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Easterbrook's hypothesis and eyewitness cue utilization

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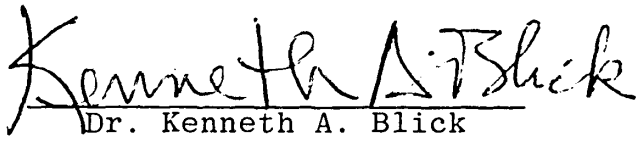

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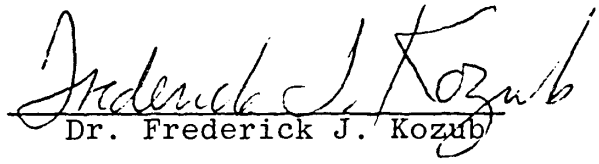

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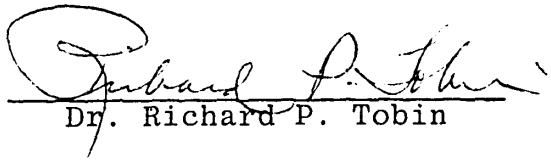

Dr. Richard P. Tobin

Abstract

Although well-supported and historically-important, the Yerkes-Dodson research cannot incorporate current findings on the relationship of arousal and selective attention. Easterbrook's hypothesis suggests that arousal produces a narrowing of attention which selects among available stimuli. Whether information is processed depends on the level of arousal and the nature of the task. As arousal increases, Easterbrook predicts more attention directed to central tasks, while superfluous stimuli are progressively removed. The present investigation studied the predictions of Easterbrook's hypothesis on incidental memory in a simulated eyewitness case. College students were aroused to either resting, 50, 65, or 85 percent maximum heartrate by their activity on an ergometer. After a nine-minute exercise period, 24 slides depicting a wallet-snatching incident were shown, followed by a projected multiple-choice questionnaire sensitive to central or peripheral detail. Following a series of nonsignificant tests for homogeneity of variance, a Two-Factor, Repeated-Measures ANOVA was performed on the data. No significant interaction between the level of arousal and errors was noted. The main effect of groups was also nonsignificant. The effect of question type was significant, but may be due more to uncontrolled differences between questions than action of the independent variable. In summary, these results suggest that Easterbrook's hypo-

thesis may not be as robust a phenomenon as originally supposed. Future research should focus on more precise control of secondary variables through the use of individualized testing procedures.

Easterbrook's Hypothesis and Eyewitness Cue Utilization

In 1908, Robert Yerkes and John Dodson put forth a comprehensive explanation of interactions between arousal and performance. Their work stimulated a wealth of research and remains historically important today. However, further investigation into the nature of arousal has revealed some limitations of their conclusions. Contemporary arousal theories have retained their ideas, while incorporating a healthy respect for the complex nature of arousal.

In the Yerkes-Dodson (1908) experiments, mice were trained to enter a white box. If they entered the alternative, a black box, they received a variable electric shock. Lighting of the boxes was manipulated to yield easy, moderate and difficult discriminant conditions. The three groups were tested under a minimum of three shock levels, and the dependent variable was the number of trials necessary to reach a three errorless trials criterion.

The results of the Yerkes-Dodson experiment established an inverted-"U" function between shock level (arousal) and performance. Under moderate shock, performance was maximal, while both low and high shock conditions suffered significant impairment. A second finding was an interaction between task difficulty and arousal. The effects of shock were more debilitating as tasks became more difficult. These results led Yerkes and Dodson to make two fundamental conclusions:

(1) moderate levels of arousal promote maximal performance; (2) there is an inverse relationship between arousal and performance on tasks of progressive difficulty.

Broadhurst (1959) and Dennenberg and Karas (1959) were able to reproduce the Yerkes-Dodson results using rats. However, rather than using shock, arousal was induced by submerging the animals in water for different lengths of time, and the consequent effects on swimming speed and discrimination in a Y-maze were examined. Their results supported the two Yerkes-Dodson contentions.

Besides rats, investigations have used other species with similar results (Young, 1936). Until recently, however, there were only a few well-controlled human experimental studies directly related to Yerkes-Dodson (Sjoberg, 1977). Sjoberg (1975, 1977) examined autonomic arousal in relation to human performance. Subjects were aroused by exercise on ergometers while they performed a reaction time task. Surprisingly, despite the use of a different species, task, and method of inducing arousal, results supported the inverted-U and task difficulty contentions found by earlier studies.

As robust as the Yerkes-Dodson conclusions seem to be, however, they cannot account for the breadth of arousal phenomena. Research on incentive-induced arousal has produced opposite results. Fantino, Kasdon and Stringer (1970) varied the level of food deprivation with pigeons and found that elevated drive actually enhanced performance of tasks of progressive difficulty. Hochhauser and Fowler (1970) obtained similar results using rats.

Another problem with the Yerkes-Dodson research is the underlying disagreement on what actually constitutes arousal. Yerkes and Dodson originally defined arousal by shock level, while Broadhurst (1959) explained arousal in terms of drive theory. Other theorists view arousal as a cognitive event (Eysenck, 1964). Still others believe that the only valid measurement of arousal is autonomic nervous system activity. This lack of unity on the definition of arousal fragments the research and makes interpretation of different studies difficult. However, there do appear to be several general types of arousal (Eysenck, 1982). Pibram and McGuinness (1975) and Lacy (1967) propose that there are actually three arousal systems. The first system is physiologically-based and makes autonomic responses to the environment; the second controls one's physical abilities to respond; and the third system monitors physical and cognitive coordination. Each system is located in specific parts of the brain, primarily in the limbic area. An important feature of their model, however, is the integral action of the three arousal processes. When one system is activated, another is usually also initiated to a degree. Through this unifying perspective, different ideas on the nature of arousal can be usefully interpreted.

Despite valiant attempts to rectify some of the problems in the Yerkes-Dodson literature, however, some flaws remain with the experimental designs of most studies. As Eysenck (1982) said:

> If, as in many studies, three levels of arousal are compared, there are six possible orderings of these three levels with respect to performance. Only two of these orderings are inconsistent with the Yerkes-Dodson law (the medium level of arousal cannot be associated with the worst level of performance). In other words, two-thirds of studies investigating this assumption of the Yerkes-Dodson law with three arousal levels would obtain supportive evidence by chance alone! (pg. 48.)

Another point against the Yerkes-Dodson research is their inability to account for experiments finding a relationship between arousal and selective attention. Work has demonstrated that attention may be channeled within one sense or among the senses as attentional demands increase (Bahrick, Fitts and Rankin, 1954). For these fundamental problems, there exists a need for a more comprehensive and powerful model.

Easterbrook (1959) offers a theory which can encompass traditional findings as well as modern selective attention research. He postulated that arousal produces a graded focussing of attention. In an initially-unaroused state, one attends to a large amount of available information, both relevant and irrelevant to the task at hand. Inefficiently, at low levels of arousal, irrelevant stimuli are processed with relevant cues. At moderate levels of arousal, however, superfluous information is selectively gleaned, leaving more

attention for central information. Further arousal tends to cause a decrement in performance as central cues are deleted with peripheral ones. Thus, as earlier studies have suggested, a moderate level of arousal permits maximal performance. As tasks become more difficult, Easterbrook assumes an increase in the number and importance of task-specific cues. Therefore, when selection occurs, there is a higher probability of removing important stimuli; and a greater decrement follows each loss. This explains the negative relationship between arousal and performance on tasks of increasing difficulty.

Easterbrook's hypothesis is well-supported by research using both humans and animals. Bruner, Matter and Papanek (1955) trained rats to perform single or double discriminations for food reward. When deprived for 12 or 36 hours, the most-deprived rats showed a marked impairment on tasks requiring the use of double discriminations, and of all the animals showed the least benefit from previous training. Bahrick, Fitts and Rankin (1954), mentioned earlier, gave human subjects a central dial-reading task and a simultaneous peripheral light-matching task. When arousal was elevated by rewarding correct responses, the incentive group demonstrated poorer performance on the peripheral task, despite pay for both tasks. Bursill (1958) induced arousal by elevating room temperature. Again, central and peripheral tasks were used. In the high-heat condition (95 - 105° F), peripheral signals had a significantly higher chance of being

missed. Lastly, Easterbrook's hypothesis is supported by research on selection among different sensory modes. Posner and Klein (1973), for instance, found that at moments of stress attention may be rechanneled from audition to vision. Evidently, Easterbrook's hypothesis can account for a great variety of arousal phenomena.

Easterbrook makes some interesting predictions for incidental learning. If incidental learning is affected by sensitivity to central or peripheral detail, arousal might disrupt normal learning. In an eyewitness case, the implications are especially intriguing. Given an aroused subject, what information will be recognized?

Previous experiments investigating the effects of arousal on eyewitness testimony have failed to examine basic relationships. Clifford and Hollin (1981) looked at the complex interactions of arousal, the number of criminals and eyewitness memory. They found that as arousal or the number of perpetrators increased, eyewitness accuracy was lost. Results suggested that the most conducive atmosphere for accuracy was a single criminal involved in nonviolent crime. Siegel and Loftus (1979) performed complex research on sustained arousal. Using questionnaires, they found a significant negative correlation between stressful events in one's life and the eyewitness reliability.

Sarason and Stroops (1978) proposed an investigation of eyewitness testimony from Easterbrook's perspective, but did not actually pursue it. Other researchers have proposed

that during arousal, subjects may focus more attention on internal processes (Siegal and Loftus, 1979; Pennybaker, 1983). However, before this experiment, no study had tested the predictions of Easterbrook's hypothesis in eyewitness testimony. The present investigation sought to produce results which might supply a foundation for more elaborate studies in the future.

Experiment 1 was performed to split Loftus' (1979) wallet-snatching incident questionnaire into central and peripheral questions based on consensus information. Advanced Psychology students were shown the Loftus slides and given her questionnaire (Appendix A). Rather than answering the multiple-choice items, however, students were asked to decide whether each question was relevant or irrelevant as an eyewitness. On the basis of the data from the experiment, the Loftus questionnaire was reconstructed with twenty questions of two types.

Experiment 1

Method

Subjects. Subjects were 43 University of Richmond students enrolled in advanced Psychology courses, 20 males and 23 females, who volunteered for testing during one of two class periods.

Apparatus. The 24 Loftus (1979) wallet-snatching incident slides were shown by a 35 mm projector with timer to a forward projection screen. Afterwards the Loftus (1979)

questionnaire was given to each student.

Procedure. Subjects were read a set of written instructions (Appendix B). After viewing the 24 slides for five seconds each, subjects were asked to judge the relative importance of each question as an eyewitness and indicate their decision on their forms. A debriefing explaining the rationale for the experiment followed.

Results

Chi-square analyses performed on the frequencies of responses to questions revealed significant agreement on 24 of the 30 items. Eight items were considered central to eyewitness testimony, while 16 items were judged to be peripheral.

Insert Table 1 about here

Discussion

Although no trend was evident among the peripheral questions, 90% of the significant central items dealt with aspects of the thief. Based on this information, two thief-related questions were added and the six least-significant peripheral questions were deleted, producing a questionnaire with twenty items, ten of each type.

The degree of agreement in this experiment was remarkable. The Chi-square analyses were able to distinctly divide Loftus' questionnaire into two types of questions. Apparently, subjects had very similar ideas of what an eye-

witness should be asked. This produced a significant concensus on most questions (some to the .001 level), and suggests that a more extensive examination of the questionnaire could be useful in future research. Later studies might probe further using factor analysis.

Experiment 2 used the modified questionnaire to study selective attention during arousal. Briefly, subjects were aroused to one of four levels and shown the Loftus slides. Immediately following, the multiple-choice questionnaire was projected, item by item, and subjects were asked to respond. It was expected that distinct patterns of interaction between arousal and question type would emerge.

Experiment 2

Method

Design. The study involved four independent groups repeated across two types of questions. There were ten subjects in each group.

Subjects. Subjects were 40 male University of Richmond Introductory Psychology students who received two (2) hours of subject pool credit for their participation. Assignment of subjects to the levels of arousal was random, 10 to a group. Participants were 18 - 22 years of age and underwent a health screening (questionnaire, see Appendix D) before involvement.

Apparatus. A Monark #811 ergometer, Harvard EKG and Franz LM-4 metronome were used to manipulate, monitor and

control heartrate levels. While aroused, subjects were cooled by a large electric fan. A 35 mm slide projector, screen and cassette sync. served for reliable projection of the Loftus (1979) wallet incident slides and the modified Loftus questionnaire (see Appendix C). Subject responses were recorded in part by a cassette tape recorder.

Procedure. Recruitment of subjects involved screening for healthy persons only. To that end, several opportunities were presented for health assessment. Before sign-up, a brief presentation of the demands of the experiment was made to Introductory Psychology classes. Also, the health criteria for participation were posted (Appendix C). A pilot study simulating the experimental procedures at the highest level of exertion was conducted to ascertain the possible strain subjects might experience during the experiment. Lastly, upon arrival at the lab, subjects were given a health questionnaire (Appendix D) to determine if they could participate.

As they arrived, each subject was read Part 1 of the instructions (see Appendix F), and randomly-assigned to an arousal group (as indicated by codes at the top of consent forms). Conditions were based on resting heartrate, or 50, 65 or 80 percent maximum recommended rate (220-age (Smith, 1979)). After the successful completion of the health questionnaire and consent form (Appendix E), subjects were wired to a three-lead EKG and the ergometer seat was adjusted to their size. When it was clear that the EKG leads

were functioning properly, the second part of the instructions was read (Appendix F.1). To control for leg movements, a metronome at 120 bpm set the beat for pedaling cadence. After five minutes of warm-up, the experimenter read part F.2 of the instructions and began adjusting the ergometer load in relation to EKG heartrate to raise the rate to group levels. Control subjects were inactive during the first nine minutes of the study. After the four minute load-adjustment period, the 24 Loftus (1979) wallet-snatching incident slides were shown, 5 seconds each, on a screen directly in front of the subject. Afterwards, 20 items from the modified Loftus questionnaire were projected for 15 seconds each, while subjects maintained exertion. The experimenter recorded item responses on paper and audiotape. At the end of the slides, a "cool down" period followed, in which the ergometer load was gradually reduced. Subjects were debriefed on the nature of the experiment and how the procedure was used to test Easterbrook's Hypothesis. Additionally, any other relevant questions were addressed.

Results

Hartley's test for homogeneity of variance revealed a nonsignificant difference between groups, F_{max} (4,9) = 2.80, $p > .05$. A closer examination of groups within question types also showed no significant difference for both control (F_{max} (4,9) = 4.41, $p > .05$) and peripheral questions (F_{max} (4,9) = 2.40, $p > .05$). Lastly, a comparison of group

standard deviations within items revealed that the control group had a slightly higher internal variability (2.85:1). The other groups had remarkably similar standard deviations.

The analysis of data continued with a Two-Factor, Repeated-Measures Analysis of Variance. Results demonstrated no significant interaction between groups and questions, $F(3,36) = <1$, $p > .05$. Therefore, main effects were examined. Although the effect of groups was nonsignificant ($F(3,36) = 1.17$, $p > .05$), there was a significant difference between questions. Peripheral questions produced significantly more errors than control items, $F(3,36) = 131.02$, $p < .05$.

Insert Table 2 about here

Insert Table 3 about here

Insert Figure 1 about here

Discussion

Although Easterbrook predicted an interaction between arousal and question types, the results of this experiment indicated a nonsignificant relationship. In light of individual differences between subjects in heartrate and reactions to stress, this result is not altogether surprising (Shiomi, 1982). Subjects who begin at different heartrates yet finish at the same rate may not experience the same degree of change. For instance, given two subjects, x and y, who begin the study at 70 bpm and 90 bpm respectively, and end at 130 bpm, x has experienced an 86% change from base-

line while y has only a 46% change. This is a within groups variation that is due in part to the use of norms rather than individual resting rates. Since baseline heartrate is difficult to accurately assess while the subject is awake, norms were used which were based on estimated percent of maximum heartrate, rather than change from resting rate. Unfortunately, while this procedure was less complex than calculating change, it could not control for large differences between subjects.

There were a number of selections prior to testing which could have affected the results. By the time a subject reached the experiment, he had chosen to enroll in college and Introductory Psychology. He also needed participation credit to fulfill subject pool requirements. Lastly, all of the subjects were male. These selections produced a population with a possibility for extreme homogeneity, crippling a random population. At first glance, it would appear to be an ideal situation for experimentation. The action of an independent variable could be sensitively measured. However, it is difficult to predict and control how selections may affect the outcome of research. Future work may produce different results using a less-restricted sample with females and others from the nonacademic community.

Although peripheral items were missed significantly more than central items, this result is essentially uninterpretable, since question difficulty was not controlled.

Differences in scoring could be due to confounding. Peripheral items may simply be more difficult. Loftus' (1979) questionnaire was adequate for her work, but needs more research before it can be used as a reliable empirical tool in arousal research. The length and wording of questions must be controlled, as must be the influence of question choices. In short, a tight rein on other variables must be present to ensure sensitivity. Since no other study has used the Loftus (1979) questionnaire in this way, the results of this investigation could stand as groundwork for future, more detailed research.

While this study attempted to test Easterbrook's hypothesis in externally valid procedures, it fell short of its goal in some ways. For example, slides are not normal stimuli, nor do people usually bicycle without moving. In a number of ways, the situation was contrived. One may wonder whether these results may be generalized to the outside world. However, external validity is not necessary when one is testing the predictions of a theory. As Mook (1983) suggests, while laboratory experiments themselves may not always generalize to the natural world, results produced in contrived surroundings and procedures can serve to test hypotheses. The broad claims of Easterbrook's hypothesis were not supported in this investigation. On the simplest level, one can say that results produced in the lab can generalize to other laboratory settings. Unnatural studies can give important information without external validity.

The results of this experiment, as contrived as it was, serve to discount the universal claims that arousal always produces a focussing of attention.

In conclusion, this study sought to explore a well-supported theory in a relatively-uninvestigated arena. As in many pieces of original research, elementary problems can become major impediments. With a few changes, this work could produce more useful results. However, the fact that Easterbrook's hypothesis was not confirmed suggests that selective attention may be a less robust phenomenon than expected. Future studies must decide whether to retain Easterbrook's hypothesis in the study of eyewitness testimony or discard it in lieu of some other ideas. Given the difficulties encountered in this investigation, it may be advisable to continue in the present direction with a revised procedure.

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Table 1

Percent Agreement and Significance Level

of Loftus Questionnaire

Central Items			Peripheral Items		
#	% agreement	sig. level	#	% agreement	sig.level
2	76	.001	1	69	.05*
3	79	.001	4	79	.001*
6	95	.001	5	67	.05*
10	97	.001	7	86	.001
12	95	.001	8	81	.001*
15	97	.001	11	72	.01*
23	67	.05	14	97	.001
24	97	.001	16	72	.01*
			19	95	.001
			20	81	.001
			21	81	.001
			22	86	.001
			25	93	.001
			26	97	.001
			27	91	.001
			28	93	.001

*deleted in final questionnaire

Table 2

Means and Measures of Variability of Groups by Questions

	Control (n = 10)	Low (n = 10)	Medium (n = 10)	High (n = 10)
Central Items				
$\bar{x}$	7.70	7.70	7.90	7.00
S^2	4.54	2.02	.88	1.98
S	2.13	1.42	.94	1.41
Peripheral Items				
$\bar{x}$	5.00	4.60	4.50	4.00
S^2	.55	1.15	1.61	1.32
S	.74	1.07	1.27	1.15
Overall				
$\bar{x}$	12.70	12.30	12.40	11.00
S^2	5.51	2.9	2.28	5.33
S	2.35	1.70	1.51	2.31

Table 3

ANOVA Summary Table

	SS	df	MSQ	F	p
Total Variance	333.8	79			
Between Subjects	95.3	1			
Between Groups	8.5	3	2.83	1.17	$>.05$
Error (A)	86.8	36	2.41		
Within Subjects	238.5	40			
Between Questions	186.05	1	186.05	131.02	$<.05$
Interaction	1.25	3	.42	.30	$>.05$
Error (B)	51.2	36	1.42		

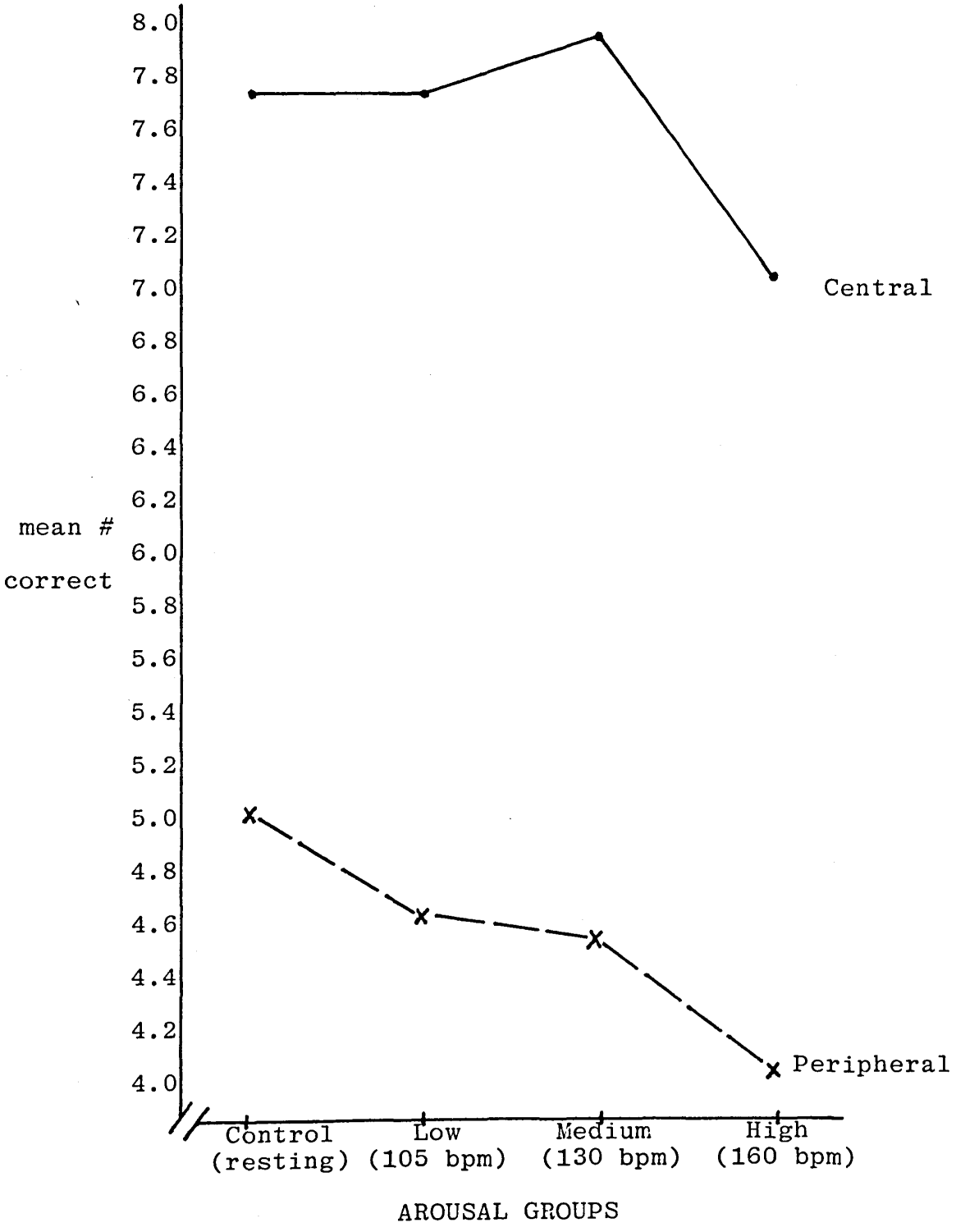

Figure 1 - Mean correct for central and peripheral questions across arousal levels

Appendix A

Loftus (1979) Questionnaire

1. The victim of the wallet snatching was wearing a brown:
   a) jacket
   b) hat
   c) shoulder bag
   d) sweater
   e) scarf
2. The action in the slides took place:
   a) on the main street of a big city
   b) on a side street of a big city
   c) on a main street of a small town
   d) in a residential area of a small town
   e) in the suburbs
3. After the thief took the wallet, he put it:
   a) in an outside jacket pocket
   b) in his hip pocket of his pants
   c) in a side pocket of his pants
   d) inside his jacket
   e) none of the above
4. The victim met her friend:
   a) as she (the victim) was waiting to cross the street
   b) as she was walking down the sidewalk
   c) while she was looking in a store window
   d) as she was picking up her dropped packages
   e) as she was waiting for a bus

5. The victim had _____ hair.

   a) short, light colored

   b) long, light colored

   c) short, dark

   d) long, dark

   e) red

6. The thief was wearing:

   a) Adidas tennis shoes

   b) brown loafers

   c) open sandals

   d) black boots

   e) tan suede shoes

7. The store buildings seen in the slides were:

   a) painted white

   b) brick

   c) natural wood

   d) concrete blocks

   e) gray stone

8. The victim's shopping bag was:

   a) brown

   b) yellow

   c) white

   d) blue

   e) gray

9. One eyewitness was wearing:

   a) a straw hat c) a wool ski cap e) none of the above

   b) a velvet beret d) a scarf

10. The man who took the wallet had:

a) a beard

b) a mustache

c) a beard and a mustache

d) long hair

e) none of the above

11. As the victim was first walking down the main street, on the sidewalk behind her was:

a) an old woman

b) a boy on a skateboard

c) a girl with a dog

d) a boy on a bicycle

e) another young woman

12. On the back of the thief's jacket there was:

a) an embroidered design

b) an American flag

c) a number printed

d) a word printed

e) nothing

13. The victim was wearing:

a) prescription eyeglasses

b) "mirror" type sunglasses

c) dark sunglasses

d) lightly tinted sunglasses

e) none of the above

14. On display in the store window there was:

a) furniture

b) stationery

c) clothing

d) toys

e) hardware

15. The color of the thief's jacket was:

a) brown

b) beige

c) black

d) green

e) navy blue

16. The victim was wearing:

a) a sweater

b) a shawl

c) a light jacket

d) a raincoat

e) a winter coat

17. The thief waited to cross the street while a _____ went by.

a) taxi

b) pick-up truck

c) station wagon

d) Volkswagen

e) sports car

18. The two eyewitnesses across the street were standing in front of:

a) an office building

b) a store

c) a restaurant

d) a tavern

e) a post office

19. The victim's friend's shoulder bag was:

a) white

b) beige

c) brown

d) black

e) she didn't have one

20. The sidewalk where the incident took place was:

a) brick

b) cobblestone

c) asphalt

d) concrete

e) dirt

21. The predominant color of the victim's friend's outfit was:

a) navy blue

b) yellow

c) green

d) rust

e) black

22. The shawls worn by the two eyewitnesses were:

a) blue and yellow

b) red and green

c) brown and red

d) black and beige

e) white and green

23. After the thief took the wallet and was walking away:

a) he passed a store window

b) he glanced in a window as he passed it

c) he stopped and looked in a window

d) he passed a person looking in a window

e) he didn't pass a store window

24. The thief wore a:

a) cowboy hat

b) derby

c) beret

d) bandana

e) none of the above

25. How many store windows did the victim either pass or look into?

a) one

b) two

c) three

d) four

e) none

26. The victim's friend was carrying:

a) a newspaper

b) a shopping bag

c) a notebook

d) an umbrella

e) none of the above

27. Were any of the women in the slide series wearing a skirt? If so, who?

a) no

b) the victim

c) one of the eyewitnesses

d) the victim's friend

e) the victim and her friend

28. How many small plastic items fell out of the victim's shopping bag?

a) one

b) two

c) three

d) four

e) five or more

29. The two eyewitnesses caught the attention of the victim after the crime occurred by:

a) yelling at her

b) running across the street in front of her

c) yelling and waving at her

d) quietly catching up with her, then discreetly gaining her attention

e) honking the horn of their car

30. As the victim and the thief were saying goodbye:

a) they both waved

b) she waved to him

c) he waved to her

d) he tipped his hat

e) none of the above

Appendix B

Instructions for Experiment #1

"You will be shown a series of slides depicting an event. At the end, you will be given a questionnaire. Do not answer the questions, but instead write either "I" or "U" next to each question. If, as an eyewitness, you consider the question important to the event, write "I" next to it. If, on the other hand, as an eyewitness, you consider the question unimportant, write "U" next to that question. Those persons who have seen these slides before, please indicate by a "Yes" at the top of the first page. These instructions will be read again after the slide show."

Appendix C

KEY

The Modified Loftus Questionnaire

1. The action in the slides took place

(Central)
a) on the main street of a big city
b) on a side street of a big city
c) on a main street of a small town
d) in a residential area of a small town
e) in the suburbs

2. The store buildings seen in the slides were:

(Peripheral)
a) painted white
b) brick
c) natural wood
d) concrete blocks
e) gray stone

3. On display in the store windows there was:

(Peripheral)
a) furniture
b) stationery
c) clothing
d) toys
e) hardware

4. After the thief took the wallet, he put it:

(Central)
a) in an outside jacket pocket
b) in his hip pocket of his pants
c) in a side pocket of his pants
d) inside his jacket
e) none of the above

5. The victim's friend's shoulder bag was:

(Peripheral) a) white

b) beige

c) brown

d) black

e) she didn't have one

6. The thief was wearing:

(Central) a) Adidas tennis shoes

b) brown loafers

c) open sandals

d) black boots

e) tan suede shoes

7. How many store windows did the victim either pass or look into?

(Peripheral) a) one

b) two

c) three

d) four

e) none

8. The man who took the wallet had:

(Central) a) a beard

b) a moustache

c) a beard and a moustache

d) long hair

e) none of the above

9. The shawls worn by the two eyewitnesses were:

(Peripheral) a) blue and yellow c) brown and red e) white

b) red and green d) black and beige & green

10. The thief wore a:

(Central)

a) denim jacket

b) light windbreaker

c) down jacket

d) heavy coat

e) none of the above

11. On the back of the thief's jacket there was:

(Central)

a) an embroidered design

b) an American flag

c) a number printed

d) a word printed

e) nothing

12. The predominant color of the victim's friend's outfit was:

(Peripheral)

a) navy blue

b) yellow

c) green

d) rust

e) black

13. The color of the thief's pants was:

(Central)

a) black

b) brown

c) white

d) light green

e) none of the above

14. The sidewalk where the incident took place was:

(Peripheral)
a) brick
b) cobblestone
c) asphalt
d) concrete
e) dirt

15. Were any of the women in the slide series wearing a skirt? If so, who?

(Peripheral)
a) no
b) the victim
c) one of the eyewitnesses
d) the victim's friend
e) the victim and her friend

16. The thief wore a:

(Central)
a) cowboy hat
b) derby
c) beret
d) bandana
e) none of the above

17. After the thief took the wallet and was walking away:

(Central)
a) he passed a store window
b) he glanced in a window as he passed it
c) he stopped and looked in a window
d) he passed a person looking in a window
e) he didn't pass a store window

18. The victim's friend was carrying:

(Peripheral) a) a newspaper

b) a shopping bag

c) a notebook

d) an umbrella

e) none of the above

19. How many small plastic items fell out of the victim's shopping bag?

(Peripheral) a) one

b) two

c) three

d) four

e) five or more

20. The color of the thief's jacket was:

(Central) a) brown

b) beige

c) black

d) green

e) navy blue

Appendix D

Health Questionnaire

Please answer the following questions:

1. Are you currently ill? YES NO

2. Are you being treated with any medication?

   YES NO

   If so, what?_____

3. How many hours has it been since you've eaten?_____

4. Do you have any known heart, lung, or neuromuscular problems that might affect you during exercise?

   YES NO

5. Have you consumed alcoholic beverages within the past 12 hours? YES NO

Appendix E

Informed Consent Form

I, _____, agree to participate in this study. I am of good health with no cardiovascular illness or known defects. I realize that I will be exercising and taking an oral exam. I also understand that I must make a sincere effort in order to receive credit. I know that the experiment should take about thirty minutes, and for my involvement I will receive two (2) credits toward fulfillment of my subject pool requirement as a student in Introductory Psychology. I understand that Mark Hill, a graduate student in the Psychology Department, will be conducting the research, and that I am volunteering for this study and, if unable to continue, may do so without credit loss. I further understand that I will not be penalized in any way if I decide not to participate, and that my involvement will be condifential. Also, I know that debriefing will follow the experiment.

_____ _____

Date Signed

Appendix F

Instructions for Experiment 2

Part 1

"Thank you for signing up for this experiment. Here is a consent form. Please read it and sign your name at the bottom. Since I will be looking at arousal, you will be wired to an electrocardiograph and asked to exercise vigorously on that stationary bibycle. Three electrodes must be taped to your chest to measure heartrate. After I attach the electrodes, please go to the stationary bicycle and have a seat."

Part 2

F.1. "Please begin pedaling the bicycle. Try to match the rhythm of your pedaling to the metronome's beat."

F.2. "You will probably notice that pedaling becomes difficult. Please maintain the same speed! It is crucial that you keep up your pace. After four minutes, a slide presentation will begin. When questions appear, please answer them verbally. Are there any questions? Once again, thank you for your participation in my Master's thesis research."

Appendix G

Experiment 2 Raw Data

Control Group										
Central Score	10	7	8	10	2	8	9	7	7	9
Peripheral Score	6	5	6	4	5	6	5	4	4	5
Low Arousal										
Central Score	4	8	9	8	9	8	7	8	8	8
Peripheral Score	5	5	5	4	4	5	4	3	4	7
Medium Arousal										
Central Score	8	7	8	8	6	10	9	8	7	8
Peripheral Score	4	6	6	2	3	4	5	5	5	5
High Arousal										
Central Score	5	7	7	5	7	9	7	8	6	9
Peripheral Score	3	6	4	2	5	4	4	4	3	5