Facilitative effects of verbal pretraining and checklist availability upon idea production

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The effects of adjective production prior to the presentation of two creativity problems and the availability of a seven-item checklist upon idea production were tested. Adjective pretraining facilitated idea production especially if the checklist was continuously available. The results suggested that pre-problem activities may be an important adjunct to the checklist procedure in markedly facilitating idea production.

Some studies have approached the training of originality (Maltzman, 1960) and creativity (Mednick, 1962; Staats, 1968) from the behavioristic tradition. For example, if Ss free-associated to stimulus words, responses became more original as more responses were produced (e.g., Maltzman, Bogartz, & Breger, 1958). Following initial training, originality in successive free-association sessions was facilitated (Maltzman, 1960), and the effect lasted for several days (Maltzman, Simon, & Licht, 1959). Also, performance on the Remote Associates Test (Freedman, 1965; Maltzman, Belloni, & Fishbein, 1964) and the Maier two-string problem (Maltzman, Brook, Bogartz, & Summers, 1958) was facilitated provided the associative pretraining was relevant.

Other studies, books, and programs concerned with creative thinking techniques common in industry and business have sought to demonstrate that idea checklists can profitably stimulate idea production (Davis & Houtman, 1968; Davis, Manske, & Train, 1967; Osborn, 1963; Parnes, 1967a, b). Checklists provide Ss with a list of general or specific ideas relevant to a specific problem. It would seem intuitively evident that individuals possessing such a list of ideas would be better prepared to generate problem solutions than individuals not provided with a checklist. However, the relationship between the availability of an idea checklist and increased idea production is not a simple one. Several recent studies (Davis & Roweton, 1968; Warren & Davis, 1969) found that a short checklist consisting of seven general statements (Table 1) facilitated college Ss in thinking of many original and practical physical changes for several common objects to a greater degree

Table 1
Aids in Thinking of Physical Changes

1. Add and/or subtract something.
2. Change color
3. Change the materials
4. Change by rearranging the parts
5. Change shape
6. Change size
7. Change design and style

than Ss provided with longer, more detailed idea checklists. The Ss in the latter group performed no better than untrained control Ss who were not provided with idea checklists (Train, 1967).

The task of thinking of physical changes, e.g., for a DOOR KNOB, consists essentially of producing *adjectives* (e.g., red, square) or combinations of adjectives (e.g., red square) each of which signifies a physical modification. Since a checklist can facilitate Ss in creating original and practical ideas, and since Ss produce many adjectives in the process, one could conclude in retrospect that the short checklist shown in Table 1 required Ss to sample from their hierarchy of adjectives. Conceivably, if S were given practice in producing adjectives, the checklist procedure might facilitate idea production to an even greater extent.

The present study required some Ss to produce adjectives for 5 min prior to the presentation of two creativity problems, i.e., thinking of physical changes for two common objects, while other Ss did not receive this pretraining. Half of the Ss in each group received the seven-item checklist to be used continuously while thinking of physical changes, while the remaining Ss were given the checklist only briefly during the instructional period. It was predicted that, since thinking of physical changes for common products consists mainly of listing adjectives, groups receiving the adjective pretraining would produce a larger total number of ideas and more highly original and/or practical ideas. Groups presented the short checklist either continuously or briefly should not differ unless the continuous presentation of the checklist serves as a "memory aid" to constantly remind S of modifiable, physical dimensions.

SUBJECTS

Thirty volunteers from undergraduate educational psychology courses at the University of Wisconsin were randomly assigned to one of four treatment conditions and were tested in small groups of four or less. Six Ss were eliminated randomly so that

the number of Ss in each treatment condition would be equal.

PROCEDURES

Verbal pretraining, introduced prior to two creativity problems, required half of the Ss to write as many adjectives as possible in 5 min; the remaining Ss received no pretraining. Following pretraining, all Ss listed physical changes for a THUMB TACK for 10 min and a KITCHEN SINK for 10 min. The order of the presentation of the two problems was counterbalanced. All Ss were given a seven-item checklist to aid in thinking of physical changes (Table 1); one-half of the Ss had the checklist available throughout the experiment while the remaining Ss studied the checklist only during the preproblem, instructional period.

Six dependent measures resulted: (1) total number of ideas, (2) mean ratings on "originality" (averaged ratings by two judges on an 8-point originality scale), (3) number of ideas rated "5" or above on the originality scale by both judges, (4) mean ratings on an 8-point "practicality" scale, (5) number of ideas rated "5" or above on the practicality scale by both judges, and (6) number of ideas rated "5" or above on both the originality and the practicality scales by both judges. Ideas rated "5" or above on both the originality and the practicality scales by both judges were arbitrarily designated *creative* physical changes.

DESIGN

A 2 by 2 by 2 repeated measures design was used. Prior to the two creativity problems, Ss received either no pretraining (N) or adjective pretraining (A); one-half of the Ss in each group received a seven-item checklist of ideas for use throughout the experiment (C) while the checklist was available to the remaining Ss only during the preproblem instructional session (B). Therefore, Ss were randomly assigned to either Group AB (adjective pretraining, brief presentation of the checklist), Group AC (adjective pretraining, checklist available continuously), Group NB (no pretraining, brief presentation of the checklist), or Group NC (no pretraining, checklist available continuously).

RESULTS

Separate analyses of variance were performed on six dependent measures. Means for the dependent measures are shown in Table 2.

First, the groups who received adjective pretraining produced significantly more total ideas than the groups not receiving pretraining ($F = 10.53$, $df = 1/20$, $p < .01$). Also, the Pretraining by Type of Checklist Presentation interaction reached significance ($F = 6.94$, $df = 1/20$, $p < .025$). Subsequent Newman-Keuls tests indicated that Group AC (adjective pretraining, continuous presentation of the checklist)

Table 2
Summary of Dependent Measures

Measure	Group AB (Adjective pretraining, brief checklist)		Group AC (Adjective pretraining, continuous checklist)		Group NB (No pretrain- ing, brief checklist)		Group NC (No pretrain- ing, continuous checklist)	
	N = 6		N = 6		N = 6		N = 6	
	Thumb tack	Kitchen sink	Thumb tack	Kitchen sink	Thumb tack	Kitchen sink	Thumb tack	Kitchen sink
1. Mean No. Ideas	35.33	34.37	46.00	44.33	32.33	32.83	21.30	22.50
2. Mean "Originality" Rating	3.92	3.38	3.37	2.58	4.00	3.53	4.25	3.58
3. Mean "Practicality" Rating	5.58	5.47	5.95	6.38	6.00	5.77	5.90	5.88
4. Mean No. Ideas above Scale Midpoint in Originality	6.00	5.17	4.17	3.50	7.00	6.83	4.50	4.83
5. Mean No. Ideas above Scale Midpoint in Practicality	20.83	19.50	32.67	34.00	21.17	21.83	12.50	14.33
6. Mean No. "Good" Ideas (above scale midpoint in both originality and practicality)	.67	.50	1.17	1.00	1.67	1.83	1.67	.83

produced significantly more ideas than Group AB (adjective pretraining, brief presentation of the checklist; $q = 3.64$, $df = 20$, $p < .05$), Group NC (no pretraining, continuous checklist; $q = 8.31$, $df = 20$, $p < .05$), and Group NB (no pretraining, brief checklist; $q = 4.50$, $df = 20$, $p < .05$). Groups NB and AB produced significantly more ideas than Group NC ($q = 3.81$, $df = 20$, $p < .05$, and $q = 4.68$, $df = 20$, $p < .05$, respectively) but were not different from each other.

Regarding originality, physical changes listed for the THUMB TACK were rated as significantly more original on the average across all groups than the ideas suggested for the KITCHEN SINK ($F = 18.75$, $df = 1/20$, $p < .01$). No other main effect nor interaction reached significance.

With three dependent measures—mean practicality, number of highly original ideas, and number of creative ideas, no main effect nor interaction reached significance.

The analysis of variance on the number of ideas rated above the scale midpoint for practicality by both judges indicated that the adjective pretraining groups produced significantly more highly practical ideas ($F = 5.45$, $df = 1/20$, $p < .05$). Also, the Pretraining by Type of Checklist Presentation interaction reached significance ($F = 7.12$, $df = 1/20$, $p < .025$). Subsequent Newman-Keuls tests indicated that Group AC produced more highly practical ideas than Groups AB ($q = 4.68$, $df = 20$, $p < .05$), NB ($q = 4.20$, $df = 20$, $p < .05$), or NC ($q = 7.08$, $df = 20$, $p < .05$). Groups AB, NB, and NC did not differ significantly.

Using the intraclass correlation (Guilford, 1954), interjudge reliabilities for the

originality and practicality ratings for the THUMB TACK problem were .84 and .81, respectively; for the KITCHEN SINK problem, interjudge reliabilities for the originality and practicality ratings were .50 and .76, respectively.

Finally, considering the 12 Ss who received adjective pretraining, the number of adjectives produced during pretraining correlated highly with the total number of ideas produced ($r = .84$, $p < .01$).

DISCUSSION

Adjective pretraining presented prior to the physical-change problems facilitated idea production. The results of the present study did not indicate whether the pretraining needed to be specifically the production of adjectives to be facilitative. Numerous other preproblem activities may cause a similar warm-up effect.

Subjects who listed quite a few adjectives were also likely to have listed quite a few physical changes. Idea fluency, an ability to think of many ideas, is a factor of importance to creative problem solving from Guilford's (1962) classic *structure of intellect* model. Since the present study found a substantial association ($r = .84$) between adjective production and idea fluency, creative thinking within the scope of physical-change problems may be essentially verbal fluency. Therefore, it may be that creative thinking and basic verbal ability are essentially the same factor under study in some laboratory varieties of creative problem solving.

Adjective pretraining, compared with no warm-up activity, differentially increased idea production when the checklist was presented continuously but not when the

checklist was presented briefly. Group AC (adjective pretraining, checklist available continuously) was definitely superior to all groups on total idea production and the number of highly practical physical changes. Ss in this group could continuously refer to the checklist which may have suggested adjectives produced during pretraining most of which were appropriate to the problems at hand. When the checklist was not available during problem solving, the seven idea-spurring statements, accessible only in memory, apparently were less likely to elicit the adjectives produced earlier, thereby resulting in fewer physical changes.

An interesting parallel can be drawn between the present results and an earlier study (Train, 1967). Train presented college Ss with a highly detailed checklist consisting of the seven general categories employed in the present study, under each of which appeared an extensive listing of values, e.g., mostly adjectives. Train found that Ss supplied with the detailed checklist did not produce significantly more ideas than control Ss not given the checklist. Ss resisted using a list of given, specific values as physical changes.

In a sense, the present study provided Ss in Group AC a similar "detailed" checklist, but in a much less deliberate fashion, and idea production was greatly facilitated. In this case, Ss first supplied the specific values (adjectives) of a detailed checklist, and E subsequently provided a relevant structure (the seven-item checklist) about which many of the adjectives could be grouped. Importantly, with the present study Ss were freer to impose their own idiosyncratic problem solving techniques than in Train's experiment, thereby making optimal use of the checklist procedure.

Perhaps the most important single result of the present study has been the demonstration of a warm-up effect, i.e., the facilitative effects of writing adjectives for idea production. Many earlier studies have focused upon the effects of creative thinking programs (e.g., Davis & Houtman, 1968), techniques such as brainstorming (e.g., Osborn, 1963) and the checklist procedure (e.g., Davis & Roweton, 1968) upon idea production. The present study suggests that preproblem activities such as adjective pretraining or other warm-up exercises, perhaps functioning in a fashion analogous to "set" in classic problem-solving literature, may significantly augment the effectiveness of existing programs and techniques.

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NOTE

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The ethical shift in the Prisoner's Dilemma Game^{1,2}

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Twenty three-man groups made of ROTC cadets were compared with 20 individuals when playing against a "dummy" strategy of 50% cooperation over 50 trials of the Prisoner's Dilemma Game. The 20 triads were further divided into two conditions: one with 10 equal status triads, the other with 10 triads comprised of unit commanders with two of their principal subordinates. Results showed groups to be less "trustworthy" than individuals; this was interpreted to be an "ethical shift." There were no significant differences between triad types.

What differences are there between contending in a mixed-motive situation with a single individual and contending with a group? Many real-life conflict situations involve dealing with the decisions of a council, a board, or a commission, but few experimental studies of simulated conflict have utilized groups as decision-making Ss. Of course, groups have been studied for their problem-solving ability as contrasted with that of individuals alone, and group "shift" phenomena have been proposed and

examined by Wallach, Kogan, & Bem (1964), who considered shifts toward risk-taking, and by Rettig (1966) who contemplated an ethical shift—away from censure avoidance and towards maximization of gain. Group structure has also been studied; member status differences have been observed to impede problem-solving (Bass, 1963; Torrence, 1955), and it would be expected that the inclusion of a formally recognized leader would militate against the diffusion of responsibility among members that has been advanced as one explanation for the risky shift.

In the process of considering what conditions are relevant to the initiation of cooperation in a mixed-motive situation, Deutsch (1964) concluded from his work that trust was an indispensable factor. The connection of trust with greater cooperation has been demonstrated in a number of other Prisoner's Dilemma Game (PDG) studies (Loomis, 1959; Evans, 1964; Tedeschi, Hiester, & Gahagan, in press). Rather than relying, as these studies did, on questionnaires and self-reports to determine Ss' predispositions in responding, Rapoport (1964) has suggested that the investigator look to the data itself and has proposed measures involving two-trial patterns of play in the PDG which he interprets as reflecting

the "propensities" of the players. The four state-conditioned propensities that he proposed were: trust, forgiveness, repentance, and trustworthiness. Trust is operationally defined as a cooperative choice on Trial $n+1$ following a double-defection outcome on Trial n , and seems to imply confidence that the other player will also cooperate in the interest of breaking out of a deadlock. Forgiveness is defined as cooperating on Trial $n+1$ after being exploited by the other player on Trial n and, similar to trust, implies some hope that one's opponent will be converted to cooperating after repeated cooperations on one's own part. Repentance is cooperating after exploiting the other player; this response pattern could be said to be related to trust since it seems to assume that the other will not retaliate after being exploited. Finally, trustworthiness refers to a cooperative choice after a double-cooperation outcome. The occurrence of a double-cooperation benefits both players equally and sets the stage for continued cooperation; therefore, unlike the first three state-conditioned propensities, trustworthiness involves strong and equal claims on both players to resist the temptation to exploit the opponent who has just been rewarded for cooperating and should be less likely to switch. Thus, the trustworthy response pattern is presumed to be dependent upon keeping a bargain once struck, while the other propensities are more in the nature of unilateral essays toward mutual promotive interdependence.

There is empirical support for Rapoport's intuitive analysis of the two-trial response patterns. Tedeschi, Steele, Aranoff, & Gahagan (1968) established that forgiveness, repentance, and trust were related to the cooperative and exploitative expectations and intentions of Ss. They interpreted their results by indicating that it is necessary for the S to trust the other in order for him to activate his dispositions to forgive or repent, but that it is not necessary that the individual be trustworthy himself in order to be trusting, forgiving, or repenting. Tedeschi, Hiester, & Gahagan (in press) found a substantial correlation between trust as displayed in the PDG and as measured by a paper-and-pencil test.

Thus, the present study was designed to compare the patterns of responses, within a mixed-motive conflict situation, of single individuals, groups with members of equal status, and groups with one high-status member. Three conditions were established: triads with a ROTC unit commander and two of his subordinates of equal rank (Group H); triads of three equal-rank ROTC cadets, not necessarily from the same unit (Group E); and Ss playing alone as individuals (Group A).

EXPERIMENT I

Subjects