

Measuring Preference for Ideation in Creative Problem-Solving Training

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Creativity, problem solving, and innovation are of increasing concern to organizations in these times of accelerating change. This article seeks to deepen readers' understanding of the specific attitudes and thinking processes associated with creative behavior in organizations. The authors report on two empirical studies that developed a reliable, valid measure of "preference for ideation," an important attitude identified in previous creative problem-solving training research. They also identify three additional, distinct ideation-related attitudes: the tendency to make premature critical evaluations of ideas, the valuing of new ideas, and the belief that creative thinking is bizarre. The article presents a speculative model that differentiates "ideation" and "deferral of judgment" attitudinally and cognitively, categorizing Osborn's brainstorming rules accordingly.

In the literature on processes of creative problem solving, some writers distinguish between - and advocate the deliberate separation and sequencing of - "idea-producing" thinking processes from "idea-selection" thinking processes (Joyner & Tunstall, 1970; Maier, 1967; Simon, 1960; Simon, Newell, & Shaw, 1962). Within this general approach, two separate schools of thought have appar-

ently emerged. One school allows for the use of judgmental and convergent thinking processes during idea production, such as trial-and-error searches (Simon et al., 1962). The other does not; it expressly prohibits any such thinking during idea production, holding that at that time *only* to-

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tally divergent, imaginative thinking should be done to proliferate options without regard to judgment or rules of logic. For this school, all evaluation of options is deferred until after ideas have been produced to the limit of the time available. This is called the principle of deferred judgment, and some of its advocates include Osborn (1963), Parnes, Noller, and Biondi (1977), Prince (1970, 1976), Parnes (1961), Parnes and Meadow (1959), MacKinnon (1977), Guilford (1967), and de Bono (1971).

Basadur, Graen, and Green (1982) have identified a separated, sequenced two-step thinking process called "ideation-evaluation." They define "ideation" as the generation of ideas without evaluation, and "evaluation" as the application of judgment to the ideas so generated. During ideation, all judgmental, rational, convergent thinking is deliberately deferred in favor of nonjudgmental, imaginative, divergent thinking. During evaluation, the reverse takes place. Basadur et al. present a model of a "complete process of creative problem solving," in which the two-step ideation-evaluation process is repeated in multiple, sequenced, and separate stages - including problem finding, problem solving, and solution implementation. Basadur (1982) and Parnes et al. (1977) describe other conceptually related "complete process" models. Thus, this school of thought values both ideation and evaluation, but believes that their separation is important.

The most well-known ideation technique is "brainstorming." To solve a presented problem, brainstorming participants are instructed to follow four operational rules: (1) defer judgment by avoiding judging their own

ideas and those of other participants of a group; (2) strive for quantity, because the more solutions the better; (3) welcome freewheeling, because the wilder the idea, the better; and (4) seek "hitchhiking" by adding on to previous ideas to make more ideas. Other ideation techniques employ different operational rules (e.g., see de Bono, 1971; Parnes et al., 1977; Prince, 1970).

Some empirical research supports both the general separation of idea production from idea selection and the more specific ideation-evaluation process (Basadur et al., 1982; Joyner & Tunstall, 1970; Parnes et al., 1977). Basadur (1979) and Basadur et al. (1982) suggest that one may at least partially explain differences in degree of success achieved when using ideation by citing attitudinal factors, but relatively little research has sought to understand and measure such attitudes. The research presented in this article was directed specifically at furthering the understanding of attitudes apparently related to ideation. Effective ideation may require specific attitudes favoring this kind of thinking, perhaps to help participants truly "let loose" and use more fully their unencumbered imaginations. Thus, for training to succeed, it may have to have a sufficient impact to increase such attitudes. Figure 1 provides a tentative model of how such training may work.

One may thus need to view ideation as having both cognitive and attitudinal elements. The research reported in this article explored this question: What *attitudes* may be associated with the ideation thinking process? Basadur (1979) and Basadur et al. (1982) identify one such attitudinal construct, "preference for ideation," and

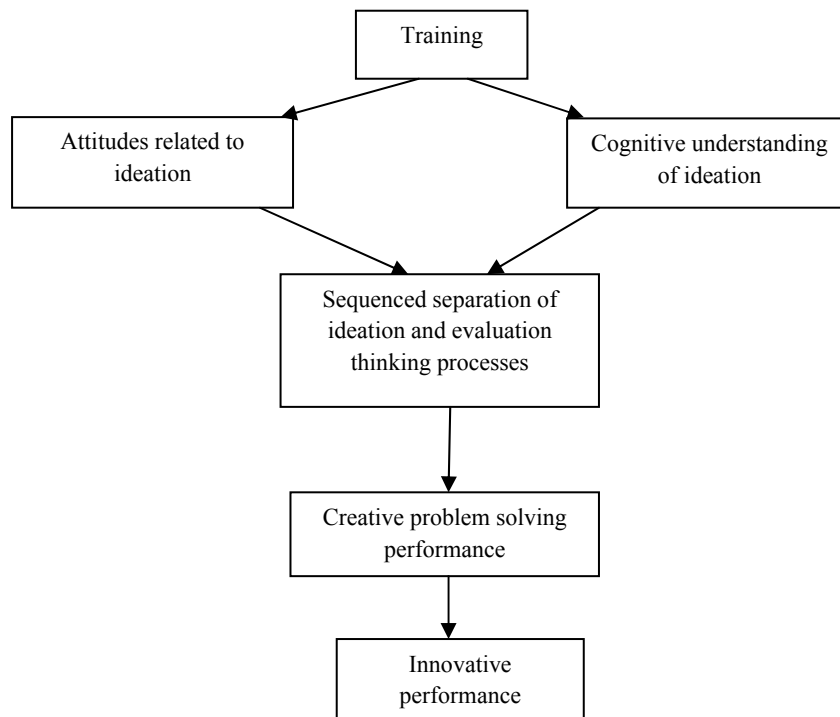


Figure 1. Modeling creative problem-solving training emphasizing ideation.

offer a preliminary seven-item scale to measure it. The research discussed here attempted to strengthen the internal consistency, reliability, and external validity of that scale. Only two of the seven items are relatively strong - or internally consistent - measures. Thus, one purpose of this research was to construct a new scale with additional and new items that could provide better internal consistency. We call this Study Number One. Study Number One also sought to identify additional attitudes related to ideation. It found three such attitudes,

thereby providing the basis for further understanding, research, and insights into training.

Furthermore, the reliability of the preliminary scale is quite low (0.45). Attitudinal measures in problem solving and decision-making research sometimes tend toward relatively low reliabilities, such as Budner's Intolerance for Ambiguity (0.49) (Budner, 1962) and the Myers-Briggs Type Indicator (0.70) (Mendelsohn, 1965). Therefore, we found it important to *improve* the original seven-item scale to increase its reliability. We also

found it desirable to *confirm* the new scale's internal validity and to provide evidence of external validity. To do so, Study Number Two evaluates the new scale by (1) *confirming* the factor analysis (internal validation) by which its items were selected in Study Number One, (2) establishing reliability, and (3) establishing construct (external) validity.

STUDY NUMBER ONE

Method

A group of 36 middle managers and professionals, drawn from across all the functions of a large industrial company and - because of training seminars - familiar with creative problem-solving concepts such as ideation and deferral of judgment, were asked to suggest scale items to add to the two strong items from the original preference-for-ideation scale. This exercise produced 101 new items. A questionnaire including the total 103 items was sent out to a broad cross section of 186 middle managers and professionals from several companies, who were asked to evaluate the items on a five-point scale, ranging from "strongly agree" to "strongly disagree." This latter sample included both people who had and had not been exposed to training.

The data from the 186 panelists were factor analyzed. Missing data were replaced with mean values prior to computing correlations (Finkbeiner, 1979). The number of factors was decided by examining the stream of eigenvalues - and their first differences - of the correlation matrix, with diagonals reduced to the squared-multiple correlations. We extracted four factors, using a

least-squares technique. The criteria we used for rotation for interpretability consisted primarily of those of simple structure, as described in Tucker and Finkbeiner (1981). The final solution meets all of L. L. Thurstone's five criteria for making a unique determination of a simple structure (Thurstone, 1947).

Results

We examined the four factors for item content and labeled them accordingly. One factor, which included the two original scale items, was identified as "preference for ideation"; we designated it factor number 1 to indicate we considered it of primary interest. Then, to construct a meaningful and relatively pure measure of factor number 1, we selected only those six items that loaded solely on it and higher than 0.30 to create Scale Number One. We tentatively named the other three factors "tendency for premature critical evaluation of ideas"; "valuing new ideas"; and "belief that creative thinking is bizarre," designating them factors number 2, 3, and 4 for convenience. The appendix shows the six items from factor number 1 and their loadings and eight typical items from factor number 2 and their loadings. Typical items and loadings for factor number 3 ("valuing new ideas") include: "I have often been able to come up with a new idea myself based on an idea from someone else" (.53) and "Ideas are fundamental to decision-making, and as such, should not be taken for granted" (.49). Typical items and loadings for factor number 4 include: "Creative people generally seem to have scrambled minds" (.5h) and "Truly creative people also have unusual life styles" (.49).

To find the remainder of the items and loadings and the correlations among the four factors, see Basadur and Finkbeiner (1983a).

STUDY NUMBER TWO

Method

Study Number Two was an independent study to establish the internal validity, reliability, and external validity of Scale Number One ("preference for ideation") from Study Number One. A new sample of 238 managers and professionals from a variety of industrial, business, and hospital organizations completed a 14-item questionnaire (see Table 1) derived by combining in random order the six items from Scale Number One with eight items selected from factor number 2. We chose the eight items constituting Scale Number Two, "tendency for premature critical evaluation of ideas," by using a procedure similar to that used for Scale Number One. The Scale Number One items are items number 3, 4, 8, 9, 12, and 13 from the questionnaire provided in the appendix. The Scale Number Two items are numbers 1, 2, 5, 6, 7, 10, 11, and 14 from this questionnaire.

We assembled Scale Number Two primarily to help validate Scale Number One, not as a focus of this research - although it could serve as the focus of future research, along with scales drawn from factors number 3 and 4. We selected Scale Number Two because factor number 2 was stronger - that is, it had more items and higher loadings - than either factor number 3 or 4.

The data from the 238 panelists were factor analyzed to confirm that the two sets of items indeed consti-

tuted two separate factors, as Study Number One led us to believe. We used factor analysis procedures identical to those of Study Number One. A two-factor solution emerged. All six items from Scale Number One loaded on one factor and all eight items from Scale Number Two loaded on the other factor. The Cronbach alpha reliability estimate was then calculated for each scale (Cronbach, 1951). Thus, internal validity and reliability had been assessed.

Next, to assess external validity, the panelists' response scores in each of the two scales were calculated as described below. From the large sample, we selected two nearly equal, smaller "known" groups. These consisted of panelists whom two independent expert judges had identified as being either high or low in their preference for ideation on the job (the judges were two people familiar with both the concept of ideation and also with *the individuals'* on-the-job attitudes and behaviors). The 238 panelists were participants in a variety of training programs. Expert judges were available for some of the training groups, but not for others. In all, the judges rated 92 of the 238 participants. Each expert judge independently rated each participant as either "high" or "low" in preference for ideation - or indicated "don't know" if the judge lacked sufficient experience with the participant to make an accurate judgment. We then compared these independent ratings for each participant. Only those participants for whom both judges' ratings agree - whether high or low - were assigned to the "known high" or "known low" groups. When the judges disagreed, or one or both assigned a participant a "don't-know"

Table 1
Fourteen-Item Questionnaire for Study Number Two Combining Scales
Number One and Two

Instructions

The following is a series of questions that are designed to increase understanding of how people approach ideas and problem solving. None of these questions are meant to *evaluate* you in any way. There are no right or wrong answers.

Please answer each question as naturally and honestly as you can. Your best description of the world as you view it is what is wanted. Please write what *you* think.

Listed below are several statements concerning various situations. Read each statement carefully and indicate the extent to which you agree or disagree with the statements by circling the letter which corresponds.

A = Strongly Agree

B = Agree

C = Neither Agree Nor Disagree

D = Disagree

E = Strongly Disagree

1. ** I should do some prejudgment of my ideas before telling them to others.
(.60)

A B C D E

2.** We should cut off ideas when they get ridiculous and get on with it.
(.67)

A B C D E

3. * I feel that people at work ought to be encouraged to share *all* their ideas, because you never
(.34) know when a crazy-sounding one might turn out to be the best.

A B C D E

4. * One new idea is worth ten old ones.
(.33)

A B C D E

5. ** Quality is a lot more important than quantity in generating ideas.
(.72)

A B C D E

6. ** A group must be focused and on track to produce worthwhile ideas.
(.55)

A B C D E

7. ** Lots of time can be wasted on wild ideas.
(.51)

A B C D E

Table 1 (Continued)

| | | | | | | |
|-------|---|---|---|---|---|---|
| 8.* | I think everyone should say whatever pops into their head whenever possible. (.47) | A | B | C | D | E |
| 9.* | I like to listen to other people's crazy ideas since even the wackiest often leads to the best (.35) solution. | A | B | C | D | E |
| 10.** | Judgment is necessary during idea generation to ensure that only quality ideas are developed. (.72) | A | B | C | D | E |
| 11.** | You need to be able to recognize and eliminate wild ideas during idea generation. (.65) | A | B | C | D | E |
| 12.* | I feel that all ideas should be given equal time and listened to with an open mind regardless of (.38) how many they seem to be. | A | B | C | D | E |
| 13.* | The best way to generate new ideas is to listen to others then tailgate or add on. (.35) | A | B | C | D | E |
| 14.** | I wish people would think about whether or not an idea is practical before they open their (.59) mouth. | A | B | C | D | E |

* Item for Scale Number One: "preference for ideation"

** Item for Scale Number Two: "tendency for premature critical evaluation of ideas"

Note: The loadings of the items on the appropriate factors in Study Number One appear in parentheses immediately below the asterisks. Neither the asterisks nor the loadings were included in the actual questionnaire.

rating, the participant was assigned to the "unknown" group. The three group sizes were $n = 25$ ("known high"), $n = 19$ ("known low"), and $n = 48$ ("unknown"). The other 146 participants, for whom expert judges were not available, were added to the "unknown" group ($n = 194$).¹

The participants' responses to each of the 14 questionnaire items were scored on a five-point scale (+ 2 = strongly agree through - 2 = strongly disagree). We then calculated scale scores by averaging appropriate items for each of the two scales for each participant, thus creating single measures

of the two factors. We intended to demonstrate the external - or construct - validity of the new "preference for ideation" scale by showing that it discriminates two groups that it should discriminate, while those two groups do not differ on a related construct - that is, that the two constructs do appear to be behaving independently. Group means on the two scales for each group were calculated and compared using a standard statistical test of significance (t-test).

STUDY NUMBER TWO

Results

Table 2 shows all the factor loadings greater than .30. The clear clustering of items from the two scales is evident. (For a graphical display of the unrotated factor loadings emphasizing this clustering, see Basadur and Finkbe-

ner [1983b].) The correlation between the two factors was -.36. Study of these data verifies the factor structure obtained in Study Number One. All items clustering on each of the two factors extracted in Study Number Two clustered on the same factors in Study Number One in the same way. Also, none of the items on either factor in Study Number Two loaded significantly on the other factor - that is, no significant complex loadings exist, which repeats the finding of Study Number One. Scale scores were then created as described above.

The Cronbach alpha for Scale Number One, "preference for ideation," was calculated to be 0.68, indicating a moderate reliability, substantially higher than the 0.45 of the original preliminary scale. The Cronbach alpha for scale Number Two, "tendency for premature critical evaluation of ideas," was 0.83, which makes the

Table 2
Factor Loadings in Study Number Two

| <i>Item number from 14-item questionnaire</i> | <i>Factor this item loaded on in 103-item questionnaire in Study Number One</i> | <i>Loading on factor number 1 ("preference for ideation")</i> | <i>Loading on factor number 2 ("tendency to make premature critical evaluations of ideas")</i> |
|---|---|---|--|
| 12 | 1 | .68 | -- |
| 9 | 1 | .67 | -- |
| 3 | 1 | .56 | -- |
| 8 | 1 | .49 | -- |
| 13 | 1 | .42 | -- |
| 4 | 1 | .30 | -- |
| 11 | 2 | -- | .77 |
| 10 | 2 | -- | .76 |
| 2 | 2 | -- | .69 |
| 5 | 2 | -- | .69 |
| 14 | 2 | -- | .62 |
| 6 | 2 | -- | .55 |
| 1 | 2 | -- | .47 |
| 7 | 2 | -- | .35 |

above suggestion that future research be done on this scale and on factors number 3 and 4 appear quite feasible. The correlation of scale scores was $-.26$.

Thus, the six-item Scale Number One would appear to be an internally valid and moderately reliable measure of "preference for ideation." The eight-item Scale Number Two also seems an internally valid and substantially reliable measure of "the tendency for premature critical evaluation of ideas."

The results of the external validation work for Scale Number One follow. Table 3 presents a summary of data for each of the two scales. The maximum score on each scale for a participant is $+ 2.0$ and the minimum is $- 2.0$. We have provided group means, standard deviations, and comparative statistical tests of significance (t-test). We have included data only from "known high" and "known

low" participant groups because the "unknown" group was not included in any external validation analyses, their preferences for ideation being unknown. The "unknown" group participants' data *were* included, however, in the calculations for reliability and the confirmatory factor analysis provided above. The t-test comparing the "known high" to "known low" groups is a one-sided test for the "preference for ideation" scale because we have a definite hypothesis about which group should score higher. The t-test for the other scale, "tendency for premature critical evaluation of ideas," is two-sided.

A significant difference occurred in the hypothesized direction between the "known high" and "known low" group mean scores on the "preference for ideation" scale. There was no evidence of a significant difference between the same groups on the "tendency for premature critical evaluation

Table 3
Group Means for "Known"
High and Low Preference for Ideation Groups

| | Scale Number One: "Preference for ideation" | | Scale Number Two: "Tendency to make premature critical evaluations of ideas" | |
|----------------------------|--|---|---|---|
| | Group 1 "Known high" in preference for ideation (n = 25) | Group 2 "Known low" in preference for ideation (n = 19) | Group 1 "Known high" in preference for ideation (n = 25) | Group 2 "Known low" in preference for ideation (n = 19) |
| I. | | | | |
| Group mean score | .71 | -.29 | -.53 | -.24 |
| Standard deviation | .52 | .56 | .69 | .75 |
| t-test, Group 1 vs Group 2 | $t_{42} = 37.4$ | | $(p < .001)$ | $t_{42} = 1.8$, Not significant; $p > .185$ |

of ideas" scale. Thus, significant evidence indicates that the "preference for ideation" scale can discriminate between the two groups while the other scale does not. This supports the idea that the "preference for ideation" scale agrees with the expert judges in identifying participants' preferences for ideation. The measure of a related construct does not. Thus, we found evidence of the external validity of the "preference for ideation" scale as a measure of the "preference for ideation" construct.

DISCUSSION

We propose that the instrument described in Table 1 (items number 3,4, 8, 9, 12, 13) acts as a suitably valid and reliable measure of the "preference for ideation" of an individual in an organizational setting. Factors number 2, 3, and 4, tentatively identified as possible valid and useful constructs on their own, are particularly intriguing for future research.

This research substantially deepens our understanding of ideation and the attitudes relating to it. It also facilitates more structured research on ideation. Ideation appears to be a relatively complex concept; one can expect various organizational members to have substantially different interpretations or attitudes that relate to it. Also, in creative problem solving training emphasizing ideation, one can now better and more completely explain the concept in terms of the different attitudes related to it. One may also be able to explain the *cognitive* aspects of ideation better, such as the differentiation between the concepts of "deferral of judgment" and "ideation," which have not been well separated or clarified in the literature to

date (Parnes et al., 1977). To *passively* "defer judgment," enhanced perhaps by an attitude of a low "tendency to make premature critical evaluations of ideas" may be very different from *actively* performing "ideation" - that is, *actively* generating a large number of ideas without using judgment, enhanced perhaps by an attitude of a high "preference for ideation." The more passive, former behavior suggests a *freedom for ideation*, while the more active latter suggests a *triggering of ideation*. One could speculate that the former may even be a prerequisite for the latter.

The above concepts may help clarify the attitudes and cognitions relating to Osborn's four brainstorming operations: (1) defer judgment, (2) strive for quantity, (3) welcome freewheeling, and (4) hitchhike. The first operation seems more passive, the latter three more active. Speculatively, a high "preference for ideation" appears associated with performing the latter three operations well - and thereby "triggering ideation" while a low "tendency for premature critical evaluation of ideas" might be associated with performing the first operation well, thereby allowing "freedom for ideation." In further speculating, an examination of the items in factors number 3 and 4 Basadur and Finkbeiner, 1983a) suggests that the attitudes of low "belief that creative thinking is bizarre" and high "valuing new ideas" might be similarly associated with the "welcome freewheeling" and "hitchhike" operations, respectively. These speculations are very tentatively modeled in Figure 2. How the attitudes actually relate to the thinking processes is a matter for further research. The model also needs to address the effects of

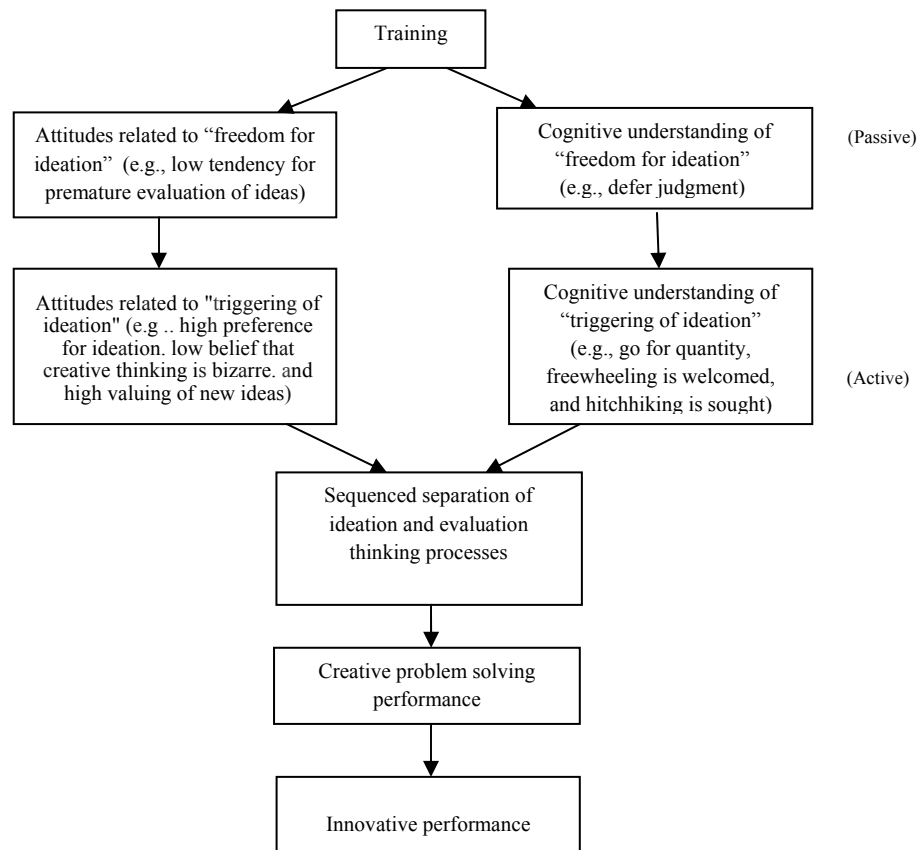


Figure 2. Speculative model of creative problem-solving training differentiating between "ideation freeing" and "ideation triggering."

training on evaluation processes and other performance-related factors (Basadur et al., 1982).

In summary, we have identified four separate attitudinal factors relating to ideation and have developed a reliable and valid measure of one of them. This differentiation may prove particularly useful in helping organizations and individuals better understand specific attitudes and thinking processes af-

fecting creative behavior - and understand how training in creative problem solving works, thereby increasing its effectiveness. For example, an organization may seek to target preferentially its training to modify whichever of these four attitudes it diagnoses as most critically needed. Also, when such training *is* provided, the concept of ideation may now be better and more completely explained

to participants. At this time, organization members likely have substantially different interpretations of the meaning of constructs associated with creative problem-solving training such as "ideation." At least some of those different interpretations seem to be represented by the four factors suggested in this research. This article may thus reduce some of the "mystery" of creativity training.

NOTE

1. A test-retest assessment of the judges' reliability on this classification task was performed in a separate study. We asked 25 managers and professionals working together in an industrial organization and familiar with ideation through prior training seminars to judge the degree of "preference for ideation" of 35 peers. These judges completed a questionnaire classifying each peer and themselves as to high or low preference for ideation or to the "uncertain/don't know" category. One day later the same procedure with the same people was repeated without prior warning. The time separation and the sheer number of peers being rated should have reduced at least the purely reflexive memory effects. The purpose of this study was to estimate the reliability of measuring "preference for ideation" using "expert" judges, as was done in Study Number Two. The test-retest comparisons follow.

Across all 25 judges making 36 ratings each for a total of 900 ratings, 788 ratings (87.5%) were *identical* from test to retest. Of the remainder, only 43 (4.8%) ratings were high/low reversals, while 69 (7.7%) were merely shifts to or from the "uncertain/don't know" category. This indicates a substantial reliability, since 95.2% of the ratings were either identical to or shifts from the "uncertain/don't know" category and in only 4.8% of the ratings did a judge reverse an opinion. Of the 25 judges, 14 made 0 or only 1 reversals out of 35, and 8 made only 2 or 3 reversals out of 35. Only 3 judges made more than 3 reversals out of 35.

As a further check, we examined the 92 ratings for "preference for ideation" made by each of the two judges in Study Number Two. Both judges agreed on 44 (93.6%) of the 47 participants known to both judges, and disagreed on only 3 (6.4%), leaving 45 ratings of "don't

know" by one or both judges. This type of classification task appears to be very reliable in view of the high levels of agreement reached both within and between judges.

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