Instructed Human Imagining Behavior: Effectiveness for Reducing Experimentally Induced Learned Helplessness

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Thesis presented to the School of Graduate Studies
at the University of Ottawa as partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

Ottawa, Canada, 1986

ISBN 0-315-36463-7

UNIVERSITÉ D'OTTAWA
UNIVERSITY OF OTTAWA

Acknowledgements

This thesis was prepared under the direction of Professor Robert Watters, Ph.D., of the School of Psychology and I would like to acknowledge my appreciation of his guidance, patience and professionalism without which this thesis could not have become reality. I also wish to thank Dr. Kenneth Campbell for his statistical advice.

I would also like to express my appreciation to the professors both within and outside of the psychology department who allowed time in their classes to recruit subjects, and to those people who volunteered their time.

Last but not least, I would like to thank my husband and son for their tolerance and support.

Curriculum Studiorum

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Abstract

One hundred and twenty nine volunteer students whose error and latency performance on an anagram solution pretest were measured, were subjected to a learned helplessness induction procedure. This involved difficult to complete anagrams, general knowledge questions and mathmetical problems. Seventy of these subjects who demonstrated a significant decrement in performance on a post learned helplessness induction test, similar to the pretest, were randomly assigned to one of five treatment conditions. The Control group waited four minutes. The Real Solve group was given ten easy to solve anagrams. The Imagine Solve group was instructed to imagine solving ten anagrams. The Real Fail group was given ten insoluable anagrams. The Imagine Fail group was instructed to imagine failing to solve ten anagrams. All groups were then given a test similar to the pretest. Performance of the Real Solve and Imagine Solve groups returned to its pretest level. Performance of the Control, Real Fail and Imagine Fail groups did not return to its pretest level. Results were interpreted in terms of the radical behaviorist perspective on private events. Implications for the radical behaviorist conception of imagining behavior are discussed and proposals for future research are presented.

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Chapter I

INTRODUCTION AND REVIEW OF THE LITERATURE

If asked to define psychology, many non-psychologists would respond that it is the study of the mind or mental activity. Psychologists define their science somewhat differently. For example, Marx and Hillix (1973), in their text on the history and systems of psychology define psychology as, "the science that studies the relationship between antecedent events or conditions and the behavior of organisms" (p. 44). Atkinson, Atkinson, and Hilgard (1983), in their introductory psychology text, define psychology as, "the science that studies behavior and mental activity" (p. 15), with mental activity defined as, "the kind of processes whether in observed behavior, subjective experience, or inferences from these, used as indications of mentality" (p. 595). Morgan, King, and Robinson (1979), in their introductory psychology text, define psychology as "the science of human and animal behavior including the application to human problems" (p. 654), behavior being defined as, "anything a person or animal does that can be observed in some way", (p. 654).

Only Atkinson et al's definition specifically addresses the area of mental activity. The other two address behavior only. One of these (Morgan et al.), specifies behavior in such a way that it could be

interpreted to exclude the type of mental activity that Atkinson et al include. These examples, taken from recent introductory text books, reflect a long standing conflict in psychology that remains unresolved to this day. The controversy concerns the inclusion or omission of mental activity as a legitimate area for psychological investigation.

For those opposing the inclusion of mental activity in psychological investigation the main issues are that: (a) there is a general lack of agreement among those studying mental activity as to how to define the subject area; (b) the definitions that have been proposed (e.g., Atkinson et al.), lack precision; and (c) there are great difficulties in objectively measuring mental activity, when it has been defined. The main arguements for the inclusion of mental activity in the subject area of psychology are: (a) the face validity of the concept and, (b) its apparent immense importance for the study of human behavior. A brief sketch of some aspects of the history of psychology is useful background for a discussion of the present controversy.

Among the many problems psychology inherited from philosophy, was that of the mind-body problem. Many philosophers proposed that man had both a physical and a spiritual aspect. The physical aspect was the physical organism, whereas the spiritual aspect was variously referred to as the heart, the mind, the soul, or the spirit. It was held that it was the presence of this latter aspect in man that distinguished him from the animals. This dualistic view of man necessitated the generation

of theories to describe how these two aspects co-existed within a person, and how they might interact. Other philosophers adopted rather different views, and the conflict that arose between the various groups became known as the mind-body controversy. Three main positions can be identified with regard to this controversy. It is important to note that within each position there still remains a great variety or range of positions, but that they are often clustered into three main categories for convenience.

One position is referred to as monism. Monism is any point of view which ignores either the mind or the body, or subsumes both under the same rubic, (e.g., materialism, phenomenalism). With this position, there is no need to provide theories about the interaction of the mind and the body, and there is the option of accepting either physical monism, or psychic monism. A second position is called dualism. Dualism refers to any position implying that two separately functioning entities (the mind and the body) are present within one individual. This position requires the generation of theories about the relationship or interaction between the mind and the body, (e.g., cartesian interactionism, psychophysical parallelism). A third position is that of some compromise. An example of one type of compromise would be a theory that assumes both the physical and the mental processes are surface manifestations or aspects of one underlying reality which is not physical and not psychic (e.g., double aspect theory).

The work of Fechner in the 1850's and 60's is often cited as first scientific investigation of the mind-body problem (Heidbredes, 1961, pp. 82-84; Marx & Hillix, 1973, pp. 37, 38). It was Fechner's intention to formulate equations that would describe the functional relationship between the mental and the physical realms. To do this, he felt that one needed to measure both entities separately. His approach was to measure the stimuli (the physical event) which acted upon the body, on the one hand, and the sensation (mental activity) on the other. The stimuli were measured using the standard techniques of the physical science, and the sensation was measured by scaling the subject's verbal reports. The mind and body, or sensation and stimulus, were therefore regarded as separate entities in order that each could be measured, and the relationship between the two could be determined. This approach reflected a dualistic position. Boring (1957) has questioned whether Fechner really intended to take a dualistic position, but as Marx and Hillix (1973, p. 37) point out, the problem appeared to many to be stated in dualistic terms. Whatever his intention with respect to the mind-body problem, since Fechner, psychologists have found it difficult to re-unite the two aspects which Fechner had isolated to study. Since Fechner, psychologists have usually found it necessary to declare their positions on the mind-body controversy. The positions outlined below are the two major viewpoints found among behavioral psychologists.

Behaviorist Positions on Mental Activity

Although the precursors of behavior theory can be found in both philosophy and biology, the initial formalization of a behavioral position within psychology was in the writings of J. B. Watson (c.f. 1913). The establishment of the behavioral approach to psychology began in opposition to the prevelent theories of Structuralism and Functionalism. The general purpose of science, as Watson saw it, was to provide a factual, empirical account of the world and the role of psychology was to fulfill the purpose of science with regard to behavior. The goal of psychology was therefore the prediction and control of behavior. He considered all oehavior, human or animal, to be composed entirely of physiochemical processes. All learning resulted from the strenghtening of stimulus-response connections in the neural pathways of the brain, due to the frequency of pairings of the neurological activity correlated with the stimulus and with the response. Watson assumed that the formation of these connections followed specific rules and that the rules applied to animals as well as humans. His objective was to demonstrate this lawfulness through the use of scientific methodology. Watson's approach to this investigation was to consider only those facts which could be directly observed in the behavior of the organism in relation to the relevant environmental variables. He argued that if all links were lawful, nothing could be gained by including in the analysis, a supposed non-physical event

occurring within the organism, that could not be precisely defined or measured. He thus excluded mental activity from the realm of psychology. He did note however, that speculation about mental activity could be relegated to the realm of the philosopher. Thus, it would appear that although he was physically monistic in his approach to psychology he did not hold a strictly physically monistic world view. Watson's position with regard to psychology is called methodological behaviorism. The essence of Watson's position is that mental activity whether physical or otherwise, is inaccessible and therefore it is to be ignored in psychology. His stand was highly influential in psychology (Marx & Hillix, 1973, pp. 201, 202). During his own time and for the decades that followed, mental activity as a subject of investigation was largely ignored by behaviorists.

Often it is assumed that the position of methodological behaviorism, with its denial of the legitimacy of the study of mental activity, is the only one to which behaviorists adhere. This is not the case. B. F. Skinner, a prominant spokesman for behaviorism, has outlined an entirely different conceptualization, often referred to as radical behaviorism (1953, 1963). Skinner utilizes the term private events and conceptualizes mental activity as one class of private events. He defines private events as events which take place within an organism's skin. They are distinguished by their limited accessibility but not by

any special structure or nature. They are conceptualized as being entirely physical.

Skinner states that radical behaviorism must provide a satisfactory account of private events. His objection to the use of private events in an analysis of behavior does not appear to be with the reality of their existence, or with their inappropriateness for psychological investigation, but with the way in which the dualists treat them as non-physical in dimension.

Skinner recognizes that the limited accessibility of private events may make it difficult to examine them as clearly as public events may be examined, but he insists that they must be studied. He has indicated that some inference or interpretation may be necessary in order to cope with the lack of information when private events are involved (Skinner, 1974, Ch. XVII). Skinner views inference or interpretation as going beyond the facts to arrive at an analysis of behavior. This inference or interpretation is based on the understanding derived from the laboratory experimental analysis of behavior, where the analysis is the product of the direct observation of environment-behavior relationships. In his view, when a choice of experimental analysis or inference exists, experimental analysis is to be preferred as it is based on objective observation. But in instances where an experimental analysis is not practical, inference is acceptable. The limitation on inference, as Skinner sees it, is that it is much more

likely to be incorrect than is the experimental analysis of public events.

Although Skinner and other radical behaviorists acknowledge the necessity of the examination of private events, to date little valid or useful experimentation has been done to demonstrate the role of private events in the interpretation of behavior (Miller & Berman, 1983). Skinner's criticism of the lack of an experimental analysis of private events has been mistakenly taken to imply that he is not in favor of their utilization in an analysis of behavior,(Lowe, 1983). This is a misunderstanding of the position he has taken (Skinner 1953, 1974). His objection has been to the manner in which private events have been conceptualized and studied, and most definitely not to the concept of private events per se.

It is then, evident, that there is a major difference in the way that Skinner and Watson conceive of private events. Watson and the methodological behaviorists have taken a position which denies the importance of private events in an analysis of behavior, whereas Skinner and the radical behaviorists see private events as physical events which must be taken into account (even if only inferentially) in an analysis of behavior. For the purposes of this proposal, the radical behavioral approach has been adopted. In a physically monistic universe private events are seen as variables that need to be taken into account for the interpretation of behavior. It is accepted that often, due to the

limitation of our instruments, they cannot be directly studied, and they will have to be dealt with inferentially.

Current Behaviorist Debate

Among psychologists with a behavioral orientation there is currently much debate about the place of mental activity in an analysis of behavior (Greenspoon & Lamal, 1978; Ledwidge, 1978; Locke, 1979). One major factor fuelling this debate, is the widespread use of the concept of mental activity in applied areas. A recent poll of the techniques used by clinicians belonging to the Association for the Advancement of Behavior Therapy found that, 84% use cognitive restructuring, 67% use emotive imagery, and 42% employ covert desensatization, (Gotchman, Allgood, & Greet, 1982). These statistics make it clear that many behaviorally oriented psychologists are employing the concept of mental activity in their clinical practices.

There are, however, problems with these applied procedures. The problems arise from; (a) the lack of a clearly stated definition of the terms used, and; (b) methodological weaknesses in the reported research.

The tendancy for those working in the field of behavior therapy is to use the terms cognition or cognitive structures rather than the term mental activity. To date, a definition of cognition or cognitive structures has not been attempted, or when the attempt has been made, the definition has not met with any form of general agreement (Cautela,

1979; Hollon, 1984). In part the lack of agreement on definition is a result of the many differing theoretical perspectives and in some cases the lack of any theoretical perspective to which those working in the field adhere. In addition, confusion arises from the ever increasing number of treatment techniques, each of which employs a somewhat different definition of the cognitive constructs involved (Stroshal & Ascough, 1981).

Of the methodological problems, the tendancy for generally relaxed experimental standards in the research, has been noted by many of those analyzing these applied studies. Specifically, the acceptance of weak inferences, the lack of experimental methodology, and selective emphasis on certain works, have been cited as the most obvious flaws (Cautela, 1979; Ledwidge, 1978; Twentyman & Zimmering, 1979). The dependent variables are also problematic. The primary justification for the popularity of the cognitive techniques is the cited effectiveness of these techniques in the alleviation of behavioral problems (Miller & Berman, 1983). Two difficulties are related to this form of justification. One is that in many studies, behavioral measures, other than self report, are not used. That is, direct measurement of the target behaviors are not taken. Some studies that take both self report and behavioral measures, show that changes in self report do not necessarily reflect changes in behavior (Miller & Berman, 1983, p. 45; Michelson, Mavissakalian, & Marchiane, 1985). Thus behavioral change,

inferred from self report only, may not have occurred. Another methodological difficulty arises from the lack of a clear separation of purely behavioral from cognitive techniques. The difference between behavioral and cognitive techniques tends to be viewed by some investigators as one of a degree in emphasis (Ledwidge, 1978; Locke, 1979). As a result of the spectrum of procedures created, comparisons of purely cognitive vs purely behavioral techniques are difficult. As to the comparisons themselves, there is little research completed that directly evaluates the effect of these two techniques when behavioral indicies are used as dependent variables. The data from the few studies meeting these two criteria (behavioral techniques vs cognitive behavioral techniques, with a dependent variable of public behavior) are equivocal. Millar and Berman (1983) reviewed 48 studies. They found that there was no firm evidence that cognitive therapies were superior to other forms of behavior therapy. They also state that their comparisons did not indicate that any specific problems responded more readily to cognitive therapy than to any other therapy. Michelson, Mavisskalian, and Marchione (1985) in a well run comparison of cognitive a behavioral techniques also found that although both types of therapy produce improvement, behavior therapy produced significantly more improvement on the behavioral measures. Ledwige (1978) reporting on 13 studies noted that in some instances cognitive therapy proved superior, in others, behavior therapy proved superior, while in other studies the two appear

to produce similar results. Hollon (1984) and Kaloupek (1983) found that the combination of behavioral and cognitive techniques has been found to produce superior performance to either technique alone. Thus, justifying the use of cognitive techniques on the basis of their efficiency in effecting behavioral change, (Miller & Berman, 1983) appears unwarrented at this time.

These weaknesses in the cognitive behavior modification literature raise serious questions regarding the usefulness of the concept of private events and regarding the effect of private events upon behavior. It should be noted however, that there is some evidence (Hollon, 1984; Kaloupek, 1983; Ledwidge, 1978), suggesting the usefulness of cognitive concepts in clinical procedures. In addition, evidence is accumulating from other areas of research indicating that the concept of private events may be useful.

The results of recent research on human operant behavior under various schedules of reinforcement is one such area. The pattern of the responding of infra humans to the various schedules of reinforcement has proved to be surprisingly similar across a wide range of species. Humans, however, provide a noteable exception. Human patterns of responding, although replicable, are not similar to those of other animals. Recent research has shown that human responding differs from that of other animals in fundamental ways, but only after language acquisition has occurred (Lowe, 1983; Lowe, Beasty, & Bental, 1983).

Lowe points out that language may be public or private. Thus when instructions from the experimenter are non-directive, the subject's internal dialogue (as opposed to the external contingencies of reinforcement) may be responsible for the response pattern obtained from adult humans. Lowe contends that this hypothesis is strongly supported by the fact that human infants (preverbal) produce response patterns similar to those of animals but which differ from those of adult humans. Children who are in the process of acquiring language, tend to produce response patterns more similar to those of adults, but, they also tend to revert to response patterns similar to those of infants, when prolonged responding is required, (Lowe, 1983). These studies suggest that what humans say to themselves (private events) influences their behavior.

The work on rule governed vs contingency governed behavior would seem to support this idea. Human operant behavior should be sensitive to the contingencies of reinforcement, and various schedules of reinforcement produce different patterns of responding. In studies where some subjects were given inaccurate instructions concerning the reinforcement contingencies, their response patterns were similar to those which would have occurred had the instructions been accurate. The response patterns did not match those which should have developed under the actual schedule of reinforcement in effect. Sensitivity to the real contingencies did not occur in many cases. Other subjects given no

instructions about the schedules of reinforcement appeared sensitive to the actual contingencies in effect, (Buskes, Bennet, & Miller, 1981; Galizio, 1979; Mathews, Catania, & Shimoff, 1985; Shimoff, Catania, & Matthews, 1981). The inference from this work is, again, that what subjects say to themselves is an important influence on their responding.

Another source of information suggesting the importance of private events can be found in the athletic mental practice literature. The term mental practice as it is applied in the literature on motor learning refers to the private (imaged) rehearsal of a physical skill without overt physical activity for the purpose of improving the public performance of that skill (Corbin, 1972; Richardson, 1967, 1976). Jacobson (1932) and Shaw (1940) have shown that imagery in which a motor skill is executed imaginally, results in the activation of the same muscles that are used during the actual physical execution of the skill. Results typically reported in the mental practice literature show that mental practice improves performance more than no practice (Corbin, 1967a, 1967b, 1972; McFadden, 1982; Mendoza & Wichman, 1978). The comparision of private and public practice appears to be somewhat more complicated. Task familiarity seems to be the critical factor. Results indicate that mental practice enhances performance to the same extent as public practice when the subjects have experience with the skill to be performed. Novices at the skill however, appear to benefit more from

public practice (Clark, 1960; Corbin, 1967a, 1967b; McFadden, 1982). These studies suggest that mental practice can facilitate subsequent performance under certain conditions. The radical behavioral interpretation of private events as physical is not inconsistent with the data of the athletic mental practice literature.

To sum up; (a) cognitive therapeutic techniques (private events) have at times appeared to influence behavior; (b) the subject's self talk (private events) may be responsible for adult response patterns that differ from those of infants or animals, and; (c) mental practice (private events) has been shown to be a useful technique for enhancing skilled athletic performance. The findings from these divergent areas suggest that the investigation of the impact of private events upon behavior, even though difficult, is warrented.

Radical Behaviorist Conception of Private Events

The present research attempted to investigate the usefulness of the concept of private events from the radical behaviorist perspective. A wide variety of private behaviors are encompassed by the term private event. Mental activity and more specifically imaging, seeing in the absence of the thing seen (Skinner, 1953, Ch. XVII), is the private event selected for study here. When an organism sees a stimulus, something physical occurs within the organism. When an organism acts something physical occurs within the organism. The radical behaviorists'

position holds that when an organism images seeing something or images doing something, physical events occurs within the organism that are similar to what occurs when the organism actually sees the stimulus or acts. Doing something or seeing something effects subsequent behavior. This position holds that imaging doing or seeing something should also effect subsequent behavior in much the same way. This study was designed to test the usefulness of this conceptualization. In this study, successfully solving anagrams should have an effect on subsequent anagram solving behavior. Failing to solve anagrams should have a different effect on subsequent anagram solving behavior. The test would be to see if imaging solving and imaging failing to solve would have the same effect as really solving or really failing to solve anagrams, as the radical behaviorist conceptualization would predict.

Learned Helplessness

Seligman's work on learned helplessness (Miller & Seligman, 1973; Seligman, 1975) was selected as a starting point for the purpose of this investigation. There are two major reasons for this choice. The first is that it provides experimental procedures in which the manipulation of public events has been shown to have reliable effects upon public overt behavior. For the purposes of the present study private events will be substituted for the public ones to allow the examination of the effect of private events on public behavior and to allow a comparison to the

established effects of public events. The second reason for selecting Seligman's work is that learned helplessness has been proposed as a model for behaviors in a much broader context than the laboratory setting. Specifically the model has been proposed as an explanation of some types of reactive depression (Miller & Seligman, 1973, 1975), inadequate school performance (Deiner & Dweck, 1980; Goetz & Stauss, 1980), and interpersonal social difficulties (Goetz & Dweck, 1980). Hence information about procedures involving private events might be usable in applied situations.

Seligman's work originated in escape avoidance experiments in which an unusual effect was demonstrated. Animals exposed to situations in which they had received inescapable shock did not subsequently produce responses which would allow them to escape the shock when the response escape contingencies were put into effect (Maeir & Testa, 1975; Overmeir & Seligman, 1967; Solomon & Wynne, 1953). Subsequent investigation of this phenomenon discovered that the animals not only failed to initiate responses, but also failed to continue responding on subsequent trials once they had successfully escaped the shock on a particular trial (Kelsy, 1977; Maier & Testa, 1975; Overmeir, 1968; Overmeir & Seligman, 1967). This behavioral pattern of non-responding and failure to continue responding after success, following non-contingent aversive stimulation, was labelled learned helplessness (Overmeir & Seligman, 1967). Learned helplessness has been demonstrated

in rats (Kelsy, 1977; Maier & Testa, 1975), dogs (Overmeir & Seligman, 1967; Seligman & Maier, 1967), fish (Frumkin & Bookshire, 1969; Padilla, 1973), cats (Seward & Humphrey, 1967), and humans (Fosca & Greer, 1971; Thornton & Jacobs, 1971).

Typically in these studies a two phase design is used. For the first phase group A is exposed to a pretreatment in which non-contingent aversive stimulation is administered. No response made by the subject can terminate the aversive stimulation. This is labelled the failure induction procedure. For the first phase group B is exposed to a pretreatment involving an escape procedure. The subject is exposed to an aversive stimulus and as soon as the subject completes a predetermined response, the aversive stimulation ceases. To ensure that there is no difference in the total amount of aversive stimulation received by these two groups, the subjects in groups A are yoked to the subjects in group B. For group C the first phase involves waiting an equivalent amount of time or completing an unrelated task.

In the second phase, all groups are tested in a situation in which the avoidance of, or escape from, an aversive stimulus is made contingent upon a predetermined target response. Group A which received the failure induction pretreatment is typically found to produce significantly fewer responses than group B. In addition, even though a response in this phase will terminate the aversive stimulation, for the A group, target responding, should it occur on a particular trial, does

not increase on trials subsequent to the successful trial. This contrasts with group C, where once responding has terminated the aversive stimulation on a particular trial, on subsequent trials responding increases significnatly.

The theory that Seligman has proposed to explain the data has become more elaborate over time. In its most recent form (Miller & Seligman, 1975; Seligman, 1975), he states that if animals and humans can learn that there is a connection between their behavior and outcome, they can also learn that there is no connection between their behavior and outcome. Subjects then exhibit a learned helplessness expectancy (hypothetical cognitive cosntruct) that develops during the failure induction procedure. The expectancy that develops is that responding will not effect outcome on this trial, or on any trial that occurs in the future. This expectancy leads to a low rate of responding, if any responses are emitted at all. Seligman interprets the failure to initiate responses as a motivational deficit, the failure to continue responding as a cognitive deficit, and with humans he states that a dysphoric mood, an emotional deficit, would also occur. The motivational, cognitive and emotional deficits are viewed as functions of the expectancy.

Application of Learned Helplessness to Present Research

Whether one agrees with Seligman's analysis or not, the use of the failure induction procedure reliably produces the behavioral pattern which has been labelled learned helplessness in humans (Fasco & Gneer, 1971; Miller & Seligman, 1975; O'Rouke, Tyroo, Raps, 1980; Seta, & Hassan, 1986; Tenner, Gillon, & Drum, 1982). The pattern consists of infrequent response initiation (or none at all), and failure to continue responding after an instance of successful responding.

For the purposes of the present research the term learned helplessness will refer to this behavioral pattern, and not to the explanation of this pattern in terms of expectation, motivational deficits and emotional deficits. This usage is consistent with the original usage by Seligman and Overmeir (1967). This position is in contrast to much of the literature where learned helplessness is a construct which is presumed to cause the behavioral pattern. Here the behavioral pattern is the focus.

There are two reasons for selecting this definition of learned helplessness. The first reason is that many of these recent extensions involve the use of hypothetical cognitive constructs. Researchers have found it difficult to establish the presence of these constructs, and difficult to establish their effect upon the development and the alleviation of learned helplessness in experiments designed to measure their impact (Garber & Hollon, 1980; Meyer, 1980; Raps, Rienhard,

Seligman, 1980). The second reason is that in the early experiments with animals, Seligman and Groves (1970) found that a greater percentage of lab raised dogs compared to dogs obtained from a pound, developed learned helplessness. This result would appear to indicate that the learning histories of the animals effected the development of learned helplessness. Studies testing the impact of learning history on the development of learned helplessness are a necessary step in the understanding of the development of learned helplessness. Research into learning history has not been done but this avenue of research should probably be developed before the theory is extended to include further constructs.

Investigation of the learned helplessness behavioral pattern has begun to concentrate on three different areas. The first is the role of contingency and failure in the development of learned helplessness. A second is the applicability of this model in a variety of situations in which humans experience behavioral problems. A third is the alleviation of the learned helplessness behavioral pattern.

Among those investigating learned helplessness there has been some debate as to the aspect of pretreatment most important to the development of the behavioral deficits. Non-contingent aversive stimulation had been the typical pretreatment. The debate developed between those who felt that it was the failure experience that led to the behavioral deficits (Butchwald, Coyne, & Cole, 1978; Worthman &

Brehm, 1975), and those who felt that it was the non-contingency between behavior and outcome which was more important (Oakes & Curtis, 1982). Recent research appears to support the view that non-contingency is the more imporant factor as learned helplessness has been demonstrated in subjects who experience non-contingent reward in the pretreatment (Griffith, 1977; Hiroto, 1974; Oakes & Curtis, 1982; O'Rourke, Tyson, Raps, 1980; Tennen, Gillen, & Drum, 1982).

Learned helplessness has been proposed as an explanation of behavioral deficits exhibited by humans in a variety of situations. Seligman has proposed that the model of learned helplessness accounts for certain forms of reactive depression (Miller & Seligman, 1975). Some experiments have found that the forms of behavior and learning deficits in analogue studies of learned helplessness are similar to those found in individuals labelled clinically depressed (Klein, Fencil-Morse, & Seligman, 1976; Klein & Seligman, 1976; Miller & Seligman, 1975; Pagel, Becker, & Coppel, 1985; Seligman, 1975). These studies have led to several reformulations of the theory of learned helplessness as it applies to humans (Abramson, Seligman, & Teasdale, 1978; Miller & Norman, 1979; Roth, 1980).

Diener and Dweck (1980) applied the learned helplessness model to poor school performance, and suggested that perceived lack of control over factors influencing grades, may debilitate student performance in the classroom setting.

Goetz and Dweck (1980) and Dobia and Murray (1985) have applied the learned helplessness model to individuals who experience difficulty socially, and suggest that perceived inability to interact socially may lead to inability to initiate or maintain social exchanges.

As noted above a third area of recent research is focused on the alleviation of the learned helplessness pattern of behavior. Subjects who received the failure induction procedure (the application of non-contingent aversive stimulation) have been given what is labelled here, the alleviation procedure. The alleviation procedure constitutes a third phase in the previously outlined typical study. In animal experimentation this phase consists of physically dragging the animal through the target response (the response required to terminate the aversive stimulation). This procedure is continued until the animal initiates the target response without aid (Seligman, Maier, & Greer, 1968). A variety of alleviation procedures have been used with human subjects. Subjects have been given; simplified tasks (Kilpatrick-Tabac & Roth, 1978; Teasdale, Klein, & Seligman, 1976); anagrams to solve (Teasdale, 1978); elation mood statements to read (Kilpatrick-Tabac & Roth, 1978); instructions requiring that they imagine past successes (Teasdale, 1978); instructions to imagine pleasant scenes sometimes combined with instructions that this would improve their performance (Coyne, Metalsky, & Lavelle, 1980); and assertion training (Dobia & Murray, 1985).

In addition to this wide range of allevaition procedures, studies with human subjects have displayed wide variability in effectiveness. Several trends are apparent. One is that as the number of learned helplessness induction trials increase, the number of alleviation trials must increase in order to reverse the performance deficits. Another is that the more similarity between the learned helplessness induction tasks and the alleviation tasks, the more effective the alleviation procedure. In addition it seems that solving simpler but similar problems to those used in the learned helplessness induction is more effective in alleviating learned helplessness than are relaxation, or the recall of past successes, or the reading of mood elevating statements.

Three problems associated with the alleviation techniques should be mentioned. One is that the studies do not take measurements of behavior before the experiment begins. Thus there is no behavioral standard against which to measure subsequent responding. The second is that the studies do not take measurements of learned helplessness after the failure induction procedures are used. Thus they assume the presence of, but do not measure, the learned helplessness behavioral deficits. The third problem is that frequently the tasks used in the alleviation procedure are not the same as those used to develop learned helplessness nor the same as those used to measure the effectiveness of the alleviation procedure. This point is critical as cross task

generalization, has not been demonstrated (Cole & Coyne, 1977; Lubow, Caspy, & Schnur, 1980). The assumption that failure on one task will produce performance deficits on another is questionable.

Modifications made to Learned Helplessness Procedures

The reported study uses a modified version of the experimental design used by Seligman and others to develop and alleviate learned helplessness in humans. The modifications are intended to avoid the problems outlined above. Performance on the target task will be measured at three points during the experiment and one task will be used throughout. As anagram solution has been used frequently in past research the solution of anagrams has been selected as the target task on which the behavioral measures will be taken. The study has two objectives. The first is to examine the effects of imagining on an individual's public behavior. The second objective is to examine the similarities and differences in performance when alleviation or continued failure is implemented in real as compared to imagined practice. Solve times will be measured on an anagram solution task at three separate points during the experiment; (a) there will be a pretest (test 1) before any intervention has occurred; (b) there will be a post failure test (test 2) after a failure induction phase, designed to produce learned helplessness, defined here as low response initiation and failure to increase responding subsequent to success, and; (c) there

will be a post treatment test (test 3) following a phase in which the subject received alleviation (real or imagined), or continued failure (real or imagined).

Statement of Hypotheses

Private events are considered the equivalent of public events from a radical behavioral perspective, and as previously stated are considered so here. They are expected to effect behavior in the same manner as public events. The private event studied here is imaging, seeing in the absence of the thing seen. As really solving or failing to solve anagrams is expected to effect behavior in specific ways, imaging solving or failing to solve anagrams would be expected to effect beavior in the same way. It is hypothesized that:

(1) both experimental groups receiving the alleviation (public or imaged) treatment procedures will have mean solve times and number of anagrams not solved on the post treatment test (test 3), that are not significantly different from those of the pretest (test 1);

(2) that the mean solve times and number of anagrams not solved in the two groups receiving alleviation (public or imaged) will not be significantly

different from one another on the post treatment test (test 3);

(3) that the groups which receive continued failure (public or imaged) instead of the alleviation procedure will have mean solve times which are significantly longer and number of anagrams not solved which are significantly larger on the post treatment test (test 3) than their own scores on the pretest (test 1);

(4) that the mean solve times and number of anagrams not solved in the two groups receiving continued failure would not be significantly different from one another on the post treatment test (test 3);

5) that the mean solve times will be significantly shorter and the number of anagrams not solved will be significantly smaller on the post treatment test (test 3) for the two groups receiving alleviation, compared to the two groups receiving continued failure.

Chapter II

METHOD

Subjects

The subjects were undergraduate students from the University of Ottawa who participated on a voluntary basis. Although each of the 129 volunteers completed the experiment, the 70 subjects selected for the study were those showing the behavioral deficits called learned helplessness on the post failure test (test 2), after they were exposed to a failure induction procedure. These deficits were measured on the subject's performance while solving anagrams. The criteria for their selection were that; (a) the subject's median solve time in two of the three subsets of five cards in the post failure set of anagrams was 20 seconds, with one subset being the final subset. This would ensure that there was not an improvement in performance as the second test progressed; b) the median solve time on the post failure 15 trials was 20 seconds. This indicated that the subject made no response on the majority of trials; (c) the mean solve time in the post failure test (test 2) was longer than the subject's own mean solve time on the pretest (test 1). This indicates that the subject was taking longer to solve the anagrams. Subjects meeting these requirements were randomly assigned to one of the five experimental groups. The number of subjects

required for each group was determined by a statistical power analysis (Cohen, 1969). There were 14 subjects per group.

Materials and Equipment

The stimuli (anagram, questions) were presented on white and pink index cards measuring 12.7 x 7.6 cm. The white cards were used on the pretest (test 1) only to help differentiate it from the failure task cards. This was done to reduce any effect that success on this pretest might have on preventing the development of learned helplessness during the learned helplessness induction phase (Coles & Coyne, 1977). Each card had a number typed on one side and was either blank, or had a question, or five capitalized letters constituting a scrambled word (anagram) typed on the other. All cards were presented in decks of 10 anagrams or 20 questions. The solve time given for each anagram was the median solve time for that anagram. These times were standardized in previous research which examined the solve times of various anagrams by undergraduate university students (Armstrong, Morry, Coppelmans, & Hayek, 1983; Tresseit & Mayzner, 1966). Specific letter sequences and order of presentation as well as solve times can be found in Appendix A pages 89-112. Another task was to answer questions of the type found in games such as Trivial Persuit and Reach for the Top. The questions were selected on the basis of pilot data which indicated that the mean number

of correct solutions was three out of twenty questions. The questions and answers can be found in Appendix A pages 95-99.

The experimental room had two tables placed side by side facing a wall with the subject's chair placed at the table on the right. The experimenter's chair was placed behind the subject, facing the subject's back. The card decks were placed on the second table to the left of the one at which the subject was seated. The table in front of the subject had two rectangles 12.7 x 7.6 cm, one white (to the left) and one yellow (to the right) taped on the centre, 25 cm in front of the subject.

Timing was done manually using an electronic stop watch with a digital display of minutes, seconds and hundredths of seconds. An audio cassette recorder was used to record the subject's verbal responses. It was placed on the experimenter's table.

When the experiment was over a measurement of imagery vividness was taken using the shortened form of the Betts Questionnaire of Mental Imagery (Sheehan, 1967) which can be found in Appendix A pages 113-116. After they had finished the Betts Questionnaire the subjects were asked a series of demographic and task related questions which can be found in Appendix A pages 117-118.

Procedure

There were five phases in the experiment. They were; (1) the pretest (test 1), (2) the learned helplessness induction phase, (3) the

post failure test (test 2), (4) learned helplessness alleviation, or continued induction, and (5) the post treatment test (test 3).

There were five groups of subjects, one control group and four experimental groups. The control group (group 1) received a pretest (test 1), the learned helplessness induction phase, a post failure test (test 2), then a four minute waiting period between post failure (test 2) and post treatment test (test 3). This four minute waiting period was approximately the time taken by subjects in the other groups to complete the tasks for this phase.

The four experimental groups (groups 2 to 5) received a pretest (test 1), the learned helplessness induction phase, a post failure test (test 2), and then either an alleviation procedure, or a further induction procedure. Experimental group two labelled Real Solve, received real practice solving 10 real anagrams. Experimental group three labelled Imagine Solve, received instructions to image solving 10 anagrams. Experimental group four labelled Real Fail, tried to solve 10 anagrams which were designed to be unsolvable. Experimental group five labelled Imagine Fail, received instructions to image failing to solve 10 anagrams. All five groups were then given a post treatment test (test 3).

Initially each subject was read a general outline of the tasks involved, but was left blind as to the purpose of the experiment. He/she was reminded that participation was voluntary and that he/she was free

to leave at any time (see Appendix A, page 90 for specific instructions read to the subject).

Each subject completed the experiment individually. The data selected for subsequent analysis was the data of the subjects who after receiving the learned helplessness induction phase met the criterion for learned helplessness in the post failure test (test 2). When the post treatment test (test 3) was completed each subject was asked to complete the shortened form of Betts Questionnaire of Mental Imagery. This form of the Betts Questionnaire consisted of 35 items. The subject is instructed to construct a mental image for each item then rate on a scale of one to seven the vividness of the image. The rating of one was to be given when the image was "perfectly clear and as vivid as the actual experience". The rating of seven was assigned when there was "no image at all, you are only aware that you are thinking of the subject". See Appendix A page 113 for the complete test. The ratings for the individual images were summed to give a total score for the 35 items. The lower the score, the more vividly the subject rated their images. The Betts was selected as research has revealed that it withstands psychometric scrutiny (Cheney, Miller, Rees, 1982; Strosahl & Ascough, 1981).

A series of demographic and task related questions were then completed (see Appendix A, page 117 for specific questions). Finally the experiment and the manipulations involved were explained to the subject

and any questions that the subject might have had were answered. A flow chart of the experiment is presented in Figure 1 on page 34.

Test Phases: Phases 1, 3 and 5

The three tests consisted of fifteen anagrams per test. The anagrams were presented in decks of ten cards each, one word per card. An explanation of this arrangement is given below. The cards were white for the pretest (test 1). Cards for the post failure test (test 2) and the post treatment test (test 3) were pink. This change was made to reduce the transference of effect of success from the pretest (test 1) to the post failure (test 2) and post treatment tests (test 3) (Cole & Coyne, 1977). Each test of fifteen anagrams was arranged in subsets of five. This created nine subsets, three per test. Each subset of five cards was arranged such that the solve times of all anagrams in the first position were equal within plus or minus .5 seconds, all anagrams in the second position were equal within plus or minus .5 seconds in solve time, etc. As it turned out the average solve time for each subset of five anagrams was equal within plus or minus .36 seconds. The median solve time for the anagrams used in the tests ranged from 5.0 seconds to 15.0 seconds. The subject was allowed twenty seconds per card in which to solve the anagram. Solve time was defined as the interval from when the subject read aloud the number on the card to when the subject said a solution. The subject received feedback after every card and at the end

FLOW CHART OF EXPERIMENT

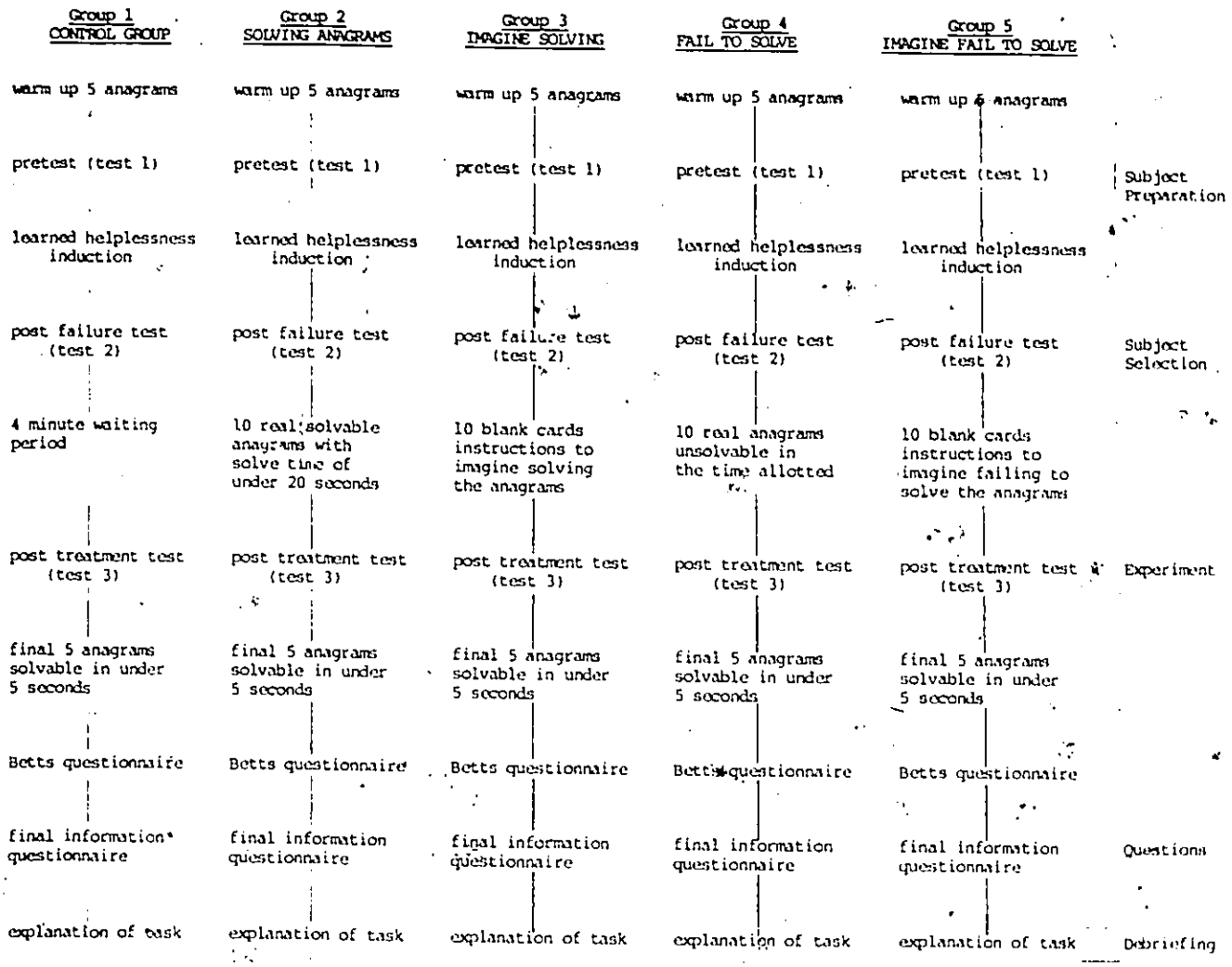


FIGURE 1

of each deck of ten anagrams. The feedback for each individual card was as follows. If the subject failed to give any response within the twenty seconds he/she was told that the trial was over. The correct answer was then provided and the subject was instructed to place the card with the unsolved anagrams, number on the yellow rectangle. If the subject gave an incorrect response to the card he/she was told that the answer was wrong and then provided with the correct solution. The subject was then told to place the card containing the anagram, number on the yellow rectangle. If the subject answered correctly he/she was told so and instructed to place the card containing the anagram, number on the white rectangle. At the end of each deck of ten cards the subject was told the number of anagrams he/she solved in that deck.

Solve time was measured by hand with a stop watch during the experiment. Solve times, correct responses, incorrect responses, and non-responses within the twenty second limit were recorded trial by trial by the experimenter. The session was also recorded on the audio cassette recorder. Later an independent timer, blind to the order of presentation of the anagrams, listened to the tape and measured the subject's solve times.

A separate deck of five anagrams was presented to the subject before the pre test (test 1). All anagrams in this deck had solve times of under ten seconds. Feedback to the subjects as well as timing was identical to that used during the tests. These cards were to familiarize

the subject with the task and the subject was informed that the deck was a "warm up" for the tasks to follow. At the end the post treatment test (test 3) there were an additional five anagrams not separate from the other decks. These final five anagrams had solve times of under five seconds, and were intended to allow the subject to complete the experiment on a successful task. Feedback and timing were identical to that used during the test.

Phase 2: Learned Helplessness Induction

The learned helplessness induction phase consisted of a series of three different tasks (a) anagram solution; (b) questions on different subject areas, and; (c) various mathematical questions and problems. The subject was not expected to be successful with these tasks. The sequence of tasks as they were presented in the learned helplessness induction phase was as follows; (a) five anagrams (following but combined with the final five anagrams in the pretest); (b) forty questions in two different subject decks of twenty questons each; (c) thirty anagrams; (d) twenty mathematical questions; (e) twenty-five anagrams (the last five of which are the first half of the deck in which the post failure test (test 2) begins). Correct responses, incorrect responses, and non responses within the time limits for each task were recorded by the experimenter. The tasks are described in detail below.

The sixty anagrams were presented on pink cards in decks of ten cards, one word per card (see Appendix A, page 103 for list of anagrams presented). Instructions and feedback were identical to that in the tests. The median reaction time for all anagrams selected for use in the learned helplessness induction phase was greater than 30 seconds. The subject was allowed 17 seconds per card to solve the anagram. This time limit reduction took place without informing the subject and was intended to further reduce the probability of the subject achieving a correct solution.

Another task was to answer questions of the type found in games like Trivial Persuit and Reach For the Top, etc. (see Appendix A pp. 95-99). There were six decks of pink cards, twenty questions per deck. Each deck represented a different subject area and was labelled accordingly. The subject was required to select any two of the six decks. The feedback was the same as for the test anagrams except that each deck had 20 cards whereas anagram decks contained ten cards so that the feedback as to the total number correct was given after 20 cards were completed. The subject was allowed five seconds to respond to the question on each card. Solve time was defined as the interval from when the subject read aloud the number on the back of the card to when the subject said a solution.

The remaining task was to solve twenty mathmetical questions or problems typed on pink cards (see Appendix A p. 102). Feedback to the

subject was identical to that for the test anagrams except that the feedback on the total number correct took place after all twenty cards had been attempted. The subject was allowed seven seconds per card in which to respond. Solve time was defined in the same way as for anagrams and subject area cards.

Phase 4: Waiting Period or Alleviation or Continued Induction

Group 1: Control Group

Each of the subjects in this group was instructed to wait. The instructions for this task were, "The experiment calls for a four minute break at this point. Remain seated. Please do not look at any of the cards in the decks." The experimenter remained seated, timed the four minute break, and did not converse with the subject.

Group 2: Real Solve

Each of the subjects in this group was instructed to solve anagrams as they had been doing throughout the experiment, but they were allowed as long as was necessary for them to solve the anagram correctly. The instructions for this task were, "The next task is to solve anagrams. Take deck W remove the letter card. When you receive the instructions "Begin Now", pick-up the first card and read aloud the number on the card. Immediately turn the card over and begin to work

through your solution. You will have as long as you require to come to a correct solution for the anagram. Say your solution loudly and clearly as soon as you have it. You will then receive further instructions. Do you wish me to repeat the instructions?" The instructions were re-read when necessary. There were ten trials. Feedback for this task was as follows. If the subject failed to respond, a paper and pencil was offered to aid in the solution of the anagram. If the subject responded incorrectly, he/she was told so and instructed to try again. The subject continued until a correct solution occurred. When the correct answer was given the subject was told so and then instructed to place the card on the white rectangle. The subject was told the number of correctly solved anagrams in the deck of ten (this was always 10). Timing commenced when the subject read aloud the number on the card, and ceased when the correct response was given. All anagrams used in this deck of ten had median solve times of 13.2 to 16.8 seconds. The anagrams and their solve times can be found in Appendix A page 107.

Group 3: Imagine Solve

Each of the subjects in this group was instructed to imagine the anagram solution task. The instructions which were read to the subject were, "The next task is to imagine solving the anagrams. Take deck H and place it close to you. Remove the letter card. When you receive the instructions "Begin Now" pick-up the next card. Read aloud the number on

the card. Immediately turn the card over and close your eyes. Imagine trying to solve an anagram. Imagine that you are successful, that you solve the anagram. Do or say nothing else. Run through the task only once per card. When you have done this say the word "Done" out loud. You will then receive further instructions. Do you wish me to repeat the instructions?". The instructions were re-read when necessary. There were ten trials. Solve time began when the subject read aloud the number on the card and ended when the subject said "Done". The experimenter said "Well done" or "Good" after every trial. Then the subject was told to "Place that card on the white rectangle and procede to the next card.". At the end of the ten trials the subject was told, "That was ten trials".

No subject reported being unable to comply with the instructions.

Group 4: Real Fail

Each of the subjects in this group was instructed to solve anagrams as they had been doing throughout the learned helplessness induction phase of the experiment. They were read the following instructions, "The next task is to solve anagrams. Take deck T and place it close to you. Remove the letter card. When you receive the instructions "Begin Now" take the next card, read aloud the number on the card. Immediately turn the card over and begin to work on your solution. Say your solution loudly and clearly as soon as you have it.

You will then receive further instructions. You will have 20 seconds per card to solve the anagram. If you have not responded within that time you will be told that the trial is over. You are allowed only one answer per card. Do you wish me to repeat the instructions?" The instructions were re-read when required. Feedback for performance on this task was as for the induction procedure. If the subject gave the correct response he/she was told "That is correct. Place that card on the white rectangle and proceed to the next card." If the subject was wrong he/she was told "That is incorrect. The correct answer is ..... Place that card on the yellow rectangle and proceed to the next card." If the subject did not respond he/she was told "The time is up. The correct response is ..... Place that card on the yellow rectangle and proceed to the next card." Solve time on this task was measured as for the induction phase.

Group 5: Imagine Fail

Each of the subjects in this group was instructed to image performing this task as they had been performing it throughout the learned helplessness induction phase of the experiment. They were read the following instructions, "The next task is to imagine failing to solve anagrams. Take deck H and place it close to you. Remove the letter card. When you receive the instructions "Begin Now" pick-up the next card and read aloud the number on the card. Immediately turn the card

over and close your eyes. Imagine trying to solve an anagram. Imagine that you are not successful, that you fail to solve an anagram. Do or say nothing else. Run through this task only once per card. When you have done this say the word "Done" out loud. You will then receive further instructions. Do you wish me to repeat the instructions?" The instructions were re-read when necessary. There were 10 trials. Solve time began when the subject read aloud the number on the card and terminated when the subject said the word "Done". The feedback for this task was, "Place that card on the yellow rectangle and proceed to the next card". At the end of ten trials the subject was told "That was ten trials".

All subjects completed the experiment facing a wall, back to the experimenter, to reduce any non-verbal cues the experimenter might give. All instructions were read to the subject and attention was paid to the voice tone and inflection in order to reduce any paralinguistic cues that might be given.

No subject reported being unable to comply with the instructions.

Chapter III

RESULTS

All subjects completed the experiment. For each subject solve times, number of non responses and number of incorrect responses were recorded by the experimenter. In addition, each session was audio recorded. A blind rater listened to a randomly selected fourteen of the total of 64 sessions of these tapes and rated solve times, non responses, and incorrect responses.

Interrater reliability was calculated using the formula number of agreements divided by the total number of trials, times 100, equals percentage agreement.

For solve time, an agreement occurred for a trial when the second rater's time was within plus or minus .5 seconds of the experimenter's time. Interrater reliability was 96%. An agreement for no response given, occurred if both raters timed the trial at 20 seconds or more. Reliability was 99%. For the number wrong, an agreement occurred if both raters rated the response given as incorrect. Reliability was 100%.

Overall Comparisons

Because the scoring procedure was deemed reliable, the experimenter's measures were applied to the entire sample. Mean solve times were calculated for each test for each subject. This involved averaging the solve times for the 15 anagrams, for each test. The mean solve time for all subjects in a group was calculated for each test. Figure 2 presents these mean solve times for each group across the three tests. The effect of the failure induction procedure is clearly visible in the increase in solve times from the pretest (test 1) to the post failure test (test 2). Note that all groups have solve times in the post treatment test (test 3) that approach those of the pretest (test 1), but that there are differences in how closely their post treatment test (test 3) performance approximates that of the pretest (test 1) performance.

The number of anagrams not solved on each test, was calculated for each subject by summing the number of anagrams for which the subject made no response and the number of anagrams solved incorrectly during the test. The mean number of anagrams not solved for a test for all subjects in a group was calculated for each group. Figure 3 represents these mean number of anagrams not solved by each group for each of the three tests. The effect of the failure induction procedure is clearly evident in the increase in the number of anagrams not solved between the pretest (test 1) and the post failure test (test 2). Note

FIGURE 2 **Mean Solve Times for Each Group**

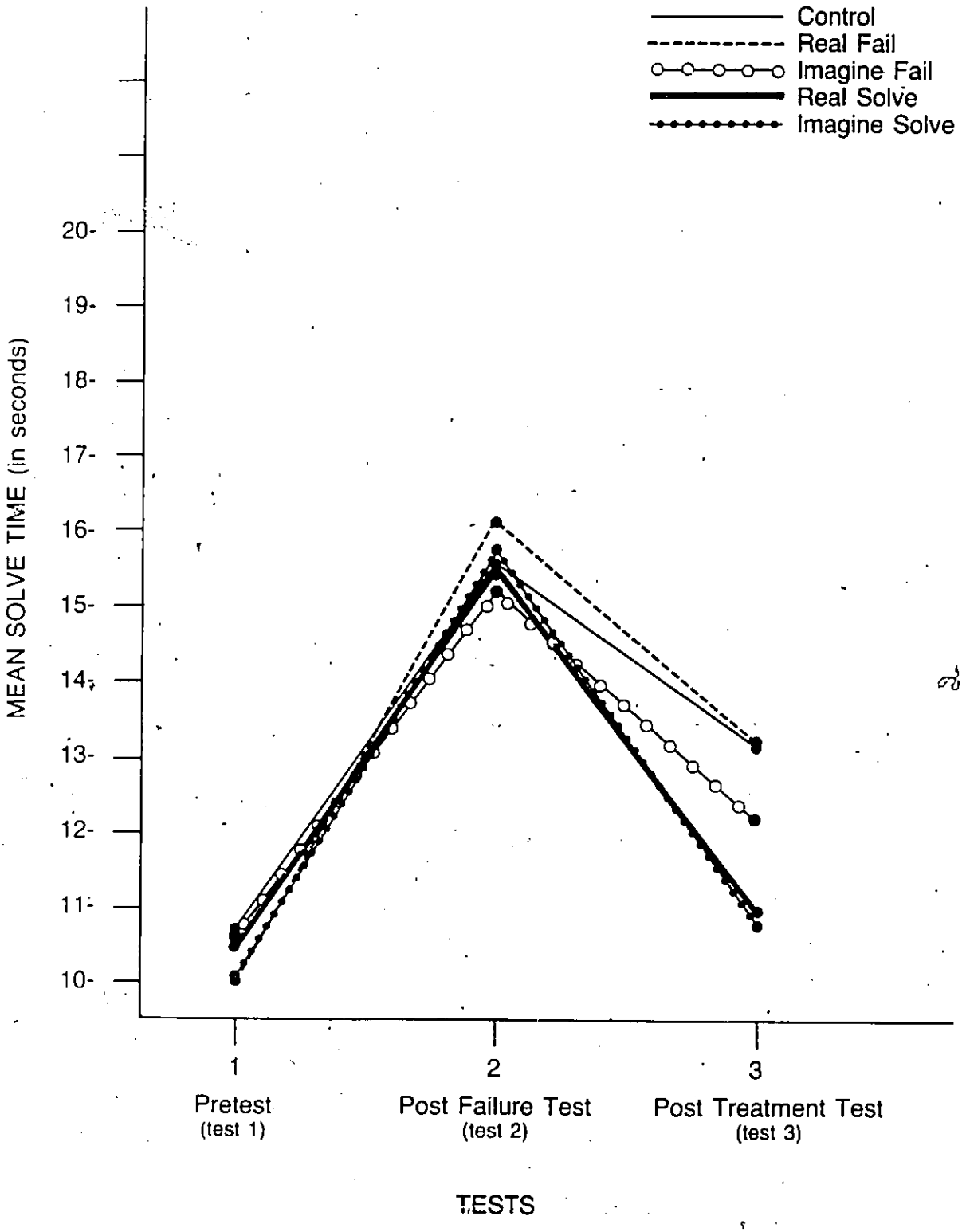
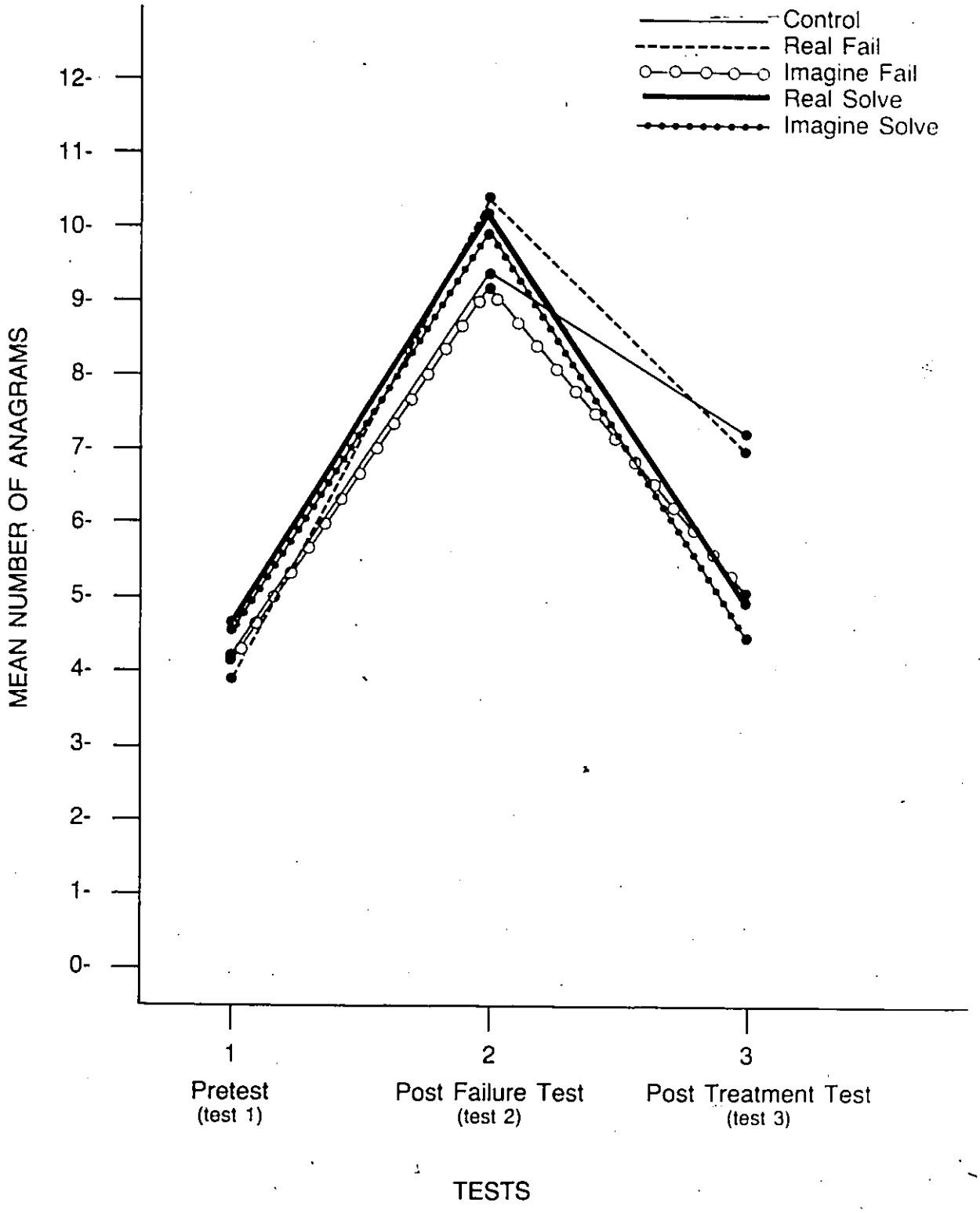


FIGURE 3 **Mean Number of Anagrams Not Solved for Each Group**



that all groups approached their pretest (test 1) performance on the post treatment test (test 3). There were differences however in how closely the post treatment test (test 3) performance approximated that of the pretest (test 1).

It will be remembered that subjects selected to participate in the experiment, were selected on criteria that applied to the post failure test (test 2) performance. The criteria were that, a) the subject's median solve time in two of the three subsets of five anagrams on the post failure set of anagrams was 20 seconds, with one subset being the final subset; b) that the median solve time on the post failure 15 trials was 20 seconds; c) that the mean solve time on the post failure test (test 2) was longer than the subject's own mean solve time on the pretest (test 1).

To confirm that post failure test (test 2) performance was in fact significantly poorer than pretest (test 1) performance, and that the groups were not significantly different from one another on either test, two 5 x 2 ANOVAS with repeated measures (five groups by two tests) were run, one for the variable mean solve time, and one for the variable number of anagrams not solved.

For the variable mean solve time, post failure test (test 2) performance was confirmed to be significantly slower than the pretest (test 1) performance, F (1,59) = 267.90, $p < .01$. There was no main effect for treatment group $F(4,1) = .07$, $p > .05$. There was no

significant test by group interaction so the effect was the same for all groups $F(4,59) = .75$, $p > .05$. See Appendix B, page 121, for the complete ANOVA table. For the variable number of anagrams not solved, there were significantly more anagrams not solved on the post failure test (test 2), $F(1,59) = 407.05$, $p < .01$. There was no main effect by group $F(4,1) = .26$, $p > .05$. Again there was no significant test by group interaction so the effect was the same for all groups $F(4,59) = .62$, $p > .05$. See Appendix B, page 122, for the complete ANOVA table. These tests confirmed that performance on the post failure test (test 2) was significantly poorer than the pretest (test 1) performance.

The comparisons of interest were between performance on the pretest (test 1) and post treatment test (test 3) performance. The comparisons concern the degree to which the post treatment (test 3) performance approximated pretest (test 1) performance, that is the degree to which the treatment removed the learned helplessness behavior pattern, and returned performance to its pre learned helplessness level as reflected by the pretest (test 1). These comparisons were done using two separate 5 x 2 ANOVA with repeated measures (five groups by two tests), one for the variable mean solve time, and the other for the variable, number of anagrams not solved.

The control group was included in the design to examine the effect of no treatment on performance. When responding to the post experimental questionnaire five of the fourteen subjects in the control

group indicated that they had employed self talk during the waiting period in an attempt to improve their performance. They gave themselves instructions to relax, rest, or concentrate harder. These subjects indicated that they felt that this would improve their performance when they again attempted to solve anagrams. One subject reported engaging in negative self talk related to the task. As these six subjects' post experiment questionnaire responses indicated they had in effect engaged in behavior which was task related which could effect their subsequent performance, their data was not included in the analysis. Only the remaining eight subjects were thus considered to be a legitimate no treatment control group.

When the overall 5 x 2 ANOVA with repeated measures for the dependent variable mean solve time was run, there were no significant differences among the groups $F(4,1) = .58$, $p > .05$. There was a significant main effect for test $F(1,4) = 34.04$, $p < .01$. There was a significant interaction group by test effect $F(4,59) = 2.47$, $p < .05$. See Appendix B, page 123 for the complete ANOVA table. Tests of simple main effects indicated that the Control group, the Real Fail group, and the Imagine Fail group, had mean solve times which were significantly slower on the post treatment test (test 3) than their own mean solve times on the pretest (test 1). The mean solve times for the Real Solve group and the Imagine Solve group on the post treatment test (test 3)

were not significantly different than their mean solve times on the pretest (test 1), see Table 1, page 51 .

Follow-up paired comparisons using the Newman-Keuls' Q statistic with the studentized range indicated that there were significant differences between the groups on their scores on the post treatment test (test 3). The Real Solve and Imagine Solve groups had significantly shorter mean solve times than either the Control or the Real Fail groups. For the details of these paired comparisons see Table 2, page 52.

No significant group differences were found for the number of anagrams not solved $F(4,1) = .73$, $p > .05$. There was a significant main effect for test $F(1,4) = 26.80$, $p < .01$. There was a significant group by test interaction $F(4,59) = 4.72$, $p < .01$. See Appendix B, page 124 , for the complete ANOVA table.

Tests of simple main effects indicated that the Control Group, the Real Fail Group and the Imagine Fail Group failed to solve significantly more anagrams on the post treatment test (test 3) compared to the pretest (test 1). The groups Real Solve and Imagine Solve missed approximately the same number of anagrams on the post treatment test (test 3) as they did on the pretest (test 1). For the details of the paired comparisons see Table 3, page 53 .

Follow-up paired comparisons using the Newman-Keuls' Q statistic with the studentized range indicated that there were significant

Table 1

Within Group Comparisons of Pretest (test 1) to the Post Treatment Test (test 3) on Mean Solve Time

Groups		Mean	SD	DF	F
Control	test 1	10.40	2.13	1,7	14.92**
	test 3	13.33	2.21		
Real Solve	test 1	10.45	2.76	1,13	.93
	test 3	11.11	2.19		
Imagine Solve	test 1	10.06	3.70	1,13	1.48
	test 3	10.89	3.29		
Real Fail	test 1	10.14	2.50	1,13	20.43**
	test 3	13.22	2.80		
Imagine Fail	test 1	10.49	2.98	1,13	6.16*
	test 3	12.21	3.01		

* $p < .05$
** $p < .01$

Table 2

Within Group Comparisons of Pretest (test 1) to the Post Treatment Test (test 3) on Number of Anagrams not Solved

Groups		Mean	SD	DF	F
Control	test 1	4.25	1.67	1,7	19.19**
	test 3	7.25	2.60		
Real Solve	test 1	4.64	2.23	1,13	.17
	test 3	4.93	1.98		
Imagine Solve	test 1	4.57	3.11	1,13	.01
	test 3	4.50	3.03		
Real Fail	test 1	3.93	2.27	1,13	21.06**
	test 3	7.07	2.43		
Imagine Fail	test 1	4.14	2.21	1,13	5.26*
	test 3	5.71	2.46		

* $p < .05$
** $p < .01$

Table 3

Between Group Comparisons on the Post Treatment Test (Test 3) for the Variable Mean Solve Time.

Groups	Newman-Keul's Q statistic with the studentized range	
Control vs Real Solve	2.72**	one-tailed
Control vs Imagine Solve	2.99**	one-tailed
Control vs Real Fail	.13	two-tailed
Control vs Imagine Fail	1.37	two-tailed
Real Solve vs Imagine Solve	.27	two-tailed
Real Solve vs Real Fail	-2.59**	one-tailed
Real Solve vs Imagine Fail	-1.35	one-tailed
Imagine Solve vs Real Fail	-2.85**	one-tailed
Imagine Solve vs Imagine Fail	-1.62	one-tailed
Real Fail vs Imagine Fail	1.24	two-tailed

** $p < .01$

differences between the groups on their scores on the post treatment test (test 3). The Control and Real Fail groups had a significantly larger number of anagrams not solved than the Real Solve or Imagine Solve groups. The Imagine Solve group had a significantly smaller number of anagrams not solved than the Imagine Fail group. For the details of these paired comparisons see Table 4, page 55.

Vividness of Imagery and Performance Change

Two Pearson Product Moment correlational analysis were performed on the data for the subjects that received instructions to image. The analysis was to determine whether or not there was a relationship between self rated vividness of imagery (score on the Betts test of Mental Imagery) and performance change. One measure of performance change was mean solve time on the post treatment test (test 3) minus mean solve time on pretest (test 1) while the other was number of anagrams not solved on post treatment test (test 3) minus the number of anagrams not solved on the pretest (test 1).

There was no significant correlation for either the Imagine Solve or the Imagine Fail group. This suggests that there was no relationship between the amount of change in mean solve times from the pretest (test 1) to the post treatment test (test 3) and the self rated vividness of images. The correlations for the change in mean solve time with self rated vividness of images for the Imagine Solve group was $r = -.10$, $p >$

Table 4

Between Group Comparisons on the Post Treatment Test (Test 3) for the Number of Anagrams Not Solved.

Groups	Newman-Keul's of statistic with the studentized range	
Control vs Real Solve	3.29**	twe-tailed
Control vs Imagine Solve	4.22**	two-tailed
Control vs Real Fail	.25	two-tailed
Control vs Imagine Fail	2.18	two-tailed
Real Solve vs Imagine Solve	.61	two-tailed
Real Solve vs Real Fail	-3.04**	one-tailed
Real Solve vs Imagine Fail	-1.11	one-tailed
Imagine Solve vs Real Fail	-3.65**	one-tailed
Imagine Solve vs Imagine Fail	-1.72*	one-tailed
Real Fail vs Imagine Fail	1.92	two-tailed

* $p < .05$
** $p < .01$

.05, and for the Imagine Fail Group the correlation was $r = -.46$, $p > .05$. Data concerning the various group's performance on the Betts are reported in Appendix C, p.126 .

Correlations Between Time in Treatment and Performance Change

Two Pearson Product Moment correlational analysis were performed for the amount of time spent in treatment and subsequent change in performance. Time spent in treatment, was calculated as the sum of the time taken in each of the ten trials in which the subject either imaged the task or actually attempted to solve anagrams. One measure of performance change was mean solve time on the post treatment test (test 3) minus the mean solve time on the pretest (test 1), while the other was the number of anagrams not solved on the post treatment test (test 3) minus the number of anagrams not solved on the pretest (test 1). There was a significant correlation between the length of time taken in treatment and the amount of change in the number of anagrams not solved for the Real Solve group only, $r = .64$, $p = .01$. The longer these subjects spent actually solving anagrams in the alleviation phase of the experiment the more poorly they did on the post treatment test (test 3) compared to the pretest (test 1), i.e., the more the number of anagrams not solved increased from the pretest (test 1). All other correlations were not significant.

Chapter IV

DISCUSSION

Discussion of Hypothesis and Conclusions

Hypothesis one was that both experimental groups receiving the alleviation treatment procedures (Real Solve and Imagine Solve) would have mean solve times, and number of anagrams not solved on the post treatment test (test 3) that were not significantly different from their own scores on the pretest (test 1).

Tests of simple main effects found that there was no significant difference on the dependent variable, mean solve time between the pretest (test 1) and the post treatment test (test 3) for the Real Solve group, (see Table 1), and for the Imagine Solve group, (see Table 1). This indicates that the mean solve time performance of the Real Solve and Imagine Solve groups after alleviation treatment, was approximately equal to their mean solve time performance at the beginning of the experiment.

Paired comparisons found that there was no significant change on the dependent variable, number of anagrams not solved between the pretest (test 1) and the post treatment test (test 3) for the Real Solve group (see Table 1), or for the Imagine Solve group (see Table 1). This indicates that in terms of the number of anagrams not solved,

performance for the Real Solve and Imagine Solve groups was approximately the same after the alleviation treatment as it was at the beginning of the experiment.

Hypothesis one was supported in that for both the Real Solve and the Imagine Solve groups, performance on the post treatment test (test 3) was not significantly different from the pretest performance (test 1). Since all subjects selected from the initial pool for inclusion in the study had post failure test (test 2) performance that was significantly poorer than pretest performance, these results indicate that performance was improved by the Real Solve and the Imagine solve alleviation treatment and returned to its pretest (test 1) level.

Hypothesis two was that the mean solve times and number of anagrams not solved for the two groups receiving alleviation, (Real Solve and Imagine Solve), would not be significantly different from one another on the post treatment test (test 3).

Paired comparisons found that the Real Solve group and the Imagine Solve group were not significantly different from one another on the post treatment test (test 3) on either the mean solve time, (see Table 3), or on the number of anagrams not solved, (see Table 4). In combination with support for hypothesis one, this support for hypothesis two means that the Real Solve and the Imagine Solve treatments were equally effective in removing the learned helplessness decrements and returning performance to its pretest (test 1) level. This finding is

consistent with the radical behaviorist conception which predicts that the real alleviation procedure and the imagined form of the alleviation procedure would have a similar effect on subsequent performance.

Hypothesis three was that the groups which received continued failure (Real Fail and Imagine Fail) would have mean solve times which were significantly longer, and number of anagrams not solved which were significantly larger on post treatment test (test 3) than their own scores on the pretest (test 1).

The tests of simple main effects found that the mean solve times were significantly longer on the post treatment test (test 3) compared to the pretest (test 1) for both groups, Real Fail (see Table 1), and Imagine Fail (see Table 1). These results indicate that the performance of the two groups, receiving continued real or imaged failure, was significantly poorer on the post treatment test (test 3) than it was on the pretest (test 1).

As can be seen on Figures 2 and 3, the performance of the Real Fail and Imagine Fail groups did improve somewhat from their post failure (test 2) performance. This was not unexpected for two reasons. One was that the criteria applied for the labelling of subjects as learned helpless, were strict. As a result of this strictness some regression toward the mean could be anticipated in the subjects' performance when next measured. The second factor that could have had an effect was that all subjects were able to solve some of the anagrams on

the post failure test (test 2). These success experiences, even if limited, would be expected to improve subsequent performance. It should be emphasized however, that even though there was some improvement, unlike the Real Solve and the Imagine Solve groups, performance of the two groups that continued to experience failure did not return to pretest (test 1) levels.

Hypothesis four was that the mean solve times and the number of anagrams not solved in the two groups receiving continued failure (groups Real and Imagine Fail) would not be significantly different from one another on the post treatment test (test 3).

Paired comparisons supported this fourth hypothesis. The two groups do not differ significantly on mean solve time on the post treatment test (test 3), (see Table 3), or on the number of anagrams not solved, (see Table 4).

In combination with the support for hypothesis three this support for hypothesis four means that the Real Fail and the Imagine Fail treatment were equally effective in preventing performance from returning to its pretest (test 1) level. Again there is support for the radical behavioral conception which suggests that public and private events are functionally equivalent. Here real continued failure and imagined continued failure appear to be equally effective in maintaining learned helpless behavior.

Hypothesis five was that the mean solve time would be significantly shorter and the number of anagrams not solved would be significantly smaller on the post treatment test (test 3) for the two groups receiving alleviation (groups Real and Imagine Solve) compared to the two groups receiving continued failure (groups Real and Imagine Fail).

This fifth hypothesis was not completely supported. The pairwise comparisons found that the mean solve times were significantly shorter for the two groups receiving alleviation compared only to the group receiving continued real failure, (Real Solve and Imagine Solve compared to Real Fail, see Table 3). There were no significant differences between the Real Solve group and the Imagine Fail groups, or between the Imagine Solve and the Imagine Fail groups on the variable mean solve time on the post treatment test (test 3), (see Table 3). Even though these latter differences did not reach significance it is worth noting that they were in the correct direction, that is that the Imagine Fail group took longer to solve the anagrams than either alleviation group.

For the number of anagrams not solved, the paired comparisons found that the Real Solve and the Imagine Solve groups both had a significantly smaller number of anagrams not solved than the Real Fail group (see Table 4). The difference between the Real Solve and the Imagine Fail groups on the variable number of anagrams not solved, was in the correct direction, but did not reach significance, (see Table 4),

that is that the Imagine Fail group had a larger number of anagrams not solved than the Real Solve group. The Imagine Solve group did have significantly smaller number of anagrams not solved than Imagine Fail group on the post treatment test (test 3), (see Table 4).

A summary of these results, relevant to hypothesis five is presented in Table 5.

The lack of significant differences between the Real Solve, Imagine Solve and Imagine Fail groups was unexpected. From a radical behavioral perspective the performance of the Imagine Fail Group was not what was expected. Although this group did not differ significantly from the Real Fail Group on the post treatment test (test 3), the performance improved more than anticipated. If, as the radical behavioral conception suggests, private events affect behavior in the same manner as public ones in this instance imaging solving anagrams compared to really solving anagrams, then the Imagine Fail group's performance should have been significantly poorer than that of the Real Solve and Imagine Solve groups on the post treatment test (test 3). The following factors may provide an explanation for what was found.

The first factor related to the performance of the Imagine Fail group was that two of the fourteen subjects in this group reported on the post experiment questionnaire, thinking that they had been asked to image failing, as a break from the main task (solving anagrams). That is they saw the image failure task as a time to relax. Two other subjects

Table 5

Paired Comparisons on the Post Treatment Test (test 3).

Groups	Variable	Difference
Real Solve < Real Fail	mean solve time	significant
	number of anagrams not solved	significant
Imagine Solve < Real Fail	mean solve time	significant
	number of anagrams not solved	significant
Real Solve < Imagine Fail	mean solve tima	predicted direction
	number of anagrams not solved	predicted direction
Imagine Solve < Imagine Fail	mean solve time	predicted direction
	number of anagrams not solved	significant

stated that although they had followed the instructions on some trials they did not comply with the Imagine Fail task instructions on all the trials (no subject in the Imagine solve group reported this). This may have occurred because imaging failure is aversive for subjects. These four subjects had an average mean solve time on the post treatment test (test 3) which was shorter (6.29 sec.) compared to the average for their group (12.21 sec.). It was also shorter than the average mean solve time for the Real Solve group (10.77 sec.) or the Imagine Solve group (10.47 sec.). These four subjects also had a smaller average number of anagrams not solved (2.75) than the average for their group (5.71). It was also smaller than the average for the Real Solve group (4.93), or the Imagine Solve group (4.50).

These reactions to the imagine fail task could be undermining the effect of this task on subsequent performance. Possible reasons for this type of response to the imagine fail task instructions and suggestions for circumventing them are discussed later.

Summary

The main focus of this research was to examine the effect of imaging doing a behavior on subsequent overt behavior and to compare the effects of imaging doing a behavior and really doing a behavior, in this case solving anagrams. These findings are consistent with a derivative of the radical behavioral perspective that the private events, in this

case imaging performing a task successfully or not, influenced behavior in the same way and to the same degree as their public events counterparts, actually performing the task and meeting with success or failure. The results also indicate that it was not imaging per se or some other non specific aspect of the treatment, as the Imagine Fail and the Imagine Solving treatments produced differing effects on subsequent performance. Performance subsequent to the Imagine Solve treatment returned to its pretest (test 1) level, performance subsequent to the Imagine Fail treatment was significantly poorer than its pre test level.

Self Talk and Performance

Imaging was the private event examined in this study. Another kind of private event is self talk. This kind of private event can also influence behavior. The data for the Control group are of interest as they are related to the position that private events influence behavior in the same way as public events, in this case the private event was self talk. There were six subjects in the control group who employed self talk, during the non treatment break. Five subjects employed positive self talk and one subject employed negative self talk. For those five subjects who employed positive self talk the data supports their contention that this was usually effective for them outside the experimental conditions when they wished to calm themselves down and enhance their performance. The five had an average mean solve time on

the post treatment test (test 3) (9.54 sec.) that was in line with the average mean solve time of the Real Solve (10.77 sec.) or the Imagine Solve (10.47 sec.) groups on the post treatment test (test 3). These same five subjects also had an average number of anagrams not solved (3) in line with the average number for the Real Solve (4.93) and the Imagine Solve (4.50) groups on the post treatment test (test 3) as well.

One subject in the Control group employed negative self talk. His mean solve time on the post treatment test (test 3) was longer (15.19 sec.) than the average mean solve time for the Real Fail (11.67 sec.) and the Imagine Fail (11.36 sec.) groups. The number of anagrams not solved (7) was larger than the average of the Imagine Fail group (5.71), and closely approximated that of the Real Fail group (7.07). The remaining eight subjects in the Control group did not report the occurrance of task related private events during the non treatment period. Their mean solve time was significantly longer on the post treatment test (test 3) than on the pretest (test 1), (see Table 1), and their number of anagrams not solved was significantly larger (see Table 2).

The self report data from the Control group highlights the effect that this type of private event appears to have on public behavior. Subjects who used positive self talk demonstrated performances on the post treatment test that were similar to those of the group which had received actual or imaged success experiences. The subject who employed

negative self talk demonstrated performance that was similar to the groups receiving real or imaged failure experiences. Implications of this finding in terms of future research will be discussed below.

Vividness of Imagery and Behavior Change

The lack of relationship between the score on the Betts Questionnaire of Mental Imagery and behavior change for the imagining groups is also of interest. The subject's self rated vividness of imagery bore no relationship to the amount of behavioral change evidenced. There was no correlation between the score on the Betts and the difference between the scores on the pretest (test 1) and the post treatment test (test 3) for either the Imagine Solve or the Imagine Fail groups. Vividness of imagery as rated on various pencil and paper self report tests has been cited as an important variable in the effectiveness of imagery based behavior therapy treatment as it is assumed that the more vivid the image, the more powerful its influence (Beere, 1972; Hazdin, 1975; McSweeney, 1976). However attempts to establish an empirical association between Behavior Therapy outcome and individual differences in imagery ability using vividness as the independent variable have produced mixed results, (Kazdin, 1975; Strosah, & Ascough, 1980).

Two separate factors may play a role in this lack of correlation between the self rated vividness of images and performance change as

measured in this study. The first is the difficulty in using self report as a measure of image vividness. There is no way of knowing whether one person's definition of vivid or dim corresponds to that of a second person. The subjectivity of the ratings could be introducing a great deal of variability into the measurements of image vividness.

The second factor of importance may be which aspect of imaging is important for performance on a particular task. Richardson (1969) has suggested that image vividness and image controlability are separate dimensions. There appears to be some support for this position (Hiscock, 1978; McLemore, 1976; Morrison, & White, 1984). It may be that the Betts Questionnaire which focuses on image vividness does not assess the capability required for effective imaging on the task required in this research. Image controlability could be the dimension of importance. Future research could attempt to measure both vividness as well as image controlability to determine whether these aspects of imaging are differentially related to performance change.

Relationship of Present Research to Previous Work: Practical Implications for Learned Helplessness Research

The results of the present research suggest directions for future work in the areas of learned helplessness. In the literature reviewed in the introduction neither the initial level of performance, nor the amount of impairment due to the failure experience was measured. It was

assumed that failure experiences (the learned helplessness induction procedures) produced learned helplessness. For the purposes of the present research it was considered essential that the decrement in performance which resulted from the learned helplessness induction procedure be demonstrated. This required, a) a pretest (test 1) to determine initial performance level, so that the occurance of a decrement could be established, and so that there was a level of performance for comparison with the post treatment performance (test 3), and b) a post failure experience test (test 2) for comparison with the pretest (test 1) in order to determine the decrement in performance due to the failure experiences.

The previous assumption that failure experiences automatically produce decrements in performance was not supported in this study. Forty six percent (59 of 129) of the initial pool of subjects did not demonstrate the decrements in performance defined as learned helplessness. Some of these subjects, (51 of 59 on the variable mean solve time, and 49 of 59 on the variable number of anagrams not solved) showed some decrement in performance but did not reach the criterion set for subject selection. Some subjects showed no change in their performance (0 of the 59 on the variable mean solve time, and 6 of 59 on the variable number of anagrams not solved). Still other subjects showed improved performance subsequent to the failure induction tasks (8 of the 59 on the variable mean solve time, 4 of the 59 on the variable number

of anagrams not solved). It will be remembered that for the purposes of this study only those subjects who did show the learned helplessness performance decrements were used. It would appear necessary that future work in this area test for and not assume the presence of performance decrements following the learned helplessness induction procedure. The suggestion here is not that learned helplessness cannot be produced, but that not every subject can be assumed to develop learned helplessness under the circumstances of a particular study. It should be noted that although there is no human data to use for comparison, the results of this study are consistent with the results of the study by Overmeir and Seligman (1968) which found that only 66% of dogs that were subjected to a learned helplessness induction procedure develop learned helplessness. The assumption that learned helplessness is an automatic outcome of the failure induction procedure is unwarrented.

In terms of the type of real world alleviation tasks used, varying the degree of difficulty of the tasks designed as success tasks would aid in determining the level of difficulty most useful in alleviating the learned helplessness. Some of the subjects in the Real Solve group indicated that they found the success trials frustrating in that they had to continue until they were successful even though this could take longer than they had been given to solve the anagram previously. Past research has indicated that simplifying the tasks has been effective in reducing performance deficits due to learned helplessness induction

(Seligman, Maier, & Greer, 1968) and other research has indicated that success which is regarded by the subject as being non-contingent on his/her performance does not alter performance deficits (Dweck, 1975). Varying degrees of difficulty and the types of tasks used as alleviation tasks would help to determine what types of success experiences would be of most benefit in alleviating learned helplessness performance deficits.

Practical Implications for Private Events Research

The post treatment test (test 3) performance of the six subjects in the Control group who employed self talk highlights the position that there are different kinds of private events which appear to influence behavior. Among the subjects engaged in self talk there seem to be three distinguishable categories of self talk. There was what might be called relaxation talk, which involved saying things such as "Calm down", "Take it easy, relax". There was positive self talk, in which the subject said, "You can do better than this", "If you try harder, you'll do better". Finally there seemed to be talk which denigrated the task, for example, "This is stupid", "It doesn't matter how I do". Future research could be directed at determining the relative impact of imagining and these different types of self talk on behavior. Future research could also be directed at the question of whether allowing the subject to

choose imaging or a particular type of self talk is more effective than instructing a subject as to what to do.

A final issue was raised by the comments of two subjects in the Imagine Fail group on the post experiment questionnaire. These subjects stated that although they had followed the instructions and performed the task on some of the trials, on other trials they did not, they simply waited what they thought to be an appropriate amount of time and said "Done". This exemplifies a problem for any task in which the subject is asked to engage in behavior that is not observable. The private events required here, imaging behaviors, are not observable, and for the period of time in which the subject engages in them the experimenter cannot be sure about what is taking place. Related to this issue is the impact of imaging aversive events. No subject in the Imagine Solve group reported that he/she had stopped performing the task. The subjects in the Imagine Fail group did not report that they were unable to comply, simply that they did not comply. Subjects then report being able to perform the imagine fail task, they simply do not.

A method of ensuring subject compliance throughout the task is essential, particularly if the task is aversive. Perhaps increasing the incentive to comply with the instructions would help in this regard, as might having the subject report when they were not doing so. Breaking the task into smaller units and having the subject report as each unit is completed might also aid in ensuring that the subjects continue to

perform the task. If private events are to be studied in terms of their impact on public behavior, careful monitoring of the private behavior must be done in order to ensure that the subjects are actually performing as required.

Summary

The present study was carried out to examine the radical behaviorist conceptualization of private events, in particular whether imaging solving or failing to solve anagrams would have the same effect on subsequent behavior, as really solving or failing to solve anagrams. Seventy subjects who demonstrated a significant decrement in performance on a post failure induction test were randomly assigned to one of five treatment conditions. The Control group waited four minutes. The Real Solve group solved ten anagrams while the Imagine Solve group imaged solving ten anagrams. The Real Fail group failed to solve ten more anagrams while the Imagine Fail group imaged failing ten more anagrams. The performance of all groups was again measured on a test similar to the pretest and post failure tests.

The findings were consistent with a derivative of the radical behavioral perspective that private events, in this case imaging performing a task, successfully or not, influenced behavior in the same way as their public event counterparts of actually performing the task. The results also indicate that it was not imaging per se as the Imagine

Fail and Imagine Solve treatments produced different effects on subsequent performance. Performance subsequent to the Imagine Solve treatment returned to its pretest (test 1) level, performance of the Imagine Fail group remained significantly poorer than its pretest (test 1) level. The responses of the Imagine Fail group were not so different from the Real and Imagine Solve groups in the post-treatment test (test 3) as was expected. Although it was suggested that subject non compliance right have been the reason, this finding somewhat qualifies the support for the radical behaviorist conception.

The results also indicate that there is a lack of relationship between the self-rated vividness of imagery, and performance change. Individual variations in rating vividness as well as the dimension of controlability rather than vividness were factors suggested to account for this finding.

Recommendations for the application of these findings for future research on learned helplessness are that: learned helplessness behavioral deficits should be measured to ensure they are present, and; varying the degree of difficulty and type of task used for alleviation should be done to determine the success experiences most beneficial.

Recommendations for the application of the findings for future research on private events are that very careful monitoring of the subject's private behavior must be done in order to ensure subject compliance: research should be done to determine the impact of various

kinds of private events on behavior, and; subject preference in the selection of the private event should also be investigated.

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APPENDIX A

Experimental tasks in order of presentation

Post Experiment Questionnaire

Appendix A

This appendix contains, in order, the instructions and tasks as presented to the subjects during the experiment.

Introduction to be read to the subject

"The purpose of this experiment is to standardize the scores obtained in problem solving tasks. Several tasks may be used and you will be given instructions for each one as it is presented.

The tasks will be presented in decks of cards, one problem per card. You will take the deck that you are instructed to and follow the instructions for that deck.

Each task will be timed. You will be given a limited amount of time per task. If you have not responded within that time you will be told that the trial is over. You will be allowed only one answer per card.

As in all experiments of this kind, the instructions are standardized. Therefore I cannot answer any questions at this time. Any questions that you might have now or during the experiment will be answered when it is over.

All efforts are made to ensure each subject's right to privacy. Any personal information obtained within this study is confidential and cannot be devulged without the written consent of the individuals involved. All data sheets are numbered and identification is made by number only. Once you begin we encourage you to stay until the study is complete, but please be reminded that you are free to leave and withdraw from the experiment at any time.

If you agree to continue, please read then sign the consent form on the desk in front of you. Then we will be ready to begin."

(If necessary) "Please turn and face the table."

"The first task is to determine the solution of five letter anagrams. Anagrams are words whose letters have been re-arranged such that they no longer form the correct sequence and the word is scrambled.

Your task will be to unscramble the letters and place them in the correct order so that they form the original word. There are no proper nouns, meaning the names of persons or places are not used, and no plural words are used.

Take the deck that you are instructed to, take the letter card off the top. When you are given the instructions 'Begin Now'. Pick-up the next card. Read the number on the card out loud, immediately turn the card over and begin to work through your solution. Call out your solution loudly and clearly as soon as you have it. You will then be given further instructions.

You will be given 20 seconds per card to solve the anagram. If you have not responded within that time you will be told that the trial is over. You are allowed only one answer per card.

Do you wish me to repeat the instructions?"
(repeat instructions if necessary)

"Place deck A close to you. Take the letter card off the top.
Deck A is a warm up or practice deck for you. Begin Now".

Feedback —— Each card

When answer is correct ——
"That is correct —— place that card on the white rectangle.
Pick up the next card.
Remember to read the number on the card out loud before turning it over."

When the answer is wrong —— "That is incorrect, the correct answer is .....
Place that card on the yellow rectangle.
Pick up the next card.
Remember to read the number on the card out loud before turning the card over."

Time fault —— "The time is up, the correct answer is .....
Place that card on the yellow rectangle.
Pick up the next card.
Remember to read the number on the card out loud before turning the card over."

When ten trials in one deck are completed, count the number correct in that deck. "You got ..... correct out of 10".

The first 5 trials are a warmup —— or practice.

The first numbers are the identification numbers. Each card has one. This number is read out loud by the subject and allows the experimenter to identify the anagram.

The letters in brackets are the scrambled words as the subject sees it. The numbers between the slashes are the median solve time for the anagrams.

Deck A —— warmup task 5 cards - Answers

30 quick _____(uickq) / 4.3 /
80 stand _____(stnad) / 3 /
139 trace _____(eract) / 6.4 /
247 novel _____(lenov) / 4.5 /
225 being _____(bnieg) / 4.8 /

"You got ..... correct out of five."
"Place all the cards together and push them to your far right."
"Take deck Z. Remove the letter card."
"Begin Now".

Deck Z - Answers

Pretest (test 1) with solve times

128 party _____(rtypa) /14.0/
222 bigot _____(otgib) / 5.2/
74 cause _____(uacse) / 5.5/
45 huffy _____(hffyu) / 7.5/
16 giant _____(ntgia) / 9.7/
129 fruit _____(iufrt) /15.0/
69 funny _____(nufyn) / 5.0/
12 drink _____(nrdki) / 7.0/
11 house _____(cuohs) / 6.0/
143 motor _____(oomtr) / 8.5/

"You got ..... correct out of 10."
"Place all the cards together and put them to your far right."
"Take deck B. Remove the letter card."
"Begin Now"

Deck B - Answers

145 smell _____(lmlse) /13.5/
91 money _____(yemon) / 5.0/
231 vogue _____(geuov) / 7.0/
90 jewel _____(jweel) / 5.9/
1 beach _____(bceah) / 9.5/

Pretest (test 1) ends
Learned helplessness failure induction begins on pink cards

430 aback _____(backa)
283 serum _____(ursem)
135 limbo _____(lombi)
22 sugar _____(gsrua)
[redacted]4 clerk _____(reckl)

"You got ..... correct out of 10."
"Place all the cards together and place them to your far right."

"The next task is an information quizz. Each one of the 6 far subject decks contains questions on the subject indicated on the front card. Your task is to answer the question. Select any two of those decks.

Take the deck that you are instructed to and remove the subject name card. When you receive the instructions 'Begin Now'. Pick-up the first card.

Read the number on the card out loud before turning the card over. Then turn the card over. Call out your answer loudly and clearly as soon as you have it. You will be given 5 seconds per card in which to respond. If you have not responded within that time you will be told that the trial is over. Remember that you are allowed only one answer per card.

Do you wish me to repeat the instructions?
(repeat instructions if necessary)

Which two decks have you selected" .....

"Place deck ..... to your left. Take off the subject name card."

"Begin Now"

Feedback instructions ---
Same as used for the anagram solution task (see page 91).

When the 20 trials are over (after each deck)

"You got ..... correct out of 20."
"Place all the cards together and place them to your far right."

Questions on the six different subject areas. Answers follow the questions.

The numbers are not consecutive as pilot data demonstrated only some of the potential questions were consistently unanswered. The others were dropped.

Sports and Games

1. How many spaces are there on a Scrabble board? (225)
2. What was the Montreal Expos' home before they moved to Olympic Stadium? (Jarry Park)
3. What's the international lawn tennis challenge trophy usually called? (Davis Cup)
4. What did the Gas House Gang play? (Baseball)
6. What is a meerschaum? (A pipe)
7. What is the name of the Iowa State football team? (The Cyclones)
9. What race did Rosie Ruiz not win in 1980? (Boston Marathon)
10. What baseball player was walked the most often? (Babe Ruth)
11. How old was Gordie Howe when he retired? (52)
13. What basketball player was known as the Big O? (Oscar Robinson)
14. What golfers were once known as The Big Three? (Gary Player, Arnold Palmer, Jack Niclaus)
16. Who was the first black to become the head coach of a major league pro sports team? (Bill Russel)
17. Who won the 1960 Olympic light-heavy weight boxing gold medal? (Cassius Clay)
18. What card game was invented by Harold S. Vanderbilt in 1925? (Contract Bridge)
21. What is the oldest stroke used in competative swimming? (Breast stroke)
22. How many horses are there on a polo team? (4)
23. What baseball player is known as Charlie Hustle? (Pete Rose)
24. What is approaching when a cyclist shouts "Oil"? (A car)
25. What does a harness racing driver sit in? (A sulky)
26. What did Dick Webster, Steve Nagey, and Don Nagey excel at? (Bowling)

Sciences and the Environment

1. What alloy do copper and tin form? (Bronze)
2. What does F.M. stand for? (Frequency Modulation)
3. How long does it take sunlight to reach the Earth? (8 minutes)

4. What part of the eye continues to grow throughout a person's life? (lens)
5. What travels through space at 66,700 miles per hour? (Earth)
7. What planet has the longest day? (Venus)
9. Who invented the reflecting telescope? (Issac Newton)
10. Where is the skin the thickest? (The back)
11. What do dates grow on? (Palm trees)
12. What does the typical Canadian eat 263 of per year? (Eggs)
13. What Antarctic base was established by Richard Byrd? (Little America)
15. What are the Roaring Forties? (Winds)
16. What glass cleaning device did Mary Anderson invent in 1902? (Windshield wiper)
17. How many pounds are there in a stone? (14)
18. Where are the cow's sweat glands located? (The nose)
20. What endangered animal is the symbol of the World Wildlife Fund? (Panda)
24. What wheel did Blaire Pascal invent in the search for perpetual motion? (Roulette Wheel)
25. What is a dactylogram? (Finger print)
26. What is the inventor Thomas Crapper famous for? (Flush toilet)

Geography

1. How many floors are there in the Empire State building? (102)
2. What was known as Spice Island? (Zanzibar)
3. Where is Nob Hill? (San Francisco)
4. What is the London street that is the home of British journalism? (Fleet Street)
5. What country exports goods through the port of Durban? (South Africa)
6. What state contains the geographic centre of ~~the U.S.?~~ (South Dakota).
7. What is the capital of Australia? (Canaberra)
8. What mountains separate Europe from Asia? (Urals)
9. What government position is held by the resident of 11 Downing Street? (Chancellor of the Exchequor).
12. What two countries border the Dead Sea? (Israel and Jordan)
13. What body of water borders Saudia Arabia to the east? (The Persian Gulf)
14. What is the largest island in the West Indies? (Cuba)
15. What country is the resort city of St. Moritz in? (Switzerland)
16. What Mormon university is found in Provo City, Utah? (Brigam Young)
19. What is the largest port in France? (Marseilles)
20. What is the capital of Iraq? (Bhagdad)

21. What city has the world's longest subway system? (London)
23. What city has the tallest building outside of the U.S.? (Toronto)
24. Where are the Pampas? (Argentina)
25. What country has the most movie theatres? (Soviet Union)

Literature

1. What is the last name of Lucy and Linus? (Van Pelt)
4. What was Odysseus called by the Romans? (Ulysses)
5. What plant did St. Patrick use to explain the Trinity? (Shammrock)
6. What Dickens novel has David carrying this message, "Barkis is willin' " to Peggy? (David Copperfield)
7. What Watergate figure was the author of numerous spy novels? (E. Howard Hunt)
8. What is the Spanish word for Black? (Negro)
9. Who built the Spruce Goose? (Howard Hughes)
10. What French Impressionist is famed for his paintings of ballet dancers? (Edgar Degas)
11. What novel contains the line, "Who promoted Major, Major?"? (Catch 22)
12. What was H.G. Wells' first novel? (Time Machine)
14. What Shakespearian play features the line, "A plague on both your houses!"? (Romeo and Julliet)
16. What Cornelius Ryan book chronicles the events of D Day? (The Longest Day)
17. What inspired Jimmy Breslin's novel .44? (Son of Sam Rillings)
19. How much did the first issue of Playboy cost? (50 cents)
20. What is the biggest selling magazine aimed at a black audience called? (Ebony)
21. What renowned Irish writer wore an eye patch? (James Joyce)
22. What Somerset Maugham novel has been filmed three times? (Human Bondage)
23. Who created Peter Rabbit? (Beatrice Potter)
24. What city did Sam Spade work in? (San Francisco)
25. What were the Dolls in Jaqueline Susann's "Valley of the Dolls"? (Pills)

Entertainment

1. What country and western singer is known as the Silver Fox? (Charlie Rich)
2. What actress played Peter Pan on Broadway? (Mary Martin)
3. Who began his entertainment career as Silver Sam the Dancing Midget? (Sammy Davis Jr.)

4. Who was Mrs. Dumbo's son? (Jumbo)
5. What was John Wayne's last movie? (The Shootist)
7. What 1963 movie comedy had over 50 stars in it? (Its a Mad Mad Mad World)
9. What was the name of Beaver Cleaver's brother? (Wally)
10. Who played Victoria Barkley on The Big Valley? (Barbara Stanwyck)
12. What British TV series featured Emma Peel? (The Avengers)
13. What singer won the 1943 Alabama - Mississippi State Fair music contest? (Elvis Presly)
14. Who signed Clark Gable's military service discharge? (Ronald Reagan)
15. Who played bounty hunter Josh Randall on TV? (Steve McQueen)
16. What were the rival gangs called on West Side Story? (The Sharks and the Jets)
17. Who was Napoleon Solo's partner? (Illya Kuryakin)
19. Who directed Anatomy of Murder? (Otto Preminger)
21. Who narrated the Untouchables for $25,000 an episode? (Walter Winchet)
22. What was the name of Humphery Bogart's club in Casablanca? (Rick's Café American)
23. Who was the announcer and sidekick on Joey Bishop's talk show? (Roger Philbin)
24. What type of acts were barred from the Miss America contest's in 1948? (Animal acts)

News, Public Events, or History

1. What began August 15, 1960, on Max Yasgurs's dairy farm? (Woodstalk Music Festival)
2. What is the name of Ronald Reagan's 688 acre California spread? (Ranch del Cielo)
3. What daughter of Czar Nicholas the second is said to have escaped death in the Russian Revolution? (Anastasia)
4. What did Englishman John Hawkins begin selling to the New World in 1562? (Slaves)
5. What des RCA stand for? (Radio Corporation of America)
6. What does S.A.L.T. stand for? (Strategic Arms Limitation Treaty)
7. Who was Bob Woodward's secret Watergate contact? (Deep throat)
8. Who married actress Nancy Davis? (Ronald Reagan)
10. What actor married John F. Kennedy's sister? (Peter Lawford)
12. Who did Elizabeth Taylor divorce 11 days before she married Richard Burton? (Eddie Fisher)
13. What 20th century African leader gave himself the title Conqueror of the British Empire? (Idi Amin)

15. What English Explorer was set adrift by his mutinous crew near the bay that bears his name? (Henry Hudson)
17. Which one of Hitler's deputies parachuted into Scotland to negotiate peace terms? (Rudolph Hess)
18. What ship sank the British battleship Hood? (Bismark)
19. What university was laid to seige in the 1968's Battle of Morningside Heights? (Columbia)
20. What explorer was nicknamed Iberia's pilot? (Christopher Columbas)
21. What country ws Sir Edmond Hillary born in? (New Zealand)
22. How many days were the 52 hostages held in Iran? (444)
23. Who declared, "I have been to the mountain!"? (Martin Luther King Jr.)
24. What did it become illegal to burn in August 1965? (Draft cards)

"The next task is anagram solution. Take the deck that you are instructed to. Take the letter card off the top. When you receive the instructions "Begin Now" Pick-up the next card. Read the number on the card out loud. Immediately turn the card over and begin to work through your solution.

Call out your solution loudly and clearly as soon as you have it. You will then be given further instructions.

You will be given 20 seconds per card to solve the anagram. If you have not responded during that time you will be told that the trial is over. You are allowed only one answer per card.
Do you wish me to repeat the instructions ? "
(repeat instructions if necessary)

"Place deck C to your left ... "
"Begin Now" Feedback as per page 91.

Failure Anagrams all median solve times over 30 seconds.

Deck C - Answers

35	youth	_____(ohytu)
180	comet	_____(coetm)
429	ultra	_____(arult)
500	irony	_____(nryni)
501	hence	_____(chene)
91	apron	_____(oaprn)
93	opium	_____(pmuoi)
48	ghoul	_____(oulgh)
129	incur	_____(nrcui)
444	mania	_____(mnaai)

"You got ..... correct out of 10."
"Place all the cards together and put them to your far right.
Place deck Q to your left and procede as before whenever you are ready."
"Begin Now".

Deck Q - Answers

391 parry _____(rpyra)
244 imply _____(ilmyp)
145 guard _____(augdr)
29 lapel _____(llpae)
77 banal _____(alanb)
400 karma _____(mkara)
92 pause _____(speua)
50 bacon _____(ocbna)
181 stare _____(stera)
108 elect _____(tlcee)

"You got ..... correct out of 10."
"Place all the cards together and put them to your far right".

"Place deck K to your left".
"Begin Now".

Deck K - Answers

61 shore _____(osher)
25 affix _____(fxfai)
505 table _____(alcbt)
176 befit _____(iefbt)
28 alarm _____(rmaal)
237 rerun _____(nerur)
27 ratio _____(orati)
504 birth _____(rhtib)
40 groin _____(rigon)

"You got ..... correct out of 10.
Place all the cards together and put them to your right."

"The next task is to determine the solution of various mathematical problems. There may be addition, subtraction, multiplication or division involved, or the question may test general mathematical knowledge. Your task will be to answer the question presented on the card.

"Place Math Deck A to your left. Take the title card off the top. When you are given the instructions 'Begin Now' pick-up the next card, read the number on the back of the card aloud. Immediately turn the card over and begin to work through your solution.

You will be given 7 seconds per card to solve the problem. If you have not responded within that time you will be told that the trial is over. You are allowed only one answer per card.
Do you wish me to repeat the instructions ? "
(repeat instructions if necessary)
"Begin Now".

Questions and Answers

4) What is 3.14158 better known as? (pi)
6) 19 x 27 = ? (513)
8) What is the normal body temperature in centigrade? (37 degrees)
9) If a litre of gas costs 40 cents how much would an imperial gallon cost? ($1.82)
13) How many gaves are played in a five team round robin? (10)
15) How many sides does a nonagon have? (9)
16) How many land miles are there in a league? (3)
19) What is a Univac one? (a computer)
21) What is the Roman numberal for 50? (L)
22) What is the minimum number of bars in an abacus? (9)
23) How many logirythmic scales are there on a slide rule? (2)
25) How many cups of butter are there in a pound? (2)
28) What is 40% of forty? (16)
31) What is 70% of seventy? (49)
33) What is the term for any four sided figure? (quadrelateral)
39) What is the square root of 900? (30)
40) What is an isosoles triangle? (One with two sides equal.)
42) Who is known as the father of geometry? (Euclid)
43) What is the curved line between any two points on a circle called? (an arc)
49) What is the formula for calculating circumference? (2 pi r)

Feedback for each card is the same as per page 91 .

"You got ..... correct out of 20.
Place all the cards together and put them to your far right."

"The next task is anagram solution. Place deck J to your left. Take the letter card off the top. When you are given the instructions 'Begin Now' pick-up the next card. Read the number on the card out loud. Immediately turn the card over and begin to work through your solution.

Call out your solution loudly and clearly as soon as you have it. You will then be given further instructions.

You will be given 20 seconds per card to solve the anagram. If you have not responded by that time, you will be told that the trial is over and you are allowed only one answer per card.

Do you with me to repeat the instructions? "
(repeat the instuctions if necessary)

Feedback as page .

Failure Anagrams

"Begin Now"

Deck J - Answers

147	flirt	_____(itlfr)
80	adopt	_____(dpaot)
43	caper	_____(ceapr)
288	rhyme	_____(yrehm)
46	scale	_____(elcsa)
247	panic	_____(pncia)
183	cargo	_____(ocarg)
280	conic	_____(iconc)
56	patio	_____(aitop)
502	flour	_____(lrufo)
428	actor	_____(oract)

"You got ..... correct out of ten."

"Place all the cards together and place them to your far right".
"Take deck D."
"Begin Now".

Deck D - Answers

182 stall _____(saltl)
94 audit _____(dtuai)
97 blare _____(aebrl)
198 horde _____(ehdro)
103 pupil _____(ulipp)
248 uncle _____(eucnl)
96 nudge _____(dneug)
298 mobil _____(lambi)
445 occur _____(crcou)
503 cough _____(huocg)

"You got ..... correct out of ten."

"Place all the cards together and put them to your far right.
Take deck S".
"Begin Now".

Deck S - Answers

106 icing _____(cnigi)
506 rated _____(aretd)
130 oasis _____(ssoia)
103 delve _____(eevdl)
449 mural _____(lamru)

Post Failure Test (test 2) begins

127 trend _____(nrtde) /14.0/
383 spore _____(repos) / 5.1/
100 prick _____(icrpk) / 5.5/
60 heart _____(hract) / 9.5/
377 couch _____(ccouh) / 6.8/

"You got ..... correct out of ten."

"Place all the cards together and put them to your far right.
Take deck F."
"Begin Now".

Deck F - Answers

130 human _____(mhnua) /15.0/
8 labor _____(orlab) / 5.0/
2 guide _____(eguid) / 7.0/
140 flood _____(olfdo) / 6.0/
18 cloth _____(lcoht) / 9.0/
125 mohth _____(ohtmn) /13.0/
7 triad _____(adtri) / 5.0/
14 fault _____(ultfa) / 7.0/
278 beefy _____(eeyfb) / 6.0/
488 lanky _____(lkany) / 9.2/

Post failure test (test 2) ends

"You got ..... correct out of 10."

"Place all the cards together and put them to your far right."

Phase 4

Control Group: Group 1

"The experiment calls for a four minute break at this point. Remain seated. Please do not look at any of the cards in the decks."

The experimenter and subject remained seated. No conversation occured.

Phase 4

Group 2: Real Solve

"The next task is again to determine the solution of anagrams. Take deck W and remove the letter card. When you receive the instructions "Begin Now" pick-up the next card and read aloud the number on the card. Turn the card over and begin to work through your solution. You will have as long as you require to come to a correct solution for the anagram.

Do you wish me to repeat the instructions ? "
(repeat the instructions if necessary)

"Begin Now"

Deck W

601	score	_____	escro (14.3)
602	alike	_____	aliek (14.7)
603	niece	_____	escin (16.8)
604	motif	_____	timof (13.5)
605	sable	_____	absle (13.5)
606	query	_____	requy (14.5)
607	adept	_____	depat (14.8)
608	print	_____	tirpn (15.1)
609	plead	_____	plaed (14.2)
610	cable	_____	calbe (13.7)

"You got ..... correct out of 10.

Place all the cards to your far right."

Feedback:

- when no response is given after 1 minute, "Would you like to use a paper and pencil."
- when the answer is wrong, "That is incorrect please try again".
- when the answer is correct, "That is correct please place the card, on the white rectangle."

Phase 4

Group 3: Imagine Solve

"The next task is to imagine solving the anagrams. Take deck H and place it close to you. Remove the letter card. When you receive the instructions "Begin Now" pick-up the next card. Read aloud the number on the card. Immediately turn the card over and close your eyes. Imagine solving an anagram. Do or say nothing else. Run through the task only once. When you have done this say "Done" out loud. You will then receive further instructions.

Do you wish me to repeat the instructions?"

(repeat the instructions if necessary)

"Begin Now"

289 _____
413 _____
116 _____
260 _____
421 _____
386 _____
34 _____
191 _____
212 _____
26 _____

"You have performed this task 10 times."

Place all the cards to your far right.

Feedback - when subject says "Done" "Well done (or Good). Place that card on the white rectangle and procede to the next card".

Phase 4

Group 4: Real Fail

The next task is to solve anagrams. Take deck T and place it close to you. Remove the letter card. When you receive the instructions "Begin Now" take the next card, read out loud the number on the card. Immediately turn the card over and begin to work on your solution. Say your solution loudly and clearly as soon as you have it. You will then receive further instructions. You will have 20 seconds per card to solve the anagram. If you have not responded within that time you will be told that the trial is over. You are allowed only one answer per card.

Do you wish me to repeat the instructions?"

(the instructions will be repeated if necessary).

"Begin Now"

Deck T

101	belie	_____(leebi)
147	lunar	_____(rlanu)
49	havoc	_____(acohv)
72	tango	_____(gaton)
57	joust	_____(sjtao)
95	endow	_____(eondw)
50	cobra	_____(baroc)
149	poker	_____(eokrp)
293	moron	_____(monor)
396	reuns	_____(nurse)

"You got ..... correct out of 10.

Place all the cards together and put them to your far right."

Feedback

- When no response is given. The time is up. The correct response is ... Place that card on the yellow rectangle.

- When the answer is wrong, "That is incorrect please try again."

- When the answer is correct, "That is correct please place the card on the white rectangle."

Phase 4

Group 5: Imagined Fail

The next task is to imagine failing to solve anagrams. Take deck H and place it close to you. Remove the letter card. When you receive the instructions "Begin Now" take the next card and read out loud the number on the card. Immediately turn the card over and close your eyes. Imagine trying to solve an anagram. Imagine that you are not successful, that you cannot solve the anagram. Do or say nothing else. Run through this task only once. When you have done this say the word "Done" out loud. You will then receive further instructions.

Do you wish me to repeat the instructions?"

(the instructions will be re-read if necessary)

"Begin Now"

289 _____
413 _____
116 _____
260 _____
421 _____
386 _____
34 _____
191 _____
212 _____
26 _____

"Place that card on the yellow rectangle and procede to the next card".

"That is ten trials."

"The next task is anagram solution. Take the deck that you are instructed to. When you receive the instructions "Begin Now" pick-up the next card and read aloud the number on the card, immediately turn the card over and work through your solution. Call out your solution loudly and clearly as soon as you have it. You will then be given further instructions.

You will be given 20 seconds per card to solve the anagram. If you have not responded during that time you will be told that the trial is over. You are allowed only one answer per card.
Do you wish to repeat the instructions? "
(repeat the instructions if necessary)

Feedback as page . All subjects are then told "I would now like you to fill in a short questionnaire. Please read carefully the instructions on the first page. There is no need to put your name on the sheet."

"Place Deck R to your left."
"Begin Now"

Deck R - Answers

Post treatment test (test 3)

507 shape _____(ahpse) /14.0/
144 shrug _____(gshru) / 5.2/
279 banjo _____(jnbao) / 5.6/
23 catty _____(tacty) / 9.7/
67 grown _____(grnow) / 6.5/
163 charm _____(rhacm) / 15.0/
152 hound _____(ounhd) / 5.0/
65 trial _____(taril) / 7.0/
32 speed _____(edpes) / 6.0/
64 wrote _____(etrow) / 9.0/

"You got ..... correct out of 10."
Place all the cards together and put them to your far right.
Place Deck P to your left and procede as before whenever you are ready."

Deck P - Answers

146 slush _____(llsuh) /14.0/
9 jaunt _____(ntjau) / 5.0/
240 anger _____(genar) / 8.0/
432 quart _____(qutra) / 5.9/
120 roach _____(hroac) / 9.5/

Post treatment test (test 3) ends

Final five simple anagrams

227 cloud _____(colud) / 2.6/
284 queen _____(nquec) / 2.1/
296 lucky _____(klucy) / 2.4/
295 major _____(mrajo) / 4.1/
36 plaza _____(pzlaa) / 2.5/

"You got ..... correct out of 10.
Place all the cards together and place them to your right.
I'd like to ask just a few questions and them I will explain what the experiment was about and answer any questions that you might have."

Subject's Number: _____

Age: _____

Sex: _____

THE BETTS QMI VIVIDNESS OF IMAGERY SCALE

Instructions for Doing Test

The aim of this test is to determine the vividness of your imagery. The items of the test will bring certain images to your mind. You are to rate the vividness of each image by reference to an accompanying rating scale, reproduced below and on top of the next page. For example, if your image is "vague and dim" you give it a rating of 5.

Before turning to items on the next pages, familiarize yourself with the different rating scale categories printed below and on top of the following page. Please do not leave any page until you have completed the items on the page you are doing, and do not go back to check on completed items. Complete each set before moving on to the next set. Try to do each item separately, independently of how you may have done other items.

The image aroused by an item of this test may be -

Perfectly clear and as vivid as the actual experience..	Rating 1
Very clear and comparable in vividness to the actual experience.....	Rating 2
Moderately clear and vivid.....	Rating 3
Not clear or vivid, but recognizable.....	Rating 4
Vague and dim.....	Rating 5
So vague and dim as to be hardly discernible.....	Rating 6
No image present at all, you are only aware that you are thinking of the object.....	Rating 7

An example of an item on the test would be one which asked you to consider an image which comes to your mind's eye of a red apple. If your visual image was moderately clear and vivid you would check the rating scale and mark "3" on the prepared answer sheet.

Now turn to the next page when you have understood these instructions and begin the test.

Here is the rating scale again in brief:

Perfectly clear and vivid:	Rating 1	Vague and dim:	Rating 5
Very clear:	Rating 2	Hardly discernible:	Rating 6
Moderately clear:	Rating 3	No image at all:	Rating 7
Recognizable:	Rating 4		

Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. Classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item		Rating
1.	The exact contour of face, head, shoulders and body..	( )
2.	Characteristic poses of head, attitudes of body, etc.	( )
3.	The precise carriage, length of step, etc. in walking	( )
4.	The different colours worn in some familiar costume..	( )

Think of seeing each of the following, considering carefully the picture which comes before your mind's eye; and classify the image suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

5. The moon as it is sinking below the horizon..... ( )

Think of each of the following sounds, considering carefully the image which comes to your mind's ear, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item

6. The whistle of a locomotive..... ( )
7. The honk of an automobile..... ( )
8. The meowing of a cat..... ( )
9. The sound of escaping steam..... ( )
10. The clapping of hands in applause..... ( )

Think of "feeling" or touching each of the following, considering carefully the image which comes to your mind's touch, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item

11. Sand..... ( )
12. Linen..... ( )
13. Fur..... ( )
14. The prick of a pin..... ( )
15. The warmth of a tepid bath..... ( )

Think of performing each of the following acts, considering carefully the image which comes to your mind's arms, legs, lips, etc., and classify the images suggested as indicated by the degree of clearness and vividness specified on the Rating Scale.

Item Rating

16. Running upstairs..... ( )
17. Springing across a gutter..... ( )
18. Drawing a circle on paper..... ( )
19. Reaching up to a high shelf..... ( )
20. Kicking something out of your way..... ( )

Think of testing each of the following considering carefully the image which comes to your mind's mouth, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item

21. Salt..... ( )
22. Granulated (white) sugar..... ( )
23. Oranges..... ( )
24. Jelly..... ( )
25. Your favourite soup..... ( )

Think of smelling each of the following, considering carefully the image which comes to your mind's nose and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item

26. An ill-ventilated room..... ( )
27. Cooking cabbage..... ( )
28. Roast beef..... ( )
29. Fresh paint..... ( )
30. New leather..... ( )

Think of each of the following sensations, considering carefully the image which comes before your mind, and classify the images suggested as indicated by the degrees of clearness and vividness specified on the Rating Scale.

Item

31. Fatigue..... ( )
32. Hunger..... ( )
33. A sore throat..... ( )
34. Drowsiness..... ( )
35. Stuffed as from a very full meal..... ( )

When subject's have completed the Betts' Questionnaire they are asked the following questions.

Subject Information Questionnaire to be given at the end of the Experiment.

Sex _____ Year _____ Area of concentration _____

Language _____

What did you think the task was about?

Do you do word games often? Yes No

Are they similar to this one? Yes No

Could you follow the instructions to the task? Yes No

Can you describe what occurred when you did?

Did you use pictures or words or any thing else when you were imagining the task.

Did you actually think of a 5 letter word? Yes No
Can you tell me what word it was they were.

Did you do or say anything else privately when you were imagining the task?
Yes No
Can you describe what that was?

Do you imagine doing things, like practicing something before you do it?
Frequently - About half the time - Sometimes - Rarely - Never

What kinds of things do you practice?

What happens when you do? The same thing as now or something else?

Why do you practice imaginally?

What generally is the end result of this practice?

Have you spoken to anyone about the experiment?
Please do not as this would interfere with their performance when they come in.

Complete debriefing - explain the tasks and the manipulations involved - explain the group that the subject was in.

Do you have any questions? answer fully.

Example of Data Collection Sheet

Subject________

Baselines

Deck Z	Deck S	Deck R
128 party____	127 trend____	507 shape____
222 bigot____	383 spore____	144 shrug____
74 cause____	100 prick____	279 banjo____
16 giant____	377 couch____	67 grown____
45 huffy____	60 heart____	23 catty____
$\bar{x}$=8.38 m=7.5	$\bar{x}$=8.18 m=6.8	$\bar{x}$= 8.2 m= 6.5
S$\bar{x}$= Sm=	S$\bar{x}$= Sm=	S$\bar{x}$= Sm=

	Deck F	
129 fruit____	130 human____	163 charm____
69 funny____	8 labor____	152 hound____
12 drink____	2 guide____	65 trail____
11 house____	140 flood____	32 speed____
143 motor____	18 cloth____	64 wrote____
$\bar{x}$=8.3[illegible] m=7	$\bar{x}$=8.4 m= 7	$\bar{x}$=8.38 m=7
S$\bar{x}$= Sm=	S$\bar{x}$= Sm=	S$\bar{x}$= Sm=

Deck B		Deck P
145 smell____	125 month____	146 slush____
91 money____	7 triad____	9 jaunt____
231 vogue____	14 fault____	240 anger____
90 jewel____	208 beefy____	432 quart____
1 beach____	488 lanky____	120 roach____
$\bar{x}$=8.18 m=7	$\bar{x}$=8.04 m=7	$\bar{x}$=8.44 m=8
S$\bar{x}$= Sm=	S$\bar{x}$= Sm=	S$\bar{x}$= Sm=

Grand $\bar{X}$=8.29 Grand M= G $\bar{X}$= G M= G$\bar{X}$= GM=

S$\bar{X}$= SM= S$\bar{X}$= SM= S$\bar{X}$= SM=

Treatment: Phase II Scores

Fail or Success Deck Imagine	Real Solving Deck W	Real Failure Deck T
1 ____	601 score____	101 belie____
2 ____	602 alike____	149 lunar____
3 ____	603 neice____	49 havoc____
4 ____	604 motif____	72 tango____
5 ____	605 sable____	57 joust____
S$\bar{x}$= Sm=____	$\bar{x}$=14.56 m= 14.3	x=78.8 m= 28
	S$\bar{x}$= Sm=	Sx= Sm=
6 ____	606 query____	95 endow____
7 ____	607 adept____	50 cobra____
8 ____	608 print____	249 poker____
9 ____	609 plead____	293 moron____
10 ____	610 cable____	396 nurse____
S$\bar{x}$= Sm=	$\bar{x}$=14.46 m= 14.5	x=97.2 m= 24
	S$\bar{x}$= Sm=	S$\bar{x}$= Sm=

BETTS Questionaire

Total Score________

Scale 1 picture____
Scale 2 Sound____
Scale 3 Tactile____
Scale 4 Kinetic____
Scale 5 Taste____
Scale 6 Smell____
Scale 6 Sense____

Failure induction data

Deck A
30____
80____
139____
247____
225____

Deck B
330____
283____
135____
22____
34____

Information Decks

Deck____
1____

Deck____

Deck C
35____
130____
429____
500____
91____
93____
48____
129____
444____

Deck Q
391____
244____
145____
29____
77____
400____

92____
50____
181____
108____

Deck K
61____
25____
505____
176____
28____
237____
27____
504____
40____

Math Deck A

Deck J
147____
[illegible]____
[illegible]____
[illegible]____
[illegible]____
[illegible]____
183____
280____
56____
502____

428____

Deck D
182____
94____
97____
198____
103____
248____
96____
298____
445____
503____

Deck S
106____
506____
130____
103____

APPENDIX B

ANOVA tables

ANOVA table for the data of the pretest (test 1) compared to the post failure test (test 2) for the variable mean solve time.

Source	SS	DF	MS	F	P(F)
A	2.6315631	4	.657890776	.0798517433	.985201957
SWG	486.095284	59	8.23890311		
B	860.648931	1	860.648931	267.903675	9.63402295E-10
AB	6.13662388	4	1.53415597	.47755363	.754698456
BS.WG	189.539345	59	3.21253127		
Tests of Simple Main Effects					
A at B1	3.39288908	4	.848222271	.148142537	.960848971
A at B2	5.37530153	4	1.34382538	.234699923	.91708516
B at A1	156.387462	1	156.387462	48.6804483	1.72874011E-06
B at A2	156.729242	1	156.729242	48.7868377	1.71030141E-06
B at A3	190.594895	1	190.594895	59.3285726	6.58387343E-07
B at A4	222.955679	1	222.955679	69.4018705	3.09800802E-07
B at A5	140.118285	1	140.118285	43.6161623	2.96972133E-06

ANOVA table for the data of the pretest (test 1) compared to the post failure test (test 2) for the variable number of anagrams not solved

Source	SS	DF	MS	F	P(F)
A	7.17546608	4	1.79386652	.262480237	.900128157
SWG	403.223213	59	6.83429175		
B	931.444494	1	931.444494	407.048827	2.25711018E-10
AB	6.0885021	4	1.52212552	.665181246	.621588379
BS.WG	135.008926	59	2.28828689		
Tests of Simple Main Effects					
A at B1	4.09937765	4	1.02484441	.224683054	.922732539
A at B2	9.16459053	4	2.29114763	.502302632	.737103566
B at A1	175.855978	1	175.855978	76.8504494	1.9106649E-07
B at A2	184.130434	1	184.130434	80.4664989	1.53945407E-07
B at A3	179.378881	1	179.378881	78.3900315	1.74038516E-07
B at A4	245.99379	1	245.99379	107.501289	4.07425902E-08
B at A5	152.173913	1	152.173913	66.5012388	3.79928681E-07

ANOVA table for the data of the pretest (test 1) compared to the post treatment test (test 3) for the variable mean solve time.

Source	SS	DF	MS	F	P(F)
A	39.0750686	4	9.76876714	.727016146	.579509045
SWG	792.770924	59	13.4367953		
B	96.5185788	1	96.518788	34.0438565	1.0123778E-05
AB	28.0146134	4	7.00365336	2.4703158	.0535448126
BS.WG	167.272358	59	2.83512471		
Test of Simple Main Effects					
A at B1	3.46926731	4	.867316826	.106602887	.976976512
A at B2	63.6204147	4	15.9051037	1.95491419	.10486128
B at A1	42.3032161	1	42.3032161	14.921113	5.24489277E-04
B at A2	2.64000934	1	2.64000934	.931179263	.65981561 4
B at A3	4.20052352	1	4.20052352	1.48160097	.226293873
B at A4	57.9309349	1	57.9309349	20.4332934	1.2249404lE-09
B at A5	17.4585104	1	17.4585104	6.15793384	.015182756

ANOVA table for the data of the pretest (test 1) compared to the post treatment test (test 3) for the variable number of anagrams not solved

Source	SS	DF	MS	F	P(F)
A	25.055895	4	6.26397376	.676832015	.613552913
SWG	546.035713	59	9.2548426		
B	76.5279473	1	76.5279473	26.8018164	3.29449071E-05
AB	53.9378906	4	13.4844727	4.72256703	2.58156971E-03
Test of Simple Main Effects					
A at B1	4.335404	4	1.083851	.178998486	.946657028
A at B2	74.6583828	4	18.6645957	3.08246647	.0185069974
B at A1	54.7826091	1	54.7826091	19.1861076	1.65081352E-04
B at A2	.496894536	1	.496894536	.174023695	.681272894
B at A3	.031055523	1	.031055523	.010863459	.91384325
B at A4	60.12422234	1	60.1242234	21.0568617	1.06126178E-04
B at A5	15.0310565	1	15.0310565	5.26421565	.0238602755

APPENDIX C

Betts Vividness of Imagery Scale Data

Appendix C

Betts Vividness of Imagery Scale Data

Group	Range on Scores of Betts	Group Mean	SD
Control	60-125	88.29	26.18
Real Solve	60-124	81.62	19.32
Imagine Solve	39-110	75.71	18.32
Real Fail	46-121	89.29	23.69
Imagine Fail	50-126	82.50	21.21

ANOVA table for the between groups comparison on the Betts

Source	SS	DF	MS	F	P(F)
Between	1558.62	4	389.655	.844745	.50
Within	26292.3	57	461.269		
Total	27850.9	61			