RESEARCH REPORT

The Utility of Problem-solving Training that Emphasises Self-management Principles

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ABSTRACT This study examined the usefulness of an 8-week applied problem-solving training program. Specifically, the study examined (a) whether problem-solving training that emphasised self-management principles would be useful, (b) if the effects of training would persist over time, (c) whether an individual difference variable (problem-solving appraisal) would affect training outcomes, and (d) whether the cognitive responses of the subjects during the course of training were related to their problem-solving appraisal or the change process. Results indicated that problem solving training was effective at enhancing students’ problem-solving appraisal, and that the self-report changes were maintained at a 1 year follow-up. In particular, training seemed most useful for students who initially appraised their problem solving very negatively. Finally, the results suggested that the process-oriented cognitive responses were related to students’ initial problem-solving self-appraisal as well as the impact of training. Implications of the results are discussed in terms of counselling interventions, problem solving training, the interpersonal influence process, and future research.

Introduction

The development of problem-solving training models has received considerable attention during the last decade. Following D’Zurilla & Goldfried’s (1971) intro-

1 Requests for reprints or copies of the instruments used in the study should be sent to: P. Paul Heppner, 210 McAlester Hall, Psychology Department, University of Missouri-Columbia, Columbia, MO 65211. Portions of this article were previously presented at the annual meeting of the American Psychological Association, Anaheim, August 1983. This research was supported in part by a research grant from the University of Missouri Research Council. Finally, the authors would like to gratefully acknowledge the assistance of the following students who assisted in the data collection and analyses phases of the study: Lee Bruning, Mary Kampa, Ken Dugan, and Joan Rosenberg.
duction of a general problem-solving stage model, some researchers have examined training issues pertaining to individual stages of the model (e.g. Nezu & D'Zurilla, 1979, 1981) while others have attempted to develop training programs that incorporate all of the stages (e.g. Dixon et al., 1979). The results of the training studies have been encouraging but mixed (D'Zurilla & Nezu, 1982). For example, Mendonca & Siess (1976) found that problem solving training increased decision-making skills only for analogue problems; training did not generalise to career decisions. Thus, Horan's (1979) earlier conclusion is still accurate: investigators have not developed a technology for training clients in problem solving.

An analysis of the training literature revealed that most of the previous investigations have not included follow-up evaluations, thus yielding little information about the generalizability (and ultimately effectiveness) of training over time (D'Zurilla & Nezu, 1982). This is particularly important given the brief (30-60 min), one session training of several of these investigations. Second, these studies have focused on the development of skills within discrete stages of problem solving to the exclusion of broader self-management skills. Yet the latter also seem important, particularly given the overwhelming data supporting the role of self-management variables in regulating human behavior. Support for such an addition within problem-solving training in particular is suggested by research indicating self-management variables such as self-statements and 'irrational' beliefs (Heppner et al., 1983) as well as causal attributions (Baumgardner et al., 1986) are related to the problem-solving process.

The purpose of the study was threefold. The major purpose of the present study was to begin to examine the utility of a problem-solving training program which focused primarily on a number of self-management principles (e.g. self-analysis, self-reinforcement, cognitive restructuring). Training for skills pertaining to the discrete problem-solving stages was kept to a minimum. Such a training focus was not to argue against the utility of the skills traditionally associated with the problem-solving stages, but rather to explore in a preliminary manner the utility of self-management skills in the problem-solving process. The basic research questions was: Would problem-solving training that emphasised self-management principles be effective? In addition, the long-term effect of the training program was examined by obtaining 1-year follow-up data.

Previous problem-solving training has not examined individual differences that might interact with training (cf. Fretz, 1981). In addition, relatively few studies have examined the effects of problem-solving training with subjects who have problem-solving deficits (Heppner, 1978); questions have been raised about differential training needs of people with varying levels of problem-solving skills (Heppner et al., 1982). Thus, a second purpose of the study was to examine the differential effects of problem-solving training on college students who appraise their problem solving as either effective or ineffective. Appraisal of one's problem solving as an important variable within problem solving was initially suggested by Butler & Meichenbaum (1981); later research has indicated that problem-solving self-appraisal was related to a number of cognitive, affective, and behavioral variables associated with problem solving, as well as indices of psychological health.
The basic research question here was: For whom would training be most effective, those who appraise their problem solving effectively or ineffectively?

Since the present investigation involved an ongoing training program, it also provided a unique opportunity to examine students' cognitions as a process measure to further document the utility of training. The third purpose of the study was to examine the cognitive responses of the subjects during the problem-solving training. We decided to examine students' cognitions in two ways. First, given the cognitive differences reported between the self-appraised effective and ineffective problem solvers on a number of self-report inventories (e.g., Heppner et al., 1982), the study sought to examine the cognitive content of these subjects during a real-life personal experience, the problem-solving training. Differences in cognitive processing (e.g., thoughts about oneself versus other people) during an extended, real-life personal experience (such as problem-solving training) have not been examined. If differences in the cognitive content of students who appraise their problem solving very negatively or positively could be found, this would have implications for future problem-solving training programs. It was hypothesised that those students who appraised their problem solving very positively (as opposed to very negatively) would report more positive and task-relevant cognitions during the course of training. The methodology used to examine the relationship between cognitive content and problem-solving appraisal was the thought-listing procedure (Brock, 1967), which was utilised throughout the course of training.

The second way in which cognitions were used to explore the utility of training was in relationship to the change process. It was hypothesised that these students who indicated benefiting most (as opposed to those reporting benefiting the least) from the training would report more positive and task-relevant cognitions during the course of training. This hypothesis was based on social psychological research on attitude change which suggests that cognitive processing (e.g., positive versus negative statements) is an important variable in attitude change (e.g., Petty & Cacioppo, 1981; Petty, Cacioppo & Heesacker, 1984). Within the last decade the interpersonal influence process has received considerable attention within therapy (see reviews by Corrigan et al., 1980; Heppner & Dixon, 1981); however, there has been a dearth of information showing how clients actually are influenced and process information related to their therapy experience. Thus, the study further examined the utility of training by exploring the relationship between cognitive content and the impact of training; thought-listings throughout the course of training were again utilised to examine this relationship.

Method

Subjects and Research Design

Subjects enrolled in an introductory psychology class who scored in the upper or bottom 18% of the distribution on the Problem Solving Inventory (PSI; Heppner & Petersen, 1982) were solicited to enroll in a one-credit hour academic class 'Applied
Problem Solving'. Thirty men and 22 women were contacted; 19 men and 21 women agreed to participate. Subjects were initially blocked by PSI scores (high and low) and sex (male and female), and then randomly assigned to one of two groups, a treatment and a delayed treatment control. The research design employed was a Pretest-Posttest Delayed Treatment Control Group Design (Design #4: Campbell & Stanley, 1973). Treatment was delayed for the latter group 8 weeks, during which five students (four men, one woman) dropped out of the study. Ethical considerations dictated that the control group also received training after the posttest data were collected from both sections. Since pre-test scores on the PSI, LPSSEF, and MPC were available, the drop-outs and treated controls were compared; no statistically significant differences were found (all p’s>0.05). The final number of subjects used in the study was 18 in the experimental group, and 17 in the delayed treatment group.

**Instruments**

The Problem Solving Inventory (PSI: Heppner & Petersen, 1982) assesses people’s perceptions of their personal problem-solving behaviors and attitudes. The PSI consists of 32, six-point Likert items where low scores indicate behaviors and attitudes typically associated with effective problem solving. The PSI is a self-rating questionnaire and scores should not be considered synonymous with level of actual problem-solving skills (Heppner, 1982). An earlier factor analysis revealed three constructs: problem-solving confidence (11 items), approach-avoidance style (16 items), and personal control (5 items). Reliability estimates revealed that the constructs were internally consistent (0.72 to 0.90, N=150) and stable over time (0.83 to 0.89, N=31). Estimates of validity are provided in previous investigations (Heppner & Anderson, 1985; Heppner et al., 1985; Heppner et al., 1982, 1983; Heppner & Krieshok, 1983; Heppner & Petersen, 1982; Larson & Heppner, 1985; Nezu, 1985; Phillips et al., 1984).

The Level of Problem-Solving Skills Estimate Form (LPSSEF: Heppner, 1979) assesses people’s evaluation of their problem-solving skills. Subjects first rate their level of problem-solving skills in comparison with other students (1=very much less, 9=very much more). In addition, students rate their satisfaction or dissatisfaction with their present level of problem-solving skills (1=very dissatisfied, 6=very satisfied). The respective test-retest reliability coefficients over a 2-week period were 0.99 and 0.93 (n=53). Correlations between the two LPSSEF items and the PSI total was −0.46 and −0.42 and −0.46 (p’s<0.0001; n=150; Heppner & Petersen, 1982).

The Mooney Problem Checklist (MPC: Mooney & Gordon, 1950) assesses the number and nature of a wide range of personal problems. The instrument consists of 330 items, which constitute 11 major problem areas (e.g. Health and Physical Development, Finances). Low scores indicate a low frequency of reported problems. The MPC has been used extensively in studies of student problems (e.g. De Sena, 1966; Hartman, 1968; Koile & Bird, 1956), and test-retest reliabilities range from 0.90 to 0.98. PSI scores are not strongly related to MPC scores; for example,
no significant differences were found between low and high scores on the PSI and the total MPC score (Heppner et al., 1982).

The Thought-Listing (TL) procedure has been developed for measuring and classifying a person’s cognitive responses elicited by some stimulus (see Brock, 1967; Cacioppo & Petty, 1981). In this study, the procedures involved giving subjects 5-10 minutes in which to list the “thoughts that crossed through their mind during the class session that just ended.” Subjects were given a lined sheet of paper identified as the Internal Reactions Questionnaire on which they were to list one thought per line. Independent judges blind to the purpose of the study were later given the subjects’ TL responses in their original handwritten form (thus, in context) and coded each distinct thought along three independent dimensions: (a) positive, negative, or neutral sentiment statements; (b) statements about oneself, other people in the group, or neither; and (c) statements related to personal problems, the problem-solving class, or neither. Scores consisted of the frequency of coded responses within each category (e.g. the number of positive thoughts, negative thoughts, and neutral thoughts). Interrater reliability for each of the three ratings were 0.83, 0.89 and 0.90 respectively. Some two-way combinations of thoughts were also of theoretical interest. Additional categories were created by combining the original categories (a) and (b) (e.g. self- and class-related thoughts), (a) and (c) (e.g. self- and class-related thoughts), and (b) and (c) (e.g. negative class-related thoughts). A final category was formed by the three-way intersection of the original three categories (e.g. positive-self-problem oriented thoughts).

The Teacher Evaluation Questionnaire (TEQ: University of Missouri, 1976) is a 21 Likert-item questionnaire assessing students’ satisfactions with course instruction; high scores indicate a more positive course evaluation. The instrument has been developed and widely used at the University of Missouri. Estimate of reliability revealed a coefficient alpha of 0.92 computed for the total inventory (Kime, 1973/1974).

The General Course Evaluation (GCE) is a short three item questionnaire developed for this study. The first three items are seven-point Likert items (1 = not at all, 7 = a great deal) assessing perceived changes in students’ problem solving: To what extent did you (a) improve your problem-solving skills during this course?; (b) become more aware of your problem-solving processes during the course?; (c) overcome problem-solving obstacles during this course? Each of the three Likert items were analysed separately in the data analysis.

Treatment

Each of the two groups were conducted over a period of 8 weeks, meeting once a week for 1½ hours. The classes were conducted by a Ph.D. level, male psychologist knowledgeable of the applied problem-solving literature, and two female graduate students pursuing advanced degrees in counseling psychology.

The overall goals of the course were for students to become aware of their problem-solving activities and style as well as to incorporate more effective self-management principles (e.g. self-reinforcement) into their problem-solving pro-
cesses. To briefly summarise, the aim of the early sessions was to increase the students' self-awareness of their problem-solving activities associated within each problem-solving stage, particularly self-reinforcement and self-punishment processes, approach and avoidant behaviors, irrational beliefs, self-statements, and affective reactions. During the last 4 weeks of the class, students were instructed in cognitive restructuring and positive cognitive coping responses. Teaching activities within each session included solving problems, analysing the process, and identifying cognitive, affective, and behavioral events that affected the outcome.

To specify the nature of treatment in more detail, the structure and content of each of the training sessions will be briefly described. The first and eighth session was used primarily for the administration of the pretest and posttest instruments, as well as course introductions and closings.

The instructional format of each of the six training sessions followed a similar pattern. An overview was given about the training that would be covered during the particular session, followed by small group activities, dyadic discussions, and exercises. Each session was then summarised, and terminated with the administration of the Thought Listing questionnaire. The content of each of the training sessions was as follows:

Session II. The subject were briefly introduced to the problem-solving stages of D'Zurilla & Goldfried (1971), including general orientation, problem definition, generation of alternatives, choosing an alternative, action, and evaluation. Subjects then brainstormed and discussed in their assigned small groups a range of obstacles they encountered in solving their personal problems. Obstacles were then categorised as cognitive, behavioral, and affective. A large group discussion on obstacles followed, which emphasised the functional and dysfunctional consequences of the obstacles.

Session III. The instructors began by emphasising the nonsequential nature of the stage model and the highly interdependent and intermittent nature of real-life problem solving. The process and consequences of problem finding and recognising obstacles was further discussed in small groups. The concept of problem-solving style was introduced and defined as patterns in one's problem-solving behaviors, such as procrastination, approach versus avoidance, feelings of confidence, control, inadequacy, fears, and self-statements. Subjects were encouraged to analyse the positive and negative aspects of their own style from recent problem solving. Small group discussions furthered students' self-analysis by involving them in a structured discussion of the similarities and differences among the participants' problem-solving style.

Session IV. This session focused primarily on the interrelationships among self-statements, fears, beliefs, feelings, and their relationship to subsequent problem-solving actions or nonactions. Working in dyads, subjects analysed these types of responses for one of their recent problematic situations (through the aid of a grid), and discussed their awareness with each other. Subjects were then introduced to thought-substitution, coping (versus mastery) cognitions, as well as the consequence of interpreting problematic situations in controllable or uncontrollable terms.

Session V. This session focused on intervention strategies, particularly by
examining obstacles and consequences while generating alternatives. Subjects ana-
lysed their personal manner of generating alternatives (through the aid of a grid),
and discussed their analyses in a dyad. Subjects were also now encouraged to begin
to examine patterns in their problem-solving styles across problems through the
dyad discussion.

Session VI. This session involved an exercise and small group discussion aimed
at analysing their problem-solving style in terms of patterns in their thoughts,
feelings, and behaviors. Subsequently, a discussion followed on ways of increasing
the generalisability of the training to new problems.

Session VII. This session involved an analysis of (a) their problem-solving
styles, (b) what has changed, and (c) what they would still like to change across
each of the problem-solving stages as well as thinking, feeling and acting obstacles.
The analysis was begun individually (on a grid), and shared within a dyad. This
project culminated in a brief five-page paper describing their problem-solving style
completed outside class.

Procedures

Subjects were selected as mentioned earlier and randomly assigned to one of two
class sections, the treatment and delayed treatment control group. The first and last
class periods were utilised to administer the pre- and post-test instruments (PSI,
LPSSEF, MPC). The problem-solving training was conducted in the second
through the seventh class periods. At the end of each session, the TL questionnaire
was administered. To reduce demand characteristics associated with TL, one of the
authors not previously associated with the class was introduced in Session II as an
independent researcher. Subjects were asked to participate in a 'research project'
which involved their confidential responses on the TL questionnaire. To enhance
their candor, each subject developed their own identifying code words which was
unknown to the authors. Students completed the TL after each class, labeled only
with their own confidential code number, and sealed the TL questionnaires in a
special envelope addressed to the independent researcher. At the end of the eighth
session, the rationale for the TL was explained and students were asked to volunteer
their code names to the independent researcher so that he could match their scores
with their other data; all subjects consented. In addition to completing the post-test
instruments in the last session, subjects also completed course evaluations, the TEQ
and GCE.

Results

Was Training Useful and Did it Persist Over Time?

In order to test whether training was useful, the treatment group was compared to
the delayed treatment control group on the PSI, LPSSEF, and MPC from pre to
posttreatment. A summary of the means and standard deviations of these variables
for the treatment and control group is presented in Table I. A repeated measures,
Time (Pre and Post) × Group (treatment and control) analysis was conducted on each of the three LPSSEF ratings; all the analyses reported below are for the Time × Group interaction, which most directly addresses the question of the effects of training from pre to post. Students who received the training reported significantly higher (i.e. more effective) self-ratings of their level of problem solving skills \[ F(1, 31) = 20.31, p < 0.0001 \], and were marginally more satisfied with their problem-solving skills \[ F(1, 31) = 2.81, p = 0.10 \] than the control group over time. Similar repeated measures analyses (Time × Group) were conducted on the PSI total score, and on each PSI factor. Students who received training appraised themselves as more effective problem solvers over time, as reflected on the PSI total score \[ F(1, 31) = 3.89, p = 0.05 \]. Examination of the three PSI factors revealed that students who had received training rated themselves as approaching problems more over time \[ F(1, 31) = 5.58, p < 0.05 \], but not necessarily as being more confident \[ F(1, 31) = 1.26, p > 0.05 \] nor having more personal control \[ F < 1.0 \] over time. Finally, a similar repeated measures (Time × Group) analysis revealed no differences between the two groups over time on the MPC \[ F < 1.0 \]. It is important to examine the MPC means across the two groups, the note and large discrepancy between the two groups at the pretest. Thus, these results may be confounded by the lack of equivalence on this measure prior to treatment. In short, these results indicate that the problem-solving training appeared successful in that students appraised their problem solving as more effective, approaching problems more readily, and reporting themselves as having more effective problem-solving skills after training as compared to the control group.

Table I. A summary of the pre- and post-treatment means on the MPC, PSI, and LPSSEF, for the experimental and control group

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control group</th>
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<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>MPC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>70.7</td>
<td>38.4</td>
</tr>
<tr>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence</td>
<td>25.6</td>
<td>10.0</td>
</tr>
<tr>
<td>Approach-avoidance</td>
<td>45.4</td>
<td>15.6</td>
</tr>
<tr>
<td>Personal confidence</td>
<td>17.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Total</td>
<td>89.1</td>
<td>29.6</td>
</tr>
<tr>
<td>LPSSEF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem-solving skill</td>
<td>5.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>3.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Notes: MPC = Mooney Problem Checklist; PSI = Problem Solving Inventory; LPSSEF = Level of Problem Solving Estimate Form.

Assessing the persistence of training 1 year after training necessitated a different analysis since the delayed treatment control group had received treatment, and it could no longer serve as a control group. Subsequently, a series of repeated
measures over time (pre, post, and follow-up) were conducted on the three dependent measures (PSI, LPSSEF, and MPC) to determine if the treatment effects were maintained for both the treatment and delayed treatment group.

For brevity, only the statistically significant findings will be mentioned. On the LPSSEF, students reported significantly higher self-ratings of their level of problem-solving skills \[ F(2, 38) = 24.9, p < 0.0001 \]; Duncan's revealed significant differences between the pretest (M = 5.5) and both the posttest (M = 6.8) and follow-up (M = 6.8). Likewise, students reported being significantly more satisfied with their problem-solving skills over time \[ F(2, 38) = 9.25, p < 0.0004 \]; Duncan's revealed significant differences between the pretest (M = 3.6) and both the posttest (M = 4.4) and follow-up (M = 4.8). Students also appraised themselves as more effective problem solvers over time, as reflected on the total PSI score \[ F(2, 38) = 5.89, p < 0.005 \]; Duncan's revealed significant differences between the pretest (M = 89.3) and both the posttest (M = 76.4) and the follow-up (M = 79.9). Examination of the PSI Approach-Avoidance factor also revealed students specifically appraised themselves as approaching problems more over time \[ F(2, 38) = 3.62, p < 0.03 \]; Duncan's revealed significant differences between the pretest (M = 44.8) and both the posttest (M = 38.4) and follow-up (M = 40.8). Also as before, no statistical significance was found on the MPC over time \[ F(2, 38) = 0.24, p < 0.05 \]. In short, these analyses suggest that the effects of training persisted one year after training.

For Whom Was Training Most Effective?

This research question was investigated by examining the relationship between (a) problem-solving appraisal and (b) the amount of change from pre- to post-test on a number of dependent variables (PSI, LPSSEF, MPC) and course evaluations (GCE, TEQ). Since this is a within group comparison, the data from the two class sections were combined for the analyses to answer this question.

In terms of more general course evaluations, a 1 × 2 (PSI: high versus low) MANOVA on the General Course Evaluation questionnaire did not reveal a statistically significant difference by high or low PSI scorers \[ F(1, 31) = 0.02, p > 0.05 \]. The means (presented in Table II) indicate that both high and low PSI groups reported substantial improvement in their problem solving. A more specific measure of the course evaluation, the Teaching Evaluation Questionnaire, was also examined. A 1 × 2 ANOVA revealed that those students with low PSI scores (perceived effective problem solvers) evaluated the course more highly than did the high PSI students \[ F(1, 31) = 5.26, p < 0.05 \].

A 1 × 2 ANOVA on the pre-post PSI total change scores revealed that those subjects with high PSI scores (perceived ineffective problem solvers) has significantly higher change scores than students with low PSI scores \[ F(1, 31) = 5.61, p < 0.05 \]. A 1 × 2 MANOVA on the pre-post changes on the PSI factor scores did not reveal a statistically significant main effect \[ F(3, 29) = 1.84, p = 0.16 \], although the univariate on Confidence was significant \[ F(1, 31) = 5.19, p < 0.05 \]; students with high PSI scores increased their confidence more than the low PSI students. A 1 × 2 ANOVA on the pre-post MPC change scores revealed no statistically signifi-


TABLE II. A summary of the means and standard deviations of the GCE, TEQ and pre-post change on the PSI, MPC, and LPSSEF by PSI level

<table>
<thead>
<tr>
<th>PSI</th>
<th>Low</th>
<th>High</th>
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<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>GCE</td>
<td>5.0</td>
<td>1.7</td>
</tr>
<tr>
<td>TEQ</td>
<td>87.1</td>
<td>9.3</td>
</tr>
<tr>
<td>PSI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence</td>
<td>1.1</td>
<td>4.9</td>
</tr>
<tr>
<td>Approach-Avoidance</td>
<td>2.1</td>
<td>9.8</td>
</tr>
<tr>
<td>Personal Control</td>
<td>1.7</td>
<td>8.7</td>
</tr>
<tr>
<td>Total</td>
<td>4.2</td>
<td>14.6</td>
</tr>
<tr>
<td>MPC</td>
<td>9.4</td>
<td>20.0</td>
</tr>
<tr>
<td>LPSSEF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS Skills</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.6</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Notes: GCE=General Course Evaluation; TEQ=Teaching Evaluation Questionnaire; PSI=Problem Solving Inventory; MPC=Mooney Problem Checklist; LPSSEF=Level of Problem Solving Skills Estimate Form.

cant differences between the high and low PSI scorers \([F(1, 31)=2.51, p=0.12]\). A 1x2 MANOVA on the pre-post LPSSEF change scores revealed no overall main effect \([F(3, 27)=2.39, p=0.09]\). However, one univariate was statistically significant: students with high PSI scores (perceived ineffective problem solvers) had statistically significant higher change scores on their level of problem-solving skill ratings than the low PSI scores \([F(1, 31)=6.28, p<0.05]\). It is noteworthy that in the cases where the change score differences between high and low PSI scorers only approached statistical significance, in each case the means of the high PSI scorers reflected more change than the low PSI scorers (see Table 2). In sum, it appears that while the low PSI students reported being more satisfied with the training, the high PSI students reported more changes in their problem solving appraisals.

Cognitions During the Training Process

The first purpose in examining cognitions was to investigate differences between the self-appraised effective and ineffective problem solvers during the problem-solving training. To do so, a series of exploratory analyses were conducted on the thought listings. Initially, a series of 1x2 (PSI: high versus low) MANOVAs were conducted on each of the three independent categories of thoughts: (a) self, other or neither directed, (b) positive, negative, or neutral sentiment, and (c) class, problem or neither oriented. There was one statistically significant main effect for PSI level on the positive-negative category, \([F(3, 29)=4.23, p<0.05]\). Examination of the univariate ANOVAs revealed that perceived effective problem solvers generated
more positive thoughts during the training process ($M=2.1$) than perceived ineffective problem solvers ($M=1.4$), $F(1, 31)=4.14, p<0.05$.

Separate $1\times 2$ (PSI) MANOVAs were conducted on the combined categories. Two of these four MANOVAs produced statistically significant PSI main effects: self-other/positive-negative, $F(6, 26)=2.39, p<0.057$, and positive-negative/class-problem, $F(6, 26)=3.61, p<0.01$. Examination of the individual ANOVAs revealed that perceived effective (as opposed to ineffective) problem solvers listed (per session) more positive thoughts about others ($M's=0.2, 0.04$), $F(1, 31)=6.62, p<0.05$; more positive thoughts about the class ($M's=0.7, 0.4$), $F(1, 31)=5.09, p<0.05$; and more neutral thoughts about problems and problem solving ($M's=1.4, 0.9$), $F(1, 31)=5.99, p<0.05$.

In sum, these data suggest that the self-appraised effective problem solvers were more favorable in processing information related to the training experience, such as reporting more positive thoughts about the class and the others in it than the perceived ineffective problem solvers. Additional analyses, using a repeated measure design across sessions, revealed these differences in thought production between perceived effective and ineffective problem solvers were magnified over time. More specifically, the perceived effective problem solvers generated over time more class related thoughts, $F(1, 33)=10.82, p<0.003$, more neutral class-related thoughts, $F(1, 33)=6.14, p<0.05$, more self-directed, neutral class-related thoughts, $F(1, 33)=5.27, p<0.05$, and more self-directed, negative class-related thoughts, $F(1, 33)=4.99, p<0.05$. In short, the self-appraised effective problem solvers increased their thoughts about the class, the others in it, and themselves as the training progressed.

The second purpose of examining subjects' cognitions was to compare the cognitive processes of those people who benefited from the training or changed over time to those people who did not; such an analysis may provide important information about how the subjects processed information during the change process. One way of assessing change or benefit is to ask subjects directly how much they gained from training. After training, all subjects completed the GCE, which contained a 7-point scale on which they recorded the extent to which the workshop was beneficial to them personally. Those who scored above the median on this question were labeled the 'high benefit group' and those who scored below the median were labeled the 'low benefit group'. In order to track the thoughts of subjects in these groups over time, separate 2 (Benefit: high or low) $\times 2$ (Time: Session 2–4 or 5–7) repeated measures ANOVAs were conducted on the original three categories of thoughts as well as the combined thought listing categories described above.

Several main effects were obtained in the ANOVAs employed the Benefit median split. Subjects who felt that they had benefited more than average (high benefit group) generated significantly more problem-solving thoughts per session than those in the low benefit group ($M's=3.5, 2.2$) $F(1, 33)=6.33, p<0.01$, more self directed thoughts ($M's=3.4, 2.67$) $F(1, 33)=3.59, p<0.06$, and fewer class related thoughts ($M's=0.77, 1.6$) $F(1, 33)=4.15, p<0.05$. Further examination of the combined thought categories revealed that the high benefit group generated
more positive thoughts about themselves ($M's=1.22, 0.75$) [$F(1, 33)=4.70, p<0.04$]; fewer negative thoughts about the class ($M's=0.13, 0.33$) [$F(1, 33)=4.48, p<0.04$]; more positive thoughts about problem solving ($M's=1.20, 0.66$) [$F(1, 33)=5.39, p<0.02$]; more self-directed problem-solving thoughts ($M's=2.13, 1.18$) [$F(1, 33)=6.41, p<0.01$]; and more self-directed positive problem-solving thoughts ($M's=0.87, 0.40$) [$F(1, 33)=5.63, p<0.02$]. Only one interaction with Time approached significance. Subjects who felt that they benefited the most generated more positive problem solving thoughts in the late ($M=1.50$) than in the early sessions ($M=0.91$), whereas those who felt less benefit did not show an increment in positive problem solving thoughts with time ($M's=0.68, 0.65$) [$F(1, 33)=2.99, p<0.09$]. In short, those students who reported benefiting from the problem solving training generated more problem solving thoughts that were positive and about themselves.

Discussion

The results of this study suggest that problem-solving training that focuses primarily on self-management principles is effective at enhancing college students' evaluation of their problem-solving skills. Specifically, students appraised their problem solving as more effective, approaching problems more readily, and reporting themselves as having more effective problem-solving skills after training. These results lend credence to earlier suggestions (e.g. Heppner et al., 1982; 1983) that it may be useful for problem-solving training to modify students' cognitive processes (e.g. self-reinforcement patterns, irrational beliefs) that are associated with personal problem solving. In addition, the results suggest that the effects of training were maintained over a 1 year period. Whereas D'Zurilla & Nezu (1982) raised concerns about the maintenance and need for widespread generalisation effects of problem-solving training, these results offer encouraging support for the utility of training that incorporates self-management principles within the problem-solving stages.

However, these findings should be interpreted cautiously since the dependent measures are self-report, and their relationship to real-life problem solving behaviors was not assessed. The self-report data alone, however, are promising when construed in terms of Bandura's (1986) self-efficacy expectations and D'Zurilla & Goldfried's (1971) problem orientation component. If students after training appraised themselves as being more effective and more readily approach problems, a number of other problem-solving correlates could possibly be affected such as their perseverance, resiliency, and anxiety levels. For instance, Bandura (1986) provides a substantial amount of evidence to support the notion that people's sense of personal efficacy affects their motivation, how they behave, their thought patterns, and their emotional reactions in stressful situations. Likewise, D'Zurilla (1986)

2 From a methodological perspective, it may interest some readers to note that six significant main effects were also obtained for time. In general, in the later sessions subjects generated more self-directed thoughts, fewer thoughts about other people, more positive self-thoughts, and fewer problem-solving thoughts than in the earlier sessions (all $p's<0.05$).
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reports that one's problem orientation has a generalised facilitative or inhibitive effect on problem-solving performance. In short, the self-report data offers promising results and suggests the need for addition research to examine the ramifications of problem-solving training on the problem-solving process.

The results also suggest that the self-appraised ineffective problem solvers improved as much as, and in some cases, more than the self-appraised effective problem solvers. The results suggest that the problem-solving training was useful for students with perceived problem-solving deficits in particular, thereby providing support for the utility of problem-solving training with target populations who are in need of problem-solving training. The results also suggest that the self-appraised effective problem solvers tended to evaluate the course more positively, implying that they also were satisfied with the training. Thus problem-solving training for non-remedial interventions as suggested by Heppner et al. (1984) also seems useful for college students.

The data from the thought-listings indicate that subjects' cognitions were related to their problem-solving appraisal. The self-appraised effective (as compared to ineffective) problem solvers seemed more favorable in processing information related to the problem-solving training, such as reporting more positive thoughts about the class. In addition, these differences in thought production increased throughout the course of training. These results are consistent with earlier research which suggested different cognitive content and processes between perceived effective and ineffective problem solvers (e.g. Heppner et al., 1982, 1983). Whereas much of the earlier data is of a self-report nature, this study provides data obtained from an ongoing, real-life situation (i.e. an extended workshop) which suggests that there may be important differences in the cognitive processes of effective and ineffective subjects appraisal of problem solving.

The subjects' cognitive responses were also related to the impact of training, and seem to reflect aspects of the change process. Thus, the pattern of subjects' ongoing cognitive responses to the problem-solving class was consistent with what would be expected based on a social psychological analysis of influence (Petty & Cacioppo, 1986). Social psychological research on persuasion has demonstrated that as perceived self-relevance and the generation of positive issue-relevant thoughts increases, so too does influence or the impact of a message (Petty & Cacioppo, 1981). In the present study those people who reported being most influenced by the problem-solving training (i.e. felt greater than average benefit), actually generated more problem-solving thoughts that were positive and about themselves than those who felt less benefit. These preliminary results underscore the potential utility of tracking subjects’ ongoing thoughts during therapeutic interventions since these thoughts appear to be related to the perceived benefit of psychological interventions including problem-solving training (cf. Petty et al., 1984).
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