: 1999–2008. *Journal of the American Medical Association*. 2010; 303(3):235–241. [PubMed: 20071471]
- Gormally J, Black S, Daston S, Rardin D. The assessment of binge eating severity among obese persons. *Addictive Behaviors*. 1982; 7:47–55. [PubMed: 7080884]
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999; 6(1):1–55.
- Kriska AM, Caspersen CJ. Introduction to a collection of physical activity questionnaires. *Medicine and Science in Sports and Exercise*. 1997; 29:S5–S9.
- Kriska AM, Knowler W, LaPorte RE, Drash AL, Wing RR, Blair SN, Kuller LH. Development of a questionnaire to examine the relationship of physical activity and diabetes in the Pima Indians. *Diabetes Care*. 1990; 13:404–411.
- Murawski ME, et al. Problem solving, treatment adherence, and weight-loss outcome among women participating in lifestyle treatment for obesity. *Eating behaviors*. 2009
- Perri MG, Nezu AM, McKelvey WF, Shermer RL, Renjilian DA, Viegner BJ. Relapse prevention training and problem-solving therapy in the long-term management of obesity. *Journal of consulting and clinical psychology*. 2001; 69(4):722–726. [PubMed: 11550740]

- Schmitt TA. Current methodological considerations in exploratory and confirmatory factor analysis. *Journal of Psychoeducational Assessment*. 2011; 29(4):304–321.
- Schulz LO, Harper IT, Smith CJ, Kriska AM, Ravussin E. Energy intake and physical activity in Pima Indians: comparison with energy expenditure measured by doubly-labeled water. *Obesity Research*. 1994; 2:541–548. [PubMed: 1635515]
- Wadden TA, Crerand CE, Brock J. Behavioral treatment of obesity. *Psychiatric Clinics of North America*. 2005; 28(1):151–170. [PubMed: 15733617]
- Ware, J.E.; Kosinski, M.; Dewey, J.E. How to score version 2 of the SF-36 health survey (Standard & Acutue Forms). Lincoln, RI: QualityMetric; 2000.
- Wing, R.R. Behavioral approaches to the treatment of obesity. In: Bray, G.A.; Bouchard, C.; James, W.P.T., editors. *Handbook of obesity: Clinical applications*. 2nd ed. New York: Marcel Dekker; 2004. p. 147-167.

Table 1

Descriptive Statistics for Candidate Predictor and Outcome Variables (N=210)

Characteristics		% (n) or M±SD
Age (years)		46.80 ± 9.02
Gender	Female	84.8 (178)
Ethnicity	White	78.1 (164)
Education (years)		15.65 ± 3.00
BMI(kg/m ²)		34.01 ± 4.49
Marital status	Currently married	68.6 (144)
	Never married	13.8 (29)
	Formerly married (divorced or separated)	17.6 (37)
Employment status	Employed full time/ Not full time	82.9 (174)
Gross household income	>\$50,000	60.0 (123)
	\$30,000–\$50,000	23.9 (49)
	\$10,000–\$30,000	16.1 (33)

Table 2

Estimated Correlation Matrix for the Five Latent Variables of the Social Problem Solving Inventory-Revised.

	PPO	NPO	RPS	ICS	AS	Range of Loadings (Standardized)
PPO	1.000					0.543–0.690
NPO	-0.703	1.000				0.728–0.908
RPS	0.842	-0.392	1.000			0.454–0.816
ICS	-0.517	0.736	-0.596	1.000		0.409–0.877
AS	-0.722	0.789	-0.332	0.700	1.000	0.461–0.920

Note: PPO: positive problem orientation, RPS: rational problem-solving style, NPO: negative problem orientation, ICS: impulsivity/carelessness style, AS: avoidance style.