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ABSTRACT

Few studies have explicitly attended to the personal problem-solving process within the counseling literature, perhaps due in part to the dearth of relevant assessment instruments. To examine the dimensions underlying the applied problem-solving process, an exploratory factor analysis was conducted using data collected from four samples of college students. A problem-solving instrument was developed based on the factor analysis results, which revealed three distinct constructs, i.e., problem solving confidence, approach-avoidance style, and personal control. The constructs were internally consistent and stable over time. Initial estimates of validity suggest that the instrument measures constructs which are: (1) amenable to change through specific skill training in problem-solving; (2) unrelated to conceptualizing means to solving a hypothetical problem situation; (3) related to general perception of problem-solving skills; (4) unrelated to intelligence or social desirability; and (5) related to personality variables, especially locus of control. (Author/JAC)

A Personal Problem Solving Inventory*

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A Problem Solving Inventory

Problem solving is of special concern for professionals who are interested in helping others solve problems which are particularly troublesome. Counselors are a group of such profesionals as Krumboltz (1965) so aptly stated 15 years ago. While a great deal of research within psychology has been conducted with regard to problem solving (e.g., Davis, 1966; Gagne, 1964; Maier, 1970; Newell, Shaw, & Simon, 1958), most of the research within counseling has remained at the conceptual level (e.g., Clark, Gelatt, & Levine, 1965; Urban & Ford, 1971). In addition, a review of the counseling literature revealed that only a few of the studies have explicitly attended to the problem solving process (Heppner, 1978). Perhaps contributing to the lack of research is the dearth of instruments which measure aspects of the personal problem solving process. The Means-Ends Problem Solving Procedure (MEPS) developed by Platt and Spivack (1975) is a notable exception.

Another reason which might explain the lack of research on problem solving in counseling is the seemingly irrelevancy of the problem solving research for the practitioner, such as research which employs water jar problems (e.g., Jacobus & Johnson, 1964), anagram problems (e.g., Tresselt & Mayzner, 1960), and arithmetic problems (e.g., Klausmeier & Laughlin, 1961). Wickelgrin (1962) noted that such research methodologies may be examining how people solve predefined laboratory problems (i.e., formal problesm), which may be different or less complex than how people solve real life, applied personal problems.

Earlier investigators have postulated the existence of several "stages" within the problem solving process (Clark, et al., 1965; Dewey, 1933; D'Zurilla & Goldfried, 1971; Goldfreid & Goldfreid, 1975; Urban & Ford, 1971). In general, five stages are common to most models of problem solving: general orientation, problem definition, generation of alternatives, decision-making, and evaluation. In addition, training programs designed to enhance subjects' problem solving skills often are developed around various "stages" (e.g., Dixon, Heppner, Peterson, & Ronning, 1979; D'Zurilla & Goldfired, 1971; Mendonca & Siess, 1976). While some evidence has suggested that problem solving is a function of different activities (Johnson, Parrott, & Stratton, 1968; Spivack & Shure, 1974), there has been an absence of research which has empirically investigated the existence of these stages and concomitant problem solving skills in applied problem solving situations. In addition, it is unclear whether there are dimensions underlying the applied problem solving process, and if the process is most accurately described in terms of distinct stages or perhaps dimensions which cut across stages.

The purpose of this investigation was to examine the dimensions underlying the applied problem solving process through an exploratory factor analysis. In Addition, the article describes the development of a problem solving instrument based on the factor analysis results, and also delineates reliability and validity estimates of the instrument.

Method

Data was collected from four samples of students. A total of 150 students initially responded to the PSI, the data of which served the basis for the factor analysis. On the basis of the factor analysis, the 35 item questionnaire was reduced to 32 items. Additonal data was collected from other students to establish an estimate of test-retest reliability and estimates of concurrent validity (N=31, 62). Finally, data was collected pre and post a problem solving workshop to provide an estimate of construct validity (N = 20).

Demographic data on the subjects will be presented as well as reliability and validity information relating to the ten instruments used in the study: the Problem Solving Inventory (PSI), Level of Problem Solving Skills (LPSSEF: Heppner, 1979), Rotter Internal-External Locus of Control (Rotter, 1966), School and College Ability Test (SCAT: Educational Testing Service, 1967), Missouri College English Test (MCET: Callis & Johnson, 1965), Missouri Mathematics Placement Test (MMPT;

Krauskopf, Baucham, & Willis, 1967), Social Desirability Scale (SDS: Crowne & Marlowe, 1964), Myers-Briggs Type Indicator (MBTI: Myers, 1962), the Means-End Problem Solving Procedure (MEPS; Platt & Spivack, 1975), and Unusual Uses Test (Torrance, 1966).

Results

Factor Analyses

A principal components factor analysis was performed using the Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1970). The analysis yielded ten factors having eigenvalues greater than 1.00 and accounting for 64% of the common variance. Using a screen test to identify only the major common factors (Cattell, 1965), three factors were extracted. Using a varimax rotation and applying the rule of retaining only those factor loadings above 0.3, three factors were identified with 11, 16, and 5 items. The factors were labled by the experimenters and contained the following respective range of loadings: problem solving confidence (.42 to .75), approach-avoidance style (.30 to .71), and personal control (.42 to .71). The items contributing to each factor will be listed in Table 1, along with the respective factor loadings.

Normative Data

Based on the responses from 147 undergraduate students, the following normative data was obtained for each of the three factors and the total inventory: factor one (problem solving confidence), raw mean = 46.21, standard deviation = 11.51, factor mean = 2.88; factor three (personal control), raw mean = 18.40, standard deviation = 4.06, factor mean = 3.68; total inventory, raw mean = 91.50, standard deviation = 30.65, inventory mean = 2.86.

A second sample (N = 62) from the same universe, undergraduate students from an introductory psychology class, provided cross-validation data. The similar normative data is as follows: factor one, raw mean = 26.16, standard deviation = 7.90, factor mean = 2.38; factor two, raw mean = 43.68; standard deviation = 11.40, factor mean = 2.71; factor three, raw mean = 18.32, standard deviation = 5.19, factor mean = 3.66; total inventory, raw mean = 88.16, standard deviation = 19.03, inventory mean = 2.75.

Estimates of Validity

Estimates of concurrent construct and validity were established through several means. First, scores on the three factors and the total PSI were correlated with the LPSSEF (N=150), specifically with students' self-rating regarding their level of problem solving skills (R = -.44, -.29, -.43, and -.46 respectively) and students' perceived satisfaction/dissatisfaction with their problem solving skills (r = -.42, -.24, -.39, and -.42 respectively). All correlations were statistically significant (p's < .001). Scores on the PSI were also correlated with scores on the first three stories of the MESP (N = 62). All correlations were statistically non-significant (p's > .05).

Campbell (1960) maintained that in establishing construct validity for any new test, it is useful to correlate the new instrument with an intelligence test. Scores on the PSI were correlated with the SCAT, Series II (N = 98); the scores on all three factors and the total PSI were correlated with scores on the Verbal section (r - .09, .08, .11, .09 respectively); with scores on the Quantitative section (r = .14, .10, .12, .15 respectively), and with the total score (r = .13, .11, .11, .13 respectively). Scores on the three factors and total PSI were also correlated with MCET scroes (N = 98; r = -.03, .12, .16, -.02, respectively), and MMPT scores (N = 99; r = .04, -.02, .11, .06 respectively). In addition, scores on the three factors and the total PSI were correlated with subjects' high school rank (N = 88; r = .14, -.01, .18, .06 respectively). Again, all correlations were statistically non-significant (p's > .05).

Campbell (1960) also maintained that in establishing construct validity each new test should be correlated with a general measure of social desirability. Scores on the three factors and total PSI were correlated with SDS (N = 62; r = -.09,

-.09, -.24, and -.16 respectively). The correlations were statistically non-significant (p's $> .05$), except with the third factor ($r = -.24$, $p < .05$). Thus, scores on the PSI do not seem to be highly correlated with scores on a general measure of social desirability.

Validity coefficients were also computed by correlating the scores on the three factors and the total PSI ~~with~~ scores on the Rotter I-E Scale ($N = 33$), the Unusual Uses Activity ($N = 62$), and the MMPT ($N = 62$). All correlations were statistically significant (p's $\leq .01$) with the Rotter I-E Scale ($r = .64, .53, .40$, and $.61$ respectively). Correlations between scores on factor one, factor two, the total PSI and both the fluency and flexibility scores on the Unusual Uses were not statistically significant (all p's $> .05$). Correlations between scores on factor three (personal control), however, were moderately low but statistically significant (p's $< .02$) with both the fluency and flexibility scores ($r = -.27$ and $-.34$ respectively). All correlations with the continuous scores of each of the four type indicators on the MBTI were statistically non-significant (p's $> .05$), except between scores on the third factor and the thinking-feeling scores ($r = .25$, $p < .05$).

Discussion

The results of the factor analysis indicate that there are at least three dimensions underlying the perceived personal problem solving process of college students. An analysis of the items that loaded on each factor revealed constructs such as confidence in one's problem solving ability, an approach-avoidance style, and personal control. Estimates of reliability indicate these constructs are internally consistent as well as stable over time. In addition, cross validation data from two different samples indicates that the normative data is consistent across similar samples of college students. It is important to note that the items depicting each of the five stages loaded in an almost random fashion across each of three constructs. Although several writers have described distinct stages within the problem solving process (e.g., Clark, et al., 1965; Dewey, 1933; D'Zurilla & Goldfired, 1971), the results can be interpreted as suggesting the existence of underlying dimensions across "stages" within students' perception of their real-life, personal problem solving. Such a notion may more ~~accurately~~ portray the complexity of real life problem solving; describing applied problem solving at the level most stage-theorists do may not only be an oversimplification but also may mask important individual differences in the applied problem solving process.

The initial findings with regard to establishing concurrent and construct validity provide additional information about the instrument. First, it appears that the PSI correlates moderately well with a simple self-rating scale. Subjects who respond to the PSI in ways which reflect behaviors and attitudes typically associated with successful problem solving also tend to rate themselves as better problem solvers and to be more satisfied with their problem solving skills. Second the PSI is able to detect differences between groups of students who have received training in problem solving and those who have not received such training. Third, subjects' responses to the PSI do not seem to be related to responses on another measure of problem solving, the MEPS. This finding may indicate that these two instruments measure different aspects of the personnal problem solving process; conceptualizing means to a hypothetical problem situation is quite different from reflecting on what one actually does in solving real-life personal problems. Parenthetically, Janis and Mann (1977) note that there is a growing body of evidence which indicates that people respond differently to hypothetical situations than they do to real-life situations (Collins & Hoyt, 1972; Cooper, 1971; Dentsch, Krauss, & Rosenhan, 1962; Gerard, Blevens, & Malcolm, 1964; Nel, Helmreich, & Aronson, 1969; Singer & Kornsfield, 1973; Taylor, 1975). Fourth, the instrument does not seem to be another variation of an intelligence test, nor does it seem to be a mislabeled social desirability inventory. Fifth, correlations with other inventories indicate that scores on the PSI are not strongly related to measures of creativity or the personality types as indicated by Myers-Briggs. People who report being more like "the successful problem solver" also tend to report having an internal locus of control. This finding confirms an observation from an early descriptive study about characteristics of successful problem solvers (Bloom & Broder, 1950). In short, these findings as an aggregate provide some initial estimates of validity for the PSI. Specificially, there is some evidence to suggest that the PSI is measuring constructs which are (a) amenable to change through specific skill training in problem solving, (b) unrelated to conceptualizing means to hypothetical problem situation, (c) related to subjects' general perceptions of their problem solving skills, (d) unrelated to intelligence or social desirability and (e) related to personality variables; most notably locus of control.

There has been an absence of instruments which attempt to measure constructs associated with applied problem solving. Thus, the PSI may serve as a much needed research tool for investigators who want to assess people's perceptions of how they solve personal problems. Until further research is conducted on the PSI, the instrument would best be restricted to research functions. It is also essential to note that the PSI assesses people's perceptions of the problem solving process. This self-report data should not be equated with actual problem solving skills as additional research is needed to examine the relationship between these two variables. An advantage of the PSI is its ease to administer and score, which is in contrast to the rather cumbersome and difficult scoring process of the MEPS.

Finally, the results of the study raise some questions about the most effacious method to enhance people's real-life problem solving skills. Previously, skills associated with the five problem solving stages have been the focus of various training formats (e.g., Dixon, Heppner, Petersen, & Ronning, 1979; D'Zurilla & Goldfried, 1971; Mendonca & Siess, 1976). There is not strong empirical evidence for the efficacy of training formats built around these stages. Perhaps the effectiveness of training might be improved by also focusing on the three underlying dimensions identified in this investigation, or on the events associated with the process of problem solving in general rather than solely on the major skills for each stage.

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