Effects of Solution Elicitation Aids and Need for Cognition on the Generation of Solutions to Ill-Structured Problems

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Abstract:

Numerous techniques have been proposed to assist problem solvers in the solution generation process. We empirically examined the effectiveness of a solution elicitation technique based on the presentation of problem objectives and also examined whether the technique was effective across individual differences in need for cognition (NC). We found that when two conflicting objectives were presented successively, more solutions, more categories of solutions, and more effective solutions were generated than when the same two objectives were presented simultaneously or not at all. However, the results indicated that effective solutions may be more efficiently generated by considering objectives simultaneously. Need for cognition was positively related to measures of divergent thinking, and the presentation of objectives was particularly effective as a solution elicitation aid for individuals with low NC. Implications for creative problem-solving research and practice are discussed.

One of the most important processes in creative problem solving is that of generating a variety of alternative solutions (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). If a variety of alternatives is not generated, the solution that is ultimately selected may be less than optimal. However, research indicates that individuals tend to prematurely stop solution generation and often miss important categories of solutions altogether (Basadur, 1994; Gettys, Pliske, Manning, & Casey, 1987; Mintzberg, Raisinghani, & Theoret, 1976; Nutt, 1984). Several different strategies to improve the ideational process in solution generation have been examined. Basadur, Graen, and Green (1982), for example, found that ideation was improved through extensive training in the creative problem-solving process. An alternative strategy is to use a technique or tool that improves the ideational process. Elicitation aids are the tools, techniques, or procedures that problem solvers may use to facilitate ideation. They are generally some sort of stimulus that encourages divergent thinking. For example, problem solvers may use a graphical display of ideas to help identify underrepresented categories (Buzan, 1983). Elicitation aids provide an attractive alternative to training because they are inexpensive and require little practice to use. Although numerous elicitation aids have been proposed (Keller & Ho, 1988; Smith, 1998), few have been subjected to empirical scrutiny. For this article, we tested elicitation aids involving the presentation of problem objectives, and we also examined whether a personality factor that should promote ideation (need for cognition) exerted a direct or moderating effect on solution generation.

Solution Elicitation Aids

Researchers have argued that a problem solver's values should play a key role in the generation of alternative solutions (Hammond, Keeney, & Raiffa, 1999; Keeney, 1992). An elicitation technique that is consistent with this view involves presenting problem objectives as cues for the generation of alternative solutions. Problem objectives can serve two functions in the process of eliciting alternative problem solutions. First, they can act as retrieval cues for problem information in memory and thereby facilitate the generation of alternative solutions (Pitz, Sachs, & Heerboth, 1980). Problem solvers will be more likely to meet one criterion for creativity to the extent that objectives facilitate the generation of novel ideas (Mumford & Gustafson, 1988). Second, objectives can function as problem constraints, promoting ideational efforts that are value-focused and relevant. Problem solvers can use objectives to identify courses of action that achieve goals, meeting another fundamental criterion for creativity—that the product be socially valued (Mumford & Gustafson, 1988; Scandura, 1977).

Complex problems typically have multiple objectives (Edwards, 1990; MacCrimmon & Taylor, 1976), and very little research has examined how multiple objectives should be presented to elicit solutions. Some researchers suggest that objectives should be presented one at a time or successively, and that solution generation should follow the presentation of each objective (Keeney, 1992; Nutt, 1990). In this approach, solution generation is conceived as a successive alternation between individual objectives and the identification of solutions. The approach also minimizes the number of constraints that any generated solution must satisfy. Pitz et al. (1980) found that more problem solutions were generated with this technique than when objectives were presented simultaneously—a result that has been replicated in subsequent studies (Butler & Scherer, 1997). Although the one-objective-ata- time approach yields a large number of solutions, the quality of many of the alternatives may be poor, particularly if the problem objectives conflict. Scherer (1986) suggested that considering conflicting objectives simultaneously might focus attention on the essential conflict in the problem and lead to higher quality solutions. However, Butler and Scherer (1997) did not find any difference in the quality of generated solutions when objectives were presented simultaneously rather than successively.

The preferred method by which objectives are used to elicit alternatives may depend on several factors. For example, if the problem solver has the resources to evaluate the consequences of a large number of solutions or prefers to select from a larger choice set, then objectives presented successively may be a more suitable method to elicit solutions. In contrast, if resources are limited, the efficiency of generation aids may be of primary importance. That is, the problem solver may wish to maximize the percentage of effective alternatives and minimize the number of solutions that fail to meet primary objectives. Research has not established how objectives should be presented to maximize the efficiency of a generated solution set. However, presenting objectives simultaneously rather than successively should increase the number of relevant constraints, resulting in the generation of fewer solutions that address only a single objective. One goal of this study is to compare methods of presenting objectives and to examine how objectives should be presented to efficiently generate solutions.

Individual Difference Moderators of the Effectiveness of Elicitation Aids

An important question about elicitation aids is whether they are equally effective for all problem solvers (Keller & Ho, 1988). According to Mumford, Reiter-Palmon, and Redmond (1994), the availability of more relevant and activated problem representations should result in more creative solutions. The effectiveness of an elicitation aid mostly depends on how it activates problem representations. Given that these representations are stored in memory, cognitive individual differences in knowledge, ability, or motivation may moderate the effectiveness of elicitation aids. Butler and Scherer (1997) found, for example, that objectives were more effective in eliciting highquality solutions for experts than for novices, presumably because the experts had more problem representations that could be cued by the objectives.

In this article we examined another individual difference variable that could moderate the effectiveness of elicitation aids: need for cognition (NC), defined as the tendency to engage in and enjoy effortful cognitive activity (Cacioppo & Petty, 1982). Athough NC was initially conceptualized as a moderator of attitude change processes, research has shown that it is related to performance on other problem-solving tasks, such as relatively well-structured anagram and mathematical problems (Baugh & Mason, 1986; Dornic, Ekehammar, & Laaksonen, 1991). We know of no research linking NC to performance on ill-structured or complex creative problem-solving tasks, but there is reason to hypothesize such a relationship. Individuals high in NC recall more information about an event or stimulus (Cacioppo, Petty, Feinstein, & Jarvis, 1996), are less distracted by irrelevant stimulus characteristics (Cacioppo et al., 1996), and generate more issue-relevant thoughts than low-NC individuals (Verplanken, 1993). In terms of the Mumford et al. (1994) model of creative problem solving, high-NC individuals could be expected to engage in a more active processing of problem representations, compared to low-NC individuals. Several studies have demonstrated that active processing is related to the quality and originality of problem solutions (Redmond, Mumford, & Teach, 1993; Reiter-Palmon, Mumford, O'Connor Boes, & Runco, 1997). Another goal of this study is to examine the relationship between NC and creative problem solving, as well as how NC affects the effectiveness of the elicitation aid.

Hypotheses

NC has not been related to performance on ill-structured creative problem solving tasks. However, because it measures an individual's tendency to exert cognitive effort, it should be related to the activation of multiple problem representations, and, therefore, solution generation. We developed the following hypothesis regarding NC:

> Hypothesis 1 (H1): Need for cognition will be positively related to fluency, flexibility, effectiveness, and efficiency, and negatively related to the number of solutions that resolve only one objective (polarization).

The presentation of problem objectives as an elicitation aid should act as a retrieval cue for alternative problem solutions, resulting in improved ideation compared to nonaided performance. However, the objectives also add constraints to ideation. When objectives are presented successively, solutions need only satisfy one constraint at a time, which should result in the generation of a large number of solutions. When objectives are presented simultaneously, solutions must satisfy multiple constraints, which should result in the generation of fewer ineffective solutions. Thus, we proposed the following hypotheses regarding the presentation of objectives as an aid for the elicitation of problem solutions:

> Hypothesis 2 (H2): Participants who are presented with objectives successively will demonstrate more fluency and more flexibility than participants presented with objectives simultaneously or not at all.

> Hypothesis 3 (H3): Participants presented with objectives in either form will generate more effective solutions than participants who are not presented with objectives.

> Hypothesis 4 (H4): Participants presented with objective simultaneously will generate fewer polarized solutions and will demonstrate more efficiency than participants presented with objectives successively or not at all.

Finally, because both NC and objectives are related to the activation of alternative problem representations, we predicted an interaction between NC and the presentation of objectives. Specifically, objectives may be particularly effective as an elicitation aid for individuals low in NC because these individuals are not likely to exert the cognitive effort to generate alternative problem representations on their own. In contrast, individuals high in NC tend to engage in effortful processing and so are likely to consider alternative problem representations, even when no objectives are presented. Thus, the presentation of objectives may compensate for low intrinsic motivation to think about the problem.

> Hypothesis 5 (H5): NC will be positively related to fluency, flexibility, effectiveness, polarization,\ and efficiency when no objectives are presented, but will not be related to those variables when objectives are presented.

Method

Participants

The participants were 120 undergraduate students enrolled at two Midwestern universities, in either a introductory psychology or introductory management course, and 69 (58%) of the participants were women. Course credit was provided in exchange for participation.

Independent Variables

Elicitation aid. The elicitation aid consisted of the presentation of two problem objectives simultaneously as a pair, successively (one at a time), or not at all. The two objectives were purposefully selected to conflict with each other. A detailed description of the procedure for selecting the objectives is provided in Butler and Scherer (1997).

*Need for cognition***.** All participants responded to the 18-item Need for Cognition scale, which measures the tendency to engage in and enjoy effortful cognitive activity (Cacioppo, Petty, & Kao, 1984). Items were rated on a 7-point Likert scale and were averaged to produce a scale score. Cronbach's alpha reliability for the scale was .86.

Dependent Measures

Creativity is a multifaceted construct, and we developed multiple measures in an effort to completely represent the construct. Typically, studies of creativity include fluency and flexibility as measures of divergent thinking. We included these measures to tap one dimension of creativity: the generation of novel and innovative products (Mumford & Gustafson, 1988). A second dimension of creativity is that the products have social value (Mumford & Gustafson, 1988). Therefore, we rated the quality of solutions to represent the value dimension of creative problem solving.

The procedure for rating solution quality entailed first listing each unique problem solution generated in the study. The solutions on this master list were then rated on a 4-point "objective achievement" scale for each of the two objectives (i.e., each solution was rated twice), from 0 (*very unlikely to achieve objective*) to 3 (*very likely to achieve objective*). The objective achievement ratings were made independently by two individuals who discussed criteria for ratings, identified types of solutions, and practiced rating on a small solution set prior to rating the complete master list. Of 394 objective achievement ratings (i.e., 197 solutions rated on two objectives), the coders initially disagreed on 47 ratings (12%). In only two cases did the discrepancy between coders exceed one scale point. Discrepancies were resolved through a consensus discussion and the agreed-upon quality ratings were then listed with the solutions.

The participants' written solutions were coded by matching them to the master solution list and recording the corresponding quality ratings. If the coder could not find a match, the unmatched solution was added to the master list and rated on quality. To check the reliability of the matching, 20% (n = 24) of the participants were randomly selected and their solutions were matched to the list by a second coder. There were three instances in which the coders differed in a solution match, but the different matches were to related solutions in the same category, and the discrepancies did not change the achievement ratings associated with the solution.

Fluency. The number of unique solutions generated by each participant was independently counted by two individuals, and discrepancies were resolved through a consensus discussion. A solution qualified as unique if the action and/or object in the solution had not previously been listed by the participant. For example, a solution reading "Get a lawyer, but in the meantime do the best job you can" would be counted as two solutions, because there are two different actions, whereas a solution reading "Talk to Frank and ask to be treated better" would be counted as one solution, because there is only one action and object. There was a discrepancy in the solution counts for 7 participants (6%), but in only one case did the difference between counters exceed one solution.

Flexibility. The solutions on the master list were sorted into categories reflecting strategies for dealing with the problem. The categories were then named and another individual independently sorted the solutions into those categories given the names. There was a discrepancy for 6 of 197 (3%) solutions; discrepancies were resolved through discussion. The flexibility score was determined by counting the number of generated solutions in different categories.

Effectiveness. An effective solution was defined as the extent to which the solution resolved both objectives. The number of effective solutions generated by each participant was determined by counting the number of solutions receiving an objective achievement rating of 2 or 3 on both objectives (the achievement rating scale and procedure are described earlier).

Polarization. A polarized solution was defined as one that was likely to achieve one objective but very unlikely to achieve the other. The number of polarized solutions generated by each participant was determined by counting the number of solutions receiving an objective achievement rating of 0 on one objective and 2 or 3 on the other.

Efficiency. An efficient solution set was defined as one that contained a high proportion of high-quality solutions. An efficiency ratio was calculated for each participant by dividing the number of effective solutions (see the previous section on effectiveness) by the total number of solutions.

Procedure

The participants were recruited in class and participated during a class period. Collaboration with other participants was not permitted, and no time constraints were imposed. After providing informed consent, the participants were given a packet of materials, including instructions, a problem vignette, and a questionnaire. The problem vignette, presented in the appendix, described a situation faced by a female lawyer who refused to become romantically involved with her supervisor and subsequently received less desirable work assignments. Participants were instructed to read the problem carefully and, in conditions where objectives were provided, to read the objectives, then to "write as many solutions as you can that address the problem," on notebook paper provided to them. Participants in the successive objectives condition were presented with the problem and one objective, were instructed to generate as many solutions as they could, then were presented with the problem and the second objective and, again, were instructed to generate as many solutions as they could. When they had finished generating solutions, participants completed the 18-item NC scale.

Results

The data were analyzed using hierarchical moderated regression. NC was entered at step 1 because it is an omnipresent individual difference factor. At step 2, the elicitation aid was entered. This allowed us to test directly the efficacy of objectives for eliciting solutions, by examining whether they explained variance in solution generation over and above NC. At step 3, the interaction terms were entered. The power of moderated regression to detect interactions is notoriously low, resulting in a high Type II error rate (Aiken & West, 1991; Cronbach, 1987; Evans, 1985; Zedeck, 1971). One remedy to this problem is to accept a higher Type I error rate (McClelland & Judd, 1993), a view that is consistent with Pedhazur's (1982, p. 440) recommendation that a significance level between .10 and .25 should be adopted to test the significance of the interaction. We attempted to strike a balance between detection of the interaction and a higher Type I error rate by setting alpha at .15 for tests of the interaction effect. The conventional significance level (.05) was used to test hypotheses involving main effects. Means and correlations among measured variables are presented in Table 1, and the regression results are reported in Table 2. There was no significant effect for participant gender on any of the dependent variables.

The categorical objectives factor was dummy coded, with the no objectives group serving as the comparison. Thus, the dummy coding produced two vectors (D1: successive objectives vs. no objectives; D2: simultaneous objectives vs. no objectives). Comparisons between the successive and control groups (D1) and simultaneous and control groups (D2) are presented in Table 2, with the regression results; comparisons between the successive and simultaneous groups are presented in the text. Descriptive statistics associated with the objectives factor are presented in Table 3.

Fluency

As predicted in H1, the effect of NC at step 1 was positive and significant, $F(1, 118) = 5.07$, $p < .05$, indicating that participants with higher levels of NC tended to generate more alternative solutions than participants with lower levels of NC. Adding objectives at step 2 resulted in a significant increase in $R2$, $\Delta F(2, 116) = 8.18$, $p < .001$. As predicted in H2, tests of the objectives factor revealed that participants presented with objectives successively generated more solutions than participants presented with objectives simultaneously, $\beta = .40$, $p < .001$, and more than participants who were not presented with any objectives. The difference between the simultaneous objectives and no objectives group was not significant. Contrary to H5, the increase in $R2$ attributable to the addition of the interaction term in step 3 was not significant, $\Delta F(2, 114) = 0.12$, *ns*.

Flexibility

As predicted in H1, the effect of NC at step 1 was positive and significant, $F(1, 118) = 8.09$, $p < .01$, indicating that participants with higher levels of NC tended to generate more categories of solutions than those with lower levels of NC. The addition of the objectives factor at step 2 significantly increased $R2$, $\Delta F(2,116) = 5.99$, $p < .01$. An examination of the objectives factor revealed support for H2. Participants presented with objectives successively generated significantly more categories of solutions than participants presented with objectives simultaneously, $\beta = .34$, $p < .001$, and more than participants who were not presented with any objectives. There was no difference between the simultaneous and no objectives groups. The increase in $R2$ with the addition of the interaction term at step 3 was significant, $\Delta F(2, 114) = 2.70$, $p < .10$. An exploration of the interaction revealed that NC was significantly correlated with flexibility in the no objectives condition (.52, $p < .01$), but not in the successive objectives (.23, *ns*) or simultaneous objectives (.01, *ns*) conditions. Thus, as predicted by H5, the effect of NC was only significant when no solution generation aids were presented.

Effectiveness

Contrary to our prediction in H1, the effect of NC at step 1 was not significant, $F(1,118) = 1.32$, *ns*. Although the addition of the objectives factor at step 2 significantly increased $R2$, $\Delta F(2, 116) = 4.67$, $p < .05$, comparisons between objectives conditions did not reveal support for H3. Participants presented with objectives successively generated significantly more alternatives that resolved both objectives than did participants in both the simultaneous objectives, $\beta = .21$, $p < .05$, and no objectives conditions. There was no significant difference between the simultaneous and no objectives conditions. H5 was not supported because the addition of the interaction in step 3 did not significantly increase $R2$, $\Delta F(2, 114) = 1.23$, *ns*.

Polarization

H1 was not supported because the effect of NC at step 1 was not significant, $F(1, 118) = 1.96$, *ns*. There was a significant increase in $R2$ at step 2 with the addition of the objectives factor, $\Delta F(2, 116) = 7.00$, $p < .01$. As predicted in H4, participants in the simultaneous objectives condition generated fewer polarized alternatives than participants in both the successive objectives, $\beta = .370$, $p < .001$, and no objectives conditions. There was no significant difference between the successive objectives and no objectives conditions. The addition of the interaction term at step 3 significantly increased $R2$, $\Delta F(2, 114) = 2.30$, $p < .15$. Consistent with H5, there was a significant correlation between NC and the number of polarized alternatives in the no objectives condition (.36, $p < .05$) but not in the successive (–.12, *ns*) or simultaneous objectives conditions (.17, *ns*).

Efficiency

H1 was not supported because the effect of NC at step 1 was not significant, $F(1, 118) = 0.05$, *ns*. The addition of the objectives factor at step 2 resulted in a significant increase in $R2$, $\Delta F(2, 116) = 3.66$, $p <$

.05. Tests of the objectives factor revealed partial support for H4. Participants in the simultaneous objectives condition had a significantly higher ratio of alternatives that resolved both objectives than did participants in the no objectives condition. However, the predicted difference between the simultaneous and successive objectives conditions was not significant, $\beta = .11$, *ns*. The addition of the interaction term at step 3 significantly increased $R2$, $\Delta F(2, 114) = 2.21$, $p < .15$. The correlation between NC and efficiency was not significant in the no objectives (–.25, *ns*), successive objectives (.15, *ns*), or simultaneous objectives (.15, *ns*) conditions. Although the correlation between NC and efficiency was not significant at any level of objectives, the fact that the correlation was strongest in the no objectives condition provided limited support for H5.

Discussion

A recurring theme in problem-solving research is that ideational processes are constrained—a premise that has resulted in a profusion of aids and techniques intended to facilitate and improve ideation (Keller & Ho, 1988; Smith, 1998). We examined the effects of an aid, based on the presentation of objectives, with two important results. First, the method of presenting the objectives differentially affected qualities of the generated solution set. When objectives were presented successively and solutions were generated after the presentation of each objective, more solutions, more categories of solutions, and more effective solutions were generated than when objectives were presented simultaneously or not at all. These findings would seem to establish the preeminence of the one-objective- at-a-time strategy for generating solutions. However, our results also suggest that presenting objectives simultaneously may be a more efficient method of generating effective solutions. When objectives were presented simultaneously, fewer polarized solutions (i.e., solutions that resolved only a single objective) were generated than when objectives were presented successively or not at all. In addition, a greater proportion of effective solutions was generated when objectives were presented simultaneously, rather than not at all. Regardless of the specific presentation method, our findings convincingly demonstrate that solution generation is enhanced through the use of objectives as elicitation aids.

The second important finding in this study is that the effects of the elicitation aid depended on a characteristic of the problem solver. We found that NC, a factor related to intrinsic motivation to think about problems (Cacioppo et al., 1996), correlated with flexibility and polarization when no objectives were presented, but was uncorrelated with those factors when objectives were presented as a solution elicitation aid. This suggests that the presentation of objectives may encourage active processing of a problem by individuals who would not normally be predisposed to engage in a high level of problem analysis. From a practical standpoint, the results suggest that objectives are likely to be more effective as an elicitation aid for individuals who generally have low intrinsic motivation to think about problems.

Overall, our results showed that NC was significantly related to divergent thinking. Individuals with higher levels of NC generated more solutions and more categories of solutions than individuals lower in NC. This is the first study we know of that examined the effects of NC on an ill-structured problem-solving task, and the nonsignificant relationship between NC and measures of solution quality suggests that it may be a better predictor of ideational effort than the quality of those efforts. Given that creative problem solving is often conceived as the sequential use of divergent and convergent thought across problem-solving stages (e.g., Basadur, 1994), individuals high in NC may particularly excel at creative tasks when other individual difference or situational factors are present that promote convergent thought. From a research perspective, the NC construct should be valuable for creativity researchers seeking a purely motivational individual difference factor that predicts divergent thought.

These results have interesting implications for the practice of creative problem solving. Although numerous authors have advocated a one-objective-at-a-time elicitation strategy (Keeney, 1992; Pitz et al., 1980; von Winterfeldt & Edwards, 1986), the appropriateness of a particular method of presenting objectives may depend on several factors. The goals of the problem solver, for instance, will be a major determinant of which method of presenting objectives is appropriate. If the problem solver wishes to select from a large number of solutions, then objectives should be considered successively. If, however, the goal is to select from a smaller number of effective solutions, then objectives should be considered simultaneously. Situational factors, such as time constraints and resource scarcity, may also influence the appropriateness of an elicitation method (cf. Beach & Mitchell, 1978). In addition, user acceptance of an elicitation technique may vary with the fit of the technique to situational constraints. Problem solvers may be unlikely, for example, to embrace a time-consuming technique when they are under pressure to advance a problem solution.

Our results were consistent with the idea that generating a large number of solutions will yield effective or higher quality solutions (e.g., D'Zurilla & Nezu, 1980; Osborn, 1963). However, our results also revealed that a greater proportion of lower quality solutions may be an ancillary consequence of generating many solutions. The effects of having a large number of lower quality solutions in the solution set has mostly been ignored. Such conditions could possibly increase the likelihood that a lower quality solution would ultimately be accepted or, perhaps, could affect the problem solver's conception of the problem space. Another avenue for research concerns the interaction between the elicitation aid and motivation of the problem solver. We found that the aids were more effective for problem solvers with low intrinsic motivation to think about a problem. It may be interesting for future research to examine whether a similar effect occurs when the motivator is extrinsic.

This study has several limitations, which temper our conclusions. The first concerns the ratings of solution effectiveness. Because there is no way of truly identifying optimal solutions to an ill-structured problem, evaluations of solution effectiveness must necessarily rely on judges' subjective judgment (cf. Reitman, 1965). Although the judges in this study showed high rates of agreement in their ratings of effectiveness, reliability is not a substitute for validity. The concern about the validity of the ratings is moderated somewhat by the fact that our results generally replicated those of other studies on elicitation aids (Butler & Scherer, 1997). The results of this study are also limited to a definition of effectiveness as the extent to which a solution resolved two conflicting objectives. It may be constructive to examine the effects of our factors on other measures of quality, such as originality, practicality, and appropriateness. Finally, the responses of undergraduates to a single, hypothetical problem may not generalize to other populations in other contexts. This study should be replicated using different problems and populations.

Our results strongly support the use of objectives as an aid in eliciting alternative problem solutions, particularly for problem solvers with low intrinsic motivation to think about problems. It appears that the practice of generating few alternative problem solutions may easily be circumvented by considering problem objectives in succession, a strategy that is also likely to yield more effective solutions. It also appears that a high-quality solution set may be more efficiently generated by considering the objectives simultaneously. The relative merits of presenting objectives successively or simultaneously warrant further study. Nevertheless, the presentation of objectives provides a simple and effective method for improving solution generation.

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Appendix: Stimulus Materials

Carol is a single, 29-year-old lawyer who recently began working for a large law firm. Most of her work involves acting as a junior lawyer, assisting Frank, one of the senior partners in the firm. Frank is a highly respected corporate lawyer who is well connected and a shrewd and successful attorney. Carol enjoyed her job very much at first. Frank saw that she was given more and more responsibility, and Carol was convinced that she was well launched into a very successful and fulfilling career. When Frank started asking Carol to accompany him to 2-hr “working” lunches and suggesting they work late into the evening, she thought nothing of it. In fact, she was pleased that Frank had such confidence in her work and opinions. Carol began to feel uncomfortable, though, when she noticed that Frank frequently stared at her body. One afternoon during lunch, Frank began questioning Carol intensely about her previous romantic relationships. Suddenly, he confessed that he was interested in her romantically. Carol said that she was not interested in a relationship. Subsequently, Frank has been overly critical of her performance in front of other partners and has been giving her less desirable assignments. Carol would like to switch to another law firm, but it took her a year to find this job because there are so many lawyers looking for work. Carol does not know what to do. She has, however, developed the following objectives for the problem solution.

Objective 1: To put an end to the harassment.

Objective 2: To maintain a good working relationship with the firm.

Table 1. *Means, Standard Deviations, and Correlations Among Measured Variables*

	M	*SD*	1	2	3	4	5
1. Flexibility	3.71	1.14					
2. Fluency	6.23	2.34	.75**				
3. Quality	2.31	1.31	.32**	.54**			
4. Polarization	1.48	1.29	.51**	.60**	–.01		
5. Efficiency	0.38	0.20	–.16	–.09	.71**	–.41**	
6. NC	4.86	0.76	.25**	.20*	.11	.13	–.02

Note: NC = need for cognition.
* $p < .05$. ** $p < .01$.

Table 2. *Moderated Regression Results*

	Standardized Regression Weights				
Criterion	**NC**	**D1**	**D2**	**D1 × NC**	**D2 × NC**
Fluency					
Step 1	.20**				
Step 2	.21**	.24**	–.16*		
Step 3	.24*	.24**	–.16*	.01	-.05
R^2	.04		.16		.16
ΔR^2			.12***		.00
Flexibility					
Step 1	.25**				
Step 2	.26***	.21**	–.13		
Step 3	.49***	.22**	–.12	–.16	–.25**
R^2	.06		.15		.19
ΔR^2			.09***		.04*
Quality					
Step 1	.11				
Step 2	.12	.31***	.10		
Step 3	–.01	.31***	.09	.19*	.05
R^2	.01		.09		.10
ΔR^2			.07**		.02
Polarization					
Step 1	.13				
Step 2	.13*	.13	–.24**		
Step 3	.32**	.13	–.23**	–.25**	-.08
R^2	.02		.12		.16
ΔR^2			.11***		.03*
Efficiency					
Step 1	–.02				
Step 2	–.01	.16*	.28***		
Step 3	–.24*	.16*	.27**	.20*	.22*
R^2	< .01		.06		.10
ΔR^2			.06**		.04*

Note: NC = need for cognition. D1 and D2 are vectors for the dummy coded objectives factor, in which the value of 1 was assigned to the successive and simultaneous objectives groups, respectively. The R^2s, reading from left to right, correspond to the three steps in the model.
*$p < .15$. **$p < .05$. ***$p < .01$.

Table 3. *Means for Levels of Objectives on All Dependent Measures*

Objectives	*n*	Fluency	Flexibility	Quality	Polarization	Efficiency
None	40					
M		6.15_a	3.68_a	1.95_a	1.60_a	$.32_a$
SD		2.12	1.16	1.18	1.26	.21
Successive	40					
M		7.23_b	4.13_b	2.78_b	1.93_b	.38
SD		2.19	1.04	1.37	1.29	.15
Simultaneous	40					
M		5.28_a	3.33_a	2.20_a	0.93_b	$.43_b$
SD		2.30	1.10	1.29	1.14	.21

Note: Means within a column not sharing a subscript are significantly different ($p < .05$).