Running Head: Eyewitness Testimony

Eyewitness Accuracy As A Function Of Extraversion And Induced Arousal

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The issue of eyewitness testimony has been extensively studied by a wide variety of individuals. Those in legal profession, such as police, prosecutors and judges, rely heavily upon the testimonies of eyewitnesses to ensure the proper carriage of justice. A correct identification of a perpetrator of a crime and a successful conviction are crucial to ensure that justice is carried out.

The Neil vs. Biggers (1972) criteria was a set of criteria outlined by Justice Blackmun who presided over the Neil vs. Biggers (1972) case (Wells & Murray,1983). At face value, the criteria appear valid; however, many researchers have found that any combination of the criteria do not always ensure a correct identification (Perfect, Watson & Wagstaff,1993) (Bell & Loftus,1988)(Loftus,1984) (Wells & Murray,1983).

Many researchers have found that extraneous variables may affect the accuracy of an eyewitness account (Matthews, Davies & Lees,1990) (Gabrys, Schumph & Utendale,1987) (Geen,1984) (Hosch & Platz,1983). Two important variables not often studied together are personality factors and induced arousal. Several personality variables have been studied, for example, self-monitoring, neuroticism and psychoticism. One variable not extensively studied is the dimension of extraversion. One's degree of extraversion may affect the accuracy of eyewitness recall.

Yet another variable that has been extensively studied

is induced arousal. There are many arousal hypotheses that explain performance as a function of arousal; the two major hypotheses are the Yerkes-Dodson Law (1908) and the Easterbrook Hypothesis (1959). Although arousal has been widely studied in relation to eyewitness accuracy, the combination of extraversion and arousal have not been extensively studied.

Eyewitness Accuracy

Eyewitnesses to crimes must recount the events they observed. Not only must they report the incident in question, they must also be accurate in their testimonies. A correct identification of an incident or a perpetrator of a crime is an important factor; without a correct identification serious repercussions may occur as a result of the false identification. Perfect, Watson & Wagstaff (1993) found that when asking an eyewitness the confidence level of the report, confidence ratings are often times very high even though they made a mistake in an identification. Many legal officials ranging from police to court officials often times ask witnesses to rate their confidence level and often time both legal professionals as well as witnesses confuse a high confidence rating with a correct identification (Perfect, Watson & Wagstaff,1993) (Loftus,1984) (Wells & Murray,1983).

In a landmark case in the United States, Neil vs. Biggers (1972), Justice Blackmun laid down five criteria on which to assess the accuracy of eyewitnesses to crimes. Each criterium may appear suitable, yet, when reviewed individually, problems slowly begin to arise.

Well and Murray (1983) took the five criteria called Biggers criteria and reviewed each criterium by individually examining its strengths and weaknesses. The first factor is eyewitness certainty, defined as the degree to which the witness believes the identification is correct. Wells and Murray (1983) concluded that eyewitness certainty is not an appropriate index for judging eyewitness accuracy. They found that confidence ratings were high when an identification was made in lineup or photo spread but had no relation to a correct identification.

An appropriate example to validate this conclusion is a study conducted by Perfect, Watson and Wagstaff (1993). They studied ratings of confidence and identification accuracy. They had participants view a film, either on general knowledge or for eyewitness memory, rate their confidence, then answer a questionnaire about the film. Following this procedure the participants again rated their confidence of a correct identification; results showed that there was a weak correlation between the two confidence ratings in the eyewitness memory condition and that memory performance is unrelated to confidence ratings.

The second factor in the Biggers criteria was the degree of attention paid to the perpetrator. The processes involved in gathering relevant and peripheral information about the incident are crucial. The time attended to the incident is not a relevant factor, however, the depth of processing is.

The third factor is the opportunity to view the assailant. This is measured by the eyewitness' account of events surrounding the crime. Problems arise because in many cases the witness' account is that upon which the courts rely. It is very difficult to determine a set amount of time to be considered long enough for a person to view an assailant before a proper identification of the assailant can be made in a lineup.

For example, Elizabeth Loftus (1984) discussed how inaccurate eyewitnesses can be; she reviewed incidents of false identifications in three cases in the United States. In each case the witnesses truly believed that the suspect was the perpetrator of the crime. Witnesses were in close proximity to the assailant during the criminal activity and they remained convinced that the assailant was in fact the man on trial. In each case, the witnesses were wrong and the convicted persons spent several years in prison for crimes they did not commit (Loftus,1984).

On the same grounds, Bell and Loftus (1988) studied the incidence of juror belief in a witness based on the details

provided by the witnesses. Results showed that more jurors tended to believe the witnesses that provided detailed descriptions of the event as well as other information including position of the victim in relation to the assailant, color of clothing, etc. (Bell & Loftus,1988).

The fourth factor is accuracy of a prior description defined as a description of the assailant given prior to an identification in a line up. Problems arise because police line ups are constructed on the basis of witness descriptions of assailants. Therefore, if descriptions are incorrect, then the line ups are also biased which makes it easier to make a false identification.

The fifth and final factor is the time between the event and the test. Forgetting increases as more time elapses between the event and the test. It has been shown that forgetting of information begins almost immediately; in just three minutes following the event, eleven percent of the information has been forgotten (Wells & Murray,1983).

According to this evaluation, it seems appropriate to survey other factors that may influence memory recall. Many researchers have turned their attention to other factors and have investigated the presence or absence of extraneous variables that may affect the accuracy of recall. Such factors include personality factors and levels of arousal.

Personality Variables

There have been few personality variable measured in relation to eyewitness testimony. Such studied variables include self-monitoring, neuroticism, psychoticism and extraversion. For example, Hosch and Platz (1984) studied the relationship between eyewitness accuracy and degree of self-monitoring. In their study they found that eyewitness testimony given by high self-monitors was more accurate than those given by low self-monitors in a laboratory setting. In another study, Gabrys, Schumph and Utendale (1987) studied the combined effects of neuroticism, psychoticism and extraversion. In their study they found that those low in neuroticism and psychoticism yet high in extraversion reported most accurately on memory recall tests.

Personality inventories may be administered to identify the degree to which one possesses a personality trait. As it has been shown, one's degree of extraversion may be very important when determining how accurate recall may be. Such personality inventories include the Myers-Briggs Type Indicator (MBTI) and the Eysenck Personality Questionnaire (EPQ) of which, both have extraversion scales. The man responsible for beginning this area of study with respect to memory recall was Hans Eysenck (1967).

Hans Eysenck (1967) was one of the first personality theorists to determine that extraversion was one of the most reliable and stable personality traits (Bullock &

Gilliland,1993) (Christianson,1992) (Matthews, Davies & Lees,1990) (Stelmack,1990) (Geen,1984). Introverts and extraverts differ on many dimensions; introverts tend to enjoy being alone, have few good friends and think before they act whereas extraverts enjoy being with others, have many friends and often times act impulsively (Trouve & Libkuman,1992). Where they differ the most lies in their stimulation levels; introverts are naturally more stimulated in any given situation than are extraverts, therefore, introverts are much more sensitive to physical stimulation and do not require as much stimulation than do extraverts (Bullock & Gilliland,1993) (Matthews, Davies & Lees,1990) (Stelmack,1990) (Geen,1984).

Biologically, the reticular activating system (RAS) receives information from the senses and informs the brain of the body's increase in arousal; the hypothalamus responds by regulating the behavior of the person in accordance with the situation (Christianson,1992) (Stelmack,1990). These studies have shown that introverts do in fact have a more stimulated RAS than do extraverts. This was further exemplified by Geen (1984) who tested the preferred stimulation levels of introverts and extraverts. In one condition Geen (1984) separated introverts and extraverts and allowed them to adjust the loudness of music while completing a task. He found that introverts preferred lower levels of loudness when compared to extraverts who preferred

higher levels of loudness. In the another condition he allowed the participants to adjust the loudness of the music for others and found that extraverts would adjust the loudness much higher for others than would introverts. It has been hypothesized that the differing levels of natural stimulation may influence attention and learning.

Arousal

Yerkes-Dodson Law]

The Yerkes-Dodson Law (1908) of arousal, otherwise known as the inverted U hypothesis, predicts performance as a function of increasing arousal. It has been shown that the level of arousal a person is experiencing may impact the level of their performance on a given task. It has been shown that at lower levels of arousal, performance is good; however, as arousal moderately increases, performance improves. Once a person has reached an optimal level of arousal, performance is very good, however if arousal continues to increase past this point, performance levels begin to decrease (Dobson & Markam,1992) (Trouve & Libkuman,1992) (Matthews, Davies & Lees,1990). Arousal seems to have a paradoxical effect; internally the body prepares itself to receive information and attention paid to the event is high, however, the ability to process the incoming information becomes very poor at high levels of arousal (Stelmack,1990) (Hosch, Lieppe, Marchioni & Cooper,1984) (Hosch & Cooper,1982).

Others have found that by exposing participants to an external stimulus such as tones or white noise, the same phenomenon occurs and the similar results are rendered (Trouve & Libkuman,1993) (Christianson,1992) (Dobson & Markham,1992) (Stelmack,1990).

The Easterbrook Hypothesis

The Easterbrook Hypothesis (1959) differs slightly from the Yerkes-Dodson Law (1908). This theory employs the inverted U function as well, but focuses on the efficiency of processing available cues (Christianson,1992). It includes central cues that focus on relevant information about the event in question and also peripheral cues that include details of the event; for example, the number on the perpetrator's jacket is considered a peripheral cue whereas a distinct facial feature of the perpetrator is a central cue. The Easterbrook Hypothesis (1959) maintains that under moderate levels of arousal, attention is restricted yet beneficial because it facilitates concentration on the relevant cues surrounding the event in question. Once arousal increases to reach high levels, the restriction of attention increases to further sacrifice peripheral cues and also sacrifices attention to central cues as well resulting in poor accuracy of recall (Christianson,1992) (Dobson & Markham,1992).

Dobson & Markham (1992) studied the effects of arousal

on eyewitness memory. They exposed the participants to either low or high stress, then measured the accuracy of recall on a recognition task. Results showed that participants under high levels of stress had poorer recall than those under low levels of stress.

There exists another interesting phenomenon that has been extensively studied, termed as weapon focus. The use of a weapon in a crime induces strong to severe levels of arousal in a witness and has been shown to hinder performance. Weapon focus deals with the fascination of the weapon used in a crime; a witness tends to spend a lot of time focusing on the weapon instead of processing the relevant information available to the witness (Christianson,1992) (Christianson, Loftus, Hoffman & Loftus,1991).

By taking into account the previous research, it has been shown that many variables may impede or enhance the accuracy of eyewitness testimony. The Biggers criteria handed down by the American court is not a reliable measure to assess the accuracy of eyewitness testimony. Those with differing personality traits as well as those under differing levels of arousal have rendered variable results. Many factors have been shown to influence the accuracy of eyewitness recall.

It may be concluded that there are two sources of

arousal: those that internally based (personality) and those that are externally based (situation). Researchers have found that introverts and extraverts differ in their levels of natural arousal, which therefore shows that stimulation occurs within the person. It has also been shown with the Yerkes-Dodson Law (1908) and the Easterbrook Hypothesis (1959) that external sources of arousal, (eg. music, tones, white noise) have been used to stimulate participants to higher states of arousal, thereby demonstrating that arousal may be influenced by external sources as well.

In light of what prior research suggests it may be hypothesized that by combining these variables, extraversion and arousal, one may predict the accuracy of eyewitness recall. Since it has been shown that introverts have higher levels of natural stimulation they would not require as much stimulation to reach their optimal level of performance, hence, accuracy would be greater at lower levels of arousal. On the other hand, extraverts do require a lot of stimulation in order to reach their optimal level of performance, hence, accuracy would be greater at lower levels of arousal.

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The present study investigated the effect of extraversion and induced arousal on eyewitness accuracy. Undergraduate students scoring in the top or bottom 40% of an extraversion scale viewed a one minute crime scenario contained within a 13 minute video and were later asked to recall the details of the crime scenario. Participants were aroused above baseline, measured with a hand held digital pulse monitor, one minute prior to the crime scenario, with a burst of 60db (low) white noise, 75db (moderate) white noise or 90db (high) white noise. Participants were later asked to complete a forced choice cued recall questionnaire to determine whether or not extraversion and arousal had affected the accuracy of recall of the crime scenario. It is hypothesized that (a) for introverts, recall will be better when arousal is low and will be impaired when arousal is high, compared to controls, whereas, (b) for extraverts, recall will be better when arousal is moderate and will be impaired when arousal is low, compared to controls. Results were statistically insignificant.

Eyewitness accuracy is a very important element in today's society. Many police investigations and court proceedings rely heavily upon eyewitnesses in attempts to try and convict assailants for their criminal action. In the landmark case, Neil vs. Biggers (1972), Justice Blackmun outlined five criteria that must be met in order to judge the accuracy and credibility of the testimony (Wells & Murray,1983). The five criteria, according to Wells and Murray (1983) include eyewitness certainty, attention paid to the perpetrator, opportunity to view the assailant, the accuracy of a prior description in forming a possibly biased line up and the elapsed time between the event and the recollection. These criteria have been assessed and criticized by many leaders in the field of eyewitness testimony and many have questioned the validity of the criteria (Perfect, Watson & Wagstaff,1993) (Bell & Loftus,1988) (Loftus,1984) (Wells & Murray,1983).

Further analysis showed that any combination of the five criteria do not ensure a correct identification of an assailant. It has been demonstrated that several intervening factors, such as personality variables and arousal may influence the accuracy reports of eyewitness testimony (Perfect, Watson & Wagstaff,1993) (Christianson,1992) (Dobson & Markham,1992) (Trouve & Libkuman,1992) (Geen,1984) (Hosch, Lieppe, Marchioni & Cooper,1984) (Wells & Murray,1983) (Hosch & Cooper,1982).

Personality

Different personality variables have been studied to determine whether they may influence the accuracy of eyewitness testimony. Personality variables have been shown to lie on continua; a person is deemed to possess a degree of a trait depending upon where they fall on the continuum and this may be determined by completing a personality inventory. Such personality variables studied in conjunction with memory recall have been self-monitoring, and the combined effects of neuroticism, psychoticism and extraversion. Studies have shown that differences exist in recall accuracy between those scoring high on a trait and those scoring low (Gabrys, Schumph & Utendale,1987) (Hosch & Platz,1984).

Extraversion has not been extensively studied in relation to memory recall. The Extraversion scale of the Myers-Briggs Type Indicator (MBTI) is a reliable tool when determining the degree to which one possesses extraversion (Trouve & Libkuman,1992) (Murray,1990). Hans Eysenck (1967) was the first theorist to show the extraversion was one of the most stable personality traits (Bullock & Gilliland,1993) (Matthews, Davies & Lees,1990) (Stelmack,1990). Previous research suggests that introverts and extraverts differ on many planes with respect to overt behaviors (Trouve & Libkuman,1992), as well as preferred stimulation levels (Christianson,1992) (Stelmack,1990). It

has been shown that introverts are naturally more stimulated than extraverts in a given situation; introverts do not require much stimulation thereby making them more sensitive to stimulation whereas extraverts require a lot of stimulation and actively seek out stimulation (Stlemack,1990) (Geen,1984).

Arousal

Research also suggests that recall accuracy is contingent upon the witness' arousal level (Christianson,1992) (Dobson & Markham,1992) (Trouve & Libkuman,1992) (Matthews et al.1990). Two major theories that explain the effects of arousal on performance include the Yerkes-Dodson Law (1908) and the Easterbrook Hypothesis (1959).

The Yerkes-Dodson Law (1908), (known as the inverted U hypothesis) (see figure 1), asserts that a moderate increase in arousal may facilitate performance and improve accuracy; however, as arousal continues to increase, performance levels decrease thereby causing accuracy levels to decrease (Stelmack,1990) (Hosch et al.,1984) (Hosch & Cooper,1982). The Easterbrook Hypothesis (1959) is somewhat of an extension of the Yerkes-Dodson Law (1908). This hypothesis includes attention to relevant cues and peripheral cues. With this, it asserts that as arousal moderately increases, attention to available cues becomes restricted to relevant

information whereas peripheral cues are sacrificed; however, as arousal levels continue to increase, attention is further restricted, sacrificing attention to relevant cues (Christianson,1992) (Dobson & Markham,1992).

The combined effects of extraversion and arousal has not been extensively studied. Since it has been shown that introverts and extraverts differ in their natural stimulation levels, by combining this variable with an arousal stimulus may influence the accuracy reports provided by introverts and extraverts. The present study attempts to combine the two factors of extraversion and arousal and aims to examine the differences in accuracy of responses in a controlled experimental setting.

Method

Hypotheses

1. Introverts will have better recall under conditions of low arousal.
2. Extraverts will have better recall under conditions of moderate arousal.
3. Both will have poor recall under conditions of high arousal.

Participants

Pretest

One hundred and twenty undergraduate students from Algoma University were administered the Extraversion scale

of the Myers-Briggs Type Indicator (MBTI) to determine their degree of extraversion. Eighty-seven of those scoring within the top and bottom 40% of the extraversion scale were invited back to continue with the next phase of the study. Thirty six participants continued in the study.

Procedure

Participants scoring within the top and bottom 40% of the MBTI Extraversion scale were assigned to their corresponding personality group, either introvert or extravert. They were then randomly assigned to one of four arousal conditions: 0db (control), 60db (low), 75db (moderate) or 90db (high) (see figure 2). Decibel levels for each condition were relatively higher than those employed in prior research. For example, Stelmack (1990) defined a 60db tone as a moderate arousal stimulus. Decibel levels were measured using a hand held Radio Shack decibel meter prior to the beginning of the procedure. Participants were tested in groups of one to three per session for purposes of convenience.

When participants arrived at the testing location their baseline arousal level was measured using an Omron hand held pulse monitor. Following this, participants were informed of a possible noise stimulus that may occur part way into the procedure. They then began to view a video of approximately 13 minutes in length regarding the procedures employed by the Sault Ste. Marie Police Department.

Approximately six minutes into the video, static noise was presented in one second bursts in three second intervals for forty seconds to those in the arousal conditions (either 60db, 75db, or 90db of noise was presented). Those in the control condition did not receive any noise. Following this stage in the procedure, a pulse measurement was again taken.

One minute following the second pulse measurement the critical crime clip had occurred in the video, which was inserted into the video but appeared to be part of the video. The crime clip was later tested on the recall test following the video presentation. Once the crime clip had occurred, the video lasted another six minutes.

Following the video presentation, pulse measurements were again taken. Participants had a seven minute delay between the end of the video presentation and the post-test. During this time participants were provided with reading materials which served as the distracter task to occupy their time while the experimenter set up the computer program for the recall test.

Post-test

Following the seven minute delay, participants were taken to the computer lab and stationed at one of the computer terminals. A series of 20 questions were presented sequentially via computer. The test consisted of questions regarding the entire video. Questions nine through thirteen in the test consisted of information regarding the critical

crime clip. Since the answers to these questions were what hypotheses were based on, they were the only answers recorded. Once the computer questionnaire was completed, the participants were thanked and excused from the procedure.

Results

Calculated means taken across personality groups by arousal condition exhibited no differences (see figure 3). Means for responses to the recall questionnaire taken across personality groups by arousal condition exhibited slight differences (see figure 4a); when plotted, they appeared to follow the direction of the hypotheses, however, results were not significant (see figure 4b).

A univariate Analysis of Variance performed on groups by condition revealed non significant results, $p=0.5$. Another univariate Analysis of Variance performed on groups by questions revealed non significant results, $p=0.8$.

Discussion

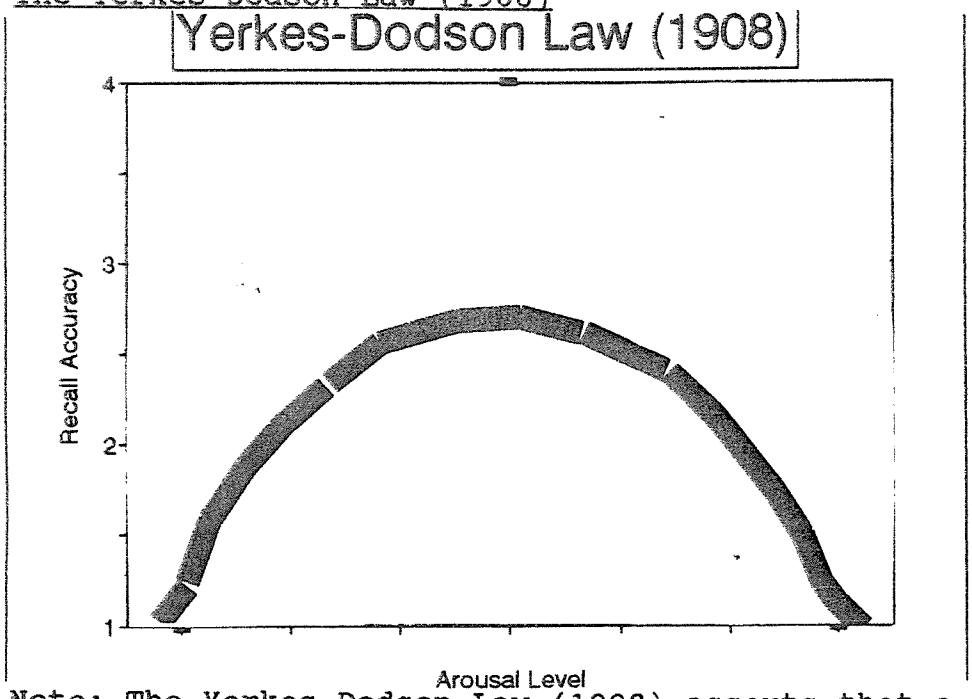
Plotted means for recall accuracy appear to follow the general direction of hypotheses. These findings show that extraversion paired with an arousal stimulus used to predict eyewitness accuracy are inconclusive. A surprising finding was that those in the extravert/control group had a high recall accuracy score; one possible explanation may be that extraverts may find silence (connotated by the control condition) very disturbing thereby, increasing their own

arousal levels by the uncomfortable silence.

Perhaps larger sample sizes and a stronger arousal manipulation may render significant results. It shows, however, that the Biggers criteria alone cannot predict the accuracy of eyewitness testimony. Further research should continue in the domain of eyewitness testimony. Research findings should be made available to the courts in order to show that confidence ratings or any other criteria should not be taken alone at face value. Many innocent individuals have been tried and convicted solely upon the testimony of an eyewitness who claimed to be highly confident of a correct identification.

Many studies have found that incorrect identifications may be influenced by extraneous variables, not usually questioned in a court of law. Perhaps if the courts were better informed of such studies, the rates of false convictions would greatly decrease. However, this claim could not be confirmed unless further studies are conducted and findings are provided for the courts' review.

Figure 1.
The Yerkes-Dodson Law (1908)



Note: The Yerkes-Dodson Law (1908) asserts that a moderate increase in arousal facilitates performance thereby improving recall up to a point. As arousal continues to increase, performance decreases, hence recall accuracy decreases as well.

Figure 2.
Assignment to Treatment Conditions

	Arousal Conditions			
Personality Variables	Control 0db	Low 60db	Moderate 75db	High 90db
Introversion	n=3	n=6	n=4	n=4
Extraversion	n=5	n=4	n=4	n=6

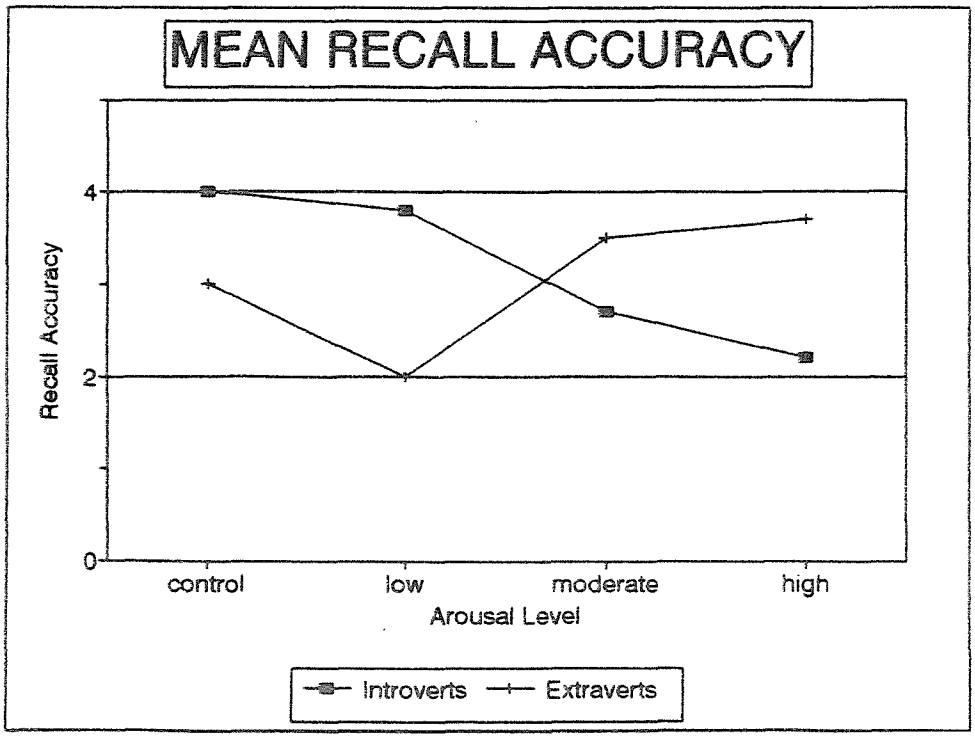
Figure 3.
Mean Arousal Rates for Treatment Conditions

Personality Variables	Arousal Conditions: Control 0db	Low 60db	Moderate 75db	High 90db
Introversion	$\bar{X}$=87.8	$\bar{X}$=79.2	$\bar{X}$=67.4	$\bar{X}$=70.8
Extraversion	$\bar{X}$=88.4	$\bar{X}$=88.6	$\bar{X}$=69.1	$\bar{X}$=85.0

Figure 4a.
Mean Recall Rates for Treatment Conditions

Personality Variables	Arousal Conditions: Control 0db	Low 60db	Moderate 75db	High 90db
Introversion	$\bar{X}$=4	$\bar{X}$=3.8	$\bar{X}$=3.7	$\bar{X}$=2.2
Extraversion	$\bar{X}$=3	$\bar{X}$=2	$\bar{X}$=2.5	$\bar{X}$=3.7

Figure 4b.
Plotted Mean Recall Rates for Treatment Conditions



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