

**EFFECTS OF FLOTATION- VERSUS
CHAMBER-RESTRICTED ENVIRONMENTAL
STIMULATION TECHNIQUE (REST) ON
CREATIVITY AND REALISM UNDER STRESS
AND NON-STRESS CONDITIONS***

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ABSTRACT

Two studies examining different aspects of the Restricted Environmental Stimulation Technique (REST) were carried out. In the first study, 38 participants were assigned randomly to either a group that floated on one occasion or a group that was given floating on three occasions. Following this, the subjects performed a test of divergent creativity and a test of logic. In the second study, 32 participants were assigned randomly first to two groups, Flotation-REST or Chamber-REST groups, and then randomly assigned to two more groups, namely to either a Stress-group or to a Non-stress group. The most important dependent variables of this second study were derived from essay-writing which was adjudged on the basis of elaboration, liveliness, originality, and realism. The results did not indicate any differences deriving from one or three flotations; both groups performed worse on the test of logic but tended to be better on the test of creativity. Both REST groups were similarly relaxed after treatment although the Flotation-REST group showed altered states of

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consciousness to a greater degree. The Flotation-REST group showed more originality whereas the Chamber-REST group showed more elaboration and realism. The results are discussed from the standpoint of fluctuations within the primary-secondary process continuum.

INTRODUCTION

Relaxation research has generated a number of sub-fields, involving, for example, stretching and autogenic exercises [1] and the benefits of mental and physical relaxation methods such as Tai Chi [2]. Further examples are offered by relaxation with the aid of certain devices (i.e., induced environmental settings), such as the physio-acoustic method [3] and the flotation tank [4]. In the present study, a floating tank was to induce a condition of relaxation. Flotation-REST (Restricted Environmental Stimulation Technique) is a method whereby an individual is placed in a horizontally floating posture and immersed in salt water in an environment (the floating tank) where all incoming stimuli are reduced to the barest minimum during a short period. The salt water in the floating tank is maintained at skin temperature while earplugs are used to minimize sounds and when the entrance to the tank is closed, complete darkness ensues. Flotation-REST is a cost-effective and secure method with minimal or complete absence of adverse effects [5, 6]. Previous reports concerning stimulus-reduction of the sensory organs (sensory deprivation) indicated several negative effects such as confusion, worry, and stress [7].

Recent research, especially in connection to the flotation form of REST, instead indicates that meaningful positive effects may be obtained. Thus, the results indicate positive effects, such as an increased well-being and relaxation [8], mild euphoria [9], greater production of ideas [10, 11], an increased originality [12, 13], improved sleep at night [14], reduced stress, tension, and anxiety [6, 9, 15-17], reduced pain [18-19], reduced headache [20], lowered blood pressure [15], less muscle tension [21], as well as a suitable complement to psychotherapy [8, 22]. It ought to be indicated that the method is experienced as pleasant and subjects are always prepared to endorse it on further occasions [23].

Flotation-REST is a form of sensory deprivation that readily induces a state of altered consciousness. At the same time, individuals experience an elevated consciousness of inner, mental processes, changes in formal thought patterns, and reduced contact with reality [23, 24]. This condition has been described as a cognitive shift to the advantage of primary process oriented cognition [25-28], i.e., a more logical thinking and directed attention (secondary process) is shunted aside by more intuitive thinking and non-directed fantasy (primary process).

In many of the documented flotation studies, the control condition usually consists of the subject being instructed to sit in an armchair and browse through magazines (Non-REST) or to lie upon a mattress in a soundproof and light-insulated

room (Chamber-REST) or both of these alternative conditions [12]. Experience from these types of studies has usually indicated that the Chamber-REST condition induces a certain relaxation effect compared with the Non-REST condition, but that the Flotation variant of REST induces a deeper relaxation and a greater range of effects. However, further investigation is to dissect out the cognitive similarities and differences existing between the two REST conditions with respect to, for example, stress management and creative functioning. Further, previous research has shown that in certain situations, like, for example, the treatment of pain symptoms [19], a series of flotations is necessary to obtain beneficial effects, whereas in other situations, like creativity studies [12] or induction of muscular relaxant effects [21], short-term effects may be obtained directly on completion of flotation. Here, too, several more studies are required to describe the conditions under which an acute intervention may be sufficient and when a longer term of treatment may be required.

Regarding cognitive aspects on chamber-REST and flotation-REST, a comprehensive review [29] indicated a consistent pattern for chamber REST but not for flotation REST. For simple cognitive tasks (like memorization and recall) chamber-REST improves performance, but for more complex, open-ended tasks (like divergent test or storytelling) chamber-REST tends to impair performance [30]. For flotation-REST, the results have been inconsistent, some studies showing the same general trend as in chamber-REST and others show more general effects regardless of task-complexity [29].

The question of whether or not previous experience of altered states of consciousness and/or treatment expectancy effects may affect the outcome of the flotation experience is another issue. Earlier studies with sensory deprivation designed to imply to the participants that sensory deprivation effects were expected has shown a higher degree of such effects than participants instructed to expect nothing to happen, despite identical treatments [31]. Other studies [32] describe sensory deprivation as a situation where immediate environment factors lack importance. In research with psychoactive drugs it is known that expectancy factors are of importance and greatly influence the participants experience [33, 34]. One study dedicated to expectancy factors and flotation-REST by Norlander, Kjellgren, and Archer [23] showed that different expectancies or earlier experiences did not exert any particular effect upon the subjects' experiences in the flotation tank. Despite this, systematic experiments are required that compare varying numbers of tank flotations not merely to study experiential factors but also to explore the areas of potential benefit.

The purpose of the present study was to explore: a) whether or not there was any difference between a single or a triple flotation occasion(s) with regard to influence on creative thought and logical thought; b) whether Chamber-REST and Flotation-REST are as effective for providing relaxation after induced stress; c) whether or not stress or REST (induced by Flotation-REST or by Chamber-REST) facilitates creativity and literacy skills; and d) further

information about the influence of primary and secondary processes upon different capacities.

METHOD

First Study

Participants

Subjects were recruited from announcements placed on announcement boards throughout the university. When participation deadline had run out, 38 persons had volunteered. Of these, 21 were female subjects and 17 were male subjects. These subjects were then randomly assigned to the two experimental groups, i.e., those subjects that were allowed to float on one occasion and those that were allowed to float on three occasions (see “Design”). Using Chi Square (Goodness-of-fit) the incidence of within-group gender differences was examined. The analysis indicated that there were no significant differences with regard to the number of male and female subjects within each group ($ps > 0.2$). The mean age of the participants was 34.31 ($SD = 11.18$, *age range* = 20 to 60 years). Two-way ANOVA, with Number of floatings and Gender as independent variables and Age as dependent variable, indicated no significant effects ($ps > 0.5$). In order to obtain further background data, the personality test, Life Orientation Test (LOT), that measures the personality trait optimism was administered; earlier studies have shown that LOT is an important variable in the context of Flotation-REST [19]. Two-way ANOVA, with Number of flotations and Gender as Independent variables and optimism as dependent variable, showed no significant effects ($ps > 0.3$).

Design

The 38 participants were randomly assigned to two groups, i.e., one flotation (9 male and 7 female subjects) and another of three flotations (8 male and 14 female subjects), thereby constructing the variable Number of Flotations that together with Gender provided the independent variables of the study. The dependent variables were fluency (number of relevant responses on the divergent test) and logical ability (measured through application of a deductive test) measured on two occasions, before and after treatment (flotation-REST).

Instruments

LOT—Life Orientation Test—The test [35] consists of eight items, plus four filler items. The task of each subject is to take up a standpoint to the extent of whether or not one is in agreement with each of the items described, on a scale of 0–4, where 0 indicates “strongly disagree” and 4 indicates “strongly agree.”

The test measures dispositional optimism, defined in terms of generalized outcome expectancies.

Syllogisms I-II—A test presented in two versions [36] that measures the ability of logical and deductive thinking. Each Syllogism test consists of 21 items demanding a quantitative type of deduction reasoning (e.g., Tom is taller than John. John is smaller than Bill. Is John taller than Tom?). Time was limited to 5.5 minutes and the number of correct answers were registered. During this examination, half of the participants received, randomly, version I before treatment and version II after treatment, and for the other half of participants versions I and II were presented in the opposite order.

Beer Can/Brick—A test of divergent [37] that measures the number of relevant responses for how many different ways one may use a beer can or a brick, respectively. The subject was allowed two minutes for each item in order to produce as many alternatives as possible. In this way, a measure of Fluency is provided. In this study, half of the subjects, randomly, responded to beer can before treatment and brick after treatment, while the other half of the subjects responded to beer can and brick in the opposite order.

Procedure

Participants were instructed to bring swimming trunks and a towel. If the participant belonged to the three-flotations group, the subject had floated on two different occasions the previous week. On arrival, each subject was instructed by the Experimenter to fill out a form with background data and then (in randomized order) LOT, Syllogisms (either version I or II), and beer can/brick (either beer can or brick). Then, the experimental manipulation (flotation-REST) took place for 45 minutes, and afterwards the participants were given the Syllogisms and beer can/brick tests and this time with the particular version they had not received earlier. After this, debriefing was initiated.

Second Study

Participants

The experiment was performed at the flotation-REST laboratory at the University of Karlstad. Thirty-two subjects were recruited from the pool of students attending evening courses on a random basis. Of these, 43.8% were students, 40.6% were employed occupationally, and 15.6% described themselves as being occupationally redundant. The mean age of the participants' was 30.37 years ($SD = 10.48$, *age range* = 18 till 65), 13 were men and 19 were women. The subjects were randomly assigned to two conditions (see below, "Design"), i.e., to a Flotation-REST or a Chamber-REST group (REST) and to a Stress or Non-stress group (Stress/Non-stress). The analyses were performed

through application of two-way ANOVA with REST and Stress/Non-stress as independent variables and with dispositional optimism (LOT), anxiety (HAD), depression (HAD), Change-Stability (FS), sleeping-time, latency to fall asleep, quality of sleep, number of nightmares, dream remembrance, amount of alcohol consumed per month, number of cigarettes per month, number of snuff doses per month, number of stress symptoms, age, and stress experience as the dependent variables. The analyses showed no significant effects either for REST or Stress/Non-stress, nor were there any significant interaction effects between the independent variables ($ps > 0.1$). The personality test FS, which measures creative attitude, was transformed to stanine in order to allow a comparison with the norm group (derived from industrial workers and office staff) of the test. A one sample t -test indicated no difference between the sample of this investigation and the norm group ($p = 0.919$).

Further analyses were performed through application of the Mann-Whitney U-test with REST and Stress/Non-stress as the independent variables and with profession, education, period within the menstrual cycle (for women), and use of preventive pills by the female subjects as dependent variables. The analyses did not indicate any significant effects either for REST or Stress/Non-stress ($ps > 0.1$). Finally, the Chi-Square test (Goodness-of-fit) was used to examine gender distribution in the four groups of the investigation (i.e., Flotation-REST, Chamber-REST, Stress, and Non-stress). It was indicated that the differences in number between genders was non-significant ($ps > 0.1$).

Design

The subjects were randomly assigned in similar numbers to either a Flotation-REST group (16 subjects) or a Chamber-REST group (16 subjects), thereby constituting the independent variable *REST*. Furthermore, the same participants were randomly assigned to either a Stress-group (16 subjects) or to a Non-stress group (16 subjects), thereby constituting the independent variable *Stress/Non-stress*. The most important dependent variables of the investigation were derived from essay-writing, wherein a panel of judges was assigned the task of judging the essays with regard to *Elaboration*, *Fantasy*, linguistic *Liveliness*, *Originality*, as well as social *Realism*.

Instruments

During the experiment, three instruments were applied before the manipulation as background variables (FS, LOT, and HAD) and two after the manipulation (Composition test and EDN) and a modified version of a test (Stresstest) was applied as a manipulative step (i.e., for Stress group). Finally, the flotation tank was used in one of the experimental groups (i.e., the Flotation-REST group).

FS—Change and Stability—An attitude to change and stability test [38] which correlates high with several creativity tests was applied. The test consists of 20 items of the type: “Risk-taking is necessary for success,” and each subject was asked to respond on a 4-point scale, ranging from agree to disagree. There was no time limit for the FS test.

LOT—Life Orientation Test—The test [35] consists of eight items, plus four filler items. The task of each subject is to take up a standpoint to the extent of whether or not one is in agreement with each of the items described, on a scale of 0–4, where 0 indicates “strongly disagree” and 4 indicates “Strongly agree.” The test measures dispositional optimism, defined in terms of generalized outcome expectancies.

HAD—Hospital Anxiety Depression Scale—The validity and reliability of the HAD-scale for assessing degree of anxiety and depression symptoms has been examined by Herrmann [39]. The HAD-scale measures the degree of anxiety and depression wherein values under 6 are considered normal, those between 6 and 10 as being borderline, and all values over 10 points are indicative of a probable depression-anxiety diagnosis.

Composition Test—Participants were instructed to write an essay based on four words: ambition, choice, ring, and disappointment. Two experienced evaluators of creative production separately judged the essays on a scale from 1 to 10 for Elaboration, Fantasy, Liveliness, Originality, and Realism. Consensual definitions [40] of Elaboration, Fantasy, Liveliness, Originality, and Realism were used.

EDN—Experienced Deviation from Normal State—A shortened instrument modified for use with flotation-REST [19] utilizing the internationally-applied psychometric instruments APZ-questionnaire and OAVAV [41] for obtaining judgments of altered states of consciousness. The APZ- and OAVAV-forms are the internationally-applied standard for this purpose and these tests have been validated in several studies in different countries [41]. Since the test forms were originally intended for the study of altered states of consciousness as induced by hallucinogenic substances, a number of the original questions were not relevant when flotation-REST was applied as the method of induction. In total, the EDN consists of 29 questions whereby each is responded on a visual analog scale (0-100). A complete “index of experience” was constructed from the points obtained from all 29 questions and were summated to provide a “sum of experience.” These values reflect the total experience of deviation from normal states (EDN).

Stress Test—The test [42] was developed in order to induce stress in subjects. It consists of a number of tasks, with conflicting descriptions that were difficult to interpret, presented to the subjects under a marked inadequate amount of time

availability (eight minutes). In order to reinforce the stress effect in the present case, several more tasks of the same type were included at the same time as the amount of time for responding was increased to 12 minutes.

Flotation Tank—A flotation tank (Flytarium Norden, Sweden) measuring 2620 mm × 1670 mm × 950 mm was used. The depth of fluid (salt water) varied between 200-to-300 mm. The flotation tank was insulated partly to maintain a constant fluid temperature (in the water and in the air) and partly to encapsulate each subject from incoming light and noise. The temperature of the fluid was maintained at 34.4°C. The water in the tank was saturated with magnesium sulphate (density: 1.3 g/cm³). The tank was equipped with a horizontally hinged lid that was easy to open and close (from inside and out) by the subject. Between flotations a hydrogen peroxide solution was regularly poured in, and after this the salt water was filtered and sterilized with UV-light.

Procedure

Directly on arrival, the participant was informed that he/she could terminate the experiment at any time, for any reason. Thereafter he/she was allowed to be seated in an armchair and read the available magazines over 5 minutes. This procedure has been shown to be effective in allowing the subjects to adapt to the laboratory environment. Following this, each subject was required to complete the information regarding background data, as well as registering on a VAS-scale the degree of stress one experienced during that particular occasion (Stress 1). The next task for the subject was to complete, in random order, the Life Orientation Test (LOT), the Hospital Anxiety and Depression scale (HAD), and the change and stability test (FS). If the subject belonged to the Non-stress group then he/she was instructed to return to the armchair and read the magazines, on this occasion for 12 minutes. If, on the other hand, the subject belonged to the Stress group then he/she instead was required to carry out the test which was designed to induce stress (Stress test) during the same 12 minute period. Following this, another stress measurement was registered (Stress 2). If the subject belonged to the Chamber-REST group he/she was given relaxation instructions according to Benson [43], and the instruction was to employ these exercises as necessary while relaxing on the pallet. Each subject was given wax ear plugs to place in their ears. After this, the door was closed with the subject left alone in the darkened chamber. If the subject belonged to the Flotation-REST group he/she was instructed to visit the bathroom and then take a shower. Furthermore, he/she was instructed to thoroughly dry his/her face so as to avoid irritating droplets of water that might have disturbed the relaxation in the tank. Thereafter, the subject was given relaxation instructions according to Benson [43, pp. 159-163] and the instruction to utilize these exercises as necessary during floating. So as not to be disturbed by the water and to further eliminate noisy sounds, wax plugs were inserted into the subject's ears. Thereafter, the subject entered the tank.

Both REST conditions were maintained for 45 minutes. The reason for this was that the norm for flotation in experiments often is 45 minutes. The norm for chamber-REST is, however, often considerably longer [44]. After 45 minutes, the REST-treatment was terminated and the subject was asked to complete the EDN instrument, after which a final stress measurement was registered (Stress 3), directly followed by the essay writing task which was continued for 20 minutes. Following this, the debriefing procedure was carried out and each participant was thanked for taking part.

Interjudge Reliability

Correlational statistics (Pearson's r) indicated that there were significant correlations between the two judges with regard to Elaboration ($r = 0.71, p < 0.001$), Liveliness ($r = 0.66, p < 0.001$), Originality ($r = 0.74, p < 0.001$), as well as Realism ($r = 0.72, p < 0.001$). On the other hand, there was no significant correlations effect obtained with regard to Fantasy ($r = 0.20, p = 0.273$). The results of the correlational analyses indicated that it was possible to combine the two judges' estimates to a mean value for the variables Elaboration, Liveliness, Originality, and Realism where it was not possible to employ further the variable Fantasy in data analysis.

RESULTS

First Study

Fluency

Two-way split-plot ANOVA with Number of Flotations and Gender as Between-Subject factors and Fluency before and after flotation-Rest, respectively, as Within-Subject factors did not indicate any significant differences with regard to number of flotations ($p = 0.364$), Gender ($p = 339$), and nor were there any significant interaction effects between the independent variables or between Between-Subject and Within-Subject factors ($ps > 0.4$). There was, however, a tendency with regard to Fluency before and after treatment ($F(1, 34) = 3.76, p = 0.061$) whereby it was found that fluency tended to increase after flotation-REST ($M = 15.47, SD = 5.67$) compared with before ($M = 14.03, SD = 4.52$). Table 1 presents means and standard deviations.

Logical Ability

Two-way split-plot ANOVA with Number of Flotations and Gender as Between-Subject factors and Logical ability before and after flotation-REST, respectively, as Within-Subject factors did not indicate any significant differences with regard to Number of Flotations ($p = 0.276$), Gender ($p = 446$), nor were there any significant interaction effects between the independent

Table 1. Means and (Standard Deviations) with Regard to Fluency Before and After Flotation-REST, Respectively, as a Function of Number of Flotations (One or Three) and Gender (Male or Female)

	One flotation		Three flotations	
	Male	Female	Male	Female
Fluency before	14.44 (4.82)	16.00 (5.72)	13.00 (4.31)	13.36 (3.93)
Fluency after	14.11 (6.55)	18.00 (5.20)	15.00 (2.78)	15.36 (6.62)
Logical before	10.78 (5.19)	13.14 (5.61)	15.62 (4.75)	11.50 (5.40)
Logical after	9.33 (5.20)	10.71 (4.68)	14.38 (6.48)	9.71 (4.51)

variables or between Between-Subject and Within-Subject factors ($ps > 0.5$). There was, however, a significant difference with regard to Logical ability before and after treatment, respectively ($F(1, 34) = 7.70, p = 0.009$), whereby it was indicated that Logical ability deteriorated after flotation ($M = 10.79, SD = 5.31$) compared with before ($M = 12.50, SD = 5.36$). Further, there was a tendency toward an interaction effect between Number of Flotations and Gender ($F(1, 34) = 3.67, p = 0.064$) whereby the male subjects in the one flotation condition tended to obtain lower scores on Logical ability compared with the female subjects in the three flotation condition. Table 1 presents the means and standard deviations.

Second Study

Essay Variables

Statistical analysis was carried out through use of two-way ANOVA (2×2 factorial design) with REST and Stress/Non-stress as independent variables and Elaboration, Liveliness, Originality, and Realism as dependent variables. The results of each ANOVA are described below. Table 2 presents the mean values and standard deviations.

Elaboration—The analysis did not show any significant effects with regard to either interaction or effects of Stress/Non-stress ($ps > 0.5$), but did with regard to REST ($F(1, 28) = 8.84, p = 0.006$) whereby further analysis indicated that the Chamber-REST group demonstrated more elaboration ($M = 5.63, SD = 2.07$) in comparison with the Flotation-REST group ($M = 3.53, SD = 1.81$).

Table 2. Means and (Standard Deviations) with Regard to Elaboration, Liveliness, Originality, and Realism in REST and Stress/Non-Stress Conditions

	Flotation-REST		Chamber-REST	
	Stress	Non-stress	Stress	Non-stress
Elaboration	3.63 (2.43)	3.44 (1.05)	6.00 (2.38)	5.25 (1.79)
Liveliness	6.38 (1.89)	3.31 (1.33)	4.13 (2.10)	5.13 (2.12)
Originality	6.56 (1.72)	5.13 (2.40)	3.63 (1.79)	4.75 (2.45)
Realism	3.56 (1.82)	5.50 (2.04)	7.13 (1.13)	5.06 (2.03)

Liveliness—The analysis did not show any significant effects for either REST or Stress/Non-stress ($ps > 0.1$) but did show an interactions effect ($F(1, 28) = 9.28$, $p = 0.005$). Interactions analysis (unrelated t -test, 5% levels) indicated that the subjects that had been exposed to stress in the Flotation-REST group produced higher scores on Liveliness ($M = 6.38$, $SD = 1.89$) in comparison with the subjects in the Flotation-REST group that had not been exposed to stress ($M = 3.31$, $SD = 1.33$). In the Chamber-REST group no significant differences were obtained between those subjects exposed to stress ($M = 4.13$, $SD = 2.10$) and those not exposed to stress ($M = 5.13$, $SD = 2.12$), respectively.

Originality—The analysis did not show any significant differences for either an interactions effect or Stress/Non-stress ($ps > 0.09$), but did so with regard to REST ($F(1, 28) = 4.90$, $p = 0.035$) whereby further analysis indicated that the Flotation-REST group showed a greater degree of originality ($M = 5.84$, $SD = 2.15$) in comparison with the Chamber-REST group ($M = 4.19$, $SD = 2.15$).

Realism—The analysis did not show any significant effect for Stress/Non-stress ($p = 0.922$), but did so with regard to REST ($F(1, 28) = 6.090$, $p = 0.020$) as well as an interactions effect ($F(1, 28) = 9.98$, $p = 0.004$). Further analysis indicated that the Chamber-REST group showed more Realism ($M = 6.09$, $SD = 1.91$) in comparison with the flotation-REST group ($M = 4.53$, $SD = 2.12$). Interactions analysis (unrelated t -test, 5% level) indicated that the subjects who had been exposed to stress in the Chamber-REST group scored more points on Realism ($M = 7.13$, $SD = 1.13$) than those subjects in the Chamber-REST group that had not been exposed to stress ($M = 5.06$, $SD = 2.03$). In the flotation-REST group, there were no significant differences obtained between those subjects who had been exposed to stress ($M = 3.56$, $SD = 1.82$) and those that had not been exposed to stress ($M = 5.50$, $SD = 2.03$), respectively.

Manipulation Controls

Experience of Stress—As already reported in the presentation of the background variables, there were no significant differences with regard to either REST or Stress/Non-stress in the measure of experienced stress at the start of the experiment. Following the induction of stress, a further measurement of stress (Stress 2) was undertaken. A two-way ANOVA with REST and Stress/Non-stress as independent variables and with Stress 2 as the dependent variable did not indicate any significant effects with regard to REST or an interaction effect but did show a significant effect of Stress/Non-stress ($F(1, 28) = 20.74, p < 0.001$). Further analysis indicated that the group that had been exposed to experimental stress demonstrated higher values ($M = 5.92, SD = 2.12$) than the group that had not been exposed to stress ($M = 2.39, SD = 2.21$). Directly following flotation and lying on the coach, respectively, and prior to essay-writing, a further measure of experienced stress was taken (Stress 3). A two-way ANOVA with REST and Stress/Non-stress as independent variables and with Stress 3 as independent variable did not show any significant effects with regard to REST, Stress/ Non-stress or any interactions effect ($ps > 0.1$). The stress group value was now 1.42 ($SD = 1.70$) and the group not exposed to stress 0.61 ($SD = 1.07$).

Experience of an Altered State of Consciousness—Experiences of altered states of consciousness (EDN) were summated to an index. A two-way ANOVA with REST and Stress/Non-stress as independent variables and with experience of altered state of consciousness as dependent variable did not indicate any significant effects with regard to Stress/Non-stress or any interaction effect but did with regard to REST ($F(1, 28) = 4.93, p = 0.035$). Further analysis indicated that the flotation-REST group experienced a higher degree of altered consciousness ($M = 117.33, SD = 65.35$) compared to the Chamber-REST group ($M = 71.32, SD = 50.60$).

Gender with Regard to the Dependent Variables

One-way ANOVA statistics with gender (male, female) as independent variable and with Elaboration, Liveliness, Originality, and Realism as dependent variables showed no significant differences between the genders ($ps > 0.15$).

Correlational Analyses

In order to analyze any eventual relationship between the essay variables and the personality variables and altered state of consciousness correlational analyses (Pearson's r) were applied (see Table 3).

Table 3. Correlations between Dependent Variables and Dispositional Optimism (LOT) and Change and Stability (FS) and Experienced Deviation from Normal State (EDN)

	Elaboration	Liveliness	Originality	Realism	LOT	FS	EDN
Elaboration	1.00						
Liveliness	0.53**	1.00					
Originality	-0.13	0.21	1.00				
Realism	-0.06	-0.43**	-0.04	1.00			
LOT	0.13	0.26	0.36*	-0.13	1.00		
FS	0.13	0.20	0.36*	0.06	0.27	1.00	
EDN	0.05	0.38*	0.07	-0.59**	0.13	0.10	1.00

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

The results of the present study may be summarized as follows:

1. No differences concerning divergent or logical production were obtained whether flotation occurred once or on three occasions.
2. Flotation-REST induced more originality, yet less deductive thinking.
3. Chamber-REST induced more realistic and elaborated thinking.
4. Subjects that were stressed in the Flotation-REST condition were more lively compared with the non-stressed subjects in that condition.
5. Stressed subjects in the Chamber-REST condition showed more realism than their non-stressed counterparts.
6. Both Flotation-REST and Chamber-REST were equally effective in reducing stress, i.e., showed comparable efficacy as relaxation techniques. However, Flotation-REST altered consciousness to a greater extent than Chamber-REST.
7. Correlational analysis indicated that the more adaptable and receptive to change and the more optimistic one was, the more originality on essay-writing one exhibited. Further, there was a relationship between more lively accompanied by less realistic.

Thus, it may be possible to derive certain conclusions against a background assumption that sensory isolation induces a shift in awareness to the advantage of primary process-oriented cognition [28], namely that a high degree of altered

consciousness (or, high degree of primary process) in combination with an optimistic outlook produces optimal conditions for originality, whereas a lesser degree of altered consciousness (or, higher degree of secondary process) produces optimal conditions for realism and elaboration. It is reasonable to consider that primary process conditions disrupt problem-solving abilities (i.e., since problem-solving is based on the secondary process). These results are in agreement with earlier studies [12, 21].

The novel findings of the present study pertain to stress interactions. Here, one may draw comparisons with earlier observations [45] indicating that in many professions with a demand upon creativity (e.g., writers, journalists, advertising agents), there is a penchant to seek out stressful situations (e.g., “just making deadlines”), and the feeling thereby that a “bonus of productivity” is achieved. Furthermore, the present findings suggest that stress induces the secondary process to greater realism.

Finally, the present study provides further support for the notion that previous experience and expectancies have a relatively minor involvement in how one experiences flotation-REST. It was shown that whether subjects underwent one or three floatations had no effect since creative ability was improved, and deductive ability deteriorated, to the same extent. On the other hand, whether subjects underwent three rather than one flotation(s) failed to influence the extent of outcome for creativity (i.e., improvement) or deductive powers (i.e., deterioration), i.e., through any possible extinction-like effect. These results may be associated with an earlier study [23] wherein it was found that earlier experience of an altered state of consciousness or the instruction “strict” or “fantasy” to subject had negligible effect upon their experience of sensory isolation in the tank. Thus, the present results stand in contrast to drug-related studies [34] where it was shown that experience and expectancies often play a critical role in the expression of drug-induced effects. This dissociation is understandable since flotation and sensory isolation ought not to affect brain processes by the type of chemical action that substances, particularly abused substances, exert on specific regions, e.g., the reticular formation. However, further studies are required to map out the circumstances dictating when several floatations are efficacious or when a single occasion induces the desired effect. Generally, flotation-REST experiments maintain only one control group, i.e., an armchair group or a couch group. In the present study, the couch group was used. A better solution had been the “double-control group design” [12], i.e., using both the couch and armchair groups thereby making comparisons possible with flotation-REST, short relaxation through chamber-REST and non-REST.

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