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**CONSTRUCTIVE THINKING
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REACTIONS TO A DIFFICULT TASK**

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Janelle Cayo Ettema

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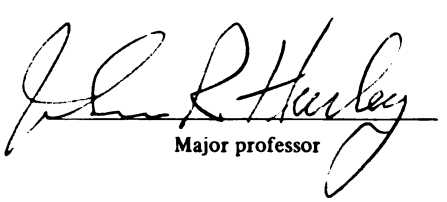

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CONSTRUCTIVE THINKING AND REACTIONS TO A DIFFICULT TASK

By

Janelle Cayo Ettema

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ABSTRACT

CONSTRUCTIVE THINKING AND REACTIONS TO A DIFFICULT TASK

By

Janelle Cayo Ettema

To explore the behavioral correlates of the experiential system of Epstein's (1992) Cognitive-Experiential Self Theory, 233 undergraduates completed measures of Constructive Thinking (Epstein & Meier, 1989), emotional state, intelligence, and self-esteem before a 40-minute task involving both easy and extremely difficult anagrams. Half instructed to "do your best" on each anagram, the others received more relaxed instructions. Emotional state was reassessed at posttask.

Constructive Thinking associated weakly and negatively ($r = -.11$, $p < .10$) with nonproductive task persistence. Lower Constructive Thinking and self-esteem (median splits) associated with longer ($p < .05$) efforts to solve extremely difficult anagrams only under the "do your best" instruction. Despite overlap of these Constructive Thinking and self-esteem scores ($r = .60$, $p < .001$), increments in posttask emotional discomfort consistently associated more negatively with Constructive Thinking than with self-esteem. The findings support the Constructive Thinking measure's utility as well as the validity of Epstein's concept of experiential thinking.

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CHAPTER 1

INTRODUCTION

Why do some intelligent people commonly behave so irrationally? If intelligence does not predict success in life, as evidenced by previous research (Felsman & Vaillant, 1987; Vaillant, 1977), what characteristics do? Questions like these led Epstein and Meier (1989) to develop the Constructive Thinking Inventory (CTI), an instrument intended to assess the degree to which the individual's habitual, preconscious thoughts are constructive and facilitative of adaptive behavior.

The primary purpose of the present study was to explore the relationship between constructive thinking and persistence. As speculated by Epstein (1992), one might expect that constructive thinkers would be more likely to persist in the face of obstacles, whereas those who are low in constructive thinking may give up more easily. A pilot study of this hypothesis (Ettema, 1993) paradoxically found that college students who scored low on the CTI's Constructive Thinking scale tended to persist longer on the practically insoluble items of an anagrams task than did higher scorers. The present work addresses a post hoc explanation of this result, that is, persistence in attempting to solve essentially insoluble anagrams is irrational and nonproductive persistence. More constructive thinkers, it is hypothesized, are better able to discriminate when persistence will or will not pay off, and to invest their energies more appropriately. Less constructive thinkers, on the other hand, tend to feel compelled to persist in situations in which success is unlikely, thereby foregoing opportunities for more promising endeavors. A second purpose of this study was to more broadly explore the nature of the construct of constructive thinking and its relationship to measures of intelligence and self-esteem.

Constructive Thinking

In his undergraduate psychology class on emotions and self-concept, Epstein (Epstein & Meier, 1989) was impressed by the degree to which some otherwise bright students led their lives in an unintelligent and self-defeating manner. Rather than approaching their problems analytically with a view toward behavioral experimentation, they often addressed these problems in ways that tended to exacerbate, rather than alleviate, them. These students often overreacted and overgeneralized from minor events, blaming themselves and others, in spite of the fact that this habitual pattern typically made matters worse for them. Epstein also found that this behavior, which appeared to be related to emotionally charged past experiences, seemed extremely resistant to correction by rational argument. These observations led him to believe that success in everyday living might be affected by the individual's capacity to manage emotions.

The development and maintenance of nonproductive thought and behavior may be analogous to animal studies of avoidance conditioning. In a study by Miller (1948), rats learned to avoid moderate electric shock in the black side of a shuttle box by escaping to the white side. After the electric current was turned off, their learned fear of the black side of the box was highly resistant to extinction, apparently because the rats did not remain in the now safe black section long enough to learn that it was safe. Perhaps in a similar manner, humans also commonly appear to persist in their learned, but later dysfunctional, behavior long after it has become inappropriate. What was once an adaptive response may become so ingrained that one no longer considers whether this behavior is still helpful. This would seem particularly likely when the original learning was traumatic or emotionally charged.

Epstein's (Epstein & Meier, 1989) cognitive-experiential self-theory (CEST) influenced his conception of constructive thinking. CEST posits the existence of three semi-independent systems, which together constitute the structure of the personality. In this schema, the associationistic system operates at the unconscious level, analogous to Freud's

concept of primary process thinking. More pertinent to present purposes, however, are Epstein's rational and experiential systems. The rational system operates on the basis of logic and at the level of conscious awareness. Operating at the preconscious level, the more holistic and loosely organized experiential system is developed on the basis of one's past experience and has its own (non-rational) rules of inference. It is closely associated with the emotions, and its inferences are experienced as self-evidently valid. It functions more automatically than the rational system, and operates both more quickly and more crudely.

From experiences with his students, Epstein deduced that the experiential system played an important role in their problem-solving abilities. He developed the CTI to access this system, tapping into the habitual thoughts that have resulted from the person's accumulated past experiences, which may either help or hinder in dealing with life's problems and stresses. Drawing on the work of cognitive theorists such as Beck (1976), Ellis (1962), and Meichenbaum (1977), and on data regarding emotional incidents reported by his students, Epstein and Meier (1989) developed items to describe the kinds of constructive and counterproductive thoughts that people report having in everyday life. Taken together, these are considered to be indicative of the individual's typical pattern of everyday thinking.

The CTI provides a composite global scale of Constructive Thinking and six factor-based, semi-independent subscales. Supporting its construct validity (Cronbach & Meehl, 1955), the authors found that the scale correlated significantly with diverse criteria of success in everyday living. These included success in the workplace, in social and intimate relationships, and in mental and physical health. Furthermore, the CTI scales were found to better predict such criteria than other measures of coping ability, apparently yielding a more inclusive measure than these other scales provided (Epstein & Meier, 1989).

Epstein and Meier also attested that the concept of constructive thinking is distinguishable from the concept of intelligence. This was supported by factor analytic findings and also by the correlation of each construct with different criteria for success in

living. Among diverse criteria, the Constructive Thinking scale correlated with all except academic achievement, whereas their IQ measure correlated only with academic achievement. However, Epstein and Meier's (1989) study employed only the Shipley (1946) Institute of Living Scale to estimate IQ scores. This measure was designed to assess intellectual impairment, and may not be an adequate measure of the intelligence of college students. The extent to which the CTI and standard measures of intelligence are correlated has not yet been reported in the literature.

Subsequent research has confirmed anticipated links between counterproductive thinking and emotional and behavioral symptoms (Katz & Epstein, 1991); between the several CTI scales and rational beliefs as measured by Kassinove, Crisci, and Tiegerman's (1977) Idea Scale (Hurley, 1991); between low CTI scores and the tendency to overgeneralize negative outcomes directed at the self (Epstein, 1992); and between Constructive Thinking and the tendency to rate oneself above peers for acceptance of self (Hurley, 1990).

Persistence

The importance of persistence and its societal value are evidenced in sayings and folk wisdom: "If at first you don't succeed, try, try again." and "Winners never quit and quitters never win." Because of the importance of persistence and its applications in schools, at the workplace, and in many other areas, this concept has interested psychologists from at least the early years of this century (Feather, 1962). Persistence has been studied in relation to many different variables, including self-esteem, intelligence, attributions for success and failure, and attributional style.

Persistence has traditionally been viewed as a positive, adaptive phenomenon, and most studies have taken this perspective in explorations of its personality correlates. Indeed, persistence is often very desirable and valued in our society because it enables people to accomplish things that they would never achieve if they gave up too readily. This view of persistence is so ingrained in most of us that it is hard to conceive of any possible

disadvantages of persistence. Yet, despite the fact that we tend to think of persistence as an unmitigated asset, clearly there are also situations in which it may be a liability. Although giving up when persistence would have later paid off may be maladaptive, persistence at impossible tasks is also maladaptive, wasting time and personal resources. Janoff-Bulman and Brickman (1984) argued that this second type of error may be even more debilitating than the first, leaving people in destructive relationships, with occupational burn-out, and with stress-related illness.

Brockner and Rubin (1985) explored nonproductive persistence in their book on "entrapment," which they define as "a decision making process whereby individuals escalate their commitment to a previously chosen, though failing, course of action in order to justify or 'make good on' prior investments" (p. 5). According to these authors, such irrational commitment to a course of action may have serious consequences in a wide variety of situations at both the personal and the societal level. This process may result, for example, in an inability or unwillingness to make productive career changes or to end unsatisfying relationships. At the societal level, it may lead to the increasing unwillingness on the part of both sides to negotiate a labor dispute, or even to the perpetuation of war when there is little to be gained by a nation's continuing military involvement.

In addition to the conflict resulting from previous investments of time, effort, and/or money described by Brockner and Rubin, the sheer momentum of behavior, as well as the plethora of pro-persistence messages that we receive throughout our lives, often make quitting very difficult (Janoff-Bulman & Brickman, 1982). Klinger (1975) has found that some degree of depression--ranging from mild disappointment to severe depressive episodes--is a normal part of disengagement from a task. A related problem is that people commonly overestimate their ability to solve problems (Fischhoff & Slovic, 1980). So discriminate persistence, or knowing when to quit and when to press on, involves skills that may be more important than commonly recognized.

In evaluating the extent to which behavior is adaptive or maladaptive, it is neither persistence, per se, nor the lack thereof, that is essential, but rather the ability to discriminate those situations in which persistence will pay off from those in which quitting may be the better strategy (Janoff-Bulman & Brickman, 1982). A few studies illustrate the importance of this skill in everyday living (Gurin, Gurin, Lao, & Beattie, 1969; Roistacher 1974). Gurin et al., for example, showed that black youths who distinguished between areas of personal life that were under their control and elements in the general situation of black Americans that were beyond their control were more likely than others to have an active, realistic coping orientation both toward personal achievement and toward social change.

Self-esteem.

Several studies have linked persistence with self-esteem. Orbach and Hadas (1982) found that, after being subjected to a failure experience, persons who received self-esteem enhancement in the form of positive feedback about their personalities were more persistent on a subsequent task than those not receiving this treatment. Shrauger and Sorman (1977) also found that low self-esteem adversely affected persistence, but only if persons with low self-esteem experienced consistent failure, and not if they were aware of some improvement across trials. Similarly, Brockner and his colleagues found that highly self-focused persons who were low in self-esteem performed particularly well on a task after limited failure, but particularly poorly after extended failure, as compared to persons high in self-esteem (Brockner et al., 1983).

In a study assessing persistence by the amount of time spent on each puzzle in an anagrams task, Sandelands, Brockner, and Glynn (1984) found that persons higher in self-esteem made better use of task information that suggested persistence would not pay off in some cases (the fact that some anagrams were insoluble) than did those low in self-esteem. The former moved on from insoluble anagrams sooner when they had this information,

whereas those lower in self-esteem persisted equally long with and without this information.

In contrast, McFarlin, Baumeister, and Blascovich (1984) found that persons lower in self-esteem made better use of failure feedback on a task involving Mednick's (1962) Remote Associations Test (RAT) than did those higher in self-esteem, reducing their level of persistence on each item, and actually performing better than those high in self-esteem, who tended to spend an inordinate amount of time on earlier items. A related phase of McFarlin et al.'s study found that persons high in self-esteem did not respond as well to advice to go on to the next in a series of puzzles if they did not succeed in solving a puzzle after two or three tries.

These contradictory conclusions as to the relationship of self-esteem to task disengagement may be explained in terms of differences in self-presentational concerns under conditions of receiving failure feedback or taking advice on the one hand, versus receiving information as to the nature of the task on the other. It may be that under the previous conditions, those high in self-esteem were more inclined to preserve their self-esteem by continuing their efforts, since acknowledging failure or accepting advice to quit might be viewed as reflecting adversely on them. Information about the solubility of the problems would not reflect in the same way on their competence. Persons low in self-esteem, on the other hand, might be more inclined to view failure feedback as a reflection on their ability, making it pointless to persist very long, and to accept advice as a way of protecting themselves against failure. In comparing their work with the McFarlin study, Sandelands et al. (1988) argued in a similar vein that while persons low in self-esteem may be especially influenced by explicit external cues, those high in self-esteem may be more likely to make use of relevant information suggesting the advantage of disengagement if their active role in decision-making is maintained.

In a later work (McFarlin, 1985) more similar to that of Janoff-Bulman and Brickman (1982), in which participants were given information rather than advice, McFarlin's results

were also similar: Persons high in self-esteem were more likely to use such information appropriately than were those low in self-esteem. Nevertheless, the conclusions of McFarlin, Baumeister and Blascovich (1984) may be valid under certain circumstances. They concluded that while most researchers tend to equate high self-esteem with optimal functioning, it may, in some situations, be the source of delusional over-confidence, causing the person to ignore sometimes subtle cues as to the likelihood of success, or to disregard legitimate advice not to persist too long.

Intelligence.

Exploring the transsituational consistency of behavior, Violato and Travis (1988) found a statistically nonsignificant trend for lower IQ persons to be more stable in persistence behavior than those with higher IQ scores, but suggested that the lack of significance may be due to the small number of subjects in the IQ subgroups. Although inconclusive, this trend may be of some interest in predicting the ability to persist or disengage as appropriate to the situation.

Task difficulty cues.

While studying test anxiety and achievement motivation, Atkinson and Litwin (1960) found that persons high in achievement motivation and low in test anxiety took more trials in a ring-tossing task from the middle range of distance than did those higher in test anxiety and lower in achievement motivation. This could be interpreted as a greater ability on the part of high achievement motivation/ low test anxiety persons to discriminate where persistence was most likely to pay off, since they concentrated their efforts at the middle range, and took fewer shots from the very easy and the very difficult ranges where persistence was either unnecessary for success or less productive. Similarly, Weiner, Heckhausen, Meyer, and Cook (1972) found that task difficulty served as a cue to determine the efficacy of extended effort, with the greatest expenditure of energy put forth for tasks of intermediate difficulty. It may be that more constructive thinkers are more attuned to task difficulty cues, and are more inclined to use even subtle cues to determine

the efficacy of effort expenditure. This ability is of particular interest in the present study, since participants will be given no explicit information as to the practical insolubility of some anagrams.

Need to please

It is also possible that eagerness to be a "good subject" and please the experimenter may affect persistence behavior. This may be particularly applicable to persons lower in constructive thinking, who have been found to be more concerned about evaluation when working on tasks (Epstein, 1992) and more concerned about the impression they are making on others (Katz & Epstein, 1991) than persons higher in constructive thinking. It may be, then, that persons lower in constructive thinking persist longer at the insoluble items, not because they cannot discriminate when persistence will and will not pay off, but because they are more concerned about making a positive impression, and are therefore more conscientious in following the directions to "do your best to solve each anagram." This can be tested by varying the task instructions for one group of participants, de-emphasizing the importance of each individual anagram and encouraging participants to go on to the next item when experiencing difficulty with an anagram. If persons low in constructive thinking are more conscientious than high constructive thinkers in following directions, they should be less inclined to stick with the essentially insoluble anagrams under this "go on" instruction condition than under the original instruction.

Overview of the Study

This study addresses two sets of questions, one involving the relationship of the global Constructive Thinking scale to productive and nonproductive persistence, and the other involving the nature of constructive thinking and its relationships to intelligence and self-esteem.

Constructive thinking and persistence

The review of the literature concerning constructive thinking and persistence provides the basis for a hypothesized relationship between these constructs. The post hoc explanation suggested in my pilot study (Ettema, 1993), that high constructive thinkers are less obsessively persistent, and better able to discriminate situations in which persistence will pay off, seems reasonable in light of what we know about constructive thinking. If this relationship holds, the concept of constructive thinking also may shed more light on discriminate persistence and what constitutes the ability to know when to persist and when to quit.

First, the ability to know when to quit and when to persist fits well with Epstein and Meier's (1989) broad description of the characteristics of constructive thinkers, which is based on the items in their scale. Constructive thinkers are characterized by a general optimism, tempered by reality considerations. They are not prone to gross overgeneralizations (e.g., "If I can't do this, I'm no good at anything."), nor to grandiose self-enhancement which could lead to extreme overconfidence of their ability to perform the task. They seem less likely to take things personally, and less sensitive to failure or disapproval, giving them greater freedom to assess the profitability of disengaging from tasks. Their greatest advantage may be flexibility, which allows them to take account of situational cues and to change their expectations for success appropriately. This is important since such expectations have been found to mediate persistence behavior (Feather, 1982). High constructive thinkers generally feel good about themselves and others, cope well with negative emotions, and behave effectively in daily life.

Secondly, differences between constructive and nonconstructive thinkers have been confirmed by research, and seem consistent with differences in the ability to know when to quit and when to persist. Persons low in constructive thinking tend to generalize negative outcomes toward the self (Epstein, 1992; e.g., "If I fail at this, I will fail at other things too."). They are more concerned with evaluation when working on a task than are high

constructive thinkers (Epstein, 1992), indicating that they may be less inclined to quit when appropriate. Also, they are more likely to produce spontaneous negative thoughts during tasks, to see stressors as more threatening, to judge themselves more harshly, and to be more concerned about the impression they are making on others (Katz & Epstein, 1991). All of these findings suggest that it may be especially difficult for low constructive thinkers to disengage from tasks, even when quitting is appropriate.

The theoretical advantage of people higher in constructive thinking in being able to "solve problems in everyday living at a minimal cost in stress" (Epstein, 1992, p. 813) could account for this greater ability to know when to persist and when to quit. Another possible explanation to be tested is that people lower in constructive thinking may be more conscientious in following directions in order to please the experimenter.

Individuals higher in constructive thinking may also be more sensitive to cues of task difficulty and may have a keener intuitive sense as to whether or not an anagram is soluble. In some problem-solving tasks, Zajonc (1980) found that intuitive or affective responses may precede formal, cognitive judgments. Other studies have indicated the importance of awareness of what one knows and the resulting awareness of where extended effort will or will not pay off (Hart, 1965; Shaughnessy, 1979). Hart found that those who performed best on a multiple-choice examination were also more accurate in their "feeling of knowing," differentiating better between those items which they knew and those which they did not know. High constructive thinkers may be better at making similar discriminations, due to greater intuitive awareness, or possibly due to stronger verbal skills.

Other possible explanations are beyond the scope of this study, but may be worth pursuing in the future. One particularly interesting possibility is that persons high and low in constructive thinking may differ in the attributions they make for success and failure. Such attributions may then affect persistence, with persons who make global, internal, and stable attributions for failure (Abramson, Seligman, & Teasdale, 1978) being less inclined to persist. Seligman, Nolen-Hoekstra, Thornton, and Thornton's (1990) study of the

effects of attributional style on swimming performance may be relevant here. After receiving falsely poor reports of their times in different swimming events, the subsequent performance of swimmers with a pessimistic style was negatively affected, whereas the performance of those with an optimistic style was not. Perhaps in a similar manner, the different attributions made by persons high or low in constructive thinking affect their level of persistence.

The nature of constructive thinking: Exploration of the construct

Although Epstein (1989) demonstrated that the CTI and one IQ measure were predictive of different types of success, it could still be that intelligence is a component of the CTI, or that the two are somehow related, even if they do not measure exactly the same thing. In light of the trend in the Violato and Travis study (1987) for persons with higher IQ scores to vary more widely in their levels of persistence across situations, this relationship bears further exploration.

Since self-esteem seems to be correlated with the ability to determine when to persist and when to disengage from a task (Brockner, et al., 1983; Janoff-Bulman & Brickman, 1982; McFarlin, Baumeister, & Blascovich, 1984; Sandelands, Brockner, & Glynn, 1988), and since it also seems plausible that self-esteem is intimately related to constructive thinking, this relationship should also be explored further. It is interesting that while self-esteem has failed to differentiate discriminate persisters from nondiscriminate persisters in the absence of explicit information about the efficacy of persistence in situations (e.g., McFarlin, 1985), data from the pilot study (Ettema, 1993) suggest that CTI scores may do so. This might indicate the ability of high constructive thinkers to pick up on more subtle cues as to the likelihood that persistence will pay off.

Finally, the relationship of the Constructive Thinking scale to emotional reactions to a frustrating task was also explored and compared to the relationship of self-esteem and intelligence to such reactions. The anagrams task employed to measure persistence in this study was anticipated to be rather frustrating. It was further expected that constructive

thinking would moderate negative reactions to the task, as high constructive thinkers would be less inclined to overgeneralize this aversive experience, to blame themselves, and to be sensitive to disapproval or failure than would those low in constructive thinking. Since self-esteem and constructive thinking are likely related, a similar pattern was expected for the relationship between self-esteem and emotional reactions. Intelligence was not expected to correlate with emotional reactions to this task.

Based on the preceding considerations, these hypotheses were formulated:

If the Constructive Thinking scale is measuring practical intelligence in relation to persistence, Hypotheses I and II follow:

Hypothesis I: There is a positive relationship between constructive thinking and productive persistence, as defined by the number of anagrams attempted and solved, after controlling for intelligence.

Hypothesis II: Constructive thinking is negatively related to nonproductive persistence, as defined by time spent on insoluble anagrams.

If low constructive thinking involves greater concern with making a positive impression, Hypothesis III follows:

Hypothesis III: The proposed general negative relationship between constructive thinking and nonproductive persistence will be attenuated if different instructions suggest bypassing an anagram when experiencing difficulty, since low constructive thinkers will follow this alternate instruction more conscientiously than high constructive thinkers.

If constructive thinking involves keener intuition as to which items are relatively easy and which are practically impossible, Hypothesis IV follows:

Hypothesis IV: Persons higher in constructive thinking will be more accurate in their intuitive ratings of the difficulty of anagrams than are those lower in constructive thinking.

Further hypotheses regarding the nature of constructive thinking are:

Hypothesis V: Constructive thinking is positively related to both intelligence and self-esteem.

Hypothesis VI: Constructive thinking is positively related to positive emotional reactions to the task and negatively related to negative emotional reactions.

CHAPTER 2

METHOD

Subjects

The participants were 233 undergraduates (152 women and 81 men) from the subject pool of the Michigan State University (MSU) Psychology Department. Participation in such studies was one option for the fulfillment of research requirements of students in introductory psychology courses. Twenty-two subjects were eliminated from those statistical analyses involving the Wonderlic Personnel Test (1989) due to a timing error that invalidated their scores.

Materials

Each participant's informed consent was obtained using the form shown in Appendix A (p. 36). Form A of the Wonderlic Personnel Test (Wonderlic, 1989) was administered to determine each person's IQ score. The Wonderlic is a written 12-minute test of mental abilities, originally developed for use in industrial settings. Its 50 items address diverse areas of cognitive functioning, including general information, similarities and differences in verbal and nonverbal material, vocabulary, visual-spatial tasks, reasoning, abstraction, and calculations. Dodrill (1981) reported that Wonderlic total scores correlated .91-.93 with the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1955) and that Wonderlic IQ scores were within 10 points of the WAIS Full Scale scores in 90% of the cases for a sample of 120 normal adults. Reported correlations between the Wonderlic and the revised version of the WAIS (WAIS-R; Wechsler, 1981) range from .75 to .96 (Dodrill, 1983; Edinger, Shipley, Watkins, & Hammett, 1985; Frisch & Jossop, 1989; Hawkins, Faraone, Pepple, & Seidman, 1990).

The 26-item Constructive Thinking scale from the Constructive Thinking Inventory (Epstein & Meier, 1989) was used to assess this variable. Rosenberg's (1965) Self-Esteem Scale (RSES) was used to measure self-esteem. This brief, convenient measure was considered adequate for present purposes, although measures of global self-worth have

been found less successful than domain-specific measures in predicting behaviors (Stake, 1994). Rosenberg (1965) cited as evidence for construct validity that persons who score higher and lower on this measure differed in expected directions on diverse other measures, such as mood, neuroticism, group status, and so forth. Hagborg (1993) reported a concurrent validity coefficient of .76 with the Global Self-worth Scale of the Self Perception Profile for Adolescents (Harter, 1988). Silber and Tippett (1965) found a test-retest correlation of .85 over two weeks. However, Byrne (1983) found a test-retest correlation of only .62 over six months, suggesting that Silber and Tippett's higher correlation was largely due to their much shorter time interval.

As is common in persistence research, an anagrams task was used to measure persistence. Productive persistence was defined by the number of soluble anagrams attempted and solved, partialing out intelligence to control for this probable moderator variable. This persistence measure has face validity, in that high scorers are those whose continued efforts were rewarded by successful solutions. Low scorers are presumably those who either did not try very hard or who spent too much time and effort on insoluble items.

Nonproductive persistence was defined by the amount of time spent on each of the essentially insoluble anagrams. Continuing to work on an insoluble puzzle constitutes evidence of nonproductive persistence, since the task is arranged so that persistence cannot accomplish anything. This measure's internal consistency was assessed by comparing the amount of time spent by each individual on each of the first two essentially insoluble anagrams. This correlation was .73 ($\underline{n} = 231$, $\underline{p} < .001$, two-tailed test). Pre- and post-task questionnaires (see Appendix B, p. 37) were used to gather information as to the participants' gender, native language, attitude toward word puzzles, involvement in the task, and mood. These items were created to assess likely mediator variables between constructive thinking and persistence, and to determine the relationship between constructive thinking and emotional reactions to the anagram-solving task.

The persistence task was generated using Micro Experimental Laboratory (MEL) software, as was a brief task in which participants rated the perceived difficulty of ten 7-letter anagrams. The CTI, the Rosenberg, and the pre- and posttask questionnaires were also administered via MEL software. Instructions and stimuli for these phases of this study were presented via computer, and are delineated in the following section. Participants responded via keyboard. Data were recorded on discs.

Procedure

Students participated in groups of 5 to 23 in MSU computer laboratories. After receiving each participant's informed consent, Form A of the Wonderlic Personnel Test was administered first as a timed paper-and-pencil measure. The CTI, the Rosenberg, and the pretask questionnaire were each administered in turn, followed by the anagram-solving task. Finally, the anagram-rating task and posttask questionnaire were administered. All measures were scored, cross-checked for accuracy, and the results recorded.

Participants were familiarized with the anagram-solving task through a brief description of anagrams and the rules for solving them. They were given two sample anagrams and their solutions, and then received the following instructions:

> The anagrams you will be given vary in difficulty. It is VERY IMPORTANT that you DO YOUR BEST TO SOLVE EACH ONE. If you cannot solve an anagram, you can go on to the next one by pressing the F10 key.
>
> You will NOT be able to return to previous anagrams once you go on to the next one.
>
> You may use pencil and paper to work out the solutions to the anagrams.
>
> Please solve as many anagrams as you can until you are asked to stop.
>
> Please do not communicate with other participants in this experiment.
>
> If you have any questions, please raise your hand and the experimenter will assist you. When you are sure that you understand the instructions, press the F1 key to continue.

Some anagrams were so obscure as to be practically impossible to solve. The first two of these were:

A C M O R R S U U ----------MACRUROUS, third in the series;

A A D O P S U Y ---------- PADUASOY, fourth in the series.

The first 10 anagrams used for this task are listed in Table 1, p. 19. A total of 165 anagrams were available to keep participants engaged in the task so that those who tended to stay with each anagram for longer periods of time would not be distracted by people finishing early and leaving the room. Two to four insoluble anagrams were included in each block of 10. Although participants were not informed of the time limit, a maximum time of 40 minutes was set for the entire anagram-solving task, after which the computer presented the next task. Due to a glitch in the MEL program, the maximum time actually varied from 40 to 41.17 minutes.

The computer recorded the time spent on each anagram. In the case of the practically insoluble anagrams, this provided a measure of nonproductive persistence. The computer also recorded the number of anagrams attempted and solved correctly, which, after partialing out intelligence, provided a measure of productive persistence.

To test whether persons lower in constructive thinking were more concerned about evaluation and the impression they were making on others, and, therefore, more conscientious in following the direction to "do your best to solve each anagram" than were those high in constructive thinking, 96 participants were presented with a different instruction, identical to the preceding except for the first paragraph :

> The anagrams you will be given vary in difficulty. It is important that you do your best to solve as many anagrams as you can. As soon as it becomes clear that you cannot solve an anagram, go on to the next one by pressing the F10 key, so as to attempt and solve as many as possible.

Table 1. Descriptive Statistics for 233 Students' Anagrams Task Performance Measures

	M (SD)
Total number of anagrams solved	7.43 (3.77)
Total seconds on anagrams task	2247 (405)

First 10 anagrams	Time in seconds: M (SD)	Percentage of persons who solved each
1 AMPST (stamp)	19.1 (14.3)	95.7
2 YWRFEEA (freeway)	42.1 (42.2)	69.1
3 ACMORRSUU (macrurous)	107.5 (114.7)	0.0
4 AADOPUSY (paduasoy)	137.3 (151.5)	0.0
5 AEFKLNOSW (snowflake)	91.8 (117.3)	54.5
6 CHNORSTUU (cothurnus)	167.6 (163.3)	0.0
7 ACEENNRT (entrance)	144.3 (117.0)	4.7
8 AFFLOOTT (flatfoot)	97.0 (81.3)	41.6
9 AERRSTUY (treasury)	136.8 (117.7)	7.3
10 ADEHIMRTY (diathermy)	139.5 (141.2)	0.0

Blocks of 10 anagrams	Time in seconds: M (SD)	Number solved in each block: M (SD)
1-10	1082 (647)	2.73 (1.06)
11-20	574 (354)	2.64 (1.69)
21-30	271 (250)	.70 (1.06)
31-40	115 (158)	.41 (.85)
41-50	63 (100)	.38 (.83)
51-60	40 (69)	.20 (.54)
61-70	22 (51)	.04 (.23)
All remaining items (71-165)	73 (173)	.34 (.97)

If persons low in constructive thinking are more compliant or more conscientious in following directions than those high in constructive thinking, it was expected that they would be less inclined to persist on the practically insoluble items under this second "go on" instruction than under the original instruction, and that the relationship between Constructive Thinking scores and time spent on insoluble anagrams would be attenuated.

The main anagrams task was followed by a request that participants rate each of a series of 10 new anagrams for perceived difficulty. In the latter series, all were seven letters long and are listed in the order of presentation with the mean rating of each in Appendix C, p. 38. Five were relatively easy to solve, and five were comparable in difficulty to the "essentially insoluble" items of the main anagrams task. Each anagram was exposed for 13 seconds before being rated as either "very difficult" or "less difficult". The number of seconds was selected after a pilot run of the experiment which determined the minimal time necessary to solve the soluble anagrams in the set. To ensure that participants would be unlikely to actually solve the anagrams before rating them, the interval was made shorter than this minimal time. This provided a very stringent measure of the ability to discern early on, perhaps in an intuitive manner (Hart, 1965; Shaughnessy, 1979; Zajonc, 1980), when persistence might and might not pay off.

The study ended with the posttask questionnaire. Emotion items from the pre- and posttask questionnaires (Appendix B, p. 37) were scored on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores for change in emotion were determined by subtracting the pretask rating of each emotion from the posttask rating. Composite scores for changes in emotion, either positive or negative, were calculated by aggregating the relevant change scores. At the end of each session, participants were debriefed and given information about the experiment as set forth in Appendix D (p. 39).

CHAPTER 4

RESULTS

Performance measures on the anagram-solving task appear in Table 1 (p. 19). Participants averaged 38 minutes on the anagram-solving task, with most persons working to the maximum time limit of approximately 40 minutes. Some persons finished early by skipping through the anagrams, but 90% of the participants spent at least 27 minutes on this task. Participants tended to spend most of their time on earlier items, with few persons spending more than a few seconds on items beyond number 30. The mean number of anagrams solved was 7.43, ranging from 1 to 22. The mean time spent on each of the first ten anagrams and the percentage of persons solving each are listed in Table 1, along with the mean time and average number of anagrams solved per each group of ten through item 70. Descriptive statistics for the other central measures appear in Table 2 (p. 22). The mean Wonderlic score of 25.5 is equivalent to a WAIS-R Full Scale IQ of 112, which appears reasonable for a sample from a college population. On average, negative emotions increased notably ($p < .001$) from pretask to posttask, while positive emotions decreased ($p < .001$). Most effect sizes for these changes are large (Cohen, 1992), the two exceptions being the changes in ratings of depression and anxiety, which were small and medium, respectively (Table 2, p. 22).

Two-tailed tests were used to determine the statistical significance of all correlations. The Constructive Thinking scale was unrelated to the Wonderlic Personnel Test (Wonderlic 1989) which estimates IQ ($r = -.01$), but did correlate substantially with the Rosenberg (1965) Self-Esteem Scale ($r = .60$; $p < .001$, two-tailed test). The CTI's global scale did not correlate meaningfully with the number of anagrams solved, neither before partialing out intelligence ($r = .01$) nor after ($r = -.02$). The correlation of Constructive Thinking with time spent on solved anagrams was also not statistically significant ($r = .02$). A search of all present variables which might be conceivably related to the number of

Table 2. Descriptive Statistics for 233 Students' Scores on Principal Measures and Related t-tests

	Pretask M (SD)	Posttask M (SD)	Pre- to Posttask M (SD)	Changes[c] t-value	Effect size of changes
Constructive Thinking	93.8 (11.8)				
Rosenberg Self-Esteem Scale	32.7 (4.4)				
Wonderlic[a]	25.5 (4.8)				
Emotion measures [b]					
I feel upset.	1.96 (.99)	2.61 (1.12)	.66 (1.11)	9.05	.51
I feel angry.	1.89 (.96)	2.65 (1.24)	.76 (1.22)	9.52	.53
I feel frustrated.	2.18 (1.02)	3.70 (1.18)	1.52 (1.36)	17.06	.75
I feel depressed.	2.14 (.99)	2.41 (1.00)	.27 (1.04)	3.92	.25
I feel anxious.	2.97 (1.08)	3.47 (1.11)	.50 (1.21)	6.28	.38
Total negative	11.15 (3.73)	14.84 (4.17)	3.70 (3.66)	15.40	.71
I feel relaxed	3.95 (.79)	2.59 (1.05)	-1.36 (1.13)	-18.46	.77
I feel happy	3.67 (.84)	2.80 (1.03)	-.87 (1.05)	-12.63	.64
I feel confident	3.82 (.78)	2.85 (.92)	-.98 (.94)	-15.97	.72
I enjoy word puzzles	3.17 (.99)	2.33 (1.20)	-.84 (1.01)	-12.62	.64
Total positive	14.62 (2.42)	10.58 (3.31)	-4.04 (2.93)	-21.05	.81
I am good at solving word puzzles.[b]	3.05 (.80)	2.14 (1.05)	-.91 (.94)	-14.84	
I did my best to solve the anagrams [b]		3.86 (1.06)			
It was important to me to do well.[b]		3.14 (.98)			

[a] Wonderlic N = 211; Wonderlic score of 25.5 is equivalent to a WAIS-R FSIQ of 112.

[b] 1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree.

[c] $p < .001$ for $t \geq 3.29$.

Note: Effect sizes were calculated from t values using Rosenow and Rosenthal's (1988) formula, p. 206.

anagrams solved yielded only one statistically significant correlation with the participants' pretask rating of their word puzzle ability ($r = .17$; $p < .01$). The same rating also had a nearly significant association with posttask ratings of how important it was to do well on the task ($r = .13$, $p = .051$), but was unrelated to the time spent on any anagram, except for the first ($r = -.18$; $p < .01$), or to the rating of the extent to which participants tried their best ($r = -.04$; *ns*). Solving the fourth anagram, which immediately followed the first two insoluble ones, was not significantly correlated with measures of constructive thinking, self-esteem, or intelligence (all r's $< .06$). The correlation between Constructive Thinking scores and the intuitive rating of anagrams for difficulty was not significant ($r = -.06$).

Accepting Cohen's (1990) suggestion that the $p < .10$ level is acceptable for exploratory studies, the CTI's Constructive Thinking scores did correlate significantly in the anticipated negative direction with time spent on the first insoluble anagram ($r = -.11$; $p < .10$, two-tailed test), whereas neither self-esteem ($r = -.04$) nor intelligence ($r = .00$) did. However, when one notably outlying score associated with the most extreme length of time spent on this anagram (8.7 standard deviations above the mean) was removed from the analysis, this correlation was no longer significant ($r = -.06$). Logarithmic transformation of the positively skewed distribution of times, as recommended by Tabachnik and Fidell (1989), slightly increased this value, but not to the point of statistical significance ($r = -.10$). Since the logarithmic transformation used in other calculations yielded the same result (slight increases, but none to the point of statistical significance), only correlations performed without the transformation are reported. Considering only the group of persons who received the original instruction to "do your best to solve each anagram," no significant relationship between Constructive Thinking scores and time spent on the first insoluble anagram was found ($r = -.09$; *ns*). The correlation of the CTI's global scale with the second insoluble anagram was not significant ($r = -.07$). Neither the time spent per anagram nor solution rates (whether or not each was solved) for the first two soluble anagrams correlated significantly with the Constructive Thinking scale (all rs $< .05$).

The groups receiving different instructions did not differ significantly in their correlations between Constructive Thinking scores and time spent on the first essentially insoluble anagram. The correlation for the subgroup of 96 persons receiving the "go on" instruction (r = -.16; *ns*) was only slightly higher than that of the 137 persons receiving the original instruction (r = -.10; *ns*). Removing the most extreme score for time spent on the essentially insoluble anagram reversed this pattern, yielding a slightly lower correlation for those receiving the "go on" instruction (r = -.03, *ns*) as compared to the group receiving the original instruction (r = -.10, *ns*). The difference between these correlations was not statistically significant.

However, although there was only a weak main effect for Constructive Thinking scores in relation to time spent on the first insoluble anagram (r = -.11; p < .10), there was a statistically significant main effect for instruction condition on time spent on this puzzle (r = -.15, p <.05), and also a significant interaction between Constructive Thinking and instruction condition for time spent on the insoluble anagram, F (2, 229) = 3.59, p < .05 when the outlying score for time spent on the insoluble anagram was removed. After splitting this sample's Constructive Thinking scores at the median, the instruction was found to have a greater effect on persons low in constructive thinking than on persons high in constructive thinking as depicted in Figure 1 (p. 25), as well as a similar impact on persons low in self-esteem as compared to those high in self-esteem F (2, 229) = 3.54, p < .05, again splitting scores at the sample's median (Figure 2, p.25). Neither interaction nor the main effect for instruction condition was statistically significant when the outlying score for time spent on the first insoluble anagram was included.

Beginning with a multiple regression equation in which self-esteem scores and instruction condition are previously included as independent variables in relation to time spent on the first insoluble anagram (R = .17), the addition of Constructive Thinking scores adds little to the predictive power of the equation (R = .18). Similarly, adding the self-esteem measure to the multiple regression of Constructive Thinking and instruction

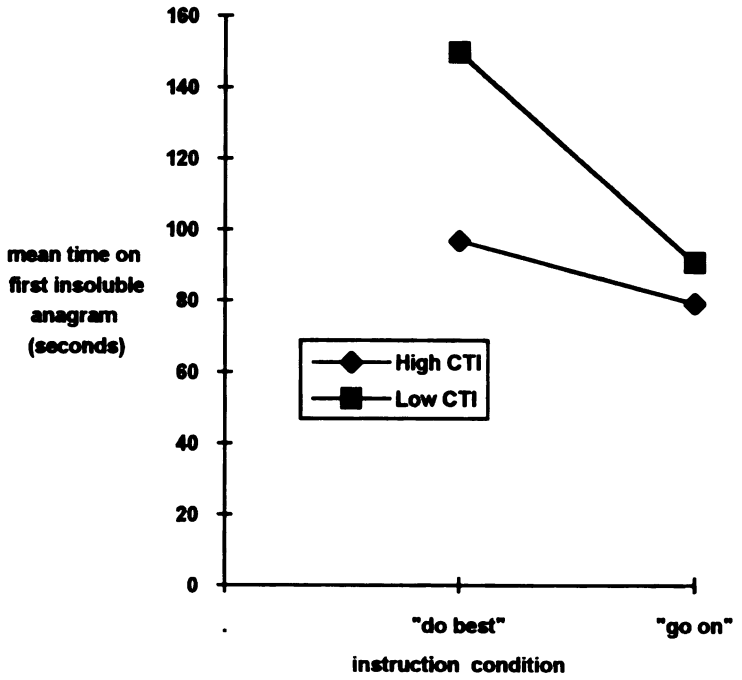

Figure 1. Interaction of Constructive Thinking scores with instruction condition in relation to time spent on the first insoluble anagram.

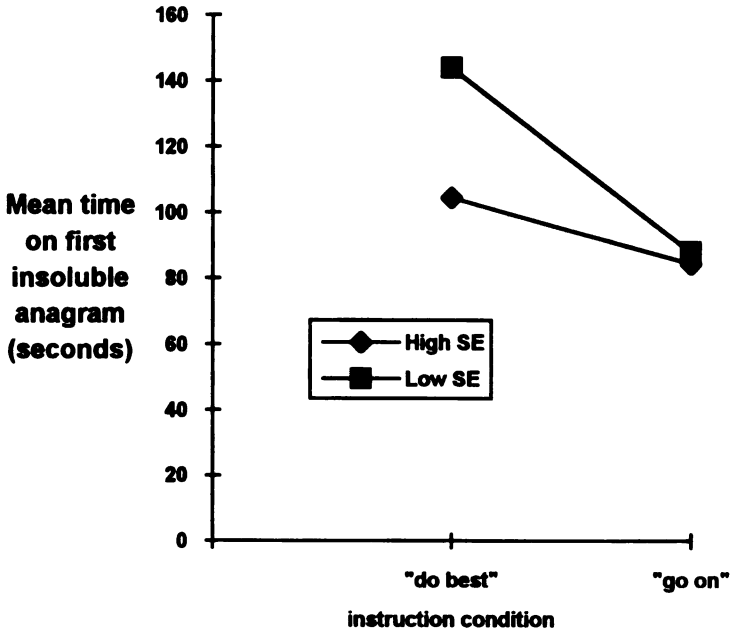

Figure 2. Interaction of Rosenberg self-esteem scores with instruction condition in relation to time spent on the first insoluble anagram.

condition onto time spent on the first insoluble anagram (R = .17) adds very little (R = .18). These results were obtained without the outlier value for time spent on the insoluble anagram. When the outlier was included, the predictive power of the equation with only the self-esteem and instruction condition variables (R = .09) was improved somewhat by the addition of Constructive Thinking scores (R = .15), but the equation including only Constructive Thinking and the instruction condition (R = .15) was not improved by the addition of the self-esteem measure (R = .15).

Table 3 (p. 27) shows all correlations of the Constructive Thinking and self-esteem measures with scores for pre- and posttask ratings of emotion and the related change scores for emotion, and the results of t-tests for the difference in the strength of the correlations of each of the emotion measures with either the global CTI scale or the Rosenberg. These t-tests indicate in what instances the strength of the relationship of constructive thinking with change in emotion is significantly different from the strength of the relationship of self-esteem with change in emotion. Bonferroni adjustments seemed unnecessary since 7 of the 11 tests (64%) for differences in the strength of the correlations are statistically significant if two at the $p < .10$ level are included, a percentage far greater than the 10% that can be expected on the basis of chance alone.

Table 4 (p. 28) shows all intercorrelations of emotion measures and the correlations of emotion measures with the Constructive Thinking scale and the Rosenberg (1965) Self-Esteem Scale. The correlations of the Constructive Thinking scale and the Rosenberg with emotion measures generally differed more at posttask than at pretask, as can be seen by comparing the first two sets of columns in Table 4. This is also illustrated by the greater difference in correlations of the Constructive Thinking scale and the Rosenberg with the two overall posttask emotion measures as compared to the lesser difference in correlations of each with the two overall pretask emotion measures. Correlations of the Constructive

Table 3. Correlations of Change in Emotion Ratings (Pretask Minus Posttask) with the Global Constructive Thinking Scale and the Rosenberg Self-Esteem Scale (N = 233)

	Constructive Thinking	Rosenberg Self-esteem	t-test of difference
Upset	-.05	.07	2.61**
Anger	-.17*	.00	2.94**
Depression	.05	.16*	1.90†
Frustration	.11	.17*	1.04
Anxiety	.05	.08	n.s.
Total negative	.00	.16*	2.76**
Happiness	.20**	.04	2.79**
Relaxation	.14*	.04	1.72†
Confidence	-.03	-.07	n.s.
Enjoyment	.14*	.09	1.53
Total positive	.16*	.04	2.07*

* $p < .05$, two-tailed test. ** $p < .01$, two-tailed test. † $p < .10$, two-tailed test.

Note. Differences between these correlations, which share a common variable, were computed using McNemar's (1963) formula, p. 158.

Table 4. Pearson Correlations Among Constructive Thinking, Self-esteem, and Emotion Ratings (Pretask, Posttask, and Changes) for 233 Participants (Decimals Omitted)

	CTI	RSES	Upset	Anger	Depression	Frustration	Anxiety	Enjoyment	Confidence	Happiness	Relaxation
CTI	-	60	-42 -42 -05	-33 -42 -17	-45 -40 05	-41 -23 11	-31 -25 05	20 29 14	54 42 -03	30 45 20	33 40 14
RSES	60	-	-40 -29 07	-31 -24 00	-46 -30 16	-36 -12 17	-17 -07 17	09 16 09	58 42 -07	34 32 04	31 27 04
Upset	-42 -42 -05	-40 -29 07	-	79 74 61	54 61 24	68 35 31	24 35 10	-30 -34 -24	-45 -51 -33	-44 -53 -26	-38 -57 -28
Anger	-33 -42 -17	-31 -24 00	79 74 61	-	45 52 20	57 46 40	18 39 15	-25 -38 -18	-35 -42 -26	-38 -54 -41	-40 -47 -36
Depression	-45 -40 05	-46 -30 16	54 61 24	45 58 20	-	43 19 00	21 25 06	-25 -24 -11	-45 -39 -13	-42 -50 -18	-41 -40 -17
Frustration	-41 -23 11	-36 -12 17	68 35 31	57 46 40	43 19 00	-	31 37 40	-08 -15 -02	-46 -27 -18	-36 -26 -11	-41 -36 -25
Anxiety	-31 -25 05	-17 -07 17	24 35 10	18 39 15	21 25 06	31 37 40	-	-14 -20 -04	-10 -23 -05	-14 -37 -11	-20 -41 -14
Enjoyment	20 29 14	09 16 09	-30 -34 -24	-25 -38 -18	-25 -24 -11	-08 -15 02	-14 -20 -04	-	22 36 23	33 43 33	14 45 27
Confidence	54 42 -03	58 42 -07	-45 -51 -33	-35 -42 -26	-45 -39 -13	-46 -27 -18	-10 -23 -05	22 36 23	-	48 56 34	39 55 38
Happiness	30 45 20	34 32 04	-44 -53 -26	-38 -54 -41	-42 -50 -18	-36 -26 -11	-14 -37 -11	33 43 33	48 56 34	-	52 63 48
Relaxation	33 40 14	31 27 04	-38 -57 -28	-40 -47 -36	-41 -40 -17	-41 -36 -25	-20 -41 -14	14 45 27	39 55 38	52 63 48	-
Neg. emotion	-52 -46 00	-46 -27 16	87 83 71	87 83 77	70 69 44	80 65 65	54 64 49	-28 -35 -17	-48 -49 -30	-47 -59 -34	-48 -58 -39
Pos. emotion	47 49 16	45 36 04	-55 -59 -39	-48 -56 -42	-53 -58 -20	-44 -32 -19	-20 -38 -12	64 74 64	70 76 66	81 83 76	69 82 77

For $p < .001$, $r \geq .22$. For $p < .01$, $r \geq .18$. For $p < .05$, $r \geq .14$.

Thinking scale and the Rosenberg were quite similar at pretask for both negative emotions ($\underline{r}$ = -.52 and $\underline{r}$ = -.46, respectively; $\underline{t}$ = .95, *ns*) and positive emotions ($\underline{r}$ = .47 and $\underline{r}$ = .45, respectively; $\underline{t}$ = .34, *ns*). However, the two measures differed significantly at posttask for both negative emotions ($\underline{r}$ = -.46 and $\underline{r}$ = -.27, respectively; $\underline{t}$ = 4.21, $\underline{p}$ < .001) and positive emotions ($\underline{r}$ = .49 and $\underline{r}$ = .36, respectively; $\underline{t}$ = 2.41, $\underline{p}$ < .05). The Wonderlic (1989) did not correlate significantly with any of the emotion scores. No significant correlations were found between scores of change in emotion with performance (anagrams solved) or with time spent on the anagram-solving task.

CHAPTER 4

DISCUSSION

Constructive Thinking and Persistence

The lack of a positive relationship between constructive thinking and productive persistence was surprising, since it is contrary to Epstein's theory of how constructive thinking and persistence ought to be related (Epstein, 1992). It may be, however, that the task was not engaging enough to make persistence on any anagram seem productive to participants, since on average they reported being "neutral" on the importance of doing well on the task. Perhaps a monetary incentive for solving anagrams would increase their motivation and clarify this finding. Alternatively, there may be better measures of productive persistence than the number of anagrams solved. Perhaps a measure with clearer external validity, such as earning a college degree (controlling for intelligence), would be significantly associated with constructive thinking.

The fact that participants' pretask rating of their word puzzle ability was significantly and positively associated with the number of solved anagrams appears to reflect the accuracy of their self-assessment, rather than a link with effort. Although it was nearly significantly related to ratings of the importance of the task, this ability rating was not related to the rating of doing one's best to solve the anagrams, nor to the time spent on any anagram but the first. The negative relationship with time spent on the first anagram supported the accuracy of the ability ratings, since those who rated their ability higher took less time to solve this relatively easy puzzle than those who rated their word puzzle ability lower.

The lack of relationship between self-esteem and persistence was also surprising, given the prior reports of such a relationship (Brockner et al., 1983; Orbach & Hadas, 1982; Shrauger & Sorman, 1997). In contrast to those works, however, the present investigation did not provide performance feedback, which may be a necessary condition for self-esteem to register influence on persistence. Without this feedback, participants may be less self-

focused and less aware of their "failure" on the task, and may more easily attribute difficulties to the nature of the task rather than themselves.

The first insoluble anagram appeared to best assess nonproductive persistence because all participants worked on this anagram without frustration from a previous insoluble anagram, whereas subsequent anagrams were not addressed by some participants due to the 40-minute time limit for this task. The absence of a significant correlation of the Constructive Thinking scale with either solutions or time spent on the first two (soluble) anagrams suggests that experience with these two anagrams did not create a confound.

On the basis of time spent on the first insoluble anagram, constructive thinking appeared weakly associated with avoiding nonproductive persistence, whereas self-esteem and intelligence appeared unrelated to nonproductive persistence. However, this relationship relied heavily on the very extreme outlier, and even with this score, the association was much weaker than that expected based on the results of my pilot study (Ettema, 1993).

One possible reason for this is that the nature of the task may have been changed too drastically in efforts to ensure sufficient time commitment on the part of participants. Pilot study participants knew at the outset that there were only five anagrams in the task. The task was changed to a larger and unspecified number of anagrams because of an apparent temptation on the part of some pilot study participants to rush through the five anagrams, without really attempting to solve any, leading to a loss of usable data. Among those who made at least a reasonable attempt to solve the puzzles, however, the time spent on the first insoluble anagram varied widely, ranging up to 2012 seconds (33.5 minutes), as opposed to the present study's ceiling of 1321 seconds (22 minutes). The tendency of some persons to persist for extremely long periods of time in order to prove their competence may have been more exaggerated when they knew that there were only five anagrams, as failure on any one anagram would reduce their potential overall success rate by 20%. The relative restriction of range in the time spent on the insoluble anagram in the present study may be

responsible in part for the attenuation. Another explanation for the smaller correlation may lie in the larger groups of participants used for the present study. Perhaps those with a need to prove their competence by solving the anagrams were less inclined to do so in larger, more anonymous groups, since their own failure to solve an anagram would seem less noticeable to the experimenter. Finally, it may also be that the pilot study, involving only nine participants, caught random fluctuations in a way that misleadingly suggested a relationship.

The interaction between Constructive Thinking scores and instructions (Figure 1, p. 25) suggested that persons lower in constructive thinking may be more inclined to follow directions carefully than persons higher in constructive thinking , perhaps in efforts be "good subjects" and to please the experimenter. This is consistent with previous findings which indicated that persons low in constructive thinking were more concerned about evaluation when working on a task (Epstein, 1992) and more concerned about the impression they make on others (Katz & Epstein, 1991) than persons high in constructive thinking. The similar interaction found between the instruction condition and self-esteem (Figure 2, p. 25) suggests that, as found in the study by McFarlin and colleagues (1984), persons higher in self-esteem may be less inclined than low scorers to follow "advice," here in the form of instructions. Since the Constructive Thinking scale is strongly related to self-esteem (r = .60), this explanation can apparently be extended to high constructive thinkers, as they also were virtually unaffected by the difference in instructions. We may speculate that, had the manipulation involved information as to the insolubility of some items, as in the studies by Sandelands et al. (1984) and McFarlin (1985), it would have had a greater impact on those higher in self-esteem and constructive thinking, since they would have been more able to maintain their sense of personal competence and control in using this information, rather than submitting to being told what to do. The present findings support the view that high constructive thinkers are more independent in their thinking and behavior than those lower in constructive thinking.

The addition of either Constructive Thinking or self-esteem scores to a multiple regression equation, which already included the other measure and the instruction condition in relation to time spent on the first insoluble anagram, had a negligible effect in each case, particularly when the outlier value for time spent on the first insoluble anagram was excluded from the analysis. This suggests that the interactions of both the Constructive Thinking scale and the Rosenberg with the instruction condition involve the overlapping aspects of each measure reflected in their correlation (r = .60).

Since Constructive Thinking scores did not correlate significantly with scores for accuracy in rating anagrams for difficulty, whatever led those higher in constructive thinking to be slightly more inclined to disengage from the insoluble anagram sooner than those lower in constructive thinking, it was apparently not a keener intuitive knowledge of the difficulty of the anagrams, at least as measured in the present study. It may be, however, that the measure of this intuitive knowledge was too stringent, and that exposure of the anagrams for more than 13 seconds would have yielded a different result. The problem with greater exposure times would be distinguishing correct intuitive ratings from anagrams solved by some participants.

While this study offered no support for the hypothesized positive relationship between constructive thinking and productive persistence, it did yield some very limited support for the negative relationship between constructive thinking and nonproductive persistence. Future studies with improved measures of the persistence constructs may provide more conclusive evidence for these relationships. The results also suggest that constructive thinking may involve greater independence and relative freedom from the need to please others.

The Nature of Constructive Thinking

Constructive Thinking was unrelated to estimated IQ scores. This finding supports the conclusion of Epstein and Meier (1989) that the Constructive Thinking Inventory, which is intended to measure practical intelligence, is not a measure of academic intelligence.

It is not surprising that constructive thinking correlated significantly with self-esteem, since the same affect-laden experiences which are thought to determine constructive thinking (Epstein & Meier, 1989), are likely to affect self-esteem as well. When the two measures are entered in a multiple regression equation, however, they maintain sufficient tolerance to suggest that the overlap is not so great as to render one or the other meaningless in the joint prediction of dependent variables (Tolerance = $1 - \underline{r}^2 = 1 - .36 = .64$; Tabachnik & Fidell, 1989).

The findings regarding emotional reactions support the hypothesis that constructive thinking is associated positively with positive emotional reactions to the task and inversely with negative emotional reactions. This task was apparently quite aversive for most participants, admittedly more aversive than intended, as most reported increased negative and decreased positive emotions. The Constructive Thinking scale was associated with a greater number of measures for change in emotions than was either the Rosenberg or the Wonderlic. It is not surprising that the Wonderlic, used here to estimate IQ scores, did not correlate with any of the measures of change in emotion. But interestingly, while both the Rosenberg and the Constructive Thinking scale correlated significantly with some measures of change in emotion, only the Constructive Thinking scale was related in the manner expected for a measure which involves the management of emotion. Considering all significant correlations of Constructive Thinking scores with change in emotion (Table 3, p. 27), higher Constructive Thinking scores were associated with lower change scores for anger and higher change scores for happiness, relaxation, enjoyment of word puzzles, and overall positive emotions. Higher self-esteem scores, on the other hand, were associated with greater increases in depression, frustration, and overall negative emotion, comprising a pattern which is opposite to that which would be expected of a measure which captures the ability to manage emotional reactions. The fact that the correlations of the overall positive and negative emotion ratings with the Constructive Thinking scale and the Rosenberg differed more at posttask than at pretask suggests that the differences in the correlations of

these measures with change in emotions reflect differences in reaction to the task, rather than differences in baseline levels of emotion.

Epstein and Meier (1989) have cited ample evidence that the ability to effectively manage emotions affects thinking and behavior in ways that can influence success in everyday living. The interaction of Constructive Thinking scores with differences in instructions indicates that this measure may involve different approaches to problem-solving and different reactions to following advice or directions when working on a problem, as does self-esteem. While constructive thinking and self-esteem are both theoretically and statistically related, constructive thinking appears to involve the management of emotions as stipulated by Epstein's CEST theory (Epstein & Meier, 1989) whereas self-esteem apparently does not. This, along with the extended evidence for the Constructive Thinking scale's independence from academic intelligence, further supports this measure's potential value for predicting success in everyday living in areas in which standard measures of intelligence fail to do so.

APPENDICES

APPENDIX A

RESEARCH CONSENT FORM

1. I have freely consented to take part in a scientific study
   being conducted by: Janelle Cayo Ettema
   Under the supervision of: John R. Hurley, Professor, Department of Psychology.
   This experiment involves solving some problems and puzzles and answering questions about thoughts and feelings.
   Participation in this experiment usually takes no more than 1.5 hours.

2. The study has been explained to me and I understand the explanation that has been given and what my participation will involve.

3. I understand that I am free to discontinue my participation in the study at any time without penalty.

4. I understand that I will receive three (3) research credits in my psychology course for my participation in this experiment. I also understand that if I prefer not to participate in this or any other research project, other options are available for fulfilling this requirement, and that the instructor of my course will inform me as to the details of such options.

5. I understand that the data will be coded to ensure my confidentiality and that no identifying information will be disclosed. Within these restrictions, results of the study will be made available to me at my request.

6. I understand that my participation in the study does not guarantee any beneficial results to me.

7. I understand that, at my request, I can receive additional explanation of the study after my participation is completed by contacting

   Janelle Ettema, (517) 548-7429.

You indicate your voluntary agreement to participate by completing and returning this form.

Signed: _____

Date: _____

APPENDIX B

ITEMS OF THE PRE- AND POSTTASK QUESTIONNAIRES

These 2 items were presented only in the Pretask Questionnaire:

What is your gender? male female

Is English your first language? yes no

The following items were presented in both the Pretask and Posttask Questionnaires and were rated by participants and scored as follows:

a. Strongly agree. (*5 points*)
b. Agree.(*4 points*)
c. Neutral. (*3 points*)
d. Disagree (*2 points*)
e. Strongly disagree. (*1 point*)

I feel relaxed.

I feel upset.

I feel anxious.

I feel depressed.

I feel frustrated.

I feel confident.

I feel angry.

I feel happy.

I enjoy word puzzles.

I am good at solving word puzzles.

These 2 items were presented only in the Posttask Questionnaire, and were rated on the same 5-point Likert scale described above:

I did my best to solve all the anagrams.

It was important to me to do well.

APPENDIX C

ANAGRAMS RATED FOR DIFFICULTY

Table 5. Anagrams Rated for Difficulty

Anagram	Solution	Mean rating (SD)[a]
E I N P R R T	printer	1.55 (.50)
A A B H L T Y	bathyal	1.72 (.45)
A B F I I L R	bifilar	1.76 (.43)
F I M N O R U	uniform	1.76 (.43)
B I O O S U V	obvious	1.79 (.41)
A D J L M O R	jarldom	1.80 (.40)
C E P S S T U	suspect	1.64 (.48)
E F F F I N O	infeoff	1.72 (.45)
A C F L R U U	furcula	1.83 (.37)
A E E G M S S	message	1.57 (.50)

[a] 1 = relatively easy; 2 = very difficult

APPENDIX D

FEEDBACK SHEET

The purpose of this experiment is to look at persistence behavior as related to a measure called the Constructive Thinking Inventory (Epstein & Meier, 1989). The CTI contains items that describe constructive and counterproductive automatic thoughts that people report having in everyday life, and is considered to reflect patterns of thinking which are linked to one's past emotional experiences. The experiment also involves measures of self-esteem and general cognitive ability, and explores how these constructs might be related to constructive thinking.

All of the anagrams in this experiment were actual words in the English language, but some of them were so obscure as to make them practically impossible to solve. The experiment explores how people who differ in "constructive thinking" might also differ in persistence behavior -- on both the soluble anagrams and those that are essentially insoluble. It is hypothesized that those higher in constructive thinking will persist longer on the soluble anagrams than those lower in constructive thinking, but not as long on the practically insoluble ones.

The experiment also explores the nature of constructive thinking as it may be related to intelligence, self-esteem, and emotional reactions to this rather frustrating task.

If you have any questions or comments about the experiment, feel free to call the experimenter, Janelle Ettema at 1-548-7429.

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