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CREATIVITY ENHANCEMENT THROUGH FLOTATION ISOLATION

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Abstract

Research over the last 25 years on the contribution of aloneness to creativity enhancement has had mixed results. Early studies of sensory deprivation generally found negative effects while more recent research on flotation isolation has reported positive influence. Sports performance, for example, has been improved by means of directed imagery and flotation aloneness. However, there has been only one study which has attempted to enhance creativity through the flotation method and while this study reported positive results, it lacked several control features and was based on a very small sample of highly selected subjects.

The present study was designed to evaluate directly the potential contribution of floating to creativity enhancement as measured by the Guilford fluency test and other measures. Subjects were male and female university students, half of whom spent one hour in a float environment and the other half in a darkened room. Each was tested before and after experimental trial on the Guilford and other creativity measures and on two personality/affect scales. Float subjects showed significant increases on the Guilford test from the pre- to post-float and meaningful increases on other thinking measures as compared to non-floating control subjects. Floating was associated with a decrease in anxiety/tension, depression, hostility, and fatigue, but with an increase in vigor and a maintenance of curiosity scores, and it is speculated that the creativity benefits may be a result of these state changes.

Introduction

Historically, the creative process has proved difficult to define and objectively describe and, thus, efforts to improve creative functioning have been the focus of considerable speculation but minimal systematic research over the past several hundreds of years. More recently, creativity experts, such as Arieti (1976), have attempted to state conditions under which the creative process is more likely to occur. Arieti describes one condition as the lack of external distraction or arousal, a state he calls aloneness. He feels that general inactivity promotes daydreaming which is frequently creative in nature. The contribution of 'aloneness' to creativity is suggested in anecdotal accounts of persons who have been accepted as creative, including artists, poets and scientists.

Well-controlled research on the possible role of aloneness in creativity processes has been slow in appearing. Early research on the alone state labeled 'sensory deprivation' reported negative effects on complex cognitive tasks (Suedfeld, 1969), although some evidence was found for positive contribution to relatively simple cognitive tasks (Suedfeld, 1968; Suedfeld & Landon, 1970). More recent and more tempered research has found support for the position that aloneness may aid complex cognition, including the creative process. For example, Shore (1971) had physical science students spend a total of a dozen hours each in room isolation over a six-month period and found an increase in material related to the processing of scientific concepts. This study, unfortunately, had only three subjects and no control observations.

Suedfeld and Landon (1972) reported evidence for divergent thinking enhancement under sensory deprivation conditions with appropriate controls. On the other hand, Suedfeld *et al.* (1985–1986) reported that 24 h of room isolation was associated with little change in ideation but a simple memorial task was improved.

Thus, while the evidence is somewhat mixed with respect to influence of isolation on cognition, and dependent in large measure on task complexity, there is little support for complex cognition benefit through room isolation. The picture is more promising in the flotation isolation environment.[2] For example, Taylor (1985) studied undergraduate students in flotation isolation as compared with a quiet room couch control group. All students studied material from a chemistry course. Taylor reports that the float subjects learned the material better than the controls, especially if visual imagery was used and if the material was more conceptually oriented. Bruno *et al.* (1985) also studied undergraduate student floaters who reported considerably more insight experience than the control group.

The float experience has been used to aid sports performance, usually through the enhancement of directed imagery, which, in itself, has been associated with the creative process. Hutchison (1984) provides much anecdotal evidence on the benefits of flotation to increased performance of professional sports team members. Lee and Hewitt (1987) studied the influence of directed visual imagery in flotation isolation in non-professional but competitive gymnasts. These researchers report that judges ratings of performance were higher for the float/imagery subjects than for an imagery group only or a control group. The float/imagery group also self-reported fewer physical problems than the other two groups. Suedfeld and Bruno (1990) compared the influence of multisensory imagery, related to basketball foul shooting, with imagery training coupled with the use of two isolation environments, one of them being flotation. In the 30 university students studied, they found that the later free-throw shooting of these previously inexperienced subjects was significantly better for the float group over the other two groups. McAleney *et al.* (1990) used flotation isolation with imagery message to benefit the competitive performance of inter-collegiate tennis players, with significant positive effects. Wagaman *et al.* (1991) found that imagery training combined with flotation isolation significantly benefited collegiate basketball players. These studies, then, are consistent in suggesting that imagery aspects of the creative process can be modified in flotation isolation to benefit later performance.

The most direct examination of the potential contribution of flotation isolation to creativity enhancement has been provided by Suedfeld *et al.* (1987). In this study, there were only seven subjects, including two of the authors of the report, and all were psychology faculty members. The 'isolation' experiences included six 1·5-h periods of aloneness in their own individual offices and six one-hour floats, in a counter-balanced design. During the office trials and for 30 min after each float, each subject dictated material related to her/his own research into a tape recorder. Later, each subject, not including the two authors, rated the goodness of the ideas contained in her/his taped material. The material obtained after floating was judged to be more creative than that obtained during the office sessions. The Profile of Mood States (POMS) (McNair *et al.*, 1971) was completed by all seven subjects after each session. Mood ratings indicated that floating was associated with increased Vigor and reduced Tension, Anger, Depression, Fatigue, and Confusion. Interview information obtained from these subjects suggested that floating induced a 'twilight state' and that this state facilitated high-level creative behavior and positive affects.

These results are highly suggestive but the study was flawed in several ways. First of all, the room and float conditions were not comparable. In the room situation, the subject dictated throughout the trial while in the float situation, dictation occurred after the float, shower, and POMS testing. Counterbalancing was incomplete since subjects completed from eight to 12 sessions, and alternation of float/room trials was not carried out. Because of these difficulties, these researchers used only part of the data collected to make final comparisons. The POMS scores were not significantly different for the two environments but the authors refer to more positive trends for the float sessions. The authors are well aware of the shortcomings of their study and they call for additional and more definitive research.

In a pilot study in our laboratory designed to study the efficacy of the float technique as a clinical intervention procedure, we collected abbreviated data based on the Guilford fluency measures of creativity (Christensen & Guilford, 1958). We found a large difference in favor of the float condition over a waiting room control group. This finding led us to undertake the present study, whose purpose was to evaluate under controlled conditions the potential contribution of floating to creativity enhancement, as measured by the Guilford fluency test and other indices. We also wished to study emotion/affect changes associated with the environmental manipulations.

Method

Subjects

Subjects were 20 female and 20 male students enrolled in the Introductory Psychology course at the University of Vermont during the spring semester 1990. They were recruited by poster sign-up on the course's bulletin board and they received course points for participation in this research. The study was described as an investigation of the influence of environmental characteristics on cognitive functioning. Ten subjects of each gender were assigned to the float condition and ten each to the room control condition. Ten subjects, seven males and three females were lost to the study, largely due to incomplete data provision. Thus, the float condition finally contained 15 subjects, eight males and seven females, while the room control condition contained 15 subjects, five males and ten females. The mean age of these subjects was 19·3 years; they were mainly first year students at the university and most had not yet declared a major field of study. Other characteristics of this student group have been described elsewhere (Forgays & Forgays, 1991).

Apparatus and procedure

The flotation unit used was purchased from the Samadhi Tank Co., Inc. of Los Angeles, California. The closed tank measured 1·22 × 2·39 m and held approximately 380 l of water. Filtering of the water solution was done automatically and the internal heating system was set to maintain the solution at 34°C. The water was saturated with 350 kg of magnesium sulfate and this solution permitted subjects of various sizes and weight to float easily in the 0·28-m water depth, with nearly one-third of the body and most of the face above water. This apparatus was located in a quiet room which was part of an isolation laboratory. The tank and room were completely dark when the subject floated. The subject also wore ear plugs.

Details of the procedure were explained to each float subject who then signed a consent form. These subjects made one float of 60-min maximum duration, and it had been made clear that s/he could terminate the float, or any procedure, at any time for any reason.

Each subject in the control group signed a consent form after details of the procedure were explained. They spent the maximum of 60 min resting on a couch in a dimly lighted room adjacent to the tank room. They were told to relax and to remain prone on the couch during the trial. They were also told that they could terminate the experiment at any time for any reason.

Before floating or resting, the subject completed the Guilford Creativity Scale (half of the subjects responded to Form A and the other half to Form B), the State Personality Inventory (SPI),[3] and the POMS. These latter two measures were used to assess emotion/affect states. After this, each float subject showered and entered the tank room; control subjects spent an equivalent amount of time reading available magazines while sitting on the couch. Float subjects entered the tank and the experimenter turned off all lights, signaling the beginning of the float. For control subjects, the experimenter entered the 'waiting room' at the appropriate time, told the subject that the trial was to begin, lowered the lights, and left. For all subjects, just before the isolation trial began, the experimenter asked each to think of an important personal problem they now had and continue to think about it during the trial. The experimenter also provided each subject with a brain teaser which s/he should try to solve during the trial.[4]

When 60 min had elapsed, the experimenter reappeared in each condition and indicated that the trial was over, put on the full lights, and directed the float subject to take another shower and the control subject to sit up and read the magazines again for about the same period as the shower duration, usually ten minutes. No subject terminated in less than 60 min.

After showering or readjusting to the well-lighted laboratory, each subject again completed the Guilford Creativity Scale (the alternate form to the one completed earlier), the SPI, and the POMS scales, and responded to a brief experimenter-administered interview. The latter inquired into the subjects' reaction to the experimental procedures, whether or not the subject thought about the personal problem and had made progress with it, the solution to the brainteaser was requested, and a brief Numbers Game was played.[5]

Results

Means and standard deviations for the Guilford Creativity Scale, the SPI and the POMS scales for pre-trial and for post-trial by isolation technique are given in Table 1. Gender differences were small and largely non-significant; because of the small number of subjects, data are combined across gender. The Guilford Creativity Scale consisted of three fluency subtests. Only the combined score is presented here.

Examining the pre-trial pattern, it can be seen that the creativity scores are almost identical for the two isolation groups. However, float subjects score somewhat higher than controls on the Anger, Anxiety and Curiosity subscales of the SPI and on the Tension subscale of the POMS. This may reflect their anticipation of a largely novel float experience.

TABLE 1
Means and standard deviation of pre- and post-scores on the various measures for float and control subjects

	Flotation $n = 15$		Controls $n = 15$	
	Pre	Post	Pre	Post
Guilford creativity				
Mean	58·80	62·20	59·00	58·75
S.D.	6·99	6·93	6·38	7·59
Spielberger SPI				
Anger mean	12·20	11·33	10·80	10·80
S.D.	06·04	04·89	02·34	02·14
Anxiety mean	21·33	14·87	15·13	13·20
S.D.	05·91	04·37	04·66	05·52
Curiosity mean	32·80	32·20	29·20	26·93
S.D.	05·63	06·11	04·33	05·62
Profile of Mood States (POMS)				
Tension mean	13·00	05·60	07·87	05·20
S.D.	07·76	03·09	04·49	04·04
Depression mean	04·13	00·93	07·20	04·00
S.D.	06·11	01·62	10·35	06·94
Confusion mean	05·93	05·20	07·80	04·47
S.D.	03·81	02·51	05·07	03·04
Hostility mean	02·87	00·60	04·87	03·07
S.D.	03·98	01·45	08·97	08·59
Vigor mean	18·47	22·20	16·13	13·53
S.D.	05·40	05·07	05·89	06·52
Fatigue mean	05·33	01·87	09·40	06·33
S.D.	04·50	02·80	07·96	05·85

Float subjects are somewhat lower than controls on the Depression, Confusion, Hostility and Fatigue scales and higher on the Vigor scale of the POMS.

Comparing post- to pre-scores, floaters increase their creativity score while controls stay at the same level. Floaters decrease their Anger and Anxiety scores on the SPI more than controls but controls decrease their Curiosity score while floaters stay at the same level. On the POMS scales, floaters decrease their Tension, Depression, Hostility, and Fatigue score more than controls while the reverse is true for the Confusion score. Interestingly, floaters increase their Vigor score while controls decrease theirs.

Because of the differences between the experimental and control groups on several of the SPI and POMS scales at pre-score, pre- to post-score change on the creativity measure and on the nine subscales of the SPI and POMS were analyzed by ANCOVA with the pre-score as the covariate and the post-score as the dependent variable. This procedure will adjust for individual variation and permit meaningful change comparisons. Thus, there were ten ANCOVA analyses in all. Since the subscales of the SPI and POMS are treated as essentially orthogonal measures, we treated them in the same manner here. In each MANOVA analysis, there were three main effects: Gender, Isolation condition, and Creativity level. In addition to using the creativity score as a dependent variable, we used it as a main effect as well by categorizing each subject as high or low depending on whether his/her pre-Guilford score was above or below the median of the combined subject distribution. Interactions were Gender by Float/control, gender by Creativity level, and Float/control by Creativity level. We did not calculate the triple interaction because of the difficulty in interpreting this effect. Rather, the variance for this term remained as part of the error term. All comparisons are based on 1 and 23 degrees of freedom.

In the ANCOVA analyses, the Float/control main effect showed a consistent pattern of significance. Floaters increased their post-score over the pre-score more than the controls on the Creativity measures ($p = <0{\cdot}03$), and decreased their score more on Anxiety ($p = <0{\cdot}001$), Tension ($p = <0{\cdot}05$), Depression ($p = <0{\cdot}02$), Hostility ($p = <0{\cdot}05$), and Fatigue ($p = <0{\cdot}0001$). Floaters maintain their level of Curiosity score while controls decrease theirs and this difference is significant ($p = <0{\cdot}03$). Floaters increase their Vigor score while controls decrease theirs and this difference in change is also significant ($p = <0{\cdot}002$).

Significance for Creativity level as a main effect was found for two of the SPI scales, Anxiety ($p = <0{\cdot}05$), and Curiosity ($p = <0{\cdot}03$), and for three of the POMS scales, Tension ($p = <0{\cdot}05$), Confusion ($p = <0{\cdot}002$), and Fatigue ($p = <0{\cdot}04$). High creatives decrease anxiety more than low creatives while low creatives decrease their curiosity scores more than high creatives. For all three POMS scales, high creatives decrease their scores more than low creatives.

No main effects were found to be significant for the Anger scale of the SPI. However, one interaction term was significant, that for Creativity level by Isolation condition. The high creative controls decreased their anger score more than the three other groups ($p = <0{\cdot}01$). Significant interactions were also found for the Depression, Hostility, and Fatigue POMS scales. For Depression, the Isolation condition by Creativity level and the Gender by Creativity level terms were significant, both at the $p = <0{\cdot}05$ level. The high creative floaters decreased their score more than the other three groups and high creative females decreased their score more than the other three groupings. Two significant interaction terms were found for the Hostility scale:

Float condition by Creativity level ($p = <0.05$) and Gender by Creativity level ($p = <0.03$). In the first case, high creative floaters decrease Hostility the most, while in the latter, high creative males decreased Hostility the most. Finally, the Gender by Creativity level interaction was significant ($p = <0.002$) for the Fatigue scale. High creative females decreased their scores more than the other three groups.

Only descriptive data will be provided for the rather informal thinking measures described above as personal problem solution, brain teaser, and Numbers Game. These data were obtained during the post-trial interview. After formal testing was completed, the researcher asked the subject: 'Did the session help you find a solution of the problem you identified before the trial? Did you think about it in a different way'? Nine of the 15 floaters responded with a 'yes' (60%), while five of the 15 controls said 'yes' (33%). Next, the interviewer requested the solution of the brain teaser provided earlier. Seven of the 15 floaters provided the correct solution (47%), and four of the 15 controls had solved the problem correctly (27%). For the Numbers Game, there were 90 possible correct solutions for each group of subjects (six problems × 15 subjects). The floaters provided 41 correct solutions (46%) and the controls 34 (38%).

Discussion

We set out to evaluate the efficacy of the flotation method as an enhancer of creativity. Using the Guilford fluency indices as our creativity measure, it is clear that the float subjects increased these scores significantly post- over pre-trial while control subjects remain at the same level. Floaters also report more help on the personal problem and show higher scores on the brain teaser and number game tasks. And these effects occur after only one hour in flotation.

The pre-isolation scores on the Guilford scales were almost identical for the two subject groups. However, scores on the SPI and POMS measures were somewhat different for the two groups. The float group displayed more anxiety, curiosity, anger and vigor but less depression, confusion, hostility and fatigue than controls. Since these measures were obtained before subjects were exposed to their respective isolation conditions but after each had been informed of group assignment, it is reasonable that anticipation of the isolation experiences influenced responses to the two measures.

Significant gender results were scant. This finding is consistent with previous studies and reviews of college student populations (Nolen-Hoeksema, 1987). However, results reflecting the isolation main effect were robust and consistent. Floaters increased their post- over their pre-scores on creativity and vigor, and maintain their curiosity level while they decreased anxiety, tension, depression, and fatigue scores, as compared with controls. It appears, then, that float subjects are alert but relaxed and that these conditions may conduce to the creativity benefits obtained.

Creativity score results as a main effect were interesting. Subjects higher in creativity at pre-measure decrease anxiety, tension, confusion and fatigue after the isolation experience over the lower creative subjects, while the latter decreased their curiosity score more. These results suggest that higher creative persons respond to isolation more positively and that such a response pattern may aid their creative process. More definitive research is required to evaluate these possibilities.

Interaction effects are more difficult to interpret here, and this is not unusual in a great deal of research. One effect is consistent with the interpretation above: high creative floaters decrease their depression and hostility scores more than the other three comparison groups (low creative floaters and high and low creative controls). On the other hand, low creative controls decrease their anger scores more than the other three groups. Is it possible that this change is associated with a decrease in responsivity which in turn may influence post-isolation cognitive functioning? Highly creative females decreased their depression and fatigue scores while highly creative males decreased their hostility scores as compared with the other three comparison groups, respectively. We would wish to see such results replicated before attempting to offer possible explanations.

We used the Guilford measure as our principal index of creativity because it is a standardized measure with adequate psychometric properties. It does satisfy the requirement of novelty for any measure of creativity and of response appropriateness by its scoring standards. However, it is clearly an index of divergent thinking, an important aspect of creativity (Sternberg & Lubart, 1992), but does not tap other parts of creativity. Perhaps, our less formal measures involve components of convergent thinking, and results based on these measures were consistent with those based on the Guilford scale.

There are now two pieces of research attempting to test the contribution of flotation isolation to creativity enhancement, the Suedfeld *et al.* (1987) study and the present one. The former used indices of creativity which involved individual but socially valuable scientific products and much more time in isolation as compared with the standardized Guilford measure and the single hour in isolation employed here. However, results in the two studies are quite similar. That is, both studies provide positive evidence for the enhancement of the creativity process, measured through limited standardized measures or through more work related measures, as a result of flotation isolation. Both studies also used the POMS mood scales and both report strikingly similar results. Floating is associated with increased vigor and a reduction in depression, confusion, hostility and fatigue. These combined findings reinforce the suggestion provided above that flotation isolation may be a priming environment producing a relaxed but alert state which may set the stage for creativity benefit. The float environment appears to be superior to room isolation in these regards but definitive analysis of contributory environmental characteristics remains to be done. It is apparent that further research is in order with larger numbers of various kinds of subjects, with systematic variation in the flotation and control conditions, and with an increased number of measures of the thinking/creative process.

Notes

(1) This research was supported in part by the Institutional Grants Program of the University of Vermont Graduate College. Thanks are due to Dennis Mathewson and Thornton Land for their help in subject recruitment and data collection for this project.

(2) We prefer the label 'isolation' to refer to those environments which reduce sensory input, physical mobility, and social contact to the subject. Others prefer the phrase 'restricted environment stimulation' to refer to similar environmental characteristics (Suedfeld, 1980).

(3) Spielberger, C. D. (1979). Preliminary manual for the State-Trait Personality Inventory (STPI). Unpublished manuscript. University of South Florida, Tampa.

(4) There were five different brain teasers. A typical example follows: 'A person is found dead in an apartment hanging from a noose. There is nothing in the room except a large puddle of water under the hanging person. How could this have occurred?' A possible explanation from the subject is that the person stood on a large block of ice and jumped off after applying the noose. Over time, the ice melted.

(5) There were six problems in the Numbers Game. The subject was asked to identify, for example: 26 L of A (26 letters of the Alphabet) or 12 S of the Z (12 signs of the Zodiac).

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