

THE UNIVERSITY OF MANITOBA
THE EFFECTS OF FAILURE STRESS ON EXAMINATION-LIKE
COMPETITIONAL AND NON-COMPETITIONAL TASKS

by

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INTRODUCTION

Most learning theorists (Kimble, 1961) agree that performance is not a direct measure of learning. Instead a variety of variables have been suggested which either enhance or detract from a true measure of learning. In an examination or testing setting one such variable may be stress and the purpose of the present thesis is to examine the effects of stress on performance in a testing situation.

The intended function of most academic testing is to reveal what a student has learned, but examinations may also reveal how capable a student is in performing in a stressful time-limited situation. The implication is that stress may in some manner interact with knowledge to produce spurious examination results. Because of the restrictions imposed upon the examinee and because of the emphasis placed upon examination results, stress appears to be a "built-in" factor in most testing situations. The level of stress itself may be a function of numerous antecedent conditions including previous examination performance, the level of competence of other examinees, personality characteristics, etc.

Spence and Taylor (1958) theorize that stress has particular effects upon performance under certain specifiable conditions. According to the Spence-Taylor theory, stress increases drive (Hull's concept) which acts as a multiplier of all habits elicited in a situation. Drive (D) is a function of the magnitude of a hypothetical mechanism r_e , a persistent emotional response aroused by aversive stimulation.

Stress, therefore, functions to arouse r_e which in turn elicits D. Individuals may differ in the magnitude of their reflex response to noxious stimulation and therefore in their level of drive under such conditions. By manipulating the level of stress, one could therefore manipulate the level of drive in individuals and hence control the habit strength of responses to any stimulus cues in a given situation.

Drive theory suggests that the strongest response is the most probable in a given situation and the stronger the drive, the more probable the response. This means that any single response with the greatest habit strength in a given situation has the greatest probability of occurrence. If the dominant response in an organism's response repertoire, with respect to a particular task, is incorrect, the position from drive theory is that the stronger the drive, then the greater is the probability that this incorrect response will occur, relative to other responses. In situations where the correct response is dominant, i.e., has the greatest habit strength, highly stressed subjects should exhibit superior performance relative to non-stressed subjects. This situation should hold as long as the ceiling for a particular response has not been reached. If a response is already occurring at maximum probability then any increase in drive should have no effect with respect to increasing its probability of occurrence.

Goulet (1968) in a survey report concludes that verbal learning paradigms are convenient and appropriate tasks in which to test the Spence-Taylor theory. The strengths of the stimuli and responses can be easily controlled. For this reason, noncompetitive lists in which

the formation of each S-R association is isolated as much as possible from the others by minimizing the degree of formal and meaningful similarity among the stimulus and response terms as well as the degree of associative connection between each stimulus and non-paired response terms, have been constructed. Similarly, competitive lists in which the degree of association is maximized have also been constructed. With respect to a noncompetitive list, drive theory would predict that there would be no difference between high and low drive groups in the early stages of learning, because no relevant habit strength exists, and that high drive groups would become superior as learning progressed (Spence, 1958; Taylor, 1958; Taylor and Chapman, 1955). On a competitive list, high drive subjects should exhibit inferior performance relative to low drive subjects (Spence, Taylor and Kretchel, 1956).

Spence, Farber, and McFann (1956) demonstrated that high drive (measured by the Manifest Anxiety Scale) impairs performance on a competitionnal paired-associates list and facilitates performance on a low competitionnal list. High anxious subjects exhibited relatively better performance than low anxious subjects on a low competitionnal list, where correct dominant responses were prevalent and hence facilitated by high drive, and relatively poorer performance on a competitionnal task where the correct responses were subordinate. On this list, high drive tended to facilitate the production of dominant responses (which in this case were incorrect) at the expense of the correct subordinate responses. Katahn and Lyda (1960), utilizing a task whereby subjects were required to choose a correct response word

from a series of either competition or low competition words for a particular stimulus word, found that anxiety facilitated the acquisition of responses highest in the individual's response hierarchy and interfered with the acquisition of responses lower in the hierarchy. These results are consistent with Spence et al. if one were to assume that the responses to a well learned task are high on the individual's response hierarchy and that those from a poorly learned task are low on the response hierarchy. This is a valid assumption since learning does appear to increase the probability of occurrence of a response.

Drive (anxiety), measured by the MAS, therefore appears to be a valid factor with respect to the level of performance for certain types of tasks. Some theorists (Child, 1954; Mandler and Sarason, 1952) have hypothesized that the problem the high anxious subject faces is that, when confronted with a potentially stressful task, he makes responses which are irrelevant to task completion and which interfere with responses leading to task completion. These hypotheses are consistent with drive theory. The task irrelevant responses may merely be competing responses which are facilitated by high drive.

There are other factors, many of which are present at examination settings, which serve to increase drive. Zajonc (1965) has proposed that the presence of an audience enhances the emission of dominant responses by increasing the subject's general drive level. When audience presence tends to impair performance it is plausible to assume that the subject's dominant responses are incorrect. Zajonc and Sales (1966) demonstrated the validity of this hypothesis when

they found that the presence of an audience did in fact enhance the emission of dominant responses at the expense of subordinate weaker responses. A procedure (Zojone and Nieuwenhuys, 1964) previously sensitiv^e to drive effects was employed in this study. Competing verbal habits of varying strengths were established in subjects by exposing them to different verbal stimuli, a different number of times. After training, these verbal stimuli served in a recognition and pseudo recognition task. On recognition trials the verbal stimuli were presented tachistoscopically for purposes of threshold assessment. Pseudo recognition trials, where the subject was led to believe that a stimulus was actually shown, while only a rapid flash of an empty T-scope was presented to him were interspersed among the recognition trials. Because the subjects were expected to guess on every trial what verbal stimulus was shown, and since no stimuli were shown on the pseudo recognition trials, their guessing responses on the pseudo trials alone were a function of the habits established during training. Because on any one trial the subject could make only one of several alternative responses, these habits were in competition with each other.

The presence of an audience apparently affects the quality of performance by increasing general drive level. With respect to most paired-associates tasks, audience presence tends to improve performance on noncompetitive lists and to impair performance on competitive lists (Cottrell, Rittle, and Wack, 1967). This may be due to the fact that for a competitive list increased drive increases the probability

of occurrence of the competing responses, i.e., the dominant responses, which serves to interfere with the emission of correct responses. The reverse situation is true for a noncompetitive list where increased drive facilitates the emission of correct responses.

Audience presence, therefore, seems to have the same effect on paired-associate learning as do high scores on the Manifest Anxiety Scale. Thus, it is plausible to assume that audience presence is in some way related to anxiety production (increased drive). However, it is important to differentiate between anxiety that is chronic or long standing and which is usually measured by the MAS (Spence, Farber, and McFann, 1956) and experimenter-induced factors which may be included under the general concept of stress (This concept will be defined operationally at a later point in this paper.) This is analogous to the differentiation provided by Cattell and Scheier (1961) between state anxiety and trait anxiety. The trait anxiety factor was interpreted as being a relatively permanent personality characteristic (defined this way by Cattell and Scheier, 1961); state anxiety was a transitory state which fluctuated over time and the intensity of which was contingent upon environmental variables. Both concepts (anxiety and stress) are relevant with respect to examination performance and much research is required in both areas. The remainder of this paper, however, will deal mainly with the concept of externally induced stress and its effects upon examination performance.

Spence (1958) clearly states that as externally manipulated psychological stress increases, performance will be greater and more

prolonged when tasks of a low degree of intratask competition are employed since the increase in drive produced by the additional stress would be expected to facilitate performance rather than, as would be expected in the case of competitive tasks, deter it. This is more or less a summary statement of the relevant research presented thus far.

Cottrell (1968) hypothesized that social facilitation phenomena, i.e., increased drive due to audience presence, occur only under conditions where audience presence creates an anticipation of evaluation. Research relevant to this hypothesis is provided by Cottrell, Wack, Sekerak, and Rittle (1968) when they conducted an experiment to determine if the mere presence of others is responsible for audience effects. Subjects were divided into three groups and were then required to perform a pseudo recognition task. One group performed the task alone, the second group performed the task in the presence of two persons who were not spectators (blindfolded "other subjects") and the third group performed in the presence of two passive spectators. The presence of an audience (spectators) was shown to increase general drive level. On the pseudo recognition trials the presence of an audience enhanced the emission of dominant responses at the expense of the subordinate responses. The mere presence of others did not enhance the emission of dominant responses. Henchy and Glass (1968) increased the scope of this research when they showed that evaluation apprehension enhances the emission of dominant responses at the expense of the subordinate responses. They used a pseudo recognition task in which subjects'

responses were based on habits of varying strength established through prior training. The evaluative aspect of an audience is, therefore, probably a necessary condition for enhancing the emission of dominant responses. These results are applicable to situations where an audience is present. However, Henchy and Glass also demonstrated that the threat of evaluation in the absence of an audience may also be instrumental in producing energizing effects upon performance which appear to be almost identical to that when an audience is actually present. It seems logical to surmise that even the threat of evaluation in the absence of an audience increases drive level.

If one were to assume that failure feedback is stressful to the subject (Shrauger and Rosenberg, 1970; Sarason, 1956) then it is also plausible to assume that, in the presence of an evaluative audience or some other similar situation, drive level should be increased. According to drive theory, this increase in drive level should enhance the emission of dominant responses and consequently produce interference for the occurrence of subordinate responses. It follows that performance on well learned tasks (which have dominant responses associated with them) should be relatively enhanced in the presence of an evaluative audience, while for poorly learned tasks (subordinate responses) performance should be relatively impaired. The evaluative aspect of the audience is assumed to be the drive energizer which increases the probability of occurrence of dominant responses while decreasing the probability of occurrence of weaker subordinate responses. If the weaker responses are the correct ones,

which is the case on a poorly learned task, then audience presence and the consequent threat of evaluation tends to impair performance. If the dominant responses are correct, as they generally are, on well learned tasks, then threat of evaluation tends to enhance performance.

Uhlmann and Saltz (1965) tested the effects of stress on retention. The purpose of their study was to investigate the retention of meaningful material as a function of anxiety properties of the material and the ability of the subjects to differentiate. Differentiation is defined as resistance to interference (i.e., resistance to competing responses). Saltz (1961) has suggested that the differentiation of S-R systems, rather than the associations between stimuli and responses, is probably the critical factor in retention. Learning involves the development of boundaries around S-R systems. Evidence suggests that stress breaks down differentiation (Saltz and Riach, 1961, Saltz and Asdourian, 1963). Hence, one would expect that stressed subjects would perform more poorly on a S-R recall task where there were many competing responses. Stress should hamper the subject's ability to discriminate which is the correct response out of a group of several competing responses, on a recall task. Results of the Uhlmann and Saltz study support this expectation. Subjects exhibiting low differentiation were more likely to deteriorate on the recall of anxiety producing material than were those subjects exhibiting high differentiation. A high differentiator was a subject who showed high resistance to interference on a previously given competition task; a low differentiator was a subject who

showed little resistance to interference from competing responses.

These results are partially consistent with the Taylor-Spence Drive Theory. High differentiators presumably have learned the material well, i.e., the correct responses are dominant. Anxiety evoking material, by increasing the subject's general drive level, should, therefore, facilitate the emission of correct dominant responses at the expense of competing subordinate incorrect responses. Low differentiators presumably have not learned the material well, i.e., the correct responses are subordinate. In this case stress tends to facilitate the production of competing dominant incorrect responses. Hence, subjects exhibiting low differentiation and therefore little resistance to competing incorrect responses should perform poorly, relative to high differentiators, on tasks involving anxiety evoking material. Saltz believes that anxiety impairs performance on both low and high competitiveness tasks. However, the effects of anxiety are more pronounced on the latter. Spence, on the other hand, believes that this increased drive would facilitate performance on a low competitiveness task. It is quite possible that both processes are operating and may in effect cancel each other out. Nevertheless, with regard to the effects of anxiety upon competitiveness tasks, both theories are consistent with that of Mandler and Sarason (1952) when they predict that anxiety should interfere with retention. Anxiety should facilitate the occurrence of dominant competing responses which may be incorrect.

It may, therefore, be that examination performance is not nec-

essarily a valid nor the sole indicant of academic ability and of the knowledge that one possesses. There appear to be many variables which interact with knowledge and thus influence performance. Much of the research presented deals with paired-associate learning. The processes involved in this type of learning and recall may be similar to those involved in examination performance.

To summarize then, high drive appears to facilitate performance on low or noncompetitive lists and to impair performance on competitive lists (Spence, 1958; Taylor, 1958; Taylor and Chapman, 1955; Spence, Taylor, and Kretschel, 1956). The concept of drive has been measured and defined in several ways. Spence, Farber, and McFann (1956) define drive in terms of scores on the Manifest Anxiety Scale, i.e., Drive is defined in terms of the anxiety level of a subject. The implication here is that drive is a chronic or long lasting anxiety symptom. Zajonc and Sales (1966), Cottrell, Rittle and Wack (1967) define drive in terms of audience presence. They control drive by manipulating external variables. These specific external variables (e.g., audience presence) are assumed to be stressful. Henchy and Glass (1968) demonstrated that audience presence alone was not necessarily stressful, but that the evaluative aspect of an audience or even the threat of evaluation alone was stressful. A supplement to the Spence-Taylor theory is furnished by Saltz (1961) when he proposed that high differentiators should exhibit superior performance relative to low differentiators, under stressful conditions. Stress therefore defined in terms of audience presence and the consequent threat of

evaluation appears to be instrumental in increasing drive level with the subsequent effects upon performance.

There are factors, other than audience presence, which may be instrumental in increasing drive level, thus influencing paired-associate learning. Schneider (1959) administered an electric shock to nine groups of human subjects to induce a different drive level in each of the groups. During paired-associate task performance experimental conditions differed for subjects only in the drive level variable. The task consisted of paired-adjectives scaled for associative connection. They found that as the lists became less competitive through learning, drive level tended to facilitate performance. They also found that the more efficient the performance, the fewer the intrusions from previously associated responses. Pinneo (1961) manipulated drive in the form of muscle tension. Groups of subjects were required to perform a complex tracking task while concurrently squeezing a modified hand dynamometer. Different groups experienced varying amounts of muscle tension. Another group performed the tracking task alone. The effect of induced tension (increased drive) on a complex, i.e., competition task, was to impair tracking performance with higher tensions having a more detrimental effect than lower ones. Thus, many variables may be utilized to increase drive, all having the same or similar effects upon performance.

The results of the research presented in this paper clears up much of the ambiguity and conflicting results of previous research on social facilitation. In some cases the presence of an audience tended

to impair performance (Husband, 1931; Pessin, 1933) and in others, audience presence functioned to improve performance (Bergum and Lehr, 1963). The proposal by Zojonc (1965) which integrated the audience variable with drive theory has cleared up this confusion. This previous research did not take into account the interaction between drive and competition.

How does all this apply to examination performance? Spielberger and Katzenmeyer (1959) and Spielberger (1962) report that college upperclassmen with high manifest anxiety scores were found to earn lower grades and to have a higher drop-out rate due to academic failure than non-anxious students of comparable ability. Increased drive (defined in terms of an anxiety score) presumably facilitated competing responses which interfere with the emission of correct responses and may partly account for the lower grades of the high anxious students. Because the students considered (both high and low anxious) were of comparable ability, it appears that drive is a relevant factor. The non-anxious students may have earned higher grades because, in this case, low drive did not facilitate the emission of competing responses and hence, the correct responses were dominant. There does appear to be a negative correlation between scores on anxiety scales and real-life indicants of intellectual performance such as course examinations, ability tests, grades, etc. (Sarason, 1960; Jeness, 1962). Paul and Eriksen (1964) found a negative correlation between scores on scholastic ability tests and test-anxiety questionnaires and between course examination scores and those

of test anxiety questionnaires. These results are consistent with theory if one were to assume that most examinations are highly competitive in nature and that the correct answers are usually subordinate. Because most examinations are more elaborate, more involved and more complicated than paired-associates tasks and often cover a much broader range of material, it is quite possible that many competing responses are involved. Examinations, specifically the types involving multiple choice, are often constructed specifically to arouse competing responses. High drive, according to theory, should therefore strengthen these competing responses at the expense of the often subordinate correct responses. Hence, the negative correlation between drive and examination performance can be accounted for. Incidentally, high drive may also function to interfere with studying behavior, thus contributing even more to poor grades.

Most of the research presented in this paper deals with subjects individually. Very little research on examination performance has been done where experimental variables have been applied to subjects as a group. Subjects in a group may not react to stress on the same manner as would individual subjects. In this sense, the research settings previously employed do not come close to properly representing actual examination settings. There is a great deal of information with respect to the effects of stress and subsequent drive level on performance for ^{SINGLE} ~~simple~~ individuals, but very little research has been done for subjects in a group. Yet, it is precisely this factor which is so common and important in examination settings. People are typically tested in groups.

The present study deals with the effects of socially induced stress (by failure) on group performance. The specific dependent variable of interest is "retention".

It was hypothesized that a group of non-stressed subjects would exhibit superior performance (i.e., fewer errors in recall) relative to a group of stressed subjects, on a competition type of paired associates list. For a low competition list, stressed subjects should exhibit relatively superior performance when compared to non-stressed subjects. It was therefore predicted that there should be an interaction between list-type and the stress conditions. The sex variable was also considered, as a guide for future research, though it was not expected that significant differences would occur.

The tasks employed were quite similar to the typical multiple choice examinations so frequently employed in university settings. The experimental setting also closely resembled a typical examination situation, and the subjects were run in a group. It was hoped that the results of this study would be relevant to everyday academic testing situations where multiple choice examinations are employed.

METHOD

Subjects

Subjects in the introductory psychology classes at the University of Manitoba winter session participated in the experiment as part of the course requirement. Forty-five male and forty-five female subjects signed up to participate. However, only thirty-four males and forty-two females appeared to participate in the actual experiment. The subjects received two course credit hours for participating.

Apparatus

The study was conducted in a large lecture theatre at the University of Manitoba campus. The subjects were randomly seated at desks, with the one restriction that there be an empty seat between each subject. This was to help prevent any interaction between subjects. The lecture theatre was large enough to accommodate this seating arrangement.

Three main tasks were involved in this study. The first task was referred to as a "culture-free IQ test" (see Appendix) though in essence it was merely a test contrived by E. Nevertheless, it closely resembled what could be considered a culture-free IQ test. It was necessary that the test be as realistic as possible in order to serve as an adequate stressor. This task was quite similar to Raven's Progressive Matrices Test (cited in Anastasi, 1969). It consisted of a fifteen page booklet. On each page a different series of five or six discrete stimulus configurations or diagrams were mimeographed.

The configurations made up a pattern of some kind. However, on each page, part of the pattern was omitted (left blank). The task of each subject was to choose the correct answer from a number of diagrams, at the bottom of each page, to complete the pattern. The tasks became increasingly difficult as the subject proceeded through the booklet. Some of the problems at the end of the booklet had no correct or logical answer. This was to ensure that none of the subjects would feel that they had performed perfectly. Separate answer sheets to this test were furnished. The subject was merely required to place the number of the diagram, which appeared to be the correct answer, in a space provided beside the question number on the answer sheet. Each subject received one booklet and answer sheet. The ordering of the pages was identical for all booklets.

The second task in this study was a type of paired-associates task. It involved a fifteen page "stimulus" booklet (see Appendix). A stimulus word and five response words were mimeographed in the centre of each page of the booklet. There were, therefore, fifteen different stimulus words (one per page) each with its five respective response words. All stimulus and response words were different, and as neutral in associative value as possible with respect to each other. The words were selected from a series of unpublished continued free association norms (McIntyre, 1971) collected at the University of Illinois and the University of Manitoba. Each subject received one booklet. The ordering of the pages (each page had one stimulus and five response words) was randomized from booklet to booklet. The

ordering of the response words was the same from booklet to booklet.

The third or retention task consisted of a fifteen page "recognition" booklet (see Appendix). Mimeographed on each page was one of the fifteen stimulus words and its five respective response words, from the stimulus booklet, plus fifteen other response words. Each page therefore had printed on it a stimulus word plus twenty response words. The additional response words were all different both between and within pages.

The recognition booklets were of two types: half of the subjects received one type and half received the other. The first type of recognition booklet contained response words that were highly competitive in nature. That is, on each page of the booklet, for each stimulus word and its five response words, was one synonym and one antonym for each of the five response words plus five either primary or secondary associates, or both, of the stimulus word. Thus, each stimulus word had now paired with it the five original response words plus fifteen highly competitive response words.

The remaining half of the recognition tests were low competitive in nature. On each page, for each of the stimulus and its five respective response words, were fifteen fairly neutral (low association) words (both to the stimulus and the five response words). Thus, on each page was printed one of the fifteen stimulus words and its five original response words, plus fifteen low competitive response words. It should be noted that the high and low competitive booklets contained the same original stimulus and response words. They

differed only in the additional response words.

The additional response words, both high and low competition, were selected from the free association norms. The ordering of the pages (each page had one stimulus and twenty response words) in both high and low competition recognition booklets was randomized in each booklet. The ordering of the response words was the same from booklet to booklet.

Procedure

The experimenter, two markers, and two proctors, were involved in the operation of the experiment. The function of the markers was to place predetermined scores on the answer sheets, after the Ss had completed the "culture-free IQ test", while giving the impression that they actually were scoring the results. The markers sat at a desk at the front of the room facing the class. The two proctors functioned in the usual manner; handing out and collecting booklets, etc. The function of the experimenter was to read the instructions, observe the class, and coordinate the proceedings. The experimental situation closely resembled a classroom testing situation in a university.

Pencils and answer sheets to the culture-free IQ tests were placed, face down, on the desks where the Ss were to be seated. This was to ensure that there would be an empty seat between each S. When the Ss entered the lecture theatre they were told to sit at only the desks with the sheets on them. There were no other seating restrictions. After the Ss entered the lecture theatre and were seated accordingly, an introduction to the experiment (see Appendix) was

read to them by E. Following this, the culture-free IQ booklets were distributed to the Ss by the proctors. Instructions (see Appendix) to this test were then read by E and an example, on the first page of each booklet, was shown to them. The function of culture-free tests was also explained, i.e., such tests were negligibly influenced by cultural heritage, past experience, learning, etc. It was essential that the Ss actually believed that they were performing an IQ test, and that their performance was independent of past experiences, grades, etc. This was to rule out the possibility that very superior, or inferior students who respectively performed very poorly or very well on the test, as indicated by the preplanned scores, would not doubt the validity of the test. The Ss were asked to print their names and sex on both the test booklet and the answer sheets. The Ss were then instructed to begin the test and given fifteen minutes to complete it. At the end of this time period the Ss were instructed to stop working, and to turn their answer sheets face down on the desk. They were also asked not to interact with each others. The proctors proceeded to collect both the answer sheets and the test booklets, keeping males' and females' separate. The answer sheets were handed to the markers who appeared to begin to score the answers, when in fact they were placing predetermined (see below) scores on the sheets.

The original plan involved eight groups of subjects with an equal number of Ss in each group. However, because not all of the Ss who signed up to participate in the experiment did in fact appear, the groups were as follows:

Groups 1 and 5: composed of 9 and 8 Ss, respectively; males who received scores between 45 and 49 on their answer sheets.

Groups 2 and 6: composed of 11 Ss each; females who received scores between 45 and 49 on their answer sheets.

Groups 1, 5, 2, and 6 received the stressful (HS) condition.

Groups 3 and 7: composed of 8 and 9 Ss, respectively; males who received scores between 65 and 69 on their answer sheets.

Groups 4 and 8: composed of 10 Ss each; females who received scores between 65 and 69 on their answer sheets.

Groups 3, 7, 4, and 8 received the nonstressful (NS) condition.

While the markers were performing this task, the stimulus booklets were distributed and instructions (see Appendix) were read to them by E. The Ss were required to memorize that the particular stimulus word and the five response words go together, and were told that later on they would be shown the same stimulus words, one at a time, and be required to choose the correct response words from a group of words.

An example was placed on the board and then erased. When E told the Ss to begin, they opened their booklets to the first page and studied the words for 20 seconds. When E said "turn the page" all the Ss turned the page and proceeded to memorize the next set. This procedure was continued for the whole booklet. E used a stop watch for accurate timing. At the end of this session the booklets were collected by the proctors.

E then informed the Ss that while they were performing this task, their answer sheets were being scored by the markers and that

because a retention interval was necessary between the task they had just completed and a recognition task they were about to perform, this would be a convenient time to return the test results. The results were handed back along with the high and low competition recognition booklets such that Groups 1, 2, 3, and 4 received high competition booklets and Groups 5, 6, 7, and 8 received low competition booklets. All factors on sex (M vs F), stress (S vs NS) and competition (C vs LC) were now accounted for. The Ss were instructed to place the booklets handed to them on the empty desk beside them and to refer to their IQ test results. E then placed the following fake normative data on the board. The Ss were informed that these norms were applicable to virtually anyone in the world taking the test. The norms were as follows:

45-49	poor	The stressful condition
50-53	below average	
54-57-60	average	
61-64	above average	
65-69	superior	The nonstressful condition

After allowing a few minutes to pass, giving the Ss time to process this information, instructions were given directing the Ss to place their answer sheets face down on the desk beside them and to write their names and sex on the recognition booklets. E then read instructions (see Appendix) which explained that the booklets contained the same stimulus and response words that they were exposed to before plus fifteen additional response words on each page. The Ss were

required to pick out the five correct response words and to write them lower down on the page in a space provided. E demonstrated with an example which was placed on the board and then erased before the session began. The Ss then began the task. They were allowed to look at each page for 50 seconds. E used a stop watch for accurate timing. Following this, the proctors collected the booklets and the answer sheets. (The recognition booklets were coded in order to facilitate differentiation between high and low competition booklets).

E then read an explanation for the experiment (see Appendix) to the Ss. This also served to "unstress" the Ss who believed that they had actually done poorly on the IQ test. The Ss were then dismissed.

RESULTS

The mean number of errors for each of the eight groups is represented in Table 1. Table 1 also depicts the combined means. The number of errors was obtained by counting the number of incorrect associations given to each of the stimulus words. Any omissions were also counted as errors.

TABLE 1

	Competition			Low Competition			Overall Total
	Male	Female	Total	Male	Female	Total	
High Stress	3.98	2.55	6.53	3.20	2.14	5.34	11.87
Non Stress	3.72	3.20	6.92	2.70	2.50	5.20	12.12
Total	7.70	5.75	13.45	5.90	4.64	10.54	23.99

It can be seen that the low competition groups appear to have had fewer errors. The analysis of variance results (Table 2) bears this out with the main effect of competition being significant ($F = 5.78, p < .05$). Contrary to previous research there appears to be no differences due to stress ($F = 0.03$) and no interaction between stress and competition ($F = 0.13$). The sex factors also yielded non-significant results, which was expected. Stress therefore appeared to have negligible effect upon performance in this study.

TABLE 2

ANALYSIS OF VARIANCE FOR NUMBER OF ERRORS, ADJUSTED FOR
UNEQUAL N BY THE USE OF HARMONIC MEANS OF N

Source	df	MS	F
Between	7		
Sex (S)	1	56.5703	0.38
Comp (C)	1	867.2229	5.78*
Stress (St)	1	4.1232	0.03
S x C	1	19.8858	0.13
S x St	1	191.4319	1.28
C x St	1	5.6930	0.04
S x C x St	1	62.0831	0.41
Within	68	149.9655	
Total	75		

DISCUSSION

It was hypothesized that a group of non-stressed subjects should exhibit superior performance, relative to a group of stressed subjects, on a high competition type of paired associates list and that the reverse situation would be true for a low competition list. It was therefore predicted that there would be an interaction between list type and the stress conditions. As a possible guide for future research, the sex factor was also considered. The results only yielded a significant difference between the high and low competition factors, which is obviously to be expected, if stress had negligible effect upon performance. The competition list may be considered the more difficult of the two lists due to its high interference properties and hence one would expect more errors to be associated with it during recall, in the absence of stress. There were also no significant interactions.

There are many possible explanations which may be proposed to account for the non-significant results. First, it is important to understand that because all subjects received the same acquisition list and were then randomly assigned to the stress and competition conditions, it was assumed that any differences in retention would be due to the interaction between the stress and competition factors. Furthermore, because all subjects learned the same list and were then randomly assigned to the different groups, it was also assumed that stress should have no confounding effect with respect to acquisition.

Whenever a study does not support a theory, there are three alternatives to consider; either the theory is in fact incorrect, the theory is correct and chance factors intervened to yield non-significant results or the study did not actually measure what it was supposed to measure. Much of the research which involves the theory of interest in this paper deals with individual rather than group performance. Perhaps, individuals in a group do not function in the same manner with respect to the effects of stress on performance as do individuals performing alone. This may be one reason why the results were not as expected. Furthermore, most of the research involving the Spence-Taylor theory deals with the recall of paired-associates. The task utilized in the present experiment is a recognition task and hence the variables involved may have functioned in a manner different to that expected.

The stress factor was introduced by presenting the stressed groups with failure feedback from a previous task (culture free IQ test) which they performed. There is evidence to show that failure feedback does affect one's level of aspiration and hence, may be stressful. In general, it has been found (Chapman and Volkmann, 1939; Festinger, 1942) that subjects tend to show lower levels of aspiration than the performance of a (experimentally induced, hypothetical) group that they considered to be superior, higher levels of aspiration than the performance of a group considered inferior, and levels of aspiration about equal to the performance of a group considered to be equivalent. These studies suggest that failure on a particular task

tends to lower one's level of aspiration for future tasks. Similarly, success tends to have a positive effect. It is quite possible that, in the present experiment, failure feedback had a reverse effect to that proposed by the author. In other words, rather than being stressful with consequent drive increasing properties, failure feedback may have been instrumental in lowering the level of aspiration for the stressed groups, thus having no or very little effect upon drive. Alternatively, success feedback may have had a similar effect for the non-stressed groups by raising their levels of aspiration and perhaps increasing drive. Zojonc and Brickman (1969) also found that subjects raised their expectancies after success feedback and lowered them after failure feedback (on a reaction time task). In other words, expectancies were shifted in order that they be in accordance, and consistent, with feedback. Incentive therefore could possibly function to counter the effects of drive. Under failure feedback, those subjects (in both high and low expectancy conditions) who resisted lowering their expectancies subsequently improved on a future task of the same kind. Feather (1966) found that subjects who were given high expectancies through previous success trials on a task were able to perform better on a subsequent task than those who obtained low expectancies from previous failure.

If, in the present study, the results of the culture-free IQ test, or even the test per se, were not realistic, i.e., the subjects did not believe in the validity of the test, it is quite probable that there was no differentiation in stress between groups. This is

possibly one of the most important reasons for non-significant results. Because the feedback may not have appeared valid, expectancies may not have shifted with the subsequent results. Alternatively, one could conclude that the stressed (failure) groups should have low expectancies (if the feedback was in fact realistic). Alluding to the results of Feather (1966) one would expect them to perform more poorly on a difficult (i.e., competition) task relative to the non-stressed groups. The results do not support this expectation.

Taylor and Lewit (1966) in a paper concerning "social comparison and deception" state that when a norm is lower than one's ability, one may alter his performance and thus demonstrate less ability. Homans (1950) believes that under such conditions people often inhibit skillful performance or at least deny the causation of products attributed to skillful performance. If the norm happens to be greater than one's ability, it is not possible to perform in a manner consistent with the norms. To maintain social acceptability, many evasion procedures to testing are brought into play. Often, deception of others with respect to the outcome of tests, or appropriation of the products of others is used. It may be assumed that the probability of occurrence of these acts would be proportional to the saliency of the norms. If the information provided by Homans is valid in the present situation, it is quite possible that the stressed group may have inhibited performance such that they be more consistent with the normative data, thus rendering any differences between groups non-significant.

Another possible reason for non-significance may be attributed to the fact that if the correct responses are initially weaker than one or more of the competing response tendencies, then the higher the drive level, the poorer will be the performance during the earlier stages of learning. However, as learning of the correct responses increases, the habit strength of these responses would be expected to equal and to then exceed those of the competing responses. Thus, performance of the different groups would tend towards equality with sufficient learning. In the present study it may be possible that over learning might have occurred thus equalizing the groups and hence contributing to the production of non-significant results. However, a pilot study conducted prior to this study showed that overlearning was quite unlikely to occur. The pilot study functioned to determine the length of time in which the subjects were allowed to look at the booklets and a comparison between times was made for errors. If the subjects exhibited errorless performances it was assumed that a ceiling for learning was reached. A time interval was finally decided upon in which enough errors were committed to ensure that over learning did not occur. The fact that there was an overall difference between the competition and non-competition lists is additional evidence to show that overlearning probably did not occur.

The degree of competition present in the two paired-associate tasks is another factor which should be considered. The lists involved in the present study were modelled after those utilized in a pilot study by Katahn (1964), cited by Katahn and Lyda (1966). In

this study a stimulus word was presented with eight response choices (two synonyms of the stimulus word, two antonyms, two rhymes, and two contiguous associates, i.e., two response words frequently associated with the stimulus word). When subjects were asked to respond with consistent reinforcement for the giving of words in any particular response class, synonyms comprised the dominant response tendency, followed by contiguous associates, antonyms, and rhymes. This study lends evidence to the fact that the synonyms, contiguous associates (from norms) and antonyms produce interference in the competition list and that the low competition list, by lacking the above requirements for competition, was in fact very low in associative value. The fact that the only significance obtained was between the two types of lists (across groups) substantiates this belief.

Several plausible reasons have been suggested to account for the non-significant results. Perhaps the most important reason is that the theory itself may not apply to individuals in a group using a recognition rather than a recall task. Stress may therefore have a different effect upon performance. Alternatively, it is also quite possible that the procedure used to induce stress was rather ineffective and thus may account for non-significance. Had the stress conditions been more effective, results consistent with those hypothesized might have been obtained. More research is required in this area with attention being focused upon the behavior of groups in stressful situations (with respect to increased drive, etc.), the performance of groups on recognition tasks, and more effective stress-

inducing procedures. Perhaps an effective stressor would involve the utilization of feedback from "real-life" examinations. It is also the belief of the author that most of the subjects (students) involved in psychology experiments, and this one specifically, simply do not really care enough about the experiment to be affected by the variables employed.

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APPENDIX A

INSTRUCTIONS

BEFORE Ss COME IN, PLACE ANSWER SHEETS ON DESK.

HAVE Ss COME IN AND SIT AT DESKS WITH THE ANSWER SHEETS.

Instructions

This experiment is composed of three parts. I would like you to work independently of each other and please do not talk to each other. If people are talking during the experiment, then the results of those talking would be invalid and we could not give you credit for the experiment.

I'm now going to hand out some booklets which I would like you to keep closed. Please do not look at them. Do you all have pencils or pens?

HAND OUT CULTURE FREE BOOKLETS

This is the first part of the experiment. I'm going to ask you to write a culture free IQ test. Before we start I'll tell you a little of what this test is all about. A culture-free IQ test is entirely different from the ordinary IQ tests which most of you are familiar with, and which are culture biased. Past experience, past learning, past grades, and any IQ score from the ordinary IQ tests which you might have previously taken, have no influence on a culture free IQ test. A culture free IQ test measures straight inherited ability. It is quite conceivable that you may have an A average and an IQ of 130, as measured by an ordinary IQ test, and yet do very poorly, average, or very well on the culture free test. The same thing applies if you have poor or average grades. What I'm trying to say is that a culture free test is independent of grades or anything else. It measures pure, inherited ability and nothing else. School grades are a reflection of your abilities in this culture. A culture free IQ test measures intellectual ability independently of culture. Do you understand this? Are there any questions?

Will you please print your name and sex at the top of these booklets and on the answer sheets.

PAUSE

This test is composed of a series of diagrams. In each diagram there is a part missing. Below this diagram there are a series of other diagrams, one of which is the missing part. Each of these is numbered. I would like you to place the number corresponding to the correct answer, on the answer sheet you have on your desk. (Please do not put your answer in the test booklet, even though a space is provided, but on the separate answer sheet).

REPEAT

Will you check to see that your name and sex are printed on both the test booklet and on the answer sheet?

PAUSE

Will everybody now please turn to the first page of the test booklet, marked A at the top? This is a sample question. You see that diagram no. 1 fits into the blank space to complete the top picture. Does everyone see this?

PAUSE

You would therefore place a no. 1 in the space marked A on the answer sheet. Would you do this please. The no. of test questions go from A to 0. Your answer sheet is composed of two pages and there is a blank space beside each letter from A to 0 for the correct answer. Not all of the questions will be in the same form as the same question. However, in all of them there will be some kind of blank space in which one of the diagrams should fit. Part of the test is to determine if you can recognize this.

When I tell you to begin, will you please start working at page B and continue until I say stop. You will be timed. Remember to place your answers on the answer sheet. Are there any questions?

PAUSE

O.K. begin.

TIME FOR FIFTEEN MINUTES

O.K. will everybody please stop and will you turn your answer sheet over. I'll collect the test booklets and answer sheets now. Please do not talk to each other.

COLLECT BOOKLETS AND ANSWER SHEETS

COLLECT SEPARATELY

I'm now going to hand out some booklets for the second part of the experiment. Will you please print your name and sex on the front and please do not look inside it.

HAND OUT STIMULUS WORDS BOOKLETS

On each page of this booklet is a stimulus word and five response words that go with it. Your task is to learn these stimulus and response words and that they go together. Later on you will be given the same stimulus words and be required to select the correct response words from a series of alternatives. We would therefore like

you to memorize which five response words go with each of the stimulus words. There are fifteen such stimulus words each with its five respective response words. You will be allowed to study the words on each page for twenty seconds. When I say "turn the page" please do so immediately and study the next set for twenty seconds. As I mentioned before there are only fifteen stimulus words, each with its five respective response words, so this is really no great chore. I'll put an example on the board.

	CHAIR
	BALLOON
NEEDLE	PEOPLE
	CORN
	TREMENDOUS

Your task is to learn that these response words go with this stimulus word. Later on you will be given this stimulus word and a series of response words including these five and your task will be to select the five from the series. Does everyone understand this?

ERASE BOARD

O.K. When I say "begin", turn to the first page and study the words. Please concentrate and try as hard as you can. "Begin".

TIME: 20 second. BETWEEN EACH STIMULUS WORD

Please stop. I'll collect the booklets now. Please do not talk to each other.

COLLECT BOOKLETS

While you were performing this last task, we were marking your culture free IQ tests.

TURN TO MARKERS AND SAY: "ARE YOU PEOPLE FINISHED MARKING?"

NOW TURN TO CLASS:

Because we need a retention interval between the learning task which you first completed and the retention task, this will be a convenient time to return the IQ results to you. I think you will be interested in them. Please do not talk to each other or look at each other's results. My proctors will call out your names and hand them back to you. Please do not talk to each other. I'm also handing out another booklet which I would like you to keep closed.

HANDS OUT RESULTS AND RETENTION BOOKLETS

I'm going to place norms for the culture free IQ test on the board.

	MEAN	
WRITE ON BOARD:	54 - 57 - 60	AVERAGE
	50 - 53	BELOW AVERAGE
	45 - 49	POOR
	61 - 64	ABOVE AVERAGE
	65 - 69	SUPERIOR

These are the norms, and they apply to anyone in the world taking the test. Each of the diagrams is worth a different number of points depending upon the degree of difficulty. Any score between 54 and 60 is about average with the true mean at 57. Any score less than 49 is poor and any score above 65 is superior.

Please do not talk to each other or look at each other's results. The retention interval is over now and we must proceed with the final part of the experiment. I'll answer any questions later. Please place your IQ answer sheets face down on your desk. I would now like you to print your name and sex at the top of the booklet you have. Please do not look inside them.

PAUSE

These booklets contain the same stimulus and response words that you saw before plus fifteen other response words on each page. That is, on each page will be one of the stimulus words you saw before along with its five response words plus fifteen other words. Your task is to pick out the five correct response words that go with the stimulus word and write them lower down on the page. I'll put an example on the board.

PUT EXAMPLE ON BOARD

Does everyone understand this? You will see each page for 50 sec. to choose the correct words. When I say turn the page, please do so and go on to the next page.

When I say begin, please turn to the first page and begin working. "Begin".

TIME EACH PAGE FOR 50 seconds.

AFTER Ss FINISH

Please place your booklets together with your IQ answer sheets on your desks. The experiment is all finished.

UNSTRESS

What I'm trying to determine, in this experiment, is the effects of stress upon examination performance. I believe that exams, as they are now, measure how well you perform under stressful conditions, rather than what you know. This is definitely not fair to many students who know their work well, but who cannot perform adequately under stressful conditions. To test the effects of stress, I firstly had to induce it in half of you. I did this by giving you false results on the culture-free IQ test. The result you received was false. If you did poorly, do not feel badly, alternatively, if you did well, do not congratulate yourself, for these scores were false also. I hope to compare the results of the stressed vs the non-stressed subjects and eventually to show that stressed subjects do not perform well on certain types of examinations and yet perform better on other types. Using these results as evidence, we might be able to change the format of examinations such that they will measure knowledge per se, and not one's ability to perform under stressful conditions.

Thank you very much.

STAMP EACH CARD TWICE.

APPENDIX B

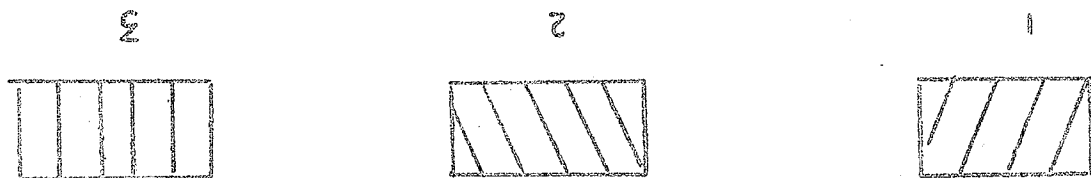
STIMULUS WORD BOOKLET

NOTE: Each stimulus word and its five response words were printed on separate pages in the actual booklet used in the experiment.

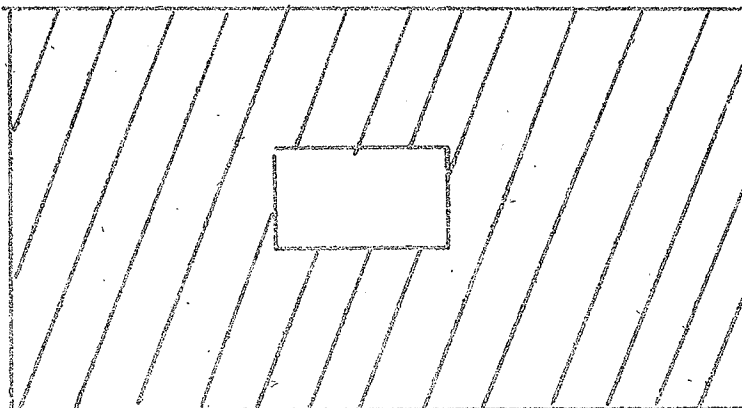
NEAR	INCREASE LEAN OFTEN VALUE CHILD	SHORT	FORCE NOVEL TAKE START MINOR	SQUARE	GRIM SMART UNUSUAL NOISY SHOUT
SICKNESS	EDUCATE SHALLOW VIOLENT REGRESS IGNORE	TOBACCO	BITTER RICH TERRIBLE RELAX MOUNTAIN	READ	PEACE QUESTION DIFFICULT FILTH SELDOM
ALWAYS	SEVERAL SLEEP CREEP BEAT END	MUTTON	ANCIENT HARD STOP THIN PLAY	TIRE	POLISH TENSE LOW LOVE BORING
AFRAID	DOUBT TOUGH HUMAN DETEST GLOOM	SNOW	DAMP BREAK CLIMB FOE SILENCE	KING	SHY HARSH PUNISH SELFISH OBEY
GRASS	BENT PULL SIT SMILE WARM	SING	DELICATE OVER BIG PLEASANT FAST	SELL	DESTROY LIVING OLD QUICK RELEASE

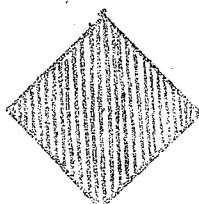
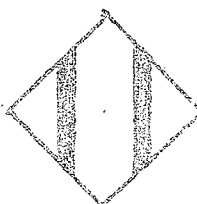
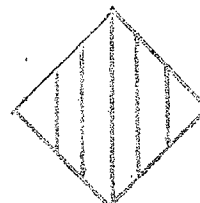
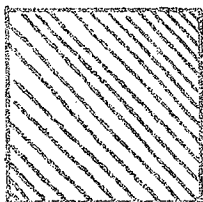
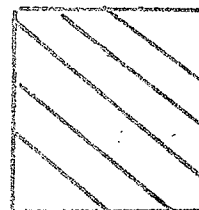
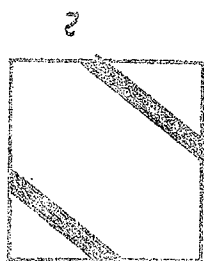
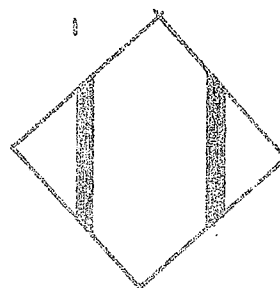
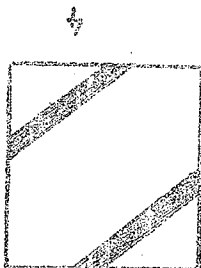
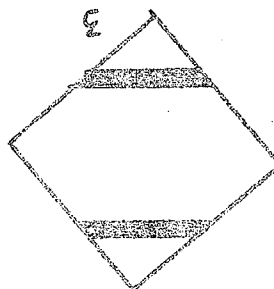
APPENDIX C

CULTURE FREE TEST

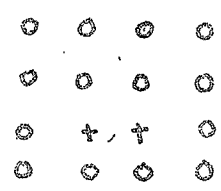
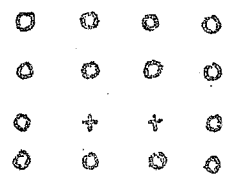
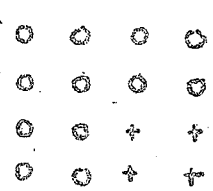
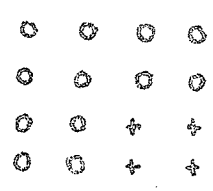
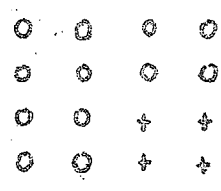
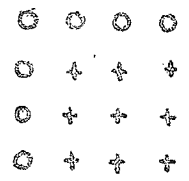
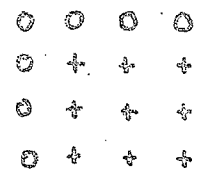
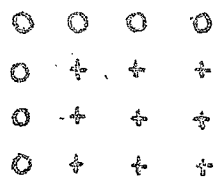


ANSWER —————

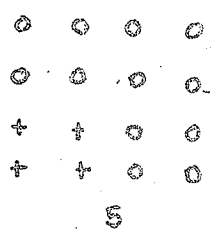
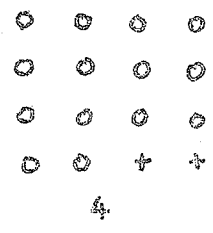
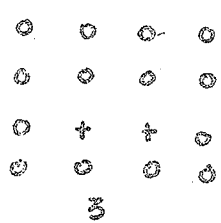
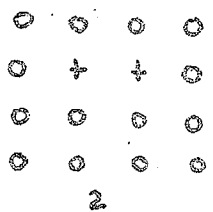
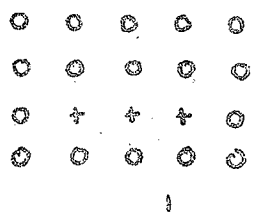


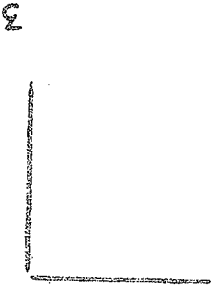
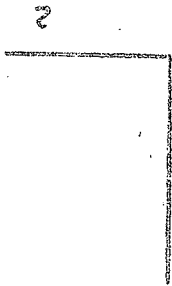
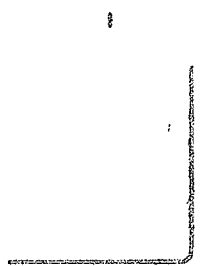
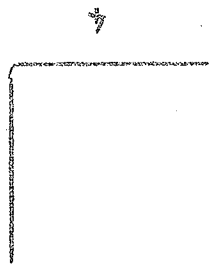


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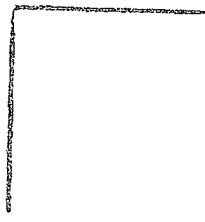
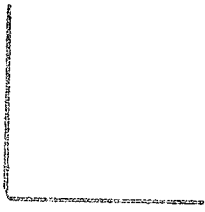
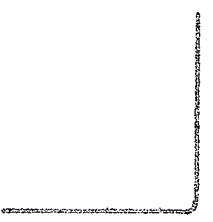
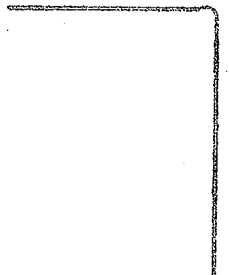
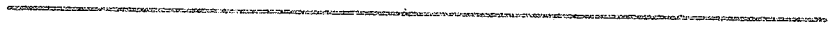


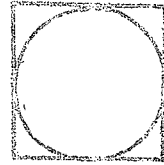
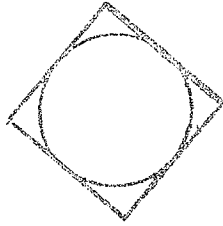
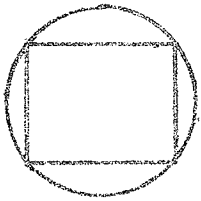
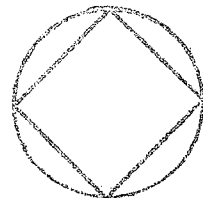
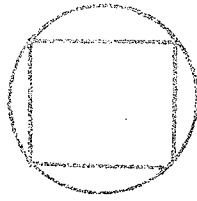
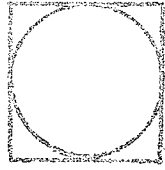
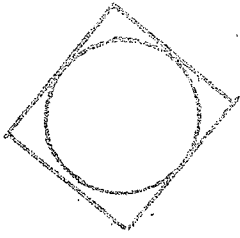
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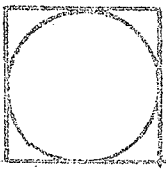


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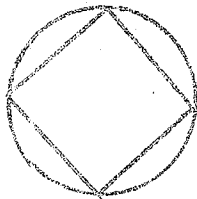




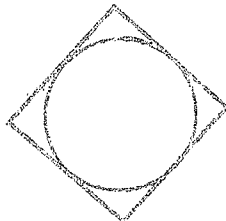
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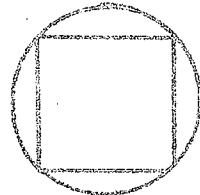
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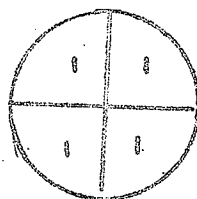
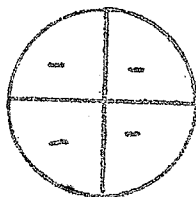
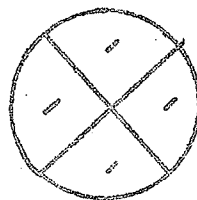
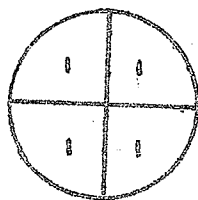
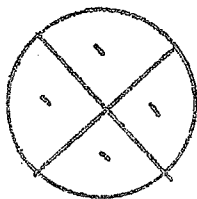
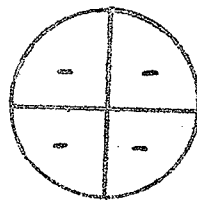
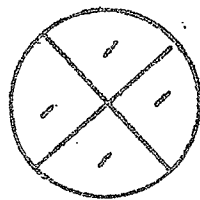
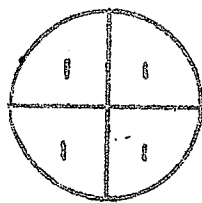
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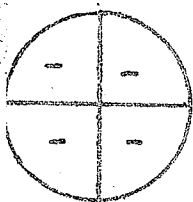
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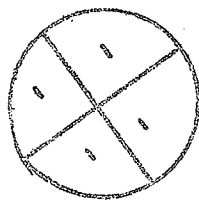
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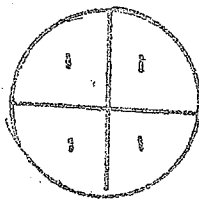
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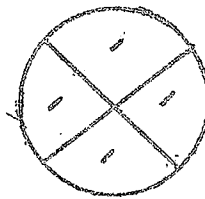
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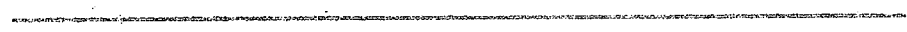
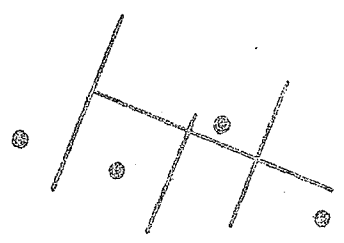
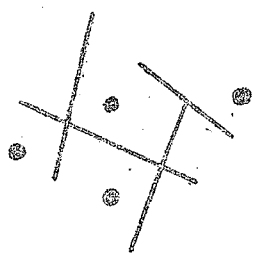
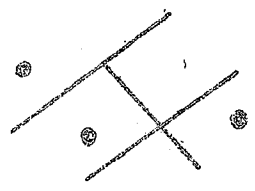
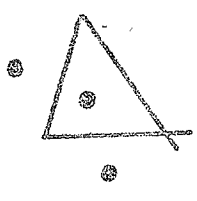
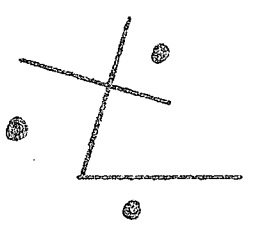
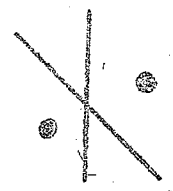
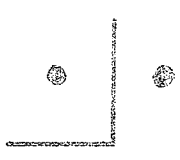
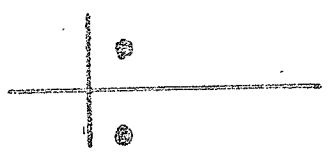
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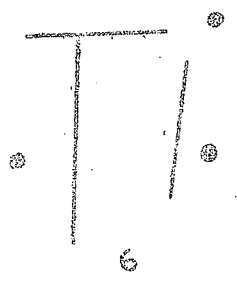
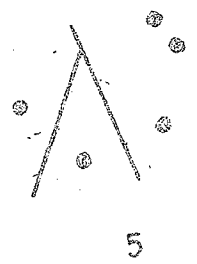
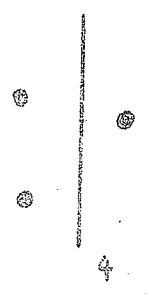
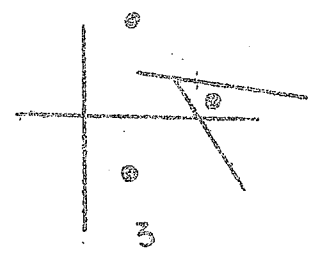
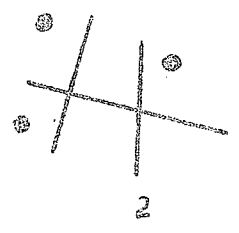
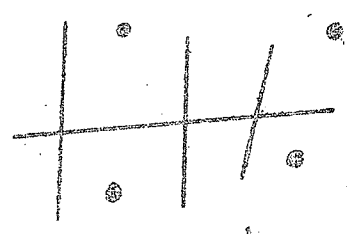
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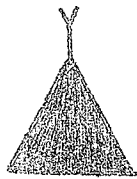
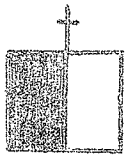
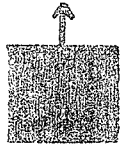
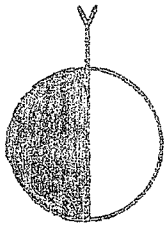
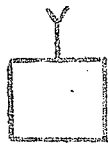
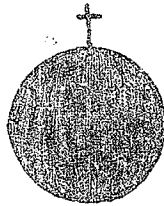
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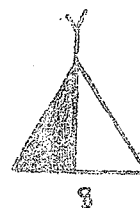
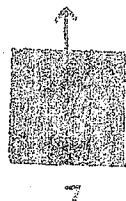
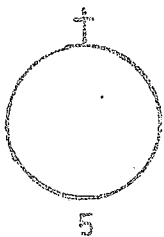
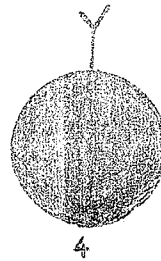
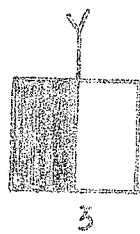
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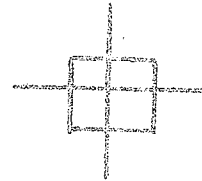
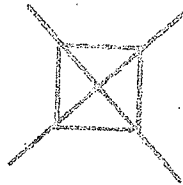
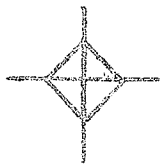
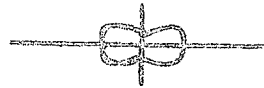
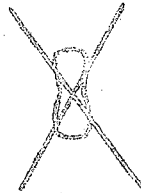
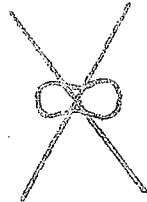
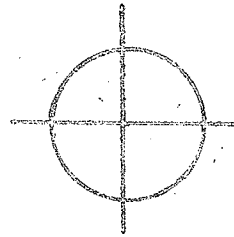
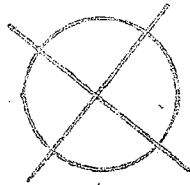
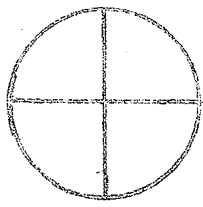


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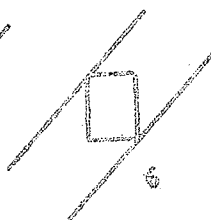
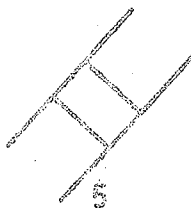
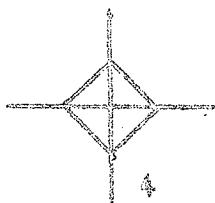
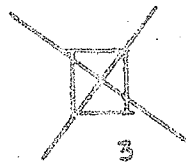
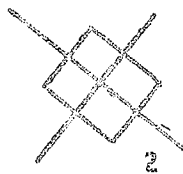
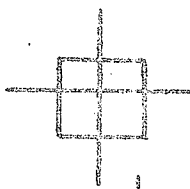
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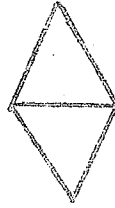
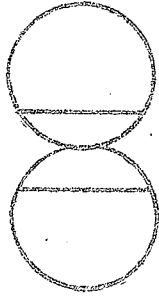
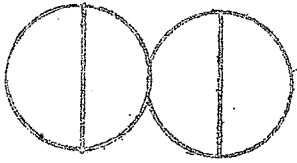
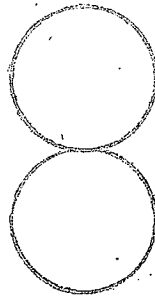
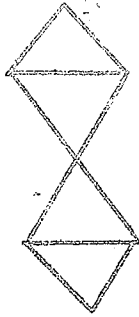
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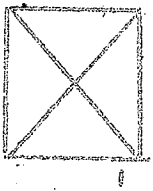


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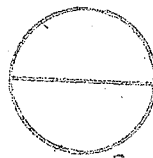
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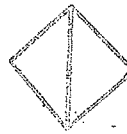
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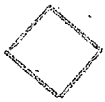
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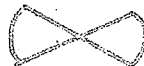
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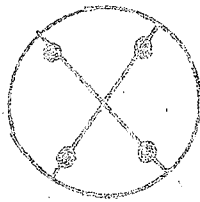
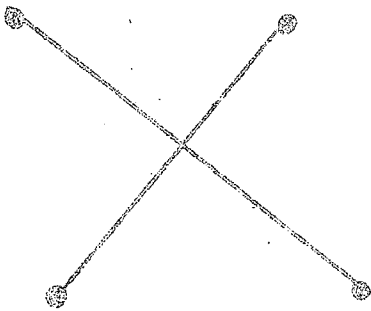
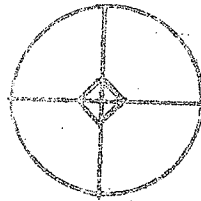
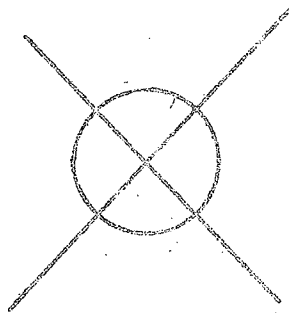
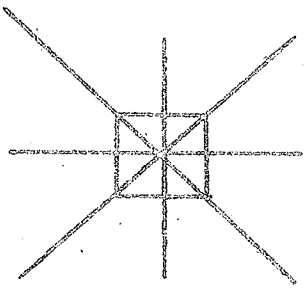
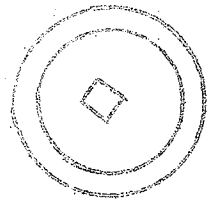
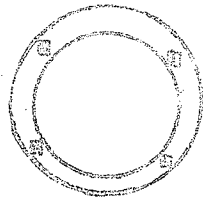
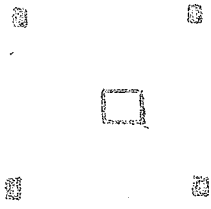
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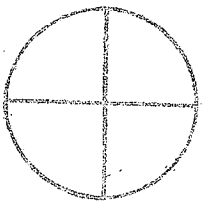
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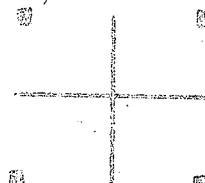
ANSWER _____



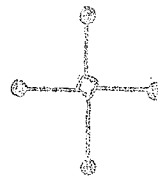
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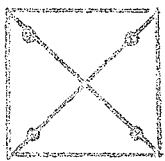
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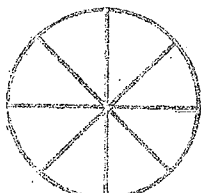
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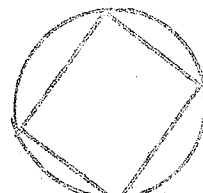
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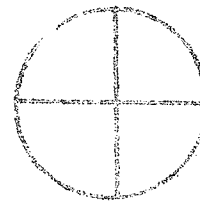
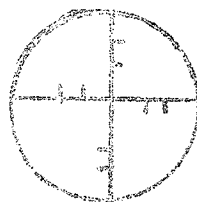
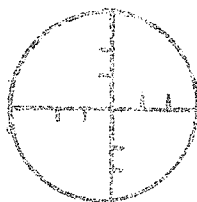
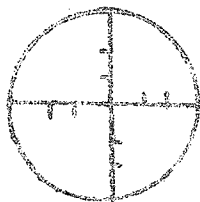
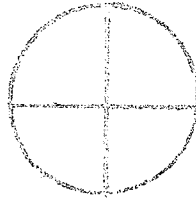
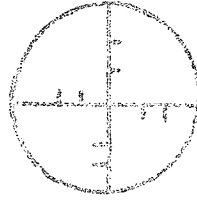
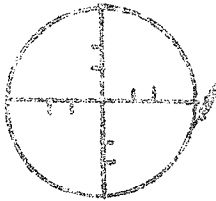
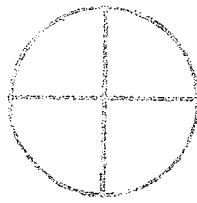
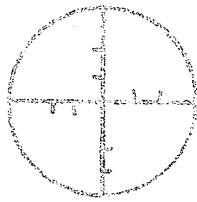
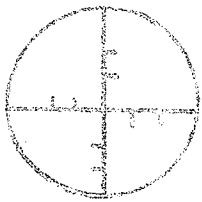
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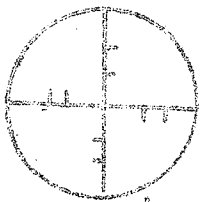


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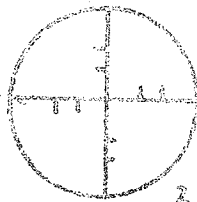


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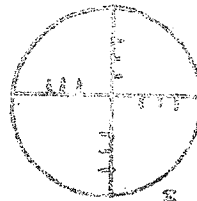
ANSWER _____



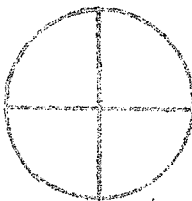
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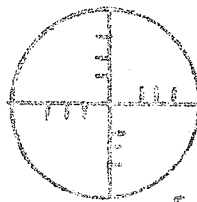
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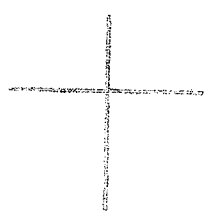
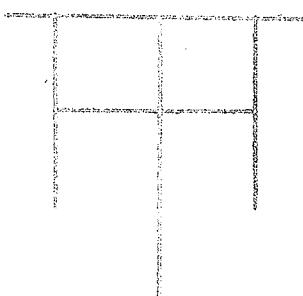
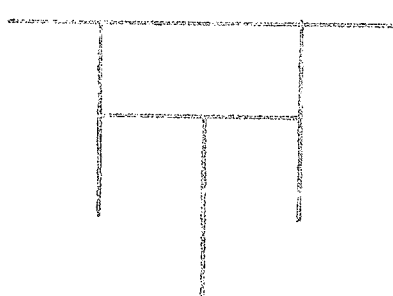
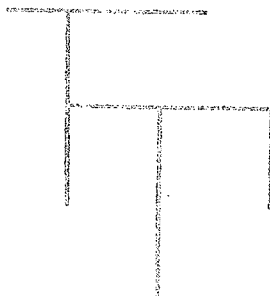
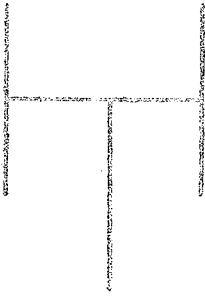
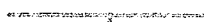
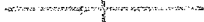
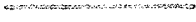
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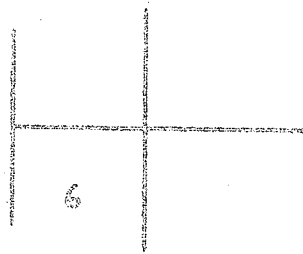
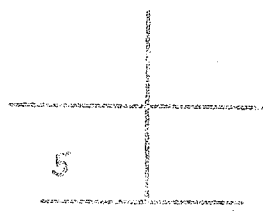
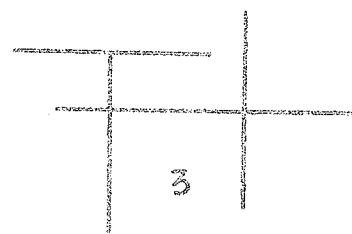
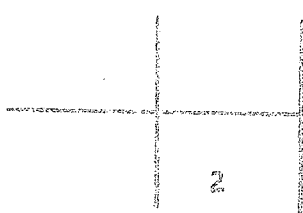
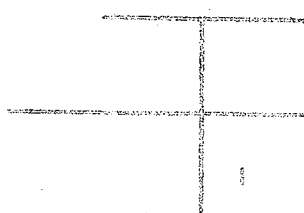
4



5



WHAT COMES NEXT IN THE SERIES ?



ANSWER _____



THE SAME NUMBER OF LINES MUST BE
 ADDED TO EACH OF THESE, TO MAKE
 THIS SERIES CORRECT. HOW MANY?

- 0
- 2
- 3
- 4
- 5
- 6

APPENDIX D

HIGH COMPETITIONAL BOOKLET

There was one stimulus word and its twenty respective response words per page in the actual booklets used in the experiment.

TOBACCO	POOR	READ	CLEANLINESS	SICKNESS	PROGRESS
	PIPE		SELDOM		HEALTH
	SWEET		DIFFICULT		BED
	RICH		HARMONY		MODERATE
	ACRID		PEACE		SHALLOW
	VALLEY		QUESTION		EDUCATE
	SMOKE		TELL		RAMPAGE
	CANCER		WRITE		DEATH
	REST		REPEATEDLY		CARE
	CIGAR		BOOK		HOSPITAL
	GOOD		WAR		BACKWARD
	HILL		ASK		VIOLENT
	WEALTHY		PERPLEXING		REGRESS
	BITTER		FILTH		DEEP
	TERRIBLE		EASY		TEACH
	HORRIBLE		DIRT		SLIGHT
	RELAX		MAGAZINE		LEARN
	MOUNTAIN		WORDS		IGNORE
	CIGARETTE		INFREQUENT		DOCTOR
	TENSE		STUDY		DISREGARD
SNOW	FLAKES	KING	REBELL	GRASS	COLD
	CLIMB		PUNISH		PUSH
	MOIST		CASTLE		SEED
	ENEMY		HARSH		CROOKED
	NOISE		BOLD		STAND
	FOE		QUEEN		POT
	WHITE		SMOOTHNESS		GRIN
	BREAK		PRINCE		FROWN
	COLD		SHY		SMILE
	WINTER		SEVERE		HOT
	MOUNT		PRAISE		BENT
	DRY		KIND		SIT
	QUIET		OBEY		STRAIGHT
	SILENCE		RULER		MOW
	DAMP		MEAN		WARM
	REPAIR		TIMID		LAWN
	CRACK		CROWN		PULL
	FRIEND		SELFISH		WEEDS
	DESCENT		COMPLY		HAUL
	MAN		PUNITIVE		PERCH

SING	SONG CHOIR DISAGREEABLE FAST UNDER FRAILTY PLEASANT ALONG AGREEABLE ABOVE DELICATE LITTLE BIG MUSIC SWIFT VOICE SLOW STRONG OVER LARGE	SELL	CLOTHES SURVIVING YOUNG DESTROY RUIN SAUNTER SALESMAN RELEASE AGED LIVING MONEY FREE STORE QUICK RAPID BUY DYING CAPTURE FIX OLD	MUTTON	FROLIC FOOD FAT HALT ARCHAIC RIGID MODERN SOFT STOP WORK WOOL PLAY GO THIN SHEEP SKINNY MEAT LAMB HARD ANCIENT
SHORT	SKIRT CEASE SEIZE LONG ANTIQUITY MINOR COERCION BOOK FORCE GIVE FREEDOM BEGIN MAJOR TALL START TAKE NOVEL SMALL LESSER TIME	NEAR	THIN FAR HOME WORTH INCREASE OFTEN VALUE LEAN CHILD ADULT CHEAP AUGMENT FAT BY CLOSE DECREASE YOUTH RARE HEAR FREQUENT	SQUARE	LAX YELL DANCE CIRCLE NOISY USUAL SMART QUIET CORNER STERN INTELLIGENT STUPID UNUSUAL GRIM LOUD STRANGE ROUND BOX WHISPER SHOUT

TIRE	SQUAT	ALWAYS	WALK	AFRAID	CHUCKLE
	LOVE		THERE		CERTAIN
	SHINE		MANY		COWARD
	LOW		CREEP		DISLIKE
	RELAX		SEVERAL		HESITATE
	ROUND		SLEEP		GLOOM
	EAR		AWAKE		HEAR
	TARNISH		BEAT		DOUBT
	HIGH		SOMETIMES		LAUGH
	FOND		FEW		FOGGY
	HATE		LOSE		FRIGHTEN
	BORING		CRAWL		HOMO-SAPIENS
	POLISH		TRUE		ANIMAL
	TENSE		SUMMER		CLEAR
	FLAT		COMMERCE		DETEST
	WHEEL		FINISH		CRY
	NERVOUS		FOREVER		HUMAN
	DULL		NEVER		LIKE
	RUBBER		END		DARK
	INTERESTING		WIN		SACRED

APPENDIX E

LOW COMPETITIONAL BOOKLET

There was one stimulus word and its twenty respective response words per page in the actual booklets used in the experiment.

MUTTON	THIN	AFRAID	WORLD	ALWAYS	GRAB
	TART		SEVEN		SLEEP
	RICE		HUMAN		PRESENTATION
	PLAY		OPEN		BEAT
	APPLE		DOUBT		RING
	ANCIENT		NUDE		WOOD
	HEALTHFUL		DINNER		CREEP
	CARE		GLOOM		YIELD
	BUSY		TAXI		STUDY
	STOP		PLEASANT		SKIN
	MUSIC		WELL		RADIO
	PUP		ACTION		PRINCIPLE
	RARE		BEGONE		END
	THREE		UNDERSTAND		FOE
	PLANT		GREET		GRADUATE
	HARD		DREAM		IMPERATIVE
	WHAT		EXCUSE		TRANSFER
	ENTERTAIN		DETEST		AHEAD
	BED		ENJOY		SEVERAL
	WORKING		LAUGH		GLITTER
TIRE	ANGER	GRASS	SMILE	KING	YET
	QUASAR		PULL		WATER
	NEVER		REAR		AREA
	LOW		PLACEMENT		OBEY
	KISS		BENT		PROGRAM
	LOVE		KEEP		ISOLATED
	SERENE		AGAIN		HARSH
	SCHOOL		MORE		LIVE
	SILVER		SIT		PLAIN
	DATE		YESTERDAY		SKIRT
	SECRETIVE		PICNIC		SELFISH
	SLEET		BEER		OUTING
	SKYSCRAPER		YES		SUSTAINED
	BORING		PERSON		PROLONG
	OMINOUS		WARM		SHY
	ESCAPE		UNEMPLOYMENT		CLIMAX
	POLISH		ABLE		RABBIT
	TENSE		SPEAKING		ABSOLUTE
	TURN		STREET		PUNISH
	COVER		PHILOSOPHY		SWEAT

SNOW	HOUSE BREAK MORE FACTORY CONTEMPORARY INCORRECT SILENCE FOE TYPING SMASH STOP GIRL JOURNALIST MIDDLE WEIGHTED STRIKE DAMP CLIMB WRAP ARTICLES	SHORT	PROTECT BOLD TAKE TEACH FRENZY FORCE WIZZARD POLLUTION GREAT ANGEL CUT CARES CALM NOVEL FEET OUT START GRAVITY MINOR CONDITIONING	NEAR	RESPONSE LEARN TOWERING EXPERIMENT GOOD OFTEN ANTIQUITY VALUE RELEASE THEORETICAL INSECT CHILD LEAVES SPECIES SIGNAL WAR CARRY INCREASE STATUS PATRIOT
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SQUARE	MALE GRIM SHIP UNUSUAL EYE NOISY LOYALTY REFLEX CATTLE HEARD NAIL KITTEN SMART SUMMER SWING SHOUT GOT TOIL YELLOW VIRUS	SICKNESS	HAPPY RAZOR VIOLENT BLOOD PLUCK NOW REGRESS HYDRAULIC HEAVEN IGNORE RACING REVERSE SHALLOW INWARD PLAY EDUCATE STOMP TONE SUBORDINATE STRIP	SING	REACTION CELESTIAL BIG SIGH WITCH FAST SOLDIER WHICH VILLAIN WOULD DELICATE POINT ZEALOUS PIE LANGUAGE PLEASANT RATING OVER SISTER NEAT
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READ	ADOPT	TOBACCO	MARSHALL	SELL	YEAR
	PEACE		ADMIRAL		SOME
	LAUGHING		BLUE		DESTROY
	TRUNKS		MOUNTAIN		RECIPE
	QUESTION		QUESTION		LIVING
	UNCOVERED		GOLDEN		GOAL
	FOOL		NONSENSE		ENLARGEMENT
	SIMPLE		PATROL		TYPING
	SELDOM		RELAX		PIECE
	TEENAGE		FIREMAN		QUICK
	MARIJUANA		KINGDOM		QUITE
	STRIVE		WEEPING		PAGE
	FILTH		SILENCE		TROUBLE
	SUITE		BITTER		GENTLY
	STONE		REACT		BLUFF
	DIFFICULT		RICH		RELEASE
	DANGER		DANGER		ABILITY
	LIVES		ADVISE		OLD
	VOICE		TERRIBLE		ARRIVE
	ABILITY		ADVENTURE		LESSER