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Roni Reiter-Palmon

University of Nebraska, Omaha, rreiter-palmon@unomaha.edu

American Institutes for Research

K. Victoria Threlfall

George Mason University

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Solving Everyday Problems Creatively: The Role of Problem Construction and Personality Type

Roni Reiter-Palmon

University of Nebraska at Omaha

Michael D. Mumford

American Institute for Research

K. Victoria Threlfall

George Mason University

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Correspondence and requests for reprints should be sent to Roni Reiter-Palmon, University of Nebraska at Omaha, Omaha, NE 68182-0274.

ABSTRACT: Problem construction has been determined to be an important process contributing to creative problem solving. The purpose of this study was to investigate whether problem construction plays a role in how individuals interpret ambiguous, ill-defined problems in a way that fits with their personality. We also hypothesized that solution quality and originality would be related not only to problem construction ability but also to the degree to which the solution fits the personality of the individual. Students who participated in this study (N = 195) were asked to complete measures to identify personality types, a measure of problem construction ability, and a problem-solving exercise. Solutions were rated for fit of the solution to the personality, quality, and originality. Results suggest that problem construction ability is positively related to the fit of the solution to the personality type, and that solution quality and originality are related to both problem construction and solution fit. Implications of the role of problem construction in solving everyday problems are discussed.

Research and theory in the area of creativity and problem solving identified problem construction as the first step in solving ill-defined problems (Getzels, 1979; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991; Newell & Simon, 1972; Sternberg, 1986). *Problem construction* is the process by which individuals structure an ill-defined problem and identify the goals and objectives of the problem-solving effort (Mumford, Reiter-Palmon, & Redmond, 1994). Because problem construction is concerned with formulating the problem, its application will have marked impact on the problem-solving effort, such as the strategies used for solving the problem or the solutions that are considered appropriate (Mumford et al., 1991). Empirical studies have found that problem construction is related to (a) more original and creative works of art and long-term success as an artist (Getzels & Csikszentmihalyi, 1976), (b) problem-solving ability (Smilansky, 1984), (c) participation in real-world creative pursuits (Okuda, Runco, & Berger, 1991), and (d) higher quality and more original solutions (Redmond, Mumford, & Teach, 1993; Reiter-Palmon, Mumford, Boes, & Runco, 1997).

Mumford, Reiter-Palmon, et al. (1994) have suggested a cognitive process model of problem construction. The basis for problem construction is that of a problem representation, which is an ad hoc category formed on the basis of past experiences in solving a problem (Holyoak, 1984). Problem representations include four components: the goals and outcomes associated with the problem-solving effort, constraints or restrictions placed on solutions, key information needed to solve the problem, and procedures used for problem solving (Barsalou, 1983; Holyoak, 1984). Problem representations can then be used as guides to construct and solve problems similar to those encountered in the past or to structure a novel problem (Holyoak, 1984; Mumford, Reiter-Palmon, et al., 1994). According to this problem construction model, problem representations are activated through attention to environmental cues. A problem representation will be activated if it has been associated with these cues in the past (Holyoak, 1984). As the complexity and diversity of the cues increases, so will the number of activated representations. Empirical studies have suggested that incoming information is filtered through available schema and knowledge structures, and attention is given to those cues that fit existing schema or signal a desired goal or outcome (Gick & Holyoak, 1980; Hogarth, 1986; Newell & Simon, 1972).

This framework may be applied not just to scientific problems or the creation of art but also to any problems the individual encounters in everyday life. Many situations and decisions that the individual has

to deal with every day can be construed as ill-defined and ambiguous, with vague goals and no consensus on what a good solution is (Schraw, Dunkle, & Bendixen, 1995), therefore requiring problem construction.

In recent years, a new approach for the conceptualization of personality has emerged. This approach, which has its roots in the interactionist perspective (Magnusson & Endler, 1977; Mischel & Shoda, 1995), suggests that personality can be understood in terms of the situations individuals select to participate in and those situations that the individual avoids (Buss, 1987). In addition, personality can be manifested by the goals, problems, or life tasks that the individual identifies and the behavioral strategies used to achieve the goal or solve the problem in that situation (Cantor, 1994; Cantor & Kihlstrom, 1987; Read, Jones, & Miller, 1990). Empirical studies employing this framework have determined that different individuals focus on different goals within the context of the same situation or life task and employ different behavioral strategies (or solutions) to achieve their goals or solve the problem they face (Cantor, 1994; Cantor & Langston, 1989; Mumford, Snell, & Hein, 1993; Zirkel & Cantor, 1990). In addition, individuals tend to interpret situations in a way that fits with previous experiences and results in a coherent pattern of behavior (Mumford, Uhlman, & Kilcullen, 1992).

The purpose of this study was to investigate whether problem construction is relevant to solving everyday problems and might be a mechanism by which individuals interpret a situation to fit their personality. Studies of problem construction have suggested that not all individuals engage in this process in an active, effortful manner (Redmond et al., 1993) and that individual differences exist in the effective application of the problem construction process (Reiter-Palmon et al., 1997; Smilansky, 1984). This ability to identify multiple goals within the problem situation will allow those individuals to solve the problem in a manner that is consistent with their goals and therefore allow them to generate a solution that fits their life template. It is hypothesized that individuals who possess a higher ability level of problem construction will generate solutions that more closely fit their personality than will individuals with low problem construction ability.

Previous studies indicate that one characteristic of creative individuals is their ability to tolerate conflict, tension, and ambiguity and benefit from it (Barron & Harrington, 1981; Runco, 1994; Sheldon, 1995). When a situation is presented that does not fit the individual's personality, conflict and tension are created. However, those individuals who are better able to define and construct the problem to fit with their personality will be more likely to capitalize and benefit from the conflict and ambiguity presented by the problem. It is therefore hypothesized that solution quality and originality will be related to not only problem construction ability (Getzels & Csikszentmihalyi, 1975; Reiter-Palmon et al., 1997), but also to the degree to which a solution fits the personality.

Method

Sample

The sample consisted of 195 undergraduates attending a large Southeastern university. The 114 women and 80 men (one participant failed to indicate gender) participated in the study for extra credit or to satisfy a requirement for a psychology course. The participants' mean age was 21.9 years (ranging from 18 to 45). Most sample members were in their sophomore and junior years.

Measures

Personality Types

According to Mumford, Snell, and Reiter-Palmon (1994), when solving everyday problems, individuals who have similar values and goals will be more likely to interpret situations in a similar way. A previous study (Reiter-Palmon, 1993) has identified personality types based on measures of values, goals, and leisure activities; these personality types will be used in this study. Personality types were identified using a cluster analysis to determine similarities in responses between individuals. Eight types were identified for female participants and four were identified for the male participants. A short description of each of the personality types is presented in Table 1.

Values. Values were measured using an adaptation of Rokeach's (1973) value scale. The same 36 values identified by Rokeach were used in this study; however, they were not ranked ordered. Each value was rated on importance using a 5-point Likert Scale ranging from 1 (extremely important) to 5 (not at all important).

Goals. Goals were measured using a procedure similar to that suggested by Oyserman and Markus (1990) to collect information about goals the individual would like to attain (hoped for selves) and goals the individual would like to avoid (feared selves). For the hoped-for goals, participants were asked to write down, in order, the five most important goals they would like to attain in the next 20 years, the five things that would indicate to them that they have reached successes. For the feared selves, participants were asked to write, in order, the five things they fear they would become in the next 20 years, what they would like to avoid becoming, those things that would indicate failure. The goals were then content coded into one of 10 categories by three judges. Categories with sample responses for positive goals (goals that indicate success) and negative goals (goals that indicate failure) are presented in Table 2. Rater agreement was indicated if at least two judges independently assigned the goal to the same category. Rater agreement was reached for 95% of the goals. When judges did not agree on the category assignment, they discussed the specific goal to reach consensus.

Leisure activities. Leisure activities were measured by two instruments. One instrument (45 items) focused on participation in active leisure activities such as writing, cooking, gardening, playing an instrument, and painting (Runco, Noble, & Luptak, 1990; Runco & Okuda, 1988). An additional measure

(25 items) focused on more passive activities such as reading, watching television, and social activities (Owens & Schoenfeldt, 1979).

Problem Construction Ability

The problem construction measure was a variation on Baer's (1988) problem-finding task. Participants were presented with a situation and were asked to write as many different restatements of the problem as they could think of. However, they were not asked to solve the problem, and this task involved different problems than those used in the problem-solving task. Two different problem construction tasks were used. An example of the problem construction task is presented in Figure 1.

The problem restatements were rated on quality and originality using the rating scales developed by Redmond et al. (1993) and are presented in Figure 2. The quality and originality of the problem restatements were assessed using Hennessey and Amabile's (1988) consensual rating technique. In accordance with the procedure suggested, three judges familiar with relevant research in creativity, cognition, and problem solving were asked to rate the quality and originality of problem restatements obtained from 10 sample problems. These judges were then brought together for a panel meeting to discuss discrepancies in the ratings. After several training sessions, the rating scales were applied to the data collected for the present study. The trained judges were given the stimulus material and the problem restatements generated by the participants and were asked to evaluate the quality and originality of each set of problem restatements. Raters were not given information about the hypotheses, experimental conditions, or expected outcomes. An interrater agreement coefficient (Shrout & Fleiss, 1979) of .66 was obtained for quality of the problem restatements ratings. The interrater agreement for originality was **.64**. These interrater reliabilities are sufficient for research purposes and are similar to those obtained in other studies using similar measures and procedures (Mobley, Doares, & Mumford, 1992). Ratings for quality and originality were then averaged across the three judges. *Problem construction ability* was defined as both quality and originality of the problem restatement. Therefore, as suggested by Harrington, Block, and Block (1983), a multiplicative index was used to indicate problem construction ability.

Problem-Solving Task

Participants in this study were asked to solve six ambiguous real-life problems from three domains: school, social, and leadership. The problems were designed and selected to reflect situations that were familiar to college students, realistic, and ill-defined, so multiple possible goals and solutions were available for each problem. Problems were presented to the participants in random order, and they were instructed to provide one solution to each problem. The problems used for the problem-solving task were different and involved a different task than that of the problem construction ability task. A sample problem is presented in Figure 3.

Solutions to the problems were rated by three judges on the following criteria: quality, originality, and fit of the solution to the personality type description. Rating scales for the three criteria are presented in Figure 4. *Solution quality* was defined as the degree to which the solution is plausible and appropriate to the problem presented, and the degree of logic and coherence in the solution. Solution quality was rated on a 5-point Likert Scale ranging from 1 (*low quality*) to 5 (*high quality*). Interrater reliability for quality

as measured by intraclass correlation (Shrout & Fleiss, 1979) was .69. *Solution originality* was defined as the degree of extrapolation from the problem presented, the degree to which the solution is not structured by the problem, and the degree of uniqueness of the solution. Solution originality was rated on a 5-point Likert Scale ranging from 1 (*low originality*) to 5 (*high originality*). Interrater reliability for originality as measured by intraclass correlation was .65.

To determine the fit of the solution to the personality type, each rater read a short paragraph describing the characteristics of each group. Participants were assigned to a particular personality type, based on their responses to the three measures of values, goals, and leisure activities. Raters then indicated whether the solution suggested for each problem was consistent with the personality description for that person. The definition of *solution fit* was the degree to which the solution is expected from a person with this personality and is consistent with his or her pattern of behavior. Again, ratings were given on a 5-point scale ranging from 1 (*low fit*) to 5 (*high fit*). Interrater reliability for solution fit was .72.

Ratings were then averaged across the three judges, for each scale, for the use in the analyses. For the purpose of this study, ratings were summed across the six different problems, providing one score for quality, one for originality, and one for solution fit across all six problems. Cronbach alphas for the three scores were .83 for quality, .80 for originality, and .76 for solution fit, displaying adequate reliability and further supporting combining all problems into one score.

Analyses

To test the first hypothesis that problem construction ability is related to the degree of fit of the solution to the template, a regression analysis was performed with problem construction ability serving as the independent variable and solution fit as the dependent variable.

To test the second set of hypotheses, two hierarchical regression analyses were performed. Solution quality was the criterion for one analysis, and solution originality was the criterion for the second analysis. Solution fit and problem construction ability were used as the predictors. Previous research has indicated that problem construction ability influences creative problem solving and solution quality and originality (Getzels & Csikszentmihalyi, 1976; Okuda et al., 1991; Reiter-Palmon et al., 1997); therefore, problem construction ability was entered first into the regression equation. The increment in R^2 due to the addition of solution fit was then examined, to determine the relation of solution fit to the template to quality and originality of solutions.

Results

To test the hypothesis that problem construction ability is related to generating solutions that closely fit the personality type of the individual, a regression analysis was performed. The dependent variable was

ratings of solution fit to the personality type, averaged across raters, summed across all six problems. The independent variable was problem construction ability. Results suggested that problem construction ability was positively and significantly related to solution fit to personality, $R = .20$, $F(1, 175) = 7.54$, $p < .01$. Individuals with higher levels of problem construction ability do generate solutions that fit closely with their personality type.

The effect of solution fit and problem construction ability on solution quality and originality was examined using hierarchical regression analyses. Because problem construction ability has been found in the past to account for a significant amount of variance in solution quality and originality (Getzels & Csikszentmihalyi, 1976; Reiter-Palmon et al., 1997), it was entered into the regression equation first, to control for its effects. The next step involved entering solution fit into the regression equation to determine the increment in R^2 , that is, whether solution fit predicts solution quality or originality above and beyond the effect of problem construction ability. Examining the results of the regression equation for quality first, problem construction ability was significantly and positively related to solution quality ($R^2 = .10$, $p < .001$). Adding solution fit ratings increased R^2 significantly ($R = .16$, R^2 change = $.06$, $p(\text{change}) < .001$). This finding suggests that solution fit is significantly related to solution quality, above and beyond the effects of problem construction ability. Similar results were obtained for solution originality. Problem construction ability was significantly and positively related to solution originality ($R^2 = .07$, $p < .001$). Adding solution fit increased R^2 significantly ($R^2 = .14$, R^2 change = $.07$, change) $< .001$, again suggesting that the solution fit to the template has an important effect on the originality of the solution above and beyond that stemming from problem construction ability.

Discussion

The first hypothesis of this study was that problem construction ability will be related to solution fit to the template, because this process allows individuals to define and structure ambiguous life problems or tasks in a way that is meaningful to them. The problem construction model suggested by Mumford, Reiter-Palmon, et al. (1994) proposed that individuals construct ill-defined, ambiguous problems based on previous experiences and available problem representations. It is further suggested that in dealing with real-life problems, the life template provides the problem representation needed to structure, design, and construct the problem (Mumford, Snell, et al., 1994). Accordingly, it was hypothesized that individuals who are capable of defining the problem in multiple ways, that is, have high problem construction ability, are more likely to construct and solve life problems in a way that would fit their personality. This hypothesis was supported in this study. Individuals with high problem construction ability were able to solve the problem in a way that fit with their personality type, compared to individuals with low problem construction ability.

It was further hypothesized that problem construction ability and the fit of the solution to the personality type will be related independently to both the quality of the solutions generated to the problems and the originality of these solutions. This study has found that both problem construction ability and solution fit were positively related to the quality and originality of the solution. Previous studies have found that problem construction ability is related to solution quality, originality, and creative problem solving (Baer,

1988; Getzels & Csikszentmihalyi, 1976; Smilansky, 1984). The findings of our study, however, suggest that problem construction ability contributes to successful problem solving in two ways. First, problem construction ability contributes to successful problem solving through its direct effect on solution quality and solution originality. The second way in which problem construction contributes to successful problem solving is indirect, through its effect on solution fit to the personality type. Individuals with high problem construction ability are able to construct an ambiguous or ill-defined problem in a way that they can relate to or understand. They are able to construct the problem in a way that matches their personality type. This, in turn, allows them to provide a high quality, more original solution because they are now dealing with a more familiar problem or drawing on their own expertise. The finding that solution fit contributes to solution quality and originality is congruent with previous findings that goal conflict will result in greater originality only when the task is congruent with the individual's self-definition (James, 1995).

Although this study provided initial evidence to the role of problem construction ability in solving everyday problems and matching solutions to personality, it does not provide a direct test of the role of problem construction process in real-life problem solving, and the mechanism by which it possibly exerts its effect on the solutions or behaviors chosen. Additional support for the role of problem construction in interpreting and defining real-life problems will be provided from studies that will evaluate the meaning of the problems to the individual or how the individual interprets the problems presented, in conjunction with problem construction ability.

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Table 1. Summary Descriptions of Personality Types

Personality Type	<i>n</i>	Description
Females		
Apathetic, Self-Absorbed	15	Apathy, lack of involvement, focus on oneself, lack of attention to others.
Social Conservatives	15	Traditional and conservative values and behaviors, focus on family and less focus on careers and achievement.
Positive Emotional Expressives	22	Positive approach to life, sunny disposition, expressive, social.
Socially Responsible Artists	16	Broad interests, particularly in the arts. Strong social convictions, responsible, mature, help others.
Pessimistic Intellectuals	7	Interests in many types of intellectual activities. They display their intellectual work, and won rewards. Cynical and pessimistic.
Creative Career-Oriented	15	Ambitious, high need for achievement, emphasis on career, self-involved, enjoy social recognition.
Social Achievers	11	High need for social acceptance and status.
Limited Pragmatics	10	Limited and less active life, lack of interest in a variety of activities, pragmatic.
Males		
Timid Self-Protectives	23	High need for security.
Traditional Athletics	26	Traditional male activities and values, active in athletics.
Intellectual Achievers	9	Broad interests in intellectual activities, high achievement.
Hedonistic Social Manipulators	16	High self-concern, willing to manipulate and use others to obtain their goals, unwillingness to work hard to achieve success.

Table 2. Goal Categories and Sample Goals

Categories	Sample Goal	
	Positive	Negative
Career/Job Goals That Focus on Obtaining or Maintaining a Career That Is a Source of Intrinsic Satisfaction to the Person.	Find fun and challenging career Finding a fulfilling job Become an officer in the Navy	Having a job I hate Being unsuccessful in my career
Material: Self Goals That Focus on Achieving Material Rewards or Outcomes for the Self. This Does Not Include the Goal of Using Money for the Benefit of Others Such as Family or Charity.	Being rich Easy but well-paying job Financially stable Own a house	Being jobless Being poor Homeless
Other Oriented Goals That Focus on the Welfare of Others (Not Including Family, but More General).	Leave something for the future, contribute to social needs A strong understanding of the environment Help people with problems	Not contribute to society Making other people suffer
Health/Physical Goals That Focus on Health Issues or Physical Appearance.	Staying healthy Being healthy and physically fit	Die AIDS Abuse drugs Be fat
Social Goals That Focus on Relationships With Others on a Social Basis.	Having good relationships with people Long-term friends Have many friends Being able to understand people	Being lonely Having no friends Being hated by people
Family Goals That Focus on Family Members (Parents, Children, Spouse) and on Relationships Within the Family.	Good marriage Have children	Death of family member Unsuccessful marriage Embarrass my family name
Spiritual Goals That Focus on Spiritual Issues.	Please God Better relationship with God	Without faith
Lifestyle/Leisure Goals That Concern a Desired Life Style or Leisure Activities.	Move to California Live overseas Having leisure time Trip to Europe	Not being able to do what I want
Education Goals That Focus on Completing or Obtaining an Education.	Finish a decent degree Graduate from college Get Master's degree	Not finish college Drop out of school
Self-Satisfaction Goals That Focus on the Need to Become or Stay a Certain Kind of Person, to Be Happy With Oneself and One's Image.	Live a very contented and happy life A strong self esteem Happiness Find peace of mind	Unhappiness Becoming depressed Waste my talents and ambitions

This is a test to find out how many different ways you can think of to state a problem. After reading a problem description, you should try to find as many different ways to state the problem as you can. State each problem in the form of a question (e.g., "How can we" or "How can I") and then write the problem.

Here is a sample item

Problem description: Mice are in my basement.

Sample problem statements:

1. How can I build a better mousetrap?
2. How can we get rid of the mice?
3. How can I not be bothered by the mice?

Figure 1. Instructions and sample problem for problem construction task.

Please rate all problem restatement together as a group.

Quality The degree to which the problem restatements are plausible and viable restatements of the problem presented.

- 1 - very low quality, problem restatements are not plausible.
- 2 - low quality, most problem restatements are not plausible.
- 3 - average quality, some problem restatements are plausible.
- 4 - high quality, most problem restatements are plausible.
- 5 - very high quality, all problem restatements are plausible.

Originality The degree to which the problem restatements are free from the problem situation presented and go beyond it. The degree to which the problem restatements are not obvious from the situation. The degree of novelty and uniqueness in the problem restatements. The degree to which the problem restatements cover multiple different views of the problem.

- 1 - very low originality, problem restatements directly tied to the problem, only one way of viewing the problem.
- 2 - low originality, problem restatements tied to the problem, few different but obvious ways of viewing the problem.
- 3 - average originality, problem restatements somewhat tied to the problem, one non-obvious way of viewing the problem.
- 4 - high originality, problem restatements somewhat free from the problem, few non-obvious ways of viewing the problem.
- 5 - very high originality, problem restatements free from the problem, multiple different non-obvious ways of viewing the problem.

Figure 2. Rating scales for problem constructions.

You are a twenty year old college junior, majoring in biology.

In high school you were a very good student and were concerned with getting good grades and being successful in school. Even though you spent a lot of time studying you were involved in different clubs and had an active social life.

In selecting a college and your major, you delayed the decision until the last minute. You had been uncertain regarding a career and were not sure what you wanted to study. Given your good grades in high school and your high SAT scores, your choice of colleges was wide open. You ended up applying to the first three schools that came to your mind when the application deadline approached. When the time came to select a college, your parents were very enthusiastic and seemed to be more interested in the colleges that you visited than you were. You elected to major in biology because science has always been an easy subject for you. You also figured that biology might be a good major in terms of opening up several career options.

You are an average student, your GPA is 2.9 and you spend a lot of time studying and worrying about your performance in school. You are unhappy with your GPA level. You are still unsure about your career choice. You are entertaining thoughts about applying to graduate school, and although your grades are high enough to get accepted, you are unsure about whether this is what you want.

You are unhappy about your learning experience in college and you feel that you are not getting what you thought you would get out of college. At some point you thought about taking a year off from school to use the time to travel, work, and get a better sense of direction. Your parents were dead set against the idea and were afraid that you would drop out of school. You have therefore decided to continue with your college education.

What would you do in the situation described?

Figure 3. *Example of problem scenario.*

- Quality** The degree to which the solution is a plausible and appropriate solution to the problem presented. The degree of logic and coherence in solution.
- 1 - very low quality, solution not plausible or appropriate
 - 2 - low quality, solution somewhat plausible, little logic and coherence
 - 3 - average quality, solution plausible, somewhat appropriate, some logic
 - 4 - high quality, solution plausible, appropriate, and logical
 - 5 - very high quality, solution very plausible and appropriated, very logical.
- Originality** The degree of extrapolation from the stimulus context (the problem scenario presented). The degree to which the solution is not structured by the problem and has gone beyond the rote. The degree of novelty and uniqueness of the solution.
- 1 - very low originality, no extrapolation, highly structured by the problem.
 - 2 - low originality, little extrapolation, structured by the problem.
 - 3 - average originality, some extrapolation, somewhat structured by the problem.
 - 4 - high originality, moderate degree of extrapolation, little structure by the problem.
 - 5 - very high originality, large degree of extrapolation, not structured by the problem.
- Solution Fit** The degree to which the solution provided is expected from a person with this personality type and is consistent with the pattern of behavior exhibited by the type description. The degree to which the solution focuses on aspects that are similar to or coincide with his or her personality type.
- 1 - very low fit, solution is not expected from a person that belongs to this type, solution inconsistent with type.
 - 2 - low fit, solution not expected, some inconsistencies with type.
 - 3 - moderate fit, solution conceivably expected, some inconsistencies with type
 - 4 - high fit, solution expected from a person that belongs to this type, consistent with type.
 - 5 - very high fit, solution expected and is consistent with type, highly consistent with type description

Figure 4. Rating scales for problem solutions.