1978

Effects of Distraction, Introversion-Extraversion and Sex Type upon Performance

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EFFECTS OF DISTRACTION, INTROVERSION-EXTRAVERSION AND SEX TYPE UPON PERFORMANCE

by

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A Thesis Submitted to the Faculty of the Graduate School of Loyola University of Chicago in Partial Fulfillment of the Requirements for the Degree of Master of Arts

October

1978

ACKNOWLEDGMENTS

I would like to thank James E. Johnson, Ph.D., whose support and guidance as director of the thesis committee made this study possible. I would also like to thank Robert Nicolay, Ph.D., for his helpful suggestions and participation on the thesis committee. Finally, I would like to thank Patrick Ahern for his invaluable help in conducting the research.

VITA

The author, Norman Harold Reed, Jr., is the son of Norman H. Reed and Bernice L. Reed. He was born July 26, 1952, in Oak Park, Illinois.

His elementary education was obtained in the public schools of Harwood Heights, Illinois, and secondary education at Ridgewood High School, Norridge, Illinois, where he was graduated in 1970.

In September, 1970, he entered Elmhurst College and in September, 1971, he transferred to Loyola University of Chicago where in June, 1974, he received the degree of Bachelor of Science with a major in psychology. While at Elmhurst College he was a recipient of the President's Award. During his attendance at Loyola University, he was a resident's assistant in Campion Hall from 1972 to 1974. He was a member of the Blue Key National Honor Fraternity in 1973 and 1974. He was also a member of the Alpha Sigma Nu National Honor Fraternity in 1974. In 1974, he was nominated for a Danforth Fellowship and became a student member of the American Psychological Association.

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CHAPTER I

INTRODUCTION

The effect of distraction upon learning would appear to be obvious. Common sense suggests distraction would impair performance on a learning task. Quiet study areas are provided for students on college campuses to help diminish noise distraction. Enclosed study desks are provided in many college libraries to help diminish visual distraction and facilitate learning. However, many people do not choose to study in quiet, secluded areas. On the contrary, some students claim they study best with some amount of noise and activity around them.

From these contradictory observations, several questions may be posited for investigation: 1) Does a noise or visual distraction really inhibit learning? 2) What is inhibiting and what is not inhibiting to the performance of a learning task? 3) What are the individual differences in responding to a distraction?

In reference to the first question, Hale and Stevenson (1974) studied visual and auditory distractors. Auditory distractors were found to impede performance the most. Baker and Madell (1965a,b) studied different types of noise distractors and found that the most meaningful distractors, i.e., someone talking rather than a white noise condition, inhibited performance the greatest. Noise distractors

which are meaningful would appear to have the greatest effect upon learning performance.

In reference to the second question, Broadbent (1957) reviewed early literature studying noise distraction and found the studies were often inconclusive and contradictory. In the review, Broadbent (1957) reported that a distractor would inhibit learning but at times, the distractor would actually facilitate performance. Easterbrook (1959) suggested that distraction may be related to arousal and this would explain the observation of both facilitation and inhibition of performance with the use of different distractors. A distraction may increase arousal level and thereby improve performance until an optimal level of arousal is surpassed. Once the arousal level goes beyond the optimal level, performance drops. Hockey (1970a,b) and Weinstein (1974) have both examined noise distraction and its effect upon the arousal-performance relationship. A noise distraction was found to impede or facilitate performance depending upon the strategy of coping with distraction adopted by the individual and what aspects of performance were being measured.

Finally, the existence of sex differences in distraction has been examined by several investigators (Bee, 1966; Kumar & Mathur, 1969; Hale & Stevenson, 1974). Little agreement concerning the effect of distraction upon the different sexes was reported by the authors mentioned above. For this reason, further investigation of a sex difference in distractibility was attempted.

Another personality distinction which appeared appropriate to

distraction, arousal, and learning was the introversion-extraversion personality dimension posited by Eysenck (1967). Introverts and extraverts are posited to react differently to the environment because of differences in excitability and inhibition. Since distraction appears to be related to arousal (Hockey, 1970a,b), then the introvert-extravert distinction may help to improve the prediction of the effect of distraction upon learning. However, Brebner and Cooper (1974) argued that it is hard to determine whether inhibition or excitability is the underlying mechanism accountable for the difference in performance under distraction for the personality types because the postulates put forth by Eysenck (1967) are unclear and the literature reviewed was contradictory and inconclusive. This study was devised to further investigate the relationship between extraversion-introversion, distractibility, and learning.

CHAPTER II

REVIEW OF THE LITERATURE AND STATEMENT OF PROBLEM

Distraction Research

Early studies investigating the effect of noise distractors on learning were often inconclusive (reviewed in Broadbent, 1959) and contradictory. Hockey (1970a), in reviewing several articles which examine the effect of noise distractors on vigilance tasks, reported noise distractors can either facilitate or inhibit performance depending upon task complexity. In two separate studies, Sanders and Baron (1975) reported significant impairment in performance by a visual interruption distractor on "complex" tasks such as number coding and a reverse alphabet task. The same distraction, on the other hand, was found to facilitate performance on less complex or simple tasks which included number copying and letter copying tasks.

It appears distraction can either impair or facilitate performance. Task complexity also appears to determine whether a distraction will impair or facilitate performance. Yet, what is the underlying mechanism which causes this to occur? Sanders and Baron (1975) suggested it has to do with the drive or motivating properties of distraction. When a distraction is presented during task performance, a conflict results between the response needed to complete the task

and the response elicited by the distracting stimulus. This conflict would increase the drive level within the subject (Sanders & Baron, 1975) and thereby improve performance on simple tasks (Spence, Taylor, & Ketchel, 1956). In support of the conflict-drive hypothesis of distraction, Sanders and Baron (1975) found that a visual distractor facilitated performance on a simple task.

Easterbrook (1959) observed an increase in drive or arousal level (due to anxiety) was associated with a shrinkage in the range of environmental cue utilization. With the reduction of cue utilization, a focusing or concentrating on more relevant cues occurs and performance improves. However, as the arousal level increases with greater distraction, attention continues to focus, more relevant cues become ignored, and performance drops (Hockey, 1970a). The performance of complex tasks requires the use of more environmental cues than simple tasks and will be impaired sooner as arousal level increases.

Hockey (1970a,b) demonstrated the focusing or selectivity effect of increasing arousal through the use of a noise distraction. Each subject was required to complete a dual task technique, including tracking a centrally located target and monitoring lights coming on in their visual periphery. The tracking task (primary task) was described to the subjects as the more relevant task and the monitoring was described as the least relevant. Performance on the primary task under noise distraction improved over time relative to a quiet condition, while there was a corresponding decrement in performance on

the secondary task. Although this demonstrates the narrowing or focusing of cue utilization described by Easterbrook (1959), the effect of task complexity does not appear to be clear since a strong experimental bias was set up in favor of the tracking task. However, this does suggest there may not just be a simple inhibitory-facilitory effect depending upon cue complexity, but the subject may have more voluntary control over which task the attentional narrowing, brought about by distraction, will be directed.

Weinstein (1974) explored the effect of task complexity and attentional narrowing with a more generalizable noise distractor (teletype sounds). Subjects were monitored on detection of errors in a proofreading exercise and overall comprehension of the text read. Errors in misspelling (noncontextual errors) were posited to be less complex and more easily monitored than grammatical errors (contextual errors), or comprehension. Non-contextual errors and comprehension of the texts were found to remain stable, while contextual errors became greater with a noise distraction in comparison to performance under a quiet condition. This suggested that narrowing of attention, as shown by Hockey (1975a,b), by the subject does occur but it does not appear to be entirely related to task complexity since comprehension, considered the most complex task, was not affected by the distraction. The fact that the most complex task was unaffected by distraction may occur because subjects have an active role in directing the attentional narrowing which occurs during distraction and develop a strategy to keep their overall performance from deteriorating

(Weinstein, 1974). In Hockey (1975a,b) the strategy was supplied by the experimenter when different task priorities were assigned. In Weinstein (1974), no strategy was supplied by the experimenter. However, it was found that most subjects sacrificed speed of reading in an attempt to keep comprehension accurate in noise conditions.

It does appear that distraction narrows cue selectivity. The narrowing, however, does not automatically affect the performance on tasks with the most complex cues. Instead, it appears that the subject can direct the focusing effect of distraction so that performance on a complex task will remain the same or even be facilitated. However, performance on other tasks, which the subject may not consider important, will deteriorate. Under distraction, the subject cannot keep up good performance on all tasks but appears to have some choice as to which part of task performance will be kept up and which part of performance is allowed to deteriorate.

The type of distraction encountered may also affect performance. Difference types of distractors may produce different levels of arousal or focusing which will affect task performance. Hale and Stevenson (1974) studied short term memory in five- and eight-year-old children under conditions of no distraction or either an auditory or visual distraction. Auditory distractors consisted of a tape of a children's story being read normally and the same story played at a slow speed to make it unintelligible. Visual distractors consisted of line drawings randomly flashed on a screen or diagonal lines randomly flashed across six windows. Children's performance on the

memory task was better under no distraction conditions than under distraction conditions, but performance also varied according to the type of distraction used. Performance in visual distractor conditions was better than performance in auditory distractor conditions.

The above findings suggest that auditory distractors may produce more arousal in subjects than visual distractors. In this experiment the distraction was also produced by manipulating the interest value of the distraction used rather than just sound intensity. Manipulation of sound intensity may produce the sought after results (i.e., change in performance) but have little in common with distractions encountered in everyday living, leaving the results of such experimentation hard to generalize.

Baker and Madell (1965a) manipulated the meaningfulness of a distractor in trying to determine whether susceptibility to distraction could be used as a means of distinguishing intellectual ability. The speed and accuracy in performing matched addition and subtraction problems were measured under five distraction conditions (warmup condition, no distraction-accuracy condition, workshop noises condition, humorous conversation condition, and verbal arithmetic computations condition) for 60 male subjects. Measures of achievement-underachievement (percentage ranking of grade point average below 15 points of percentage ranking of S.A.T. scores) were taken for all of the subjects and were compared with performance under the distraction conditions. Workshop noises were found to be the least effective distractor (least arousing) while the humorous conversation condition

was found to create the most impairment in performance. Subjects designated as underachievers were found to be more distracted from performance than the achievers group. In a follow up study (Baker & Madell, 1965b), only one distractor (humorous conversation) was used with a narrower group of subjects (freshman college students) in an effort to maximize opportunity for the hypothesized personality variable to be operative. Using a reading test as the dependent variable, no significant difference was found between achievers and nonachievers in the no distraction condition. In the humorous distraction condition, though, underachievers suffered a significantly greater impairment in both speed and comprehension measures of the reading test.

It appears, then, that different types of distractors can have a differential effect upon performance. Auditory distractors appear to have greater effect upon performance than visual distractors and conversational or more meaningful distractors have greater effect on performance than unmeaningful background noise. However, Baker and Madell (1965b) also reported that subjects displayed both impaired comprehension and speed of comprehension in a distraction condition. Yet, the review of distraction literature presented here suggests that this should not occur. As arousal increases with distraction, a narrowing of attention occurs (Easterbrook, 1959) and the subject will have to drop attending to some cues thereby affecting performance. The results from Weinstein (1974) suggested that the subjects will probably maintain comprehension, but speed of comprehension may become impaired with distraction. Further investigations of the

effect of different types of distraction upon performance may be needed to clarify these apparent contradictions.

Individual Differences in Distractibility

Weinstein (1974) showed that individuals used different strategies in performing tasks under distraction. Although subjects generally sacrificed speed to maintain comprehension, there appeared to be a greater variability in response during the noise condition than in the no noise condition. This variability suggests there will be some individual differences in coping with a distraction when a strategy of performance is not supplied. Baker and Madell (1965a,b) also found individual differences in coping with distraction between achievers and underachievers. Their findings suggest that there are consistent individual differences in coping with distraction. If there are consistent individual differences in coping with distraction, then what might be the nature of these individual differences?

Sex differences. Bee (1966) found disagreement in the literature concerning the existence of individual differences in distractibility. In a study designed to determine the effect of ten different noise distractors (ranging from buzzer sounds, to music, to a voice reading) upon three different problem solving tasks, Bee (1966) discovered that there were consistent differences in coping with distraction. Kumar and Mathur (1969) found that a noise distraction caused by two bells facilitated performance for 40 female subjects in a mechanical task and had no effect on performance of an arithmetic task. Deteriorated performance on both tasks were found for the

40 male subjects. However, Hale and Stevenson (1974) found no sex related difference of auditory or visual distraction upon short term memory. Although there is some evidence of sex differences in coping with distraction, the literature does not appear to be all that clear.

Introversion-extraversion: Theoretical considerations. Eysenck (1967) has proposed two dimensions of individual differences or personality factors which can be considered when studying the effects of distraction upon learning. In a review of personality traits and factor analytic studies, Eysenck (1970) concluded that there were two separate sets of traits which exhibit very little overlap upon factor analysis. These two sets of traits, better conceived of as two superfactors or two types of personality, were measured through a dimensional framework (Eysenck, 1964) on the Eysenck Personality Inventory (EPI) (Eysenck & Eysenck, 1968) and include the dimensions of extraversion-introversion and neuroticism-stability. In this paper attention will be focused mainly towards the introversion-extraversion continuum.

Phenotypically, the extravert was described by Eysenck and Eysenck (1975) as:

> . . . sociable, likes parties, has many friends, needs to have people to talk to, and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment and is generally an impulsive individual. He is fond of practical jokes, always has a ready answer, and generally likes change. He is carefree, easygoing, optimistic, and likes to "laugh and be merry." He prefers to keep moving and doing things, tends to be aggressive and to lose his temper quickly. His feelings are not kept under tight control, and he is not always a

reliable person. (p. 5)

Eysenck and Eysenck (1975) described the typical person scoring in the introverted end of the introversion-extraversion scale as:

> . . . quiet, retiring sort of person, introspective, fond of books rather than people; he is reserved and distant except to intimate friends. He tends to plan ahead, 'looks before he leaps' and distrusts the impulse of the moment. He does not like excitement, takes matters of everyday life with proper seriousness, and likes a well ordered mode of life. He keeps his feelings under close control, seldom behaves in an aggressive manner, and does not lose his temper easily. He is reliable, somewhat pessimistic, and places great value on ethical standards. (p. 5)

Eysenck (1967) did not stop with a phenotypical description of the introversion-extraversion factor, however, and attempted to link the personality dimensions with the main body of experimental, physiological, and theoretical psychology. The extraversion dimension was postulated to be related to the balance of excitation and inhibition prevalent in the central nervous system. This balance is largely inherited and may be directed by the reticular formation. Eysenck (1967) suggested that introverts have greater levels of cortical arousal or "excitation" which may be due to a lower threshold of reticular arousal. An introvert would also be characterized by a weak inhibitory potential while extraverts would be characterized by weak excitatory and strong inhibitory potentials.

Introversion-extraversion: Research. How does the hypothesized difference in excitatory and inhibitory potentials manifest itself so that the difference can be measured? It has been hypothesized that reticular stimulation or arousal enhances the efficiency of the sensory system (Eysenck, 1967). If introverts do possess greater

levels of cortical arousal because of a lower reticular arousal threshold, then introverts and extraverts may exhibit a differential sensitivity to sensory input. Introverts would be more sensitive to various levels of sensory input than extraverts because of the hypothesized lower threshold of reticular arousal.

Several experimenters have used sound as an independent variable to study the proposed difference in sensory sensitivity between introverts and extraverts. Stelmack and Campbell (1974) found that introverts exhibited more sensitivity to lower frequency tones (500 HZ) than extraverts. Elliot (1971) investigated the different tolerance effect of high levels of noise upon children of five to ten years of age who were either extraverts or introverts. Since noise is an arousing stimulus, introverts may experience the same level of noise as more arousing than extraverts if there is a difference in reticular arousal threshold. Assuming that there is an optimal arousal level, where the sensory system is not overstimulated nor understimulated, there may be a difference in the optimal arousal level between extraverts and introverts. Elliot (1971) suggested that subjects attempt to maintain this optimal level of arousal and would exhibit less tolerance for higher levels of arousal. Introverted children, regardless of age, were found to prefer lower levels of noise and exhibited less tolerance for higher levels of noise than extraverts. Males were also reported to have a significantly higher noise tolerance than females.

These two experiments support the hypothesis that there is a

difference in sensory sensitivity between introverts and extraverts. They also support, indirectly, the hypothesized biological mechanism underlying this difference (i.e., a difference in reticular threshold). There does appear to be individual differences in arousal thresholds and the differences are predicted well by scores on the I-E personality dimension.

Differences in the reticular arousal threshold between extraverts and introverts may affect the level of sensory sensitivity of the personality types and may also lead to a measurable difference in task performance between the two personality types. Hebb (1955) reported a curvilinear relationship between arousal level and performance. As arousal increases, task performance improves until an optimal level of arousal and performance is reached. As arousal increases beyond the optimal level, task performance decreases. If introverts, rather than extraverts, have a lower reticular arousal threshold, then, for a low arousal condition, the introvert will perform better than the extravert. Under low arousal conditions, the introvert will be more aroused than the extravert and, therefore, be closer to the optimal arousal level. Thus, the introvert will display better task performance than the extravert.

Harkins and Green (1975) found that introverts showed superior vigilance to a visual display task and also interpreted these results as being associated with the differential cortical excitation between introverts and extraverts. The visual display task was interpreted as being less arousing than an auditory-vigilance task. The small

level of arousal produced by the visual display task was enough to gain introverts their optimal level of arousal and improve performance, but not enough to arouse extraverts to a point where vigilance performance would improve. The degree of arousal produced, then, by various tasks is important as to how it affects the performance of extraverts and introverts.

Further differences between extraverts and introverts in performance were reported by Eysenck and Cookson (1969). Introverts were found inferior to extraverts in the area of academic achievement up to the age of 11. Extraversion and ability correlated positively for children of 11 years of age but were negatively correlated for older students. It was suggested that introverts develop differently in academic performance (learning) than extraverts. Elliot (1972) also found that introverted British school children attained greater learning efficiency than extraverts once beyond the age of 12. Extraverts showed greater learning efficiency below the age of 12. This suggests a developmental aspect to the interaction between personality trait and learning which may be correlated with the development of the reticular formation system. Entwistle and Entwistle (1970) studied personality and academic achievement with university students. It was found that introversion scores correlated significantly with measures of academic achievement but extraversion scores did not. Rather than relate these results to different reticular arousal thresholds, Entwistle and Entwistle (1970) related the findings to the development of reactive inhibition. They suggested that extraverts

develop reactive inhibition on learning simple motor skills before introverts do, which leads to an earlier detriment in learning efficiency for extraverts than for introverts.

This introduces a major difficulty in research related to the differences found between extraversion and introversion on performance or learning. The difficulty lies in the explanatory constructs used to describe the differences found between extraversion and introversion. Up until now this review has focused mainly on the difference in "excitatory" potential or arousal threshold differences. However, Eysenck (1969) also posited a difference in inhibitory potential between the personality types. Introverts are posited to have a weak inhibitory potential (Eysenck, 1967) and may dissipate any inhibition which does develop faster than extraverts (Elliot, 1972). In performing a simple task, then, the introvert would less likely develop a negative drive state (reactive inhibition) which would effect performance. The extraverts, however, would experience a stronger, quicker build of reactive inhibition and this would manifest itself by decreasing effective performance.

The different theoretical explanations for the I-E difference can lead to contradictory predictions for the same experimental conditions (Brebner & Cooper, 1974). Brebner and Cooper (1974) reported conflicting results in experiments concerned with extraversion and tolerance for sensory deprivation. Introverts should be capable of tolerating greater sensory deprivation than extraverts because introverts may have a higher level of excitatory potential (Eysenck, 1967).

Extraverts may exhibit less tolerance because the sensory deprivation conditions will not provide the stimulus necessary to raise their low arousal level to a preferred level (Brebner & Cooper, 1974). However, if one considers that extraverts have a stronger inhibitory potential, rather than a lower excitatory potential, a difference prediction for sensory deprivation tolerance can be made. Brebner and Cooper (1974) suggested that in applying the reactive inhibition postulate, "the low response rates typically required of subjects in deprivation situation avoid the build up of any strong response related negative drive state (R-inhibition) in extraverts whose tolerance, it could be argued, would, therefore, be more akin to that of the introverts in this setting." (p. 265)

In a free response situation, Phillips and Wilde (1970) reported that extraverts maintained a higher response rate than introverts. The inhibitory potential construct, however, predicts that extraverts exhibit a lower response rate in a free response situation because inhibition would build up faster and the subsequent rest pauses would reduce the response rate. The arousal construct, however, supports the Phillips and Wilde (1970) findings because extraverts are hypothesized to possess a lower level of cortical arousal (due to a higher reticular arousal threshold) and "would seek more stimulation in order to maintain a balance between excitation and inhibition" (Brebner & Cooper, 1974, p. 265).

These studies point to the rather unclear and sometimes contradictory predictions that can be made from the theory put forth by

Eysenck and Eysenck (1968) concerning the differences in performance between extraverts and introverts. Cohen and Horn (1974) reported contradictory predictions based on the same theoretical postulates concerning introversion-extraversion differences in cortical inhibition. Two types of cortical inhibition, i.e., temporal inhibition and spatial inhibition, were identified as affecting performance (Eysenck & Rachman, 1965). Cohen and Horn (1974) described temporal inhibition as being "manifested by lowered vigilance and increased susceptibility to boredom during massed trials" (p. 304). Spatial inhibition was described as being "manifested in terms of distractibility by task irrelevant input . . . (and) . . . is not due to performance but rather to events outside the organism during performance" (Cohen & Horn, 1974, p. 304). The relationship between both types of inhibition and the I-E dimension was unclear from the theory used to explain differences in performance between extraverts and introverts. Extraverts were described as quickly developing a performance decrement due to a strong inhibitory potential. Yet, introverts were described as being more distractible (spatial inhibition) even though they were hypothesized to possess a weak inhibiting potential. Cohen and Horn (1974) reported that Eysenck (1955) suggested that both types of inhibition are caused by the same cortical processes. Since extraverts are posited to have a strong inhibitory potential, then the extravert should display a strong spatial inhibition (distractibility).

In a study designed to explore the relationship of temporal

inhibition, spatial inhibition, and extraversion, Cohen and Horn (1974) administered three spatial inhibition tasks (Stroop Color Word Test, Gibson Spiral Maze, and Digit Symbol subtest with verbal distraction) and two temporal inhibition tasks (Archemides spiral and Necker cube) to 104 female college students who had completed the EPI. Cohen and Horn (1974) reported that performance on all of the inhibition producing behavioral tasks did not significantly correlate with the I-E dimension. It was concluded that a difference in cortical inhibition, as an explanatory construct for any introversion-extraversion difference, was not supported.

Although Cohen and Horn (1974) found no support for the cortical inhibition postulate, distraction was operationalized in terms of inhibition rather than excitation, as done above (Eysenck & Rachman, 1965). If the assumption can be made that extraversion, which is described as possessing a stronger inhibitory potential, includes both types of inhibition, then extraverts may be described as more distractible than introverts. However, in considering what was discussed previously about noise distraction, arousal, and attentional narrowing, introverts, alone, could be predicted as being more distractible because of the high cortical arousal potential of the introvert. There is a definite contradiction in the predicted direction of performance under distraction, depending upon which theoretical construct the experimenter chooses to apply, inhibition or excitation.

Several experimenters have studied the effects of distraction on performance and how it varies according to the I-E personality

dimensions. Davies and Hockey (1966) and Davies et al. (1969) reported that under conditions of high intensity white noise, the performance of extraverts on a visual vigilance task was improved significantly more than the performance of the introverts. One way to explain this is that the high level of arousal produced by the high intensity noise may have increased the arousal level of both extraverts and introverts. However, the increase may have been beyond the optimal performance level for introverts, because of their lower reticular arousal level. The introverts showed some improvement but actually their performance could have already been deteriorating from the optimal arousal-performance level. The extravert, however, possessing a higher reticular arousal threshold, could have been aroused by the noise to an optimal level of arousal and showed the most improved performance.

In another experiment designed to observe the effect of distraction upon the performance of extraverts and introverts, Howarth (1969) found extraverts performed better in a serial learning task than introverts under distraction (a visual response competition). Gulian (1971), however, found extraverts made more errors in vigilance performance under a noise distraction than introverts. Introverts made more errors during the no noise condition than extraverts. These results do not support Eysenck's (1967) expectations based on differential arousal level hypothesizing. Extraverts would be expected to make fewer errors in a noise condition because the distraction should increase their arousal level, thereby improving performance. However,

the results reported by Gulian (1971) can be explained by the fact that extraverts may have a higher temporal inhibition potential than introverts. The vigilance talk may have produced greater temporal (reactive) inhibition in extraverts which decreased vigilance efficiency.

Mohan and Munjal (1972) attempted to qualify the relationships among personality type, performance, and distraction. No significant difference in performance was formed between introverts and extraverts under distraction. It was suggested that no significant interaction was found because of the poor quality of distraction (bell) and the lack of sensitivity of the dependent measure (backward alphabet writing).

It is apparent from the literature that just how distraction effects the performance of introverts and extraverts is unclear. Theoretically, there should be a difference in performance between the personality types under distraction. However, what direction this predicted difference assumes, depends on whether differences in excitation, or inhibition are the primary processes active during the experimental procedure. If excitation or arousal is the primary process underlying distraction, then extraverts should perform better under a strong distraction condition. If spatial and temporal inhibition are the underlying processes, then extraverts would do worse under strong distraction conditions. A careful study, examining levels of distraction, performance, and the introversion-extraversion dimension may determine whether excitation or inhibition are the active

processes in distraction. However, in studying the variables, the generalizability of these data must be considered so that results can be relevant to everyday situations.

Experimental Hypotheses

A highly meaningful noise distractor (HD) should impair performance on the reading test more than a less meaningful distractor (LD). The more meaningful the distractor, the more arousing it is. The more arousing the distractor is, the greater the degree of attentional narrowing and some aspect of performance becomes impaired. However, what part of performance becomes impaired depends upon the subject's task strategy. The following hypotheses can be formulated concerning the effect of different levels of distraction upon different aspects of reading performance:

Hypothesis 1: The level of comprehension score remains the same under LD and HD conditions because of task strategy.

Hypothesis 2: The speed of comprehension performance is facilitated under LD conditions and is impaired under HD conditions.

The literature reviewed also suggested that the effects of distraction upon performance and learning varies according to certain individual differences, specifically, according to sex type and the introversion-extraversion personality dimension. The effect of distraction upon the different sexes was not clear from the literature reviewed. However, a male's performance did deteriorate under a

distraction condition (Kumar & Mathur, 1969).

The following hypothesis is concerned with sex differences in distractibility:

Hypothesis 3: Under HD conditions, males show a greater deterioration in performance than females.

Finally, a difference in performance under distraction conditions between extraverts and introverts has been observed (Davies & Hockey, 1966; Howarth, 1969; Gulian, 1971). The direction of this difference is not clear from the literature reviewed here and can be predicted to be in either direction depending on which theoretical construct the experimenter applies. Since distraction has been examined in terms of arousal rather than inhibition, it is suggested that excitation is the underlying process active when performing under distraction.

The following hypotheses are concerned with personality differences in distractibility:

Hypothesis 4: Under nondistraction (ND) conditions, introverts perform significantly better than ambiverts and ambiverts better than extraverts on both dependent measures.

Hypothesis 5: Under LD conditions, introverts perform better than ambiverts and ambiverts better than extraverts on both dependent measures.

Hypothesis 6: Under HD conditions, extraverts perform better than ambiverts and ambiverts better than introverts on both dependent measures.

CHAPTER III

METHOD

Subjects. A sample of 48 male and 48 female subjects were selected from 326 introductory psychology students at Loyola University of Chicago according to scores received on the EPI. The 16 lowest scoring males and 16 lowest scoring females were considered introverts. The introvert group had a mean EPI score of 6.84 with a standard deviation of 3.49. The 16 highest scoring males and 16 highest scoring females were considered extraverts. Extraverts had a mean score of 19.56 with a standard deviation of 1.29. The 16 males and 16 females closest to the mean score of the population were considered ambiverts. Ambiverts had a mean score of 13.47 with a standard deviation of 1.16.

Selected subjects were assigned to one of eight counterbalanced distraction conditions according to sex type and introversion-extraversion score. Each counterbalanced condition consisted of two male and two female introverts. There were three female and three male subjects dropped from the original sample because the subjects were presented with an improper data collection procedure. Six more subjects were selected from the same introductory psychology group, according to sex type and EPI score, to replace the dropped subjects.

Materials. Distraction has been shown to facilitate or impair performance depending upon the degree of arousal a distractor elicits,

the tasks performed, and the strategy used by the subject. As distraction increases, attention to performance narrows or focuses. The narrowing facilitates performance to a certain point; then performance begins to deteriorate because the subject can no longer attend to all of the important cues. This facilitation-deterioration of performance operates according to an inverted U function. However, what cues attention remains focused on and which cues are ignored under distraction is determined by the subject's strategy of performance (Weinstein, 1974). In order to best determine the effect of a distraction upon performance, then, more than one aspect of performance should be measured.

In this experiment the dependent variable (learning) was measured by the Reading Comprehension subtest of the Cooperative English Test (Forms 1 and 2) which yields both speed and level of comprehension scores for each subject. The two scores offer a broad enough dependent measure so that any narrowing of attention which takes place under distraction can be measured. The standardized test procedure allowed a maximum of 25 minutes to complete the subtest. The different forms were presented to each subject in a counterbalanced manner to control for any differential practice effect.

Two levels of distraction were manipulated in this study to determine whether a mildly arousing distractor affects performance differently than a highly arousing distractor. The more meaning a distractor has, the more arousing it is, and the more performance should be impaired. The noise distractors, then, differed in their

level of meaning rather than frequency or volume.

The LD condition included a 25 minute tape of traffic sounds. The sounds were collected on a cassette tape recorder during rush hour in Chicago. The sounds included passing car sounds and some distant horn sounds. The volume of the tape was controlled for by measuring the intensity of sound from where subjects sat and setting the recorder volume so that the sounds were at a normal level of intensity.

The HD condition included a 25 minute tape of cuts from the comedy album, "Nichols and May in Retrospect." The album cuts used were "Telephone," "Adultery," and "Disc Jockey." The volume was controlled for as described above.

Finally, a short questionnaire was used. The following questions were asked on the questionnaire: 1) Were you distracted from reading by the tape? 2) Briefly describe what you heard. 3) Do you have any hearing problems? The questions were aimed at finding out how the distraction was heard and what was heard.

Procedure. The EPI was given to introductory psychology students as part of a survey which included a number of other questionnaires and paper and pencil tests. The experimental sample was selected from this large group of subjects according to sex and EPI scores. The selected subjects were assigned to experimental conditions by sex and EPI score. The experimenter then contacted the subjects and asked them to come in for the second part of the experiment. If subjects did not wish to take part in the experiment,

the closest scoring same sex subject was called. If there were several subjects to choose from then the subjects were randomly picked.

When subjects arrived they were seated in a quiet classroom in groups of two to six people. All subjects were situated in desks around the perimeter of the room, facing out towards the walls of the room. Desks were situated far enough apart so other subjects would not be a distraction. The tape recorder was situated in the center of the subject perimeter and set so each subject got an equivalent intensity of sound.

Upon entering the room subjects were asked to seat themselves around the room. The experimenter passed out a small booklet consisting of a brief explanation of the study. The booklet stated that the experiment was designed to study how personality and environment effect learning. The experimenter passed out one form of the Reading Comprehension subtest of the Cooperative English Test, two answer sheets, and a questionnaire. Standard administration instructions for the reading test were used. During administration of the first test form, one of three distracting conditions was presented. Either a ND condition was presented or a distractor (High, Low) was presented. After 25 minutes the subjects were instructed to stop and the second form of the reading subtest was administered under a different distraction condition than presented before.

The distractors and alternate test forms were counterbalanced to form eight different treatment conditions which are presented in Table 1. The counterbalanced conditions controlled practice effects

Table 1

Test Forms, Type of Distraction, and Experimental Conditions Devised by Counterbalancing

Test Forms	Distractors
1-A	No (N)
1-B	Low (L)
	High (H)

Counterbalanced Conditions							
1A-H	1A-L	1A-N	1A-N	1B-H	1B-L	1B-N	1B-N
1B-N	1B-N	1B-H	1B-L	1A-N	1A-N	1A-H	1A-L

and distributed effects of fatigue created by presenting two alternate reading tests to one subject.

Finally, after both forms of the reading test were completed under different conditions of distraction, the experimenter asked subjects to briefly answer the questionnaire and dismissed the subjects as they finished.

CHAPTER IV

RESULTS

Counterbalancing. Each subject completed the reading test twice, once under a ND condition and once under either a HD condition or a LD condition. Presentation of the ND and distraction conditions were counterbalanced in order to control for any practice, order, and fatigue effects. One assumption of counterbalancing is that there is no differential or asymmetrical transfer (McGuigan, 1968) between the counterbalanced conditions. If there were no differential transfer between conditions, then no difference between reading scores obtained from groups receiving the ND condition first and from groups receiving the ND condition second would be observed. Table 2 includes the mean and standard deviation of the sample's performance under the ND condition for both dependent measures. The data are presented according to the three independent variables of sex, personality, and distraction and also examined according to an order of presentation variable to check for differential transfer.

The summary of a four-way analysis of variance for the level of comprehension scores obtained under the ND condition are presented in Table 3. The data were analyzed according to the subject's EPI score, sex, the type of distraction received, and the order of the distraction condition (whether the distraction condition was completed before or after the ND condition). There was no significant main

Table 2

Means and Standard Deviations of Level and Speed of Comprehension Scores for No Distraction Condition

	Distraction condition and order of presentation							
	Low				High			
	Before		After		Before		After	
	M	SD	M	SD	M	SD	M	SD
Level of Comprehension								
Extravert								
Male	16.25	(7.85)	13.75	(4.50)	16.25	(5.74)	25.25	(2.50)
Female	22.00	(6.38)	17.25	(7.80)	16.25	(6.13)	14.75	(6.24)
Ambivert								
Male	16.25	(4.99)	17.75	(7.41)	17.25	(1.71)	16.25	(2.06)
Female	22.75	(7.27)	21.50	(2.38)	14.00	(5.60)	20.50	(2.08)
Introvert								
Male	21.25	(4.99)	16.25	(2.06)	18.75	(5.34)	19.50	(.58)
Female	20.00	(6.16)	20.50	(2.08)	23.25	(3.78)	22.50	(2.88)
Speed of Comprehension								
Extravert								
Male	30.25	(14.89)	20.00	(5.10)	29.50	(6.76)	40.50	(7.33)
Female	42.50	(6.40)	27.25	(6.70)	19.25	(8.50)	26.50	(7.19)
Ambivert								
Male	32.25	(12.01)	32.50	(11.56)	28.75	(6.65)	28.50	(8.54)
Female	35.50	(12.77)	28.50	(3.70)	22.75	(9.32)	26.50	(5.45)
Introvert								
Male	27.75	(9.07)	28.25	(5.12)	27.25	(9.74)	34.50	(5.74)
Female	28.50	(9.33)	32.25	(5.97)	32.75	(6.24)	30.75	(6.45)

Table 3

Analysis of Variance Results for Level of Comprehension Under No Distraction

Source of variance	df	MS	F
Extraversion score (A)	2	55.22	2.02
Sex (B)	1	52.51	1.92
Distraction condition (C)	1	.01	
Order of presentation (D)	1	.85	.03
A X B	2	19.76	.72
A X D	2	15.22	.56
B X D	1	7.59	.28
C X D	1	106.26	3.89*
A X B X D	2	41.84	1.53
A X C X D	2	15.32	.56
B X C X D	1	10.01	.37
Error	72	27.37	

Note. Interactions of no relevance to evaluation of experimental design and/or experimental hypotheses were not included in this table.

*p .06

effect for order of presentation, $F(1,72) = .03$, p = NS.

Therefore, it appears that the ND scores were not significantly confounded by a differential transfer effect from the counterbalanced design. Since the ND scores are used to control for different reading abilities, it is important that the ND scores not be confounded by design.

A summary of the analysis of variance for the speed of comprehension scores obtained under ND conditions are included in Table 4. There was no significant main order of presentation effect, $F(1,72) = .02$, p = NS. However, there was a significant interaction between the order of presentation and the level of distraction received by the subject, $F(1,72) = 6.67$, $p < .01$.

The means for the speed of comprehension scores obtained under a ND condition are presented in Figure 1 according to the order of presentation of distraction conditions and the type of distraction received. Examination of Figure 1 reveals that subjects who completed the reading test under ND conditions first performed at a slower mean speed of comprehension during the ND condition than the subjects who performed under a ND condition after completing a LD condition. Subjects who completed a HD condition before the ND condition performed at a slower mean rate under ND than subjects who completed the ND condition before the HD condition.

The speed of comprehension scores obtained under a ND condition are confounded by the order of presentation of the other distraction conditions. The assumption that there was no differential transfer

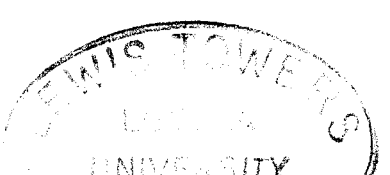

Table 4

Analysis of Variance Results for Speed of Comprehension Under No Distraction

Source of variance	df	MS	F
Extraversion score (A)	2	12.07	.17
Sex (B)	1	4.17	.06
Distraction condition (C)	1	42.67	.61
Order of presentation (D)	1	1.50	.02
A X B	2	40.76	.58
A X D	2	29.09	.41
B X D	1	66.67	.95
C X D	1	468.17	6.67**
A X B X D	2	4.45	.06
A X C X D	2	270.95	3.86*
B X C X D	1	.68	.01
Error	72	70.19	

Note. Interactions of no relevance to evaluation of experimental design and/or experimental hypotheses were not included in this table.

*$p < .03$

**$p < .01$

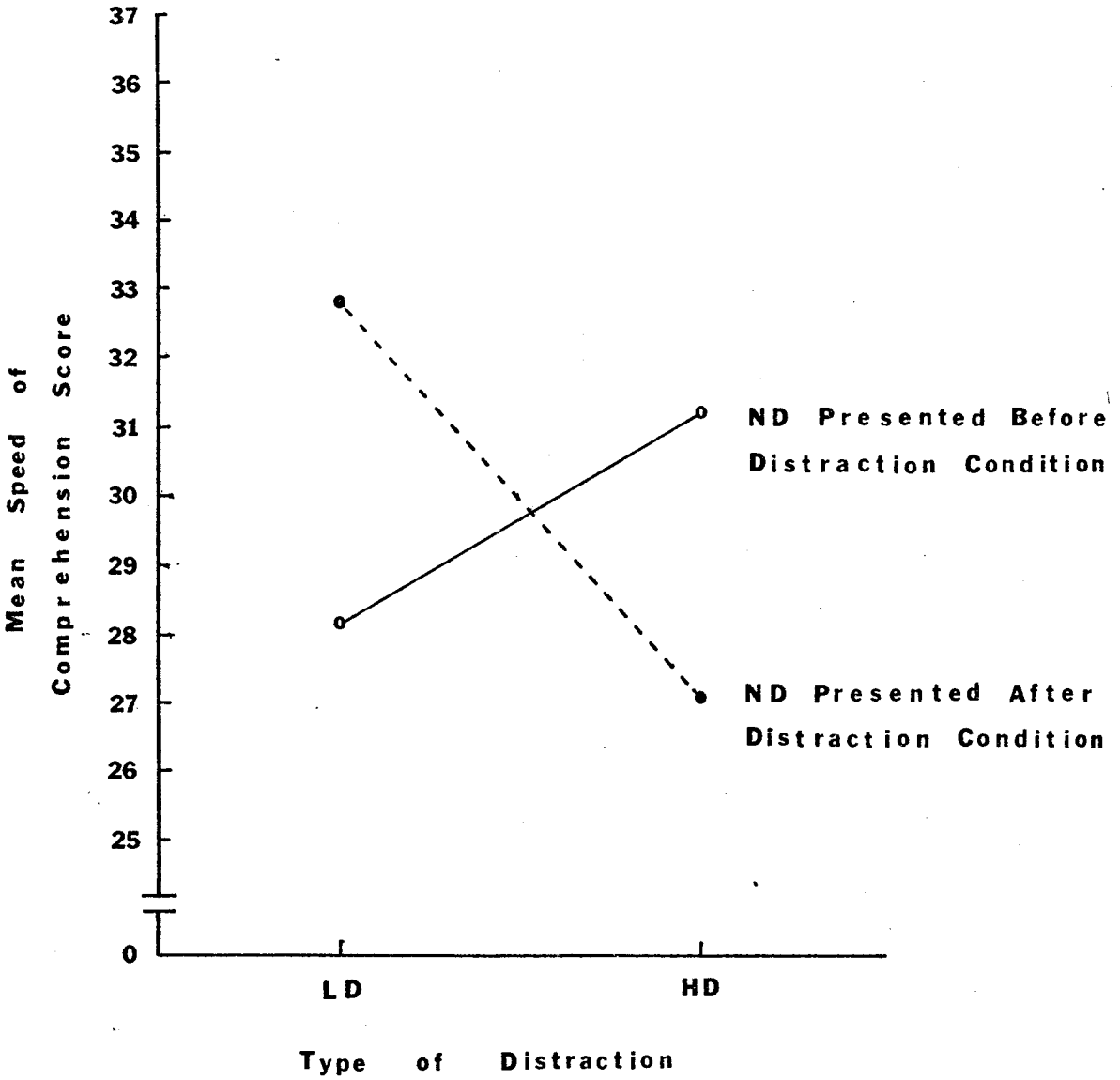

Figure 1. The mean speed of comprehension score for ND conditions completed before or after an LD or HD condition.

between conditions was not appropriate for the speed of comprehension scores obtained under ND conditions. In this study going from HD to ND was not the same as going from ND to HD. The HD condition had a detrimental carry over effect on the ND condition performed afterwards which did not occur when the ND condition was performed before the HD condition. The LD condition, however, had a facilitative carry over effect on performance in the ND condition performed following it.

No distraction condition. It was hypothesized that introverts perform better under ND conditions than ambiverts and ambiverts better than extraverts. There were no significant main introversion-extraversion personality dimension effects for level of comprehension scores, $F(2,72) = 2.02$, p = NS, or for speed of comprehension scores, $F(2,72) = .17$, p = NS, obtained under a ND condition. There was no difference in performance on a learning task under a ND condition between introverts, ambiverts, and extraverts.

Distraction conditions. Previous research has indicated introverts to be more efficient in academic skill than extraverts (Elliot, 1972). In order to control for systematic reading skill and experience with reading tests, a difference score was used to determine the effect of the distraction conditions. A subject's reading score obtained under a ND condition was subtracted from the score obtained under a LD or HD condition. The resulting difference score was a measure of change in performance under a distraction condition in comparison to a subject's baseline performance. Table 5 displays the

Table 5

Means and Standard Deviations of Difference Scores for Level and Speed of Comprehension

Variable	Low level of distraction M	SD	High level of distraction M	SD
Level of Comprehension				
Extravert				
Male	1.25	(8.17)	-3.75	(6.20)
Female	-4.50	(4.69)	-1.38	(5.24)
Ambivert				
Male	3.25	(7.05)	-3.00	(4.07)
Female	-2.62	(4.63)	-2.25	(5.34)
Introvert				
Male	.38	(5.55)	- .62	(5.83)
Female	- .12	(4.58)	-4.00	(3.62)
Speed of Comprehension				
Extravert				
Male	2.75	(12.34)	-6.62	(9.57)
Female	-5.12	(9.75)	-3.50	(6.70)
Ambivert				
Male	2.88	(9.45)	-6.12	(3.40)
Female	-3.12	(8.87)	-3.50	(6.41)
Introvert				
Male	- .12	(5.46)	-3.88	(11.63)
Female	-1.39	(10.35)	-7.88	(5.11)

mean differences and standard deviations for both dependent measures according to personality type, sex, and type of distraction. A group with a positive mean performed better under a LD or HD condition than under a ND condition. A group with a negative mean exhibited an inhibited performance under a LD or HD condition than under a ND condition.

It was predicted that under a LD condition the speed of comprehension score is facilitated and under a HD condition, the score is inhibited. Table 6 shows the result of a three-way analysis of variance on the speed of comprehension difference scores. The scores are presented according to an analysis of variance table with three independent variables: personality type, sex type, and type of distraction. The type of distraction a subject performed under did significantly effect the speed of comprehension difference scores, $F(1,84) = 6.64$, $p < .01$. The speed of comprehension performance was inhibited under a HD condition as predicted ($M = -5.25$). However, the speed of comprehension performance was not facilitated under a LD condition but was slightly inhibited ($M = -.69$). Although there is a significant difference between the two types of distraction, these results are based on difference scores which are confounded by the differential transfer effect of the ND speed of comprehension scores. The difference scores may be inflated or inhibited because of the differential transfer effect.

The level of comprehension difference score obtained under a LD or HD condition was predicted to remain the same. The summary of

Table 6

Analysis of Variance Results for Speed of Comprehension Difference Scores

Source of variance	df	MS	F
Extraversion score (A)	2	6.28	.08
Sex (B)	1	119.26	1.58
Distraction condition (C)	1	499.59	6.64*
A X B	2	1.88	.02
A X C	2	3.27	.04
B X C	1	189.84	2.52
A X B X C	2	108.03	1.44
Error	84	75.23	

*$p < .01$

a three-way analysis of variance for level of comprehension difference scores is presented in Table 7. There was no significant main effect for the type of distraction presented, $F(1,84) = 3.45$, $p < .06$. The level of comprehension score remained the same under both types of distraction as predicted.

Sex type. There was no significant sex difference in either the speed of comprehension scores, $F(1,84) = 1.58$, p = NS, or the level of comprehension difference scores, $F(1,84) = 3.31$, $p < .07$. However, the sex difference in the level of comprehension difference scores approached significance. Examination of the mean difference score for each sex showed that females ($M = -2.48$) performed less well under distraction than males did ($M = -.38$).

Performance by males under HD condition was predicted to deteriorate. There was no significant sex by type of distraction interaction for speed of comprehension difference scores, $F(1,84) = 2.52$, p = NS, or for the level of comprehension difference scores, $F(1,84) = 2.05$, p = NS. However, the interaction for the level of comprehension dependent measure was near significance and was further investigated. The sex by type of distraction interaction for the mean level of comprehension difference scores is represented in Figure 2. Male subjects performing under a LD condition performed better in comparison to their ND condition scores while females under a LD condition and both males and females under a HD condition performed worse. A simple effects analysis of sex type for the LD condition was significant, $F(1,72) = 5.93$, $p < .05$. Instead of showing

Table 7

Analysis of Variance Results for Level of Comprehension Difference Scores

Source of variance	df	MS	F
Extraversion score (A)	2	10.04	.33
Sex (B)	1	102.09	3.31***
Distraction condition (C)	1	106.26	3.45***
A X B	2	1.62	.05
A X C	2	8.67	.28
B X C	1	94.01	3.05**
A X B X C	2	71.17	2.31*
Error	84	30.81	

*p<.10

**p<.08

***p<.07

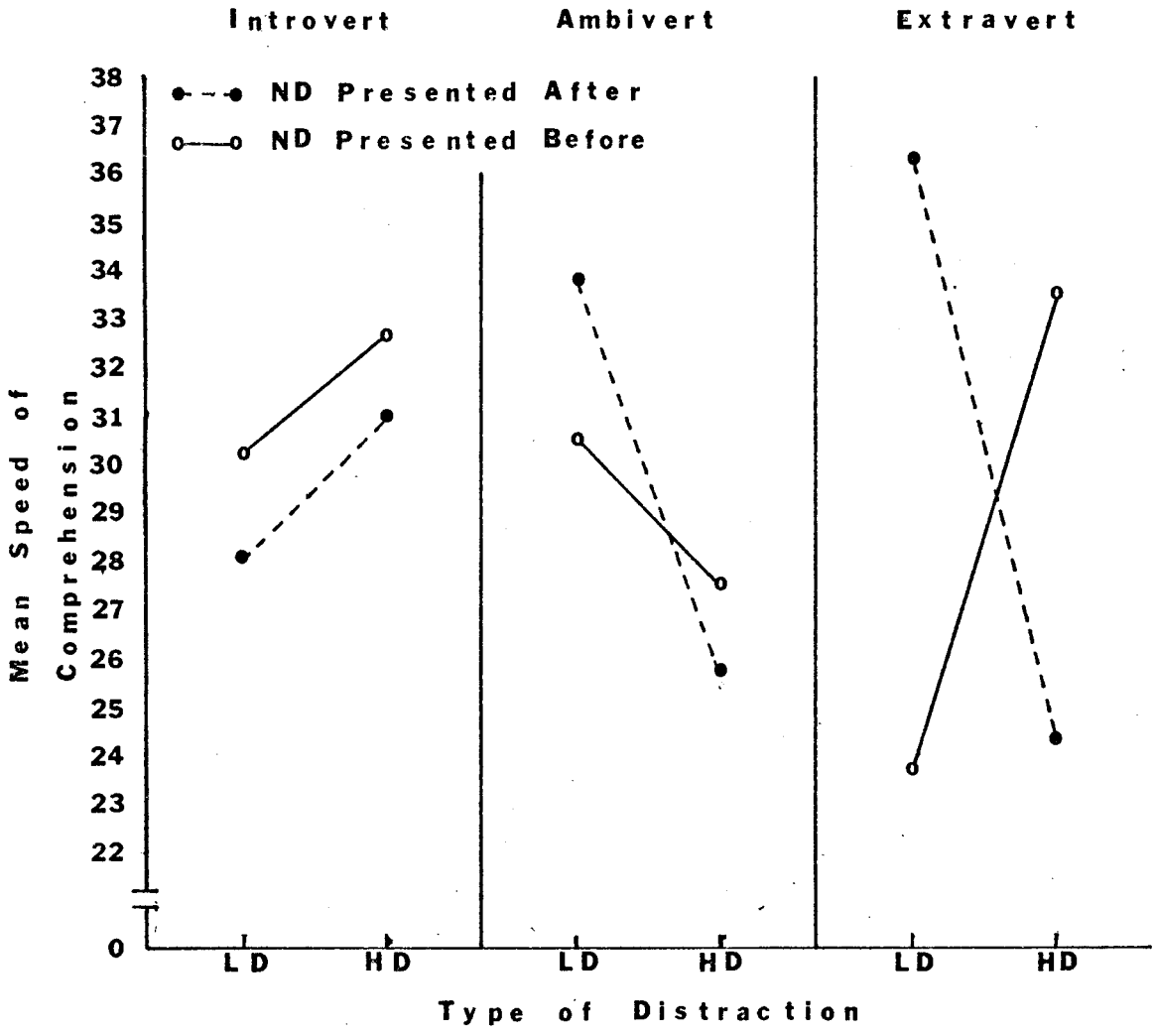

Figure 2. The mean speed of comprehension score, obtained under a ND condition, by personality type, distraction and order of presentation.

deterioration under a HD condition as predicted, males showed a facilitation in performance under a LD condition and performed the same as females under a HD condition.

Personality type. Introverts were predicted to perform differently from ambiverts and ambiverts to perform differently than extraverts under distraction conditions. There were no significant differences between introverts, ambiverts, and extraverts on either the speed of comprehension difference score, $F(1,84) = .08$, p = NS, or the level of comprehension difference score, $F(1,84) = .33$, p = NS. Introverts were hypothesized to perform better than ambiverts and ambiverts to perform better than extraverts under a LD condition. Extraverts were hypothesized to perform better than ambiverts and ambiverts better than introverts under a HD condition. No significant personality by distraction interaction was observed for either the speed of comprehension difference scores, $F(1,84) = .04$, p = NS, or for level of comprehension difference scores, $F(1,84) = .28$, p = NS.

Post distraction effect. In examining the effectiveness of the counterbalancing procedure, a significant three-way interaction between the personality type variable, the order of presentation variable, and the type of distraction variable for the speed of comprehension scores obtained under the ND condition, $F(2,72) = 3.86$, $p < .03$, was observed.

Figure 3 graphically represents the means of the three-way interaction between the three variables. The figure shows that introverts performed differently under ND conditions presented after

a distraction condition than ambiverts and extraverts. The distraction by order of presentation interaction for speed of comprehension scores presented above showed that performance under a ND condition following a LD condition was facilitated in comparison to performance on a ND condition with no condition preceding it. Figure 3 shows that introverts performed worse under a ND condition following a LD condition. A simple effects analysis of the distraction by order of presentation interaction for introverts was not significant, however, $F(1,72) = .01$, p = NS. In both the ambivert and extravert groups, subjects showed facilitation on performance under a ND condition following a LD condition. Both personality groups also exhibited an impaired performance under ND condition following a HD condition in comparison to performance under a plain ND condition. A simple effects analysis of the distraction type by order of presentation interaction for ambiverts showed that the interaction for the ambivert group was not significant, $F(1,72) = .75$, p = NS. The simple effects analysis of the same interaction for the extravert group, however, was significant, $F(1,72) = 13.63$, p .01. The extravert's performance under a ND condition was significantly facilitated by performing under a LD condition first and performance was inhibited by performing under a HD condition first.

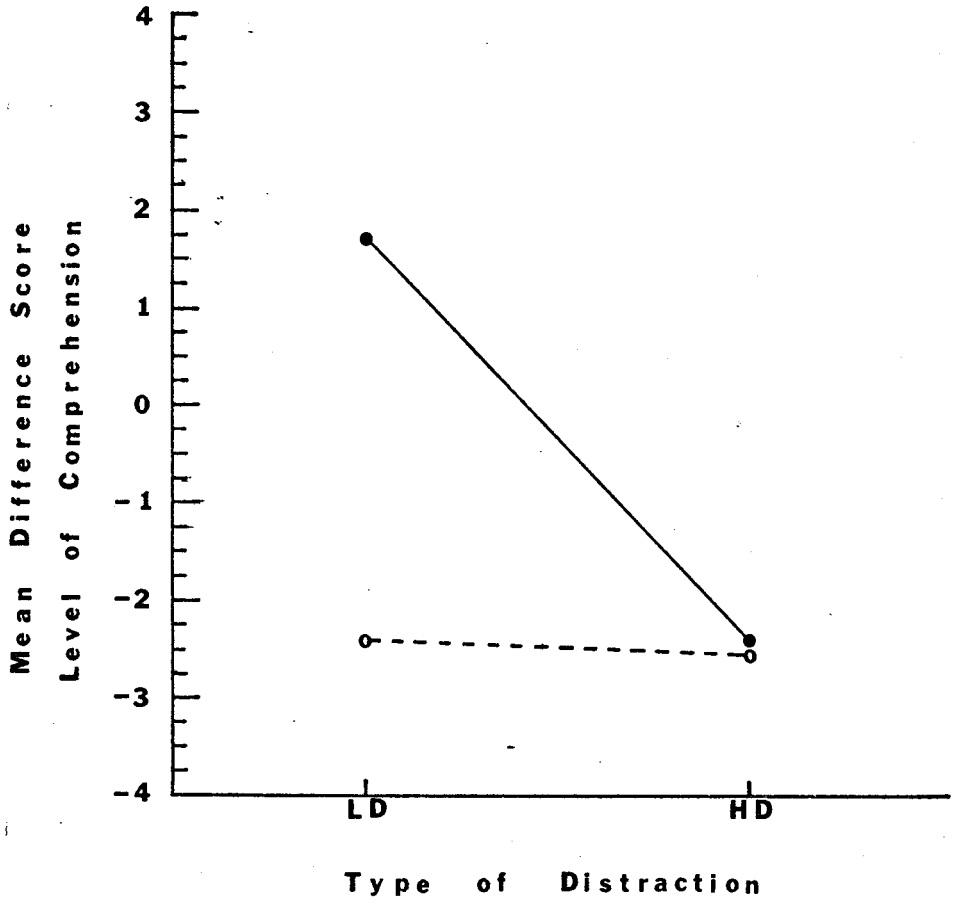

Figure 3. The mean level of comprehension difference score, obtained under a LD or HD condition, for each sex.

CHAPTER V

DISCUSSION

Overall, the results of this study offer partial support for the hypothesized sex difference in distractibility, the hypothesized difference in performance between distraction conditions, and the hypothesized difference between the two measures of task performance in response to the different distraction conditions. The significant distraction effect for speed of comprehension difference scores offered partial support for the focusing or narrowing explanation of distraction (Easterbrook, 1959; Hockey, 1970a,b). The HD condition did inhibit performance on the reading test but only for the speed of comprehension difference scores and not for the level of comprehension scores. If distraction were to affect all aspects of performance, then both scores should have decreased under the HD condition. However, only one aspect of performance was inhibited and the other was maintained. This would only occur if distraction has a narrowing or focusing effect.

However, the LD condition failed to facilitate performance on the speed of comprehension dependent measure as predicted. If distraction focuses attention, then why was not performance facilitated in a low arousal condition? The LD condition may not have stimulated enough arousal to facilitate performance. The LD condition consisted

of a consistent drone of traffic sounds. The HD condition, on the other hand, was quite inconsistent or unpredictable with sporadic laughing, punch lines, and uncommon speech patterns. Glass, Singer, and Freidman (1969) reported that unpredictable noise impaired proofreading performance more than a predictable noise. Glass, Reim, and Singer (1971) suggested that a distraction which is predictable or perceived as controllable allows the subject to "prepare for the onset of the interruptive stimulus . . . (and) . . . there will be less arousal than if he has no control available to him" (p. 256). The HD condition was unpredictable and possibly much more arousing than the LD condition. The LD condition, on the other hand, was much more predictable and therefore probably much easier to adapt to. Since the LD condition was more predictable it may not have enhanced arousal enough to change performance.

The Glass, Reim, and Singer (1971) study can also be used to partially explain the differential transfer effect found in the ND speed of comprehension scores. Glass, Reim, and Singer (1971) found significant post distraction effects between perceived control and no perceived control conditions. Subjects in a perceived control condition made significantly fewer mistakes on a proofreading task, completed after the noise distraction stopped, than subjects in a no perceived noise control group. The adaptation to a noise distraction does appear to have a 'post adaptive' effect. Glass, Reim, and Singer (1971) explained that:

> . . . exposure to unpredictable or uncontrollable noise, while performing cognitive tasks, is an interrupting

> experience which results in feelings of helplessness and heightened organismic arousal. Efforts to overcome these feelings add to the difficulty of adaptation, result in greater energy depletion after adaptation has occurred, and produce a significant increment in arousal by the end of noise exposure. In contrast, the perception of direct or indirect control over the noise minimizes feelings of helplessness, makes adaptation less difficult and energy depleting, and produces less of a terminal increment in autonomic arousal (p. 256).

The strong increment in arousal produced by unpredictable noise (HD) may leave performance on further tasks difficult and performance may be decreased in comparison to a task performed after a predictable noise (LD). However, the Glass, Reim, and Singer (1971) study did not compare performance following distraction conditions with a no distraction group. It is suggested that the experience of having successfully adapted to the feelings of helplessness and disruption caused by a predictable noise distractor facilitates performance, in comparison to a no distraction control group, on a post distractor task. In this study, the predictable noise group (LD) did significantly facilitate performance on a post distractor task in comparison to performance under a ND condition. A successful adaptation may increase arousal level to an optimal level and facilitate performance on post noise tasks. Further investigation aimed at discovering the mechanism for the post noise facilitation effect following a predictable noise distraction needs to be done. If arousal level is the underlying mechanism, then it can be shown by measuring arousal level, through a palmar skin resistance measure, following a successful adaptation condition.

The post noise adaptive effect also varies according to different

personality types. Extraverts are significantly facilitated or inhibited on post noise performance while introverts are not. Introverts perform the same on a post noise task as they do on a ND task. This is not exactly what would be expected considering the postulated differences in arousal level between introverts and extraverts and the underlying arousal mechanism used to describe the post adaptive distraction effect. Extraverts would be expected to perform better on a post unpredictable noise task then introverts because of their postulated higher reticular arousal threshold. However, just the opposite occurred in this study with extraverts performing worse than introverts under a post unpredictable noise condition and better than introverts on a post predictable noise performance.

One possible explanation for these results is that the difference in performance is not due to a characteristic difference in arousal level but is attributable to some other mechanism (e.g., inhibition). However, if inhibition were the underlying mechanism, extraverts would not be expected to do better on a post predictable noise distraction condition. Another plausible explanation is that introverts adapt and recover more quickly from different levels of arousal than extraverts. This may be evaluated by looking at introvert and extravert arousal levels over different distraction and ND conditions through a palmar skin resistance technique.

There were no other significant introversion-extraversion differences found in this study. Although there was a significant

personality interaction using ND speed of comprehension scores, the hypothesized introversion-extraversion differences under the distraction conditions were not supported by this study. There are a couple of explanations which may account for this outcome. One to be considered is that there is no difference between introverts and extraverts in reading under distraction. Another possibility is that the dependent measure was not sensitive to personality differences under distraction. The nature of the reading test is that it requires good immediate recall for 14 stories over a 20-minute span of time. Howarth and Eysenck (1968) found that extraverts had better recall if the interval between the learning task and testing was under five minutes. The reading test, then, would favor the extravert under HD conditions. However, the fact that the extraverts must keep this performance up for 20 minutes may have created stronger inhibition in the extravert which would decrease performance. The dependent measure may have been both inhibitory and facilitative to extraverts which would cloud any personality difference due to the distraction. The use of a dependent measure which can be scored over shorter time intervals may better measure any introversion-extraversion differences under distraction conditions.

The data collected in this study can also offer partial support to the idea that the narrowing of attention caused by distraction arousal does not automatically affect the most complex aspect of task performance (Weinstein, 1974). The speed of comprehension measure which was considered the least complex aspect of

task performance appeared to be the most sensitive to performance differences under the HD condition and the different distraction conditions. The level of comprehension score, on the other hand, showed no differences for the distraction conditions. If the narrowing caused by distraction automatically affected the more complex aspects of task performance, then the level of comprehension measure would have shown the most change under conditions of distraction. Weinstein (1974) suggested that this does not occur because a subject has a certain strategy he uses to cope with distraction. When no strategy is offered by the experimenter, then comprehension will be maintained under distraction over other aspects of task performance.

However, this study can only offer partial support to Weinstein (1974) because the level of comprehension difference measure was slightly more sensitive to sex differences in coping with distraction than the speed of comprehension difference measure. Males showed significant facilitation on the level of comprehension difference score under a LD condition but did not show this on the speed of comprehension difference score. If the speed of comprehension performance is the more likely to change under a high arousal condition, then why did not this measure also register the facilitation in performance by males under a LD condition? It is possible that comprehension can increase under a mildly arousing condition while speed cannot. The speed of reading or comprehension may not be facilitated by a mild distraction but can be inhibited by a strong distraction. The fact that facilitation of speed of comprehension scores was

observed under a post noise ND condition detracts from this interpretation. Also, since the facilitation did not occur across all personality and sex conditions suggests that the facilitation on the level of comprehension and not on the speed of comprehension scores does have something to do with that subject variable (e.g., males may have a different strategy in coping with distraction than females under mildly arousing conditions). Further investigation into the effect of distraction upon different task performances needs to continue before these results can be fully understood.

The fact that males did significantly better than females in level of comprehension under a LD condition suggests that there is a sex difference in learning under distraction, but it does not support previous studies. Either no sex difference in performance under distraction was reported (Hale & Stevenson, 1974) or deteriorated performance for males and facilitated performance for females was reported (Kumar & Mathur, 1969). This study does not support either of these previously reported observations. Although this study used different distractors and dependent measures than the previously cited studies, a complete difference in the direction of the effect of distraction upon males and females would not be expected. This study only clouds the issue of sex differences in learning under distraction. Until further theorizing about the causes underlying a sex difference in coping with distraction (e.g., different arousal levels or cognitive styles), research may continue to be confusing in this area.

The experimental study completed here offered partial support for the hypotheses proposed. There was a definite difference in performance on speed of comprehension scores caused by the distraction conditions. A decline in performance under a HD condition was shown but facilitation in performance was not observed under a LD condition. This was related to differences in arousal level caused by distraction. None of the hypothesized introversion-extraversion differences in performance were found but a post noise introversion-extraversion by distraction interaction was observed. Extraverts improved in performance following a LD condition in comparison to performance under a ND condition. Introverts showed no significant facilitation or inhibition. This was related to characteristic differences in arousal level between introverts and extraverts. Speed of comprehension scores exhibited more sensitivity to the effects of distraction which gave support to Weinstein's (1974) hypothesis that the effect distraction has on performance is not directly related to task complexity. Finally, a sex difference in level of comprehension under a mildly arousing condition was observed. However, the fact that the direction of this difference does not replicate any previously reported sex differences makes interpretation difficult. Further theorizing about the underlying mechanism of this sex difference under distraction must be accomplished before further investigation continues.

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APPROVAL SHEET

The thesis submitted by Norman Reed has been read and approved by the following committee:

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The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts.

11/16/78
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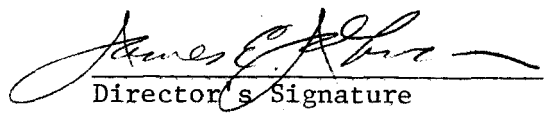
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