

THE EFFECTS OF CREATIVE AND NONCREATIVE
PROBLEM-SOLVING ON ANXIETY

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by

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ABSTRACT

This study investigated whether the type of problem involved in creative performance increases anxiety level to a greater extent than the type of problem involved in noncreative performance. Subjects were 9 male and 48 female undergraduate Psychology students, selected from a voluntary subject pool, and randomly assigned to either a divergent creative problem-solving (CPS) condition, a convergent noncreative problem-solving (NCPS) condition, or a control condition involving a passive neutral problem-solving (NPS) task. The Spielberger State-Trait Anxiety Inventory (STAI) was administered to each group before and after the experimental conditions. The study tested two opposing hypotheses: (a) the view held by many humanistic psychologists that creative activity increases anxiety and (b) the psychoanalytic prediction that creative activity decreases anxiety. A subsidiary hypothesis was that (c) trait anxiety would not change significantly. The results showed that there was no significant pre to post increase in state anxiety for the creative divergent problem-solving group but that the other two groups did manifest significant increases in state anxiety. Trait anxiety remained stable throughout the groups. These results were interpreted in favour of the psychoanalytic

hypothesis with the reservation that tasks more challenging for the student subjects in this study might have produced more anxiety than the creative divergent task employed. Suggestions for future research were made.

INTRODUCTION

Research in Creativity

Creativity has long been an issue of interest in literature, philosophy, and psychological theory. However, scientific research in creativity is a fairly recent occurrence and its emergence may be associated with the stimulating influence of Guilford (1950), who incorporated creativity into his model of human intelligence and analyzed creativity into testable mental abilities.

The basic meaning of creativity is the capacity to produce something novel. For many theorists and researchers, this definition is too vague and overinclusive. As a result, different investigators have qualified and expanded upon this general definition and have limited the concept of creativity to specific conditions, situations, and mental processes, to more adequately fit their own theoretical orientations and/or experimental purposes. In response to this state of affairs, Maddi (1975) has written:

I am aware of the danger, in defining creativity, of substituting my value judgment for another which I find unacceptable. A Chinese wise man is reputed to have said, "If you would know what a man holds dear, ask him to define intelligence." In our culture and era, this insight is even more true of the creativity concept. Nonetheless, each of us must push ahead with his definition of creativity, trying to make it as relevant as possible, and hoping through argument and experiment to convince the others that it is best. (p. 178)

Getzels (1975) has suggested that definitions of creativity form three categories based on the relative emphasis they place on the product, the process, or the experience of creativity. MacKinnon (1962), e.g., has suggested a statistically infrequent and adaptive product as the criterion for creativity. For Ghiselin (1952) creativity is basically a process of psychic change and development leading to invention. Maslow (1963), on the other hand, has emphasized the experience of inspiration as the essential criterion of creativity, regardless of the product of such experience.

In view of the many possibilities for conceptualizing creativity, the present study has investigated divergent production as representative of creative activity. This is based on Guilford's (1975) statement that, "it is apparently generally recognized that divergent production (DP) has the most to do with creative behavior" (p. 42).

In addition to the variety of definitions, there exists a variety of systematic frames of reference in which creativity has been explained. The psychoanalytic view as presented by Freud holds that sublimation is the key process of creativity and that creative production occurs when frustrated libidinal energies are channelled into culturally acceptable outlets. Creativity, thus, is seen as serving a drive reducing function. Also, from this point of view, creativity is regarded as having the same origin as psychopathology (Taylor, 1975), which is basically a frustration of instinctive needs. In the words of Freud (1908):

Happy people never make phantasies, only unsatisfied ones. Unsatisfied wishes are the driving power behind phantasies; every separate phantasy contains the fulfillment of a wish, and improves on unsatisfactory reality. (p. 47)

For Jung (1971), also, the source of creativity lay in "the unsatisfied yearnings of the artist" (p. 321) and the creative product, according to Jung, is an actualization of those primordial images of the collective unconscious which are best suited to make whole the unbalanced nature of the artist. Adler, however, differed with the view of Freud and Jung that creativity arises mainly from the unconscious. According to Adler, creativity arises in consciousness and is the result of the individual's attempt to compensate for his inferiorities (I. A. Taylor, 1975).

Perhaps the most contrasting view of creativity with respect to the psychoanalytic orientation may be found in humanistic psychology. Psychoanalytic accounts of creativity tend to focus on pathological motivating forces. In humanistic psychology, creativity is regarded as being motivated by a healthy drive towards self-actualization (Rogers, 1959; Maslow, 1976) and it is also emphasized that psychological health facilitates creativity (Rogers, 1959; May, 1975; Maslow, 1967; 1976). Creative activity in the humanistic context is often seen as a relatively threatening event which is consequently encouraged by threat reducing conditions, such as unconditional social acceptance (Rogers, 1959), and a personality able to tolerate, and possibly enjoy as a

challenge, the type of threat involved in creativity. According to Maslow (1976), creativity and psychological health are almost synonymous and represent the individual's ability to encounter contradictions in himself and his environment. For Maslow, creativity represents the fullest expression of humanness and may be manifested in boldness, courage, freedom, spontaneity, perspicuity, and self-acceptance, which are essentially descriptions of personality. Creative products are secondary for Maslow and result naturally from healthy and self-actualizing conditions of the personality.

A further approach to creativity, which is not as concerned with the motivational dynamics of creativity as psychoanalytic and humanistic psychologies, may be described as trait-factorial. This approach holds that creativity is based on specific traits which differ from individual to individual. Galton (1870) and Cattell (1903) emphasized the genetic basis of creativity. Spearman (1931) suggested that creativity is related to a person's ability to generate new ideas by transposing the relations of certain ideas to other ideas. One of the most influential proponents of the trait-factorial approach to creativity is Guilford (1959). Using factor-analytic techniques, Guilford established 120 factors of intellectual ability including those necessary for creative functioning, and suggested that creativity is multidimensional, differs from intelligence as it is usually measured, and is present in most persons to different degrees.

Holistic and associationistic views of creativity are somewhat similar to the trait-factorial approach in that they postulate certain abilities which are necessary for creativity. Holistic theorists, e.g., have referred to the abilities of being open to object experiences, of returning to the origins of one's experience as a source of creativity, and of producing closure, i.e., establishing harmony or a gestalt in problem situations through a process of cognitive reorganizing (I. A. Taylor, 1975). In accordance with the associationistic approach, Mednick (1962) has suggested that creativity involves a reorganizing of associative elements into new units. Similar in certain respects is Koestler's (1964) conception of creativity as the ability to shift the attention to previously unconscious aspects of reality.

The research in creativity, according to I. A. Taylor (1975), may be divided into several areas. One of these involves the creative personality. Some of the most intriguing research in this area has been done by MacKinnon (1960, 1961a, 1961b) and his associates at the Institute for Personality Assessment and Research (IPAR). From his research on highly creative scientists, writers, mathematicians, and architects, it appears that the creative personality is characterized to a heightened degree by self-confidence, flexibility, self-acceptance, little concern with social conventions, and strong achievement motivation. It is interesting that Barron (1961) found more psychological difficulties among creative individuals in conjunction with greater ego strength and resources for

handling these problems. The psychological difficulties could account for the higher energy levels found in such individuals. In addition, it appears that the highly creative are persons who are open to experiences of intra- and extrapersonal conflicts with the motivation to resolve these unsatisfactory conditions.

A second area of research concerns creative problem formulation. Little research has occurred in this area. However, Lowenfeld (1962) has stated that creative individuals are more able to perceive problems in situations which are often overlooked by others. Also, I. A. Taylor (1972b) has found that creative persons have a greater tendency to respond to generic, i.e., underlying problems while less creative individuals tend to respond to the superficial manifestations of such problems.

Research has also focused on the process and development of creativity. Descriptions by creative persons of their own experiences of the creative process have been collected by Ghiselin (1952), Rosner and Abt (1970), and Vernon (1970). From these descriptions, it appears that creativity is often associated with a heightened drive to achieve and can be facilitated by certain environmental conditions. Osborn (1953) found that in certain situations, the presence of others can enhance creativity. Based on this principle, he developed a social interaction procedure to stimulate creativity, which he called "brain storming". A similar program has been developed by Gordon (1961) and is called "synectics". With regard to educational settings, Torrance in 1967 gave the

following suggestions for enhancing creativity: "respect unusual questions, respect unusual ideas, show that ideas have value, provide opportunities and credit for self-initiated learning, and allow performance to occur without constant threat of evaluation" (I. A. Taylor, 1975, p. 19). I. A. Taylor (1972a) has also shown that intensive simultaneous sensory stimulation can increase divergent production. In addition to findings showing that external conditions affect creativity, MacKinnon (1971) has experimentally generated a repressed emotional content in hypnotized subjects to investigate the intrapsychic dynamics of the creative process.

The result of the creative process is a creative product. Research has attempted to establish criteria for identifying these products. By integrating previous research in this area, Taylor (I. A. Taylor & Sandler, 1972) has developed the Creative Product Inventory which takes into account the following criteria: the product's generative power, transformation power, degree of originality, relevancy, hedonics, complexity, and condensation.

A final area of research has dealt with the relationships between creativity and mental health as well as creativity and intelligence. Psychoanalytic theory has associated creativity with neurotic patterns while humanistic psychology has regarded creativity as a sign of mental health. I. A. Taylor (1975) has suggested that future research might determine that different types of creative processes exist which may be differentially predisposing to neurotic or healthy behavior.

With regard to the relationship between creativity and intelligence, as commonly measured by IQ tests, research has shown that a certain amount of intelligence is required for creativity but that above a certain level of intelligence, creativity appears to be determined by nonintellectual factors (I. A. Taylor, 1975).

Several tests have been developed to measure creativity. Guilford has developed a number of tests assessing the ability for divergent production within the framework of his structure of intellect, since he regarded creative functions to be components of general intelligence, although not necessarily correlated with other factors of intelligence. Torrance has developed tests for assessing both verbal and figural creativity. The Remote Associations Test (RAT) (Mednick, 1967) is characterized by incorporating a convergent element into the creative tasks. This was based on Mednick's belief that creativity involves both the abilities to diverge and to converge towards the most appropriate (I. A. Taylor, 1975). Aside from attempts to assess creativity directly by measuring creative production, various personality tests have been used to infer creative potential, e.g., the Cattell Sixteen Personality Factors Questionnaire (Guilford, 1967).

Research in Anxiety

As is the case with creativity, anxiety is a construct, i.e., a hypothetical entity with no definite physical properties.

It is, like creativity, only inferred from observable events. Levitt (1980) has cited some general definitions of anxiety:

...the unpleasure experienced when the object is unknown and the anticipation of being overwhelmed by an internal or external force is present... (Eidelsberg, 1968, p. 37).

A painful or apprehensive uneasiness of mind usually over an impending or anticipated ill... (Webster, 1976, p. 51).

Unpleasurable affect consisting of psychophysiological changes in response to an intrapsychic conflict... an uncomfortable feeling of impending danger, accompanied by overwhelming awareness of being powerless, inability to perceive the unreality of the threat, prolonged feeling of tension, and exhaustive readiness for expected danger (Freedman, Kaplan, & Saddock, 1976, p. 1283).

For scientific use, however, these definitions are not sufficient. Instead, operational definitions, i.e., definitions in terms of the methods of measurement, must be used, e.g., a certain level of heart rate in response to the threat of shock or the answer "yes" to the question "Are you anxious?". Each investigator may operationalize the concept of anxiety to best suit his theoretical orientation and the requirements of his experimentation. (Levitt, 1980)

An important concept in the literature on anxiety is stress. Unfortunately, the concept has been used differentially by different authors to refer to stimulus situations and/or the reactions of the individual. Levitt (1980) has suggested the following usage of the concept "stress" which is in accordance with the views of Lazarus (1966) and Spielberger (1972a, 1976):

1. A "stress" or "stressful" situation is one containing stimuli or circumstances calculated to arouse anxiety in the individual.
2. "Under stress" or "stressed" refer to an individual who is faced by, or in the midst of, a stress situation.
3. A "stress reaction" is an alteration of the individual's condition or performance that comes about presumably as a result of being under stress. (p. 10)

This usage has the advantage of distinguishing more clearly between stress and anxiety than if stress were used to refer to an individual's reactions to certain situations.

When an individual is referred to as anxious, there are two possibilities of interpreting this: the individual may be experiencing anxiety momentarily or he may be a person who is in general predisposed to experiencing anxiety. A distinction has, therefore, been made between state anxiety and trait anxiety. This distinction has been expanded upon and made popular by Spielberger (1966, 1972b, 1975).

State anxiety refers to an organism's momentary response to a situation with anxiety while trait anxiety refers to an organism's relatively stable proneness to respond with anxiety to various situations. State anxiety is often measured in one or more of the following four modes: (a) verbal behaviour; (b) gross motor behaviour; (c) surface physical reactions; and (d) internal physiological reactions. Research has shown that these response modes do not necessarily correlate, indicating that state anxiety is a rather complex phenomenon. Trait anxiety has been interpreted in three ways. It has been

regarded as a unitary personality trait by Spielberger (1975) which is most critical in the perception of threat in certain situations. Social scientists (e.g. Endler & Okada, 1975), however, maintain that situational determinants are at least equally important to a person's disposition in the occurrence of state anxiety. Finally, trait anxiety may simply be seen as the average level of a sequence of state anxiety measurements. This would apply regardless of whether trait anxiety is thought of in terms of personality or in terms of situations.

Measurement of anxiety is possible through physiological and verbal assessment. Physiological measurement of anxiety involves a number of difficulties and only a small percentage of experimental investigations, therefore, use physiological reactions as a major criterion. First, from physiological arousal alone it is difficult to determine the associated subjective state, since a number of different emotional states have similar physiological correlates. In addition, physiological research often requires complex and expensive equipment which is a practical hindrance and may in itself produce a stressful experience for subjects, thus affecting the obtained data. As a result, most studies on anxiety have used verbal measures. In the development of verbal measures of anxiety, the focus has mostly been on trait anxiety. In this category is Taylor's Manifest Anxiety Scale (MAS or TMAS), published by J. A. Taylor (1953), which was a development underlying the increase of research interest in anxiety, which started about 25 years ago. Other commonly employed measures of trait anxiety include the

State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, and Lushene, 1970), the Anxiety Scale Questionnaire (ASQ) published in 1957, and the Affective Adjective Check List (AACL) developed by Zuckerman (1960). With regard to the measurement of state anxiety, the most useful instruments for research are the AACL with the instructions to respond to the items as it is appropriate "now-today" and the state section of the STAI. Levitt (1967) praised the STAI as "the most carefully developed instrument, from both theoretical and methodological standpoints" (p. 71) of the anxiety measures he had reviewed. This high estimation was repeated by Levitt (1980) and is the reason for the employment of the STAI in the present study. State measures of anxiety may also be obtained from measures of immediate mood, e.g., the Mood Adjective Check List (Nowlis, 1970).

Research in Creativity and Anxiety

Research dealing with the relationship between creativity and anxiety has been essentially of a correlational nature. The data suggests that individuals of low anxiety levels tend to be more creative and that creative individuals tend to have a greater tolerance for complexity and anxiety-producing situations (Reid, King, & Wickwire, 1959; MacKinnon, 1962; Dentler & Mackler, 1964; Kerr & McGehee, 1964; Fleischer, 1965; Zdep, 1966). Due to their correlational nature, these studies do not show a causal relationship between anxiety and creativity.

No experimental evidence has been found to indicate that anxiety influences creative performance, but this possibility is suggested by studies that have revealed an inverted-U relationship between stress, which may indicate anxiety, and creativity, i.e., both too much and too little stress appear to have a debilitating effect on creative production while creativity appears to be greatest at an optimal level of stress (Belcher, 1975; Rollens & Calder, 1975). Since stress has been shown to be a determinant of anxiety (Spielberger et al, 1970; Levitt, 1980) it appears likely that there also exists an optimal level of anxiety at which creativity is greatest.

A question which has received as little consideration in the research literature as the effects of anxiety on creativity is whether a reversed causal relationship exists between anxiety and creativity, i.e., whether creative activity has an influence on the level of anxiety. Theoretical formulations suggest an answer to this question. May (1975) has frankly stated that to attempt a creative act is to invite anxiety and guilt and that the creative act is a rebellion against anxiety. It follows that creativity requires courage, and courage according to May (1975) is the ability to persevere in spite of despair or anxiety. In keeping with this, Maslow (1967) has included strength and courage in his description of the attitude which facilitates creativity.

Gowan (1974) has expressed a similar interpretation of the circumstances surrounding creativity. According to him,

creativity arises from contact with an aspect of the psyche which he calls the preconscious. The preconscious is a realm of uncanniness, awe, and dissociation but also the realm in which a truer perception of reality and meaning can be found. Gowan (1974) has maintained that it requires courage to explore this "nightmare" of the preconscious and that a supreme "act of will" may be necessary to create a higher order out of this horror and seeming chaos. Creativity necessitates the ability to dip into and struggle with the preconscious. Furthermore, contact with the dissociative preconscious requires strength and intactness of the ego.

To extend this line of thought, it may be pointed out that situations or problems involving creativity have certain features such as requiring openness (Rogers, 1959). The person in a situation of this nature receives little guidance from conventional rules and it seems plausible that the uncertainty of such situations may produce anxiety. Rogers (1959) has also suggested that creative work may be followed by the anxiety of being separated from others -- alone with one's achievement or experience.

In contrast to the notion that creative activity is anxiety producing, is the psychoanalytic conception of creativity as a drive reducing process which establishes socially acceptable outlets for ego threatening impulses. According to this explanation, creative activity would be expected to produce an increase of homeostatic wellbeing and a decrease of anxiety (Maddi, 1975; Arieti, 1976). This

theory, however, does not specify the type of anxiety (state or trait) or the time after a creative effort which is necessary to experience the decrease in anxiety. With this in mind, it is possible to integrate the humanistic conception of creative performance as anxiety producing with the psychoanalytic conception of creative performance as anxiety relieving. An integration of both theories suggests that creative activity is essentially anxiety producing, because of the necessity to face internal and external conflict, the lack of structure intrinsic to creative tasks, and the lack of criteria for the evaluation of the creative performance, but that creative activity, in the long run, is anxiety reducing and productive of greater mental health and personal growth, due to the resolution of conflict or the mastery of threatening conditions. On the basis of this integrated conception of creativity, it would be expected that an increase in anxiety could be observed during or immediately after creative activity and that a decrease in anxiety could be observed some time after a successful completion of creative activity.

A search through the literature has revealed only one experimental study (Gallicchio, 1977) which has dealt with the effects of creative activity on anxiety. It was hypothesized that a series of brainstorming sessions, in which students solved mathematical problems, would decrease test-anxiety, but this was not confirmed by the results. It is possible that no decrease in anxiety was encountered because the

brainstorming sessions may have not resolved the dynamics responsible for the text-anxiety in the subjects. Nevertheless, it could be that resolution of conflict did occur but that this reduced anxiety in an area not tapped by Gallicchio's measurement of test-anxiety.

The present study has also investigated the effects of creative activity on anxiety but it differs from Gallicchio's (1977) study because creative activity was defined in the present study as divergent production and state anxiety was measured immediately after students were told to stop working on the given divergent creative task, unlike the conditions in the Gallicchio (1977) study in which test-anxiety was measured some considerable time after several brainstorming sessions. Both state and trait anxiety were measured before and after students randomly received either a divergent creative, convergent noncreative, or a neither divergent nor convergent neutral task.

Hypotheses

This experiment was designed to confirm one of two major hypotheses: a) the humanistically based prediction that divergent creative problem-solving would increase state anxiety significantly more than both convergent noncreative problem-solving and a neutral problem-solving task, or (b) the psychoanalytical hypothesis that divergent creative

problem-solving would reduce state anxiety significantly more than the other two tasks. Secondly, it was hypothesized that: c) there would be no significant pre- to post-treatment changes in trait anxiety since trait anxiety is relatively stable and not expected to change quickly.

METHOD

Subjects

Subjects were 9 male and 48 female undergraduate Psychology students selected from a voluntary subject pool.

Materials

Both state and trait anxiety were measured by the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, Lushene, 1970) (see Appendix A).

The creative problem-solving condition required divergent thinking, in which there was no one correct answer or solution, and consisted of writing down as many uses as possible for each object on a given list. The specific instructions were: "For each of the objects printed below, list as many uses as you can." Thirty common objects, such as "book," "tie," "rope," etc., were listed. The task sheet for subjects in the creative problem-solving condition is shown in Appendix B.

The noncreative problem-solving condition required convergent thinking, in which there was essentially only one correct solution, and consisted of writing down an accurate definition for each object on the given list. The specific instructions were: "For each of the objects printed below, give as accurate a definition as you can." The same list of 30 objects as presented in the creative problem-solving condition was used in the noncreative problem-solving condition.

The task sheet given to subjects in the noncreative problem-solving condition is shown in Appendix C.

The neutral problem-solving condition required no divergent or convergent thinking and was intended to control for the effects of participating in an experiment of this nature on the subjects' level of anxiety. It consisted of copying each of the 30 words which were also presented in the creative and noncreative problem-solving conditions 60 times. The specific instructions were: "Write down each of the objects printed below 60 times as quickly as you can". The task sheet given to subjects in the neutral problem-solving condition is shown in Appendix D.

In addition, subjects rated the task they were assigned to on a five-point scale of 15 adjectives such as "difficult", "stressful", "threatening", etc. This was to determine any differences in subjective stimulus value between the three tasks which may have had an effect on anxiety level. The rating scale filled out by each subject is shown in Appendix E.

Procedure

All 57 subjects were seated simultaneously in a lecture hall and first filled out the state section of the STAI and then the trait section. Three males and 16 females were randomly assigned to each of the three experimental conditions: divergent creative problem-solving (CPS), convergent noncreative problem-solving (NCPS), and neutral problem-solving (NPS). Each group of subjects were given 15 minutes to work on the

assigned tasks. Subjects then again filled out the state and trait sections of the STAI and also rated the task they were assigned to on the five-point scale of 15 adjectives.

RESULTS

The group means and standard deviations for pre- and post-treatment scores on state and trait anxiety are given in Table 1. Figure 1 shows that for all three groups, state anxiety scores were higher after the task and that the increase in state anxiety was greatest in the NPS group and smallest in the CPS group.

Separate three (groups) by two (pre-post) analyses of variance were performed for state and trait anxiety scores (Tables 2 and 3). These showed that pre-post changes across all groups were only significant for state anxiety. Separate two-tailed t-tests revealed that the pre-post changes in state anxiety were significant only for the NPS group ($t = -4.56, p < .01$) and the NCPS group ($t = -2.87, p = .01$). The 3×2 analysis of variance on state anxiety scores also showed that there existed a marginally significant interaction between pre-post changes and the three groups ($F = 3.03, p = .06$). Further analyses indicated that the pre-post changes in state anxiety differed significantly only between the CPS and NPS groups ($F = 6.44, p = .02$).

The means and standard deviations for the task ratings are given in Table 4. An analysis of variance and a multiple pairwise comparison of group scores with the Student-Newman-Keuls procedure were performed for each of the 15 adjectives on which the tasks were rated. These analyses showed that at

the $p < .05$ level of significance, CPS was more enjoyable than NCPS and NPS; CPS was less stressful and annoying than NCPS and NPS; NCPS was perceived to be more difficult than CPS and NPS; NPS was more annoying and boring than CPS and NCPS; and NPS was less enjoyable, interesting, pleasant, and creative than CPS and NCPS.

Since state anxiety in the CPS group, contrary to expectation, did not increase significantly, state anxiety scores within this group were analysed in relation to subjects' creative performance. The rationale for this was to discover whether the more creatively performing subjects differed significantly in their experiences of anxiety from the less creatively performing subjects. The scores of 21 subjects from the CPS group were available. Two of these subjects had been randomly excluded from the previous analyses, to equalize the groups.

Three different measures of creative performance were used: (a) the total number of uses which each subject had written down during the 15 minute task, (b) the total number of items, in a given list of 30 objects, which each subject had responded to, and (c) the average number of uses per item.

Subjects' total number of uses correlated negatively with pre-trait anxiety ($r = -.47$, $p = .03$) and post-trait anxiety ($r = -.51$, $p = .02$) and positively with anxiety

reduction, i.e., post-state anxiety subtracted from pre-state anxiety ($r = .49$, $p = .03$). The number of items responded to did not correlate significantly with any of the anxiety measures and the number of uses per item only had a negative correlation with post-trait anxiety ($r = -.40$, $p = .04$). Probabilities for these correlations are one-tailed. The subjects were also divided into high and low performance groups on the three measures of creative production and two-tailed t-tests were used to test the differences between the mean anxiety scores. Table 5 lists the means and standard deviations of state anxiety for each grouping of subjects. The only significant changes in state anxiety were pre-post increases among the 10 subjects who had listed the fewest uses in total ($t = -2.95$, $p = .02$), the 5 subjects who had listed the fewest uses ($t = -2.75$, $p = .05$), and the 5 subjects who had the fewest uses per item ($t = -3.37$, $p = .03$). When the total number of uses was taken as criterion of creative performance pre-post changes in state anxiety differed significantly between the top and bottom 10 subjects ($t = 2.92$, $p = .01$) and the top and bottom 5 subjects ($t = 1.88$, $p = .05$, one-tailed). The top 5 subjects who listed the most uses had significantly less pre-trait anxiety ($t = -5.37$, $p = .001$) and post-trait anxiety ($t = -4.19$, $p = .003$) than the bottom 5 subjects who listed the least number of uses.

TABLE 1
 Group Means and Standard Deviations for
 Pre and Post-treatment
 State and Trait Anxiety Scores

Problem		State Anxiety		Trait Anxiety	
		Pre	Post	Pre	Post
Creative	M :	35.16	38.05	36.32	34.63
	SD :	10.62	12.26	8.31	8.01
Noncreative	M :	36.74	44.00	39.89	39.42
	SD :	8.94	12.81	7.25	8.06
Neutral	M :	37.11	48.32	37.32	37.63
	SD :	11.37	12.86	9.59	11.74

Figure 1. Mean Pre- and Post-treatment
State Anxiety Scores for Different
Problem Groups

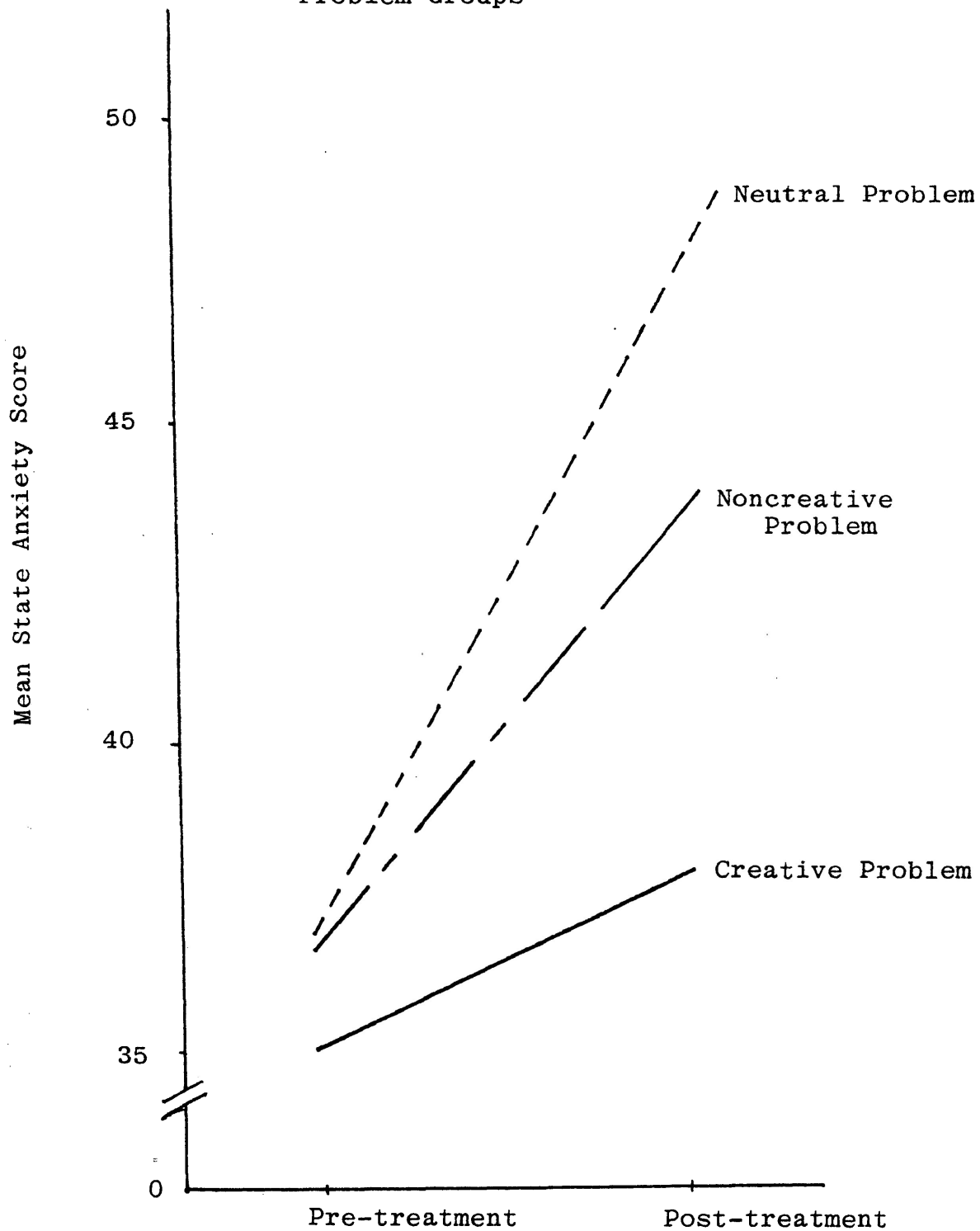


TABLE 2

Summary of Analysis of Variance for Pre- and
Post-treatment State Anxiety Scores
Between Problem Groups

Source	df	SS	MS	F
<u>Between Subjects</u>				
Problems	2	721.00	360.50	1.6925
Error	54	11,501.74	213.00	
<u>Within Subjects</u>				
Pre-Post	1	1,445.93	1,445.93	26.6366*
Pre-Post X Problems	2	328.75	165.38	3.0281
Error	54	2,931.32	54.28	
Total	113	16,928.74		

* $P < .001$

TABLE 3

Summary of Analysis of Variance for Pre- and
Post-treatment Trait Anxiety Scores
Between Problem Groups

Source	df	SS	MS	F
<u>Between Subjects</u>				
Problems	2	332.86	166.43	1.0685
Error	54	8,411.00	155.76	
<u>Within Subjects</u>				
Pre-Post	1	10.75	10.75	2.4130
Pre-Post X Problems	2	19.28	9.64	2.1648
Error	54	240.47	4.45	
Total	113	9,014.36		

TABLE 4
Means and Standard Deviations for
Adjective Ratings

Adjectives	Creative Problem		Noncreative Problem		Neutral Problem	
	M	SD	M	SD	M	SD
1. difficult *	4.28	0.89	3.05	1.35	4.11	1.33
2. stressful *	3.74	1.19	2.79	1.40	2.47	1.35
3. threatening	4.42	0.90	3.95	1.18	3.84	1.26
4. enjoyable *	2.84	0.83	3.47	1.12	4.42	0.90
5. interesting *	2.32	0.89	3.00	1.25	3.84	1.17
6. stimulating *	2.53	1.12	3.05	1.35	3.84	1.17
7. anxiety-producing	3.68	1.42	3.11	1.33	2.68	1.45
8. humourous *	3.37	1.21	3.89	1.05	4.32	1.16
9. pleasant *	3.26	0.99	3.63	1.16	4.53	0.70
10. annoying *	3.68	1.11	2.95	1.03	2.11	1.10
11. unfamiliar	2.68	1.53	2.89	0.99	2.68	1.34
12. structured	2.47	1.02	2.53	0.90	2.06	1.00
13. boring *	3.53	1.12	3.26	1.28	2.37	1.30
14. creative *	2.42	1.43	2.68	1.20	4.11	1.18
15. neutral	3.26	0.87	2.95	0.78	3.26	0.99

* $P < .05$

TABLE 5
Means and Standard Deviations of
State Anxiety for Subclassifications of
High and Low Performing
Subjects in the Creative
Problem-solving Group

Subclassification	Pre-State Anxiety		Post-State Anxiety	
	M	SD	M	SD
<u>Uses as criterion:</u>				
(a) top 10	38.20	12.44	35.60	14.18
(b) bottom 10 *	32.10	6.74	39.80	9.90
(c) top 5	38.00	11.62	34.80	11.78
(d) bottom 5 †	37.00	5.24	42.60	8.62
<u>Items as criterion:</u>				
(a) top 5	36.40	12.72	36.40	16.71
(b) bottom 5	31.80	8.50	40.40	12.90
<u>Uses per item as criterion:</u>				
(a) top 5	31.80	11.43	33.40	12.10
(b) bottom 5 *	38.60	12.26	43.60	14.05

† pre-test increase is significant at $p = .052$ level

* pre-post increase is significant at $p < .05$ level

DISCUSSION

The first hypothesis of this study that CPS would produce the greatest increase in state anxiety was not confirmed. CPS produced the least increase in state anxiety. This result shows that divergent creative activity need not be anxiety-producing and indicates that qualifications must be added to the theoretical statements of humanistic psychologists, such as Gowan (1974) and May (1975), which describe creative activity as involving a heightened state of tension and anxiety. As previously indicated, Gowan (1974) has suggested that creative work requires dipping into a psychic realm of chaos and terror. Apparently, this did not occur during the creative task in this experiment, or only to a slight degree. Indeed, the fact that the NPS and NCPS groups both experienced a significant pre-post increase in state anxiety while no significant change occurred in the CPS group suggests a state of affairs which is in keeping with the psychoanalytic theory, that creative activity reduces anxiety. Any kind of problem-solving task can be seen as a stressing situation with the potential to raise the level of anxiety. Thus, the finding that CPS subjects were the only group in which there was no significant increase in anxiety indicates that divergent problem-solving was the most relaxing of the three tasks. It is possible that the divergent or creative

task was reducing anxiety while the general experimental situation was increasing anxiety and that these two influences neutralized each other so that the net result was a nonsignificant change in anxiety for the CPS group.

The question which remains is why the creative task was most relaxing and not more anxiety-producing as would have been expected from humanistic theory as well as from several anecdotal self-reports (e.g., Ghiselin, 1952). It is possible that this is partially due to the specific type of creative task employed in this study and that other types of creative tasks exist which do significantly increase the level of anxiety. Different creative tasks could require qualitatively different mental processes. For example, creating a novel industrial product may involve a considerable degree of convergent thinking in contrast to the purely divergent creative task used in this experiment and artistic creative production may involve more resolution of personal psychological conflict than other types of creative activity. Also, there could be differences in variables independent of the actual creative processes, such as the structure of the task and its subjective impact. It appears that creative tasks differ from each other on numerous variables and would, therefore, be expected to differ in the degree to which they produce anxiety.

Furthermore, the lack of significant anxiety increase in the CPS group may also be related to the specific population employed in this study. As shown by the investigations of MacKinnon (1962), individuals of heightened creative ability show a greater tolerance, and even preference, for ambiguous and complex stimulation and do not respond with anxiety as readily to such stimulation as non-creatives. Given the ambiguous nature of CPS, the non-significant anxiety increase in response to CPS would be understandable if it were true that the subjects employed were of above average creative ability. As the subjects in the present experiment consisted exclusively of university students, this appears to have been the case. It could, therefore, be that subjects responded with less anxiety increase to the divergent creative task in this study because of their inherent preference for the openness characterizing this task. University students may feel more comfortable with divergent tasks than with convergent tasks, which, to the students, may appear constricting and doctrinary. It is possible that lay people are less sophisticated in handling divergent problems and more at ease with convergent problems in which there is essentially only one correct solution.

This argument was supported by the results from analyzing the anxiety scores within the CPS group in relation to creative performance. These results may be summarized

as follows: (a) those subjects who were best at creative problem-solving were lowest in trait anxiety before and after the task, (b) the total number of uses which subjects wrote down correlated significantly with the degree of anxiety reduction, and (c) those who did least well on the creative task had a significant pre-post increase in state anxiety.

The first of these findings replicates studies, such as Reid, King, & Wickwire (1959), Dentler & Mackler (1964), Kerr & McGehee (1964), Fleischer (1965), and Zdep (1966), which have shown that creative individuals tend to have lower levels of anxiety. The second and third findings are of greater interest because they show that the more creative the subjects were the less anxiety was produced by the creative task. Thus, if students are above average in creative ability (and this can be tested empirically) the lack of significant state anxiety increase among CPS subjects makes sense and could be due to a general tendency of creative individuals to respond with less anxiety to this type of creative problem.

From the above, it appears that the lack of significant change in state anxiety for CPS may be explained in terms of the interaction effect of task and population characteristics.

In this respect, it may be pointed out that the lack of significant change in state anxiety for CPS replicates the finding of Gallicchio (1977) that brainstorming sessions did not significantly alter test-anxiety among the subjects. The fact that Gallicchio (1977) also employed students as subjects again points towards the possibility of the importance of an interaction effect of task and population characteristics. Although different types of anxiety were measured under different conditions in the present experiment and the Gallicchio (1977) experiment, it appears that students are essentially unaffected by creative activities of the specified types. It is possible that students require creative tasks which are more provocative in order to be significantly affected.

The greatest increase in state anxiety occurred in the NPS group. This was unexpected since the NPS task was designed to be neutral in terms of requiring neither divergent or convergent thinking. Also, it was attempted to make this task comparable to the other two tasks in terms of the structure and wording of the NPS task instructions. In retrospect, it has become apparent that the attempt to make the NPS task instructions comparable to the other task instructions was not successful and that the unfortunate inclusion of a time element ("Write down each of the objects printed below 60 times as quickly as you can.") which did not occur in the other task instructions may have been partially responsible for the strong increase in state anxiety as well as for the adjective ratings showing that NPS was perceived to be

the significantly most annoying and boring task. In addition, these effects may have been due to the simplicity of the task which may have appeared silly and senseless to the students.

The adjective rating, in general, showed that the three tasks were perceived to differ significantly on a number of variables. CPS was perceived to be significantly more enjoyable and less stressful and annoying than both NCPS and NPS. NPS, as indicated above, was perceived to be significantly more annoying and boring than both CPS and NCPS. From the adjective ratings, CPS apparently elicited the most positive subjective reaction while NPS elicited the most negative subjective reaction. The subjective impact of the three experimental tasks, as measured by the adjective ratings is, therefore, in agreement with the state anxiety responses to the three tasks, in which CPS produced the least and NPS produced the greatest increase. This correlation between subjective impact and anxiety production is understandable and demonstrates the generalizability of these dimensions of the effect a task has on the performer. For this reason, the same explanations accounting for the state anxiety scores may be taken to account for the adjective ratings. Thus, the adjective ratings may also be seen as the results of the interaction effect of task and population characteristics.

The secondary hypothesis that there would be no significant pre-post changes in trait anxiety was confirmed. This was expected since the items of the trait section of the STAI

require a subject to remember how he or she generally feels. The findings reported in Spielberger et al. (1970) were, therefore, replicated.

Limitations

One limitation of the subject population of the present study is the predominance of females over males (48:9). Since it was necessary to obtain volunteers from Psychology classes, the uneven sex distribution may be due to the possibility that females were more willing to participate in this type of study and that the classes consisted of more females, in the first place. The low number of male volunteers unfortunately precluded analysis of sex differences.

The unfortunate formulation of the NPS task instructions eliminated NPS from being a useful control condition for comparison with CPS and NCPS. NPS was intended to control for the effect on state anxiety of performing a comparable task in an experimental situation regardless of requirements of divergent or convergent thinking. Since the NPS instructions were not comparable to the CPS and NCPS instructions, it is impossible to tell whether the state anxiety increases of CPS and NCPS, which did not differ significantly, were due to the divergent and convergent natures of the tasks or simply to the fact that the tasks were performed in an experimental condition, regardless of divergency and convergency. A suggestion for improvement of the task instructions is as follows:

CPS: Write down uses for each of the objects printed below.

Work at your own rate.

NCPS: Write down a definition for each of the objects

printed below. Work at your own rate.

NPS: Write down sixty times each of the objects printed

below. Work at your own rate.

This would reduce the differences between task instructions to a minimum.

A possible criticism of a study comparing the effects of qualitatively different tasks is that these tasks may differ in other ways than the distinguishing dimension, e.g. stressfulness or pleasantness, thus confounding the influence of the task qualities to be tested such as divergency or convergency. All these variables are determined by the objective characteristics of a task instruction, such as wording, structure, and mode of communication, and their interaction with the subjective responsiveness of the task performers. Since manipulation of the objective characteristics of the task instructions is necessary to qualitatively distinguish tasks from each other, possible differences in subjective impact due to the differences in stimulus value of the task instructions is basically unavoidable. With this in mind, however, research comparing the effects of qualitatively different tasks must not be rejected. The problem, although essentially unavoidable, can be reduced by limiting the differences in task instructions to those absolutely necessary for specification of the tasks.

As mentioned above, the effect of creative activity on state anxiety may depend on an interaction between task and population characteristics. In the present investigation, only one type of creative, noncreative, and neutral tasks was employed and the subject population consisted only of undergraduate students taking Psychology, most of whom were females. The results of this study are naturally limited to the specific conditions under which the data was collected. A possibility for further research is to investigate state anxiety changes of subjects differing in levels of creative ability and to employ different types of creative and noncreative tasks.

Conclusion

The present study has suggested the importance of an interaction effect between task and population characteristics in determining changes in state anxiety. This represents a qualification of the humanistic conception of creativity as anxiety producing. The question of whether or not creative activity produces anxiety is too simplistic and must be substituted by the question of which type of creative activity produces anxiety for whom under which conditions.

The fact that divergent creative problem-solving (CPS) in this study failed to significantly increase state anxiety is understandable since the subjects consisted of students assumed to be above average in creative ability. The results are in harmony with findings describing creative persons as

less anxious (Reid et al, 1959; Deutler & Mackler, 1964; Kerr & McGehee, 1964; Fleischer, 1964; Zdep, 1966) and with the ability to derive pleasure from the challenge of ambiguity (MacKinnon, 1962). The creative person may have developed a capacity to remain fearless and relaxed in situations which for others are anxiety evoking. It would appear natural that many creative individuals have learned to do that.

Since an optimal level of anxiety appears necessary for optimal creative performance, based on the findings of Belcher (1975) and Rollins and Calder (1975), is it possible that individuals of heightened creative ability have learned to adjust their anxiety to the optimal level necessary for their best performance in creative endeavors? Would this level of anxiety be optimal for other activities as well? Research on the effects of creative activity will, perhaps, be dealing with and discovering the role that creativity, in the broadest sense, plays in our lives. In various theories creativity has been seen as an expression of healthy personality (e.g., Rogers, 1959; May, 1975; Maslow, 1976). It would be intriguing to find that stimulating creativity does more than facilitate divergent problem-solving ability and that it has a wider influence on the total personality.

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APPENDIX A

Self-evaluation questionnaire on leaves 47, 48, are
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SELF-EVALUATION QUESTIONNAIRE

Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene

STAI FORM X-1

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *feel* right now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I am regretful	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel rested	①	②	③	④
9. I feel anxious	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel "high strung"	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel over-excited and "rattled"	①	②	③	④
19. I feel joyful	①	②	③	④
20. I feel pleasant	①	②	③	④



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SELF-EVALUATION QUESTIONNAIRE

STAI FORM X-2

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I tire quickly	①	②	③	④
23. I feel like crying	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I am losing out on things because I can't make up my mind soon enough	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I am inclined to take things hard	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I try to avoid facing a crisis or difficulty	①	②	③	④
35. I feel blue	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	①	②	③	④

APPENDIX B

For each of the objects printed below, list as many uses as you can.

1. book
2. tie
3. rope
4. log
5. needle
6. rubber band
7. pencil
8. paper bag
9. chair
10. light bulb
11. mirror
12. candle
13. brick
14. tin can
15. ring
16. button
17. mail stamp
18. shell
19. pebble
20. magazine
21. shoe lace
22. shirt
23. walking stick
24. rubber ball
25. axe
26. butter
27. candy
28. leaf
29. diamond
30. banana

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APPENDIX C

For each of the objects printed below, give as accurate a definition as you can.

- | | |
|----------------|-------------------|
| 1. book | 16. button |
| 2. tie | 17. mail stamp |
| 3. rope | 18. shell |
| 4. log | 19. pebble |
| 5. needle | 20. magazine |
| 6. rubber band | 21. shoe lace |
| 7. pencil | 22. shirt |
| 8. paper bag | 23. walking stick |
| 9. chair | 24. rubber bank |
| 10. light bulb | 25. axe |
| 11. mirror | 26. butter |
| 12. candle | 27. candy |
| 13. brick | 28. leaf |
| 14. tin can | 29. diamond |
| 15. ring | 30. banana |

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APPENDIX D

Write down each of the objects printed below 60 times as quickly as you can.

1. book
2. tie
3. rope
4. log
5. needle
6. rubber bank
7. pencil
8. paper bag
9. chair
10. light bulb
11. mirror
12. candle
13. brick
14. tin can
15. ring
16. button
17. mail stamp
18. shell
19. pebble
20. magazine
21. shoe lace
22. shirt
23. walking stick
24. rubber bank
25. axe
26. butter
27. candy
28. leaf
29. diamond
30. banana

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APPENDIX E

For each of the following adjectives, indicate how you evaluate the task you did, by circling the appropriate number.

The task was:

- | | | | | | | | |
|----------------------|------------------|---|---|---|---|---|---------------------|
| 1. difficult | agree completely | 1 | 2 | 3 | 4 | 5 | disagree completely |
| 2. stressful | | 1 | 2 | 3 | 4 | 5 | |
| 3. threatening | | 1 | 2 | 3 | 4 | 5 | |
| 4. enjoyable | | 1 | 2 | 3 | 4 | 5 | |
| 5. interesting | | 1 | 2 | 3 | 4 | 5 | |
| 6. stimulating | | 1 | 2 | 3 | 4 | 5 | |
| 7. anxiety-producing | | 1 | 2 | 3 | 4 | 5 | |
| 8. humourous | | 1 | 2 | 3 | 4 | 5 | |
| 9. pleasant | | 1 | 2 | 3 | 4 | 5 | |
| 10. annoying | | 1 | 2 | 3 | 4 | 5 | |
| 11. unfamiliar | | 1 | 2 | 3 | 4 | 5 | |
| 12. structured | | 1 | 2 | 3 | 4 | 5 | |
| 13. boring | | 1 | 2 | 3 | 4 | 5 | |
| 14. creative | | 1 | 2 | 3 | 4 | 5 | |
| 15. neutral | | 1 | 2 | 3 | 4 | 5 | |

Give additional impressions about the task or your attitude towards the task.