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Invasions of personal space : a field experiment

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INVASIONS OF PERSONAL SPACE: A FIELD EXPERIMENT

by

LISA DEMIAN

A thesis submitted in partial fulfillment of the
requirements for the degree of

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in
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The present study examined the relationship between invasions of personal space and measures of glancing, blocking, leaning, head-shoulder orientation, movement away from the invader, and flight latency. These behaviors have been described in previous studies as occurring in response to spatial invasions, and the equilibrium model proposed to account for their occurrence. Hypotheses consistent with this model were tested in a 2 x 2 x 3 design which varied sex of invader, sex of subject and distance of subject from invader (1 foot, 2 feet, or 5 feet). None of the predicted relationships obtained,

although females blocked more frequently than males, and also exhibited a greater variety of the target behaviors than did males. A significant difference was found for variety of behaviors emitted and distance, with Ss in the 1 foot condition exhibiting more of the target behaviors than those in the 5 foot condition. No other significant results were found. An alternate model to account for these discrepancies as well as previous discrepancies was discussed and suggestions for future research were made.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

> Personal space refers to an area with invisible boundaries surrounding a person's body into which intruders may not come. Like the porcupine in Schopenhauer's fable, people like to be close enough to obtain warmth and comradeship but far enough away to avoid pricking one another....It has been likened to a snail shell, a soap bubble, an aura, and "breathing room."
>
> Sommer, 1969, p. 26

Researchers, in recent years, have begun to pay attention to that area of human social behavior referred to as personal space. While initial work in the area was done by anthropologists, the psychological literature contains increasing numbers of studies of this phenomenon. Conceptualizations of personal space have varied somewhat, but it is generally agreed to be an area surrounding the physical self which is enclosed by an invisible, flexible, portable and semi-permeable boundary. Altman (1975) pointed out that there are four properties of personal space implicit in any workable definition. First, it separates the self from others, although the boundary is invisible; second, it moves with the person rather than being place-specific; third, the regulation of the personal space boundary is a dynamic process; and fourth, when intrusion occurs, "anxiety or stress often results, or even flight or aggression" (p. 54). People tend, finally, to be unaware of their personal space boundary regulation activities.

CHAPTER II

PERSONAL SPACE

Background

Significant early descriptive and theoretical work was done in the area of personal space by Edward T. Hall, an anthropologist. Hall (1966) proposed that social interactions take place within a series of four spatial zones. The nature of the relationship between interactants and/or the nature of the interaction influences the distance at which it takes place. Intimate distance ranges from 0 to 18 inches from the body, and it is within this distance that a rich variety of information is available to each interactant; each can touch, smell, and see many details of the body of the other, as well as being able to sense the body heat of the other. As the label implies, this distance is generally reserved for those with whom one is intimate. While there are cultural variations, the boundary for intimate distance generally corresponds to the personal space boundary.

Personal distance, which ranges from one and one-half to four feet, is the characteristic distance people use when interacting; people engaged in conversations will typically adopt positions within this range of each other. Interactants can still see a great deal of detail, can potentially touch each other, and have access to body odors. This distance is less intimate than intimate distance,

and less formal than social distance.

Social distance extends from four to twelve feet, and typically is used by interactants in a business context, or for social contact among strangers or acquaintances. Fewer cues are available at this distance, particularly as the far boundary is approached. Touch is not possible, and olfactory and thermal cues, unless quite strong, are not noticeable.

Finally, public distance varies from twelve to twenty-five feet, or to the limits of vision or hearing. Public speakers typically maintain this distance.

Hall (1963) proposed that various behaviors occur in each of these distance zones, and provided a notational system for coding these behaviors in eight different classes. These are: (1) postural-sex identifiers; (2) body orientation of interactants with respect to each other; (3) kinesthetic factors; (4) a touch code; (5) a visual code; (6) the thermal code; (7) an olfaction code; and (8) a voice loudness code. This coding system can be used in its entirety or in part, and was a significant methodological advance in the area.

Research in personal space since the provision of this notational system has tended to rely on using portions of it for behavioral recording. It has been applied to simulation, laboratory and field studies. Among other things, these studies have examined the relationships between personal space and personality factors, emotional abnormalities, individual differences, sex differences, and cultural differences. Reviews of this literature have been

provided by Evans and Howard (1973), Pedersen and Shears (1973) and Altman (1975). While many studies in the area reveal marked and interesting differences between individuals in the above-mentioned areas, there are also marked similarities. These similarities, or patterns of behavior occurring across varied groups of individuals, imply the presence of a set of rules governing the use and regulation of personal space boundaries. In an attempt to explicate the underlying rules, Argyle and Dean (1965) observed individuals interacting in a laboratory setting, and from the results of their observations formulated what is known as the Equilibrium Model.

The Equilibrium Model

In their classic study, Argyle and Dean (1965) had a subject sit at a table either 2 feet, 6 feet or 10 feet from, and at right angles to, a confederate. While engaged in a structured verbal task, subject and confederate (who maintained constant looking at the eyes of the subject) were observed through a one-way window. Observers measured both frequency of subject's glances at the confederate's eyes (eye contact), and the duration of such looking. Their findings indicated that as distance between interactants decreased, so did eye contact.

They further reported (Argyle and Dean, 1965) a study which approached the issue of eye contact and distance from a somewhat different perspective. In this study, subjects were instructed to approach to a comfortable distance various objects, including a life-size photographic cutout of a face, a plaster bust, and a book. In addition, they were asked to complete the same task in relation to

the author, who stood with his eyes open in some cases, and with them closed in others. Distances were measured and recorded. It was found that subjects stood closer to the photograph and to the author with his eyes closed than they did to the author with his eyes open.

Based on the results of these two investigations, as well as on their perusal of the literature, Argyle and Dean (1965) proposed the Equilibrium Model.

This model postulates that there is a dynamic balance of approach and avoidance forces affecting behavior in any social situation, and these forces will tend toward equilibrium or balance. The specific nonverbal behaviors utilized to create and maintain this equilibrium or balance are interpersonal distance, eye contact, body orientation, smiling and others (although these others are not specified, they seem to include gestures, etc.). In a particular social situation, the creation of disequilibrium from, for example, invasion of the personal space boundary, would be expected to evoke the use of various of the above-mentioned behaviors to compensate for the disequilibrium. For example, an acquaintance who stands too close (inside the personal space boundary), or who moves into the personal space zone during an interaction, is likely to provoke one to turn away, look at him/her less, or move away. Any or all of these behaviors would serve the purpose of bringing the level of interpersonal intimacy, or immediacy, back to a comfortable level. Specific predictions regarding which of the various available compensatory behaviors will be utilized by an individual are uncertain and may be a function of individual predisposition.

The model was criticized from a methodological viewpoint by Stephenson and Rutter (1970), who argued that at the farther distances untrained observers tended to record eye contact very unreliably, thus casting doubt on the basic finding which Argyle and Dean (1965) used in support of the model. Stephenson and Rutter further argued that there may be an increasing tendency with increased training of observers to bias them in the direction of recording glances at the ears, chin, neck, etc. at farther distances as eye contact, thus inflating both frequency and duration measures of eye contact.

Additional support for this criticism was found in the work of Goldberg, Kiesler and Collins (1969), who reported possible confounding of their work by difficulty in making discriminations between eye contact and other glances at the face at the far distances. However, Goldberg, et al., believed that the high observer reliability reported by Argyle and Dean (1965) was not due to observer bias, but to skill in observation.

Argyle (1970) replied to the criticism by proposing that in real situations involving real interactions, most glancing is in the direction of the eyes rather than other portions of the face. In addition, Argyle provided anecdotal evidence that trained observers reported that the discrimination was easy to make.

Since that time, a body of research literature has developed which generally has supported the Equilibrium Model, although for the most part the focus has been on examining specific compensatory behaviors (increased distance, alterations in eye contact, etc.) two at a time rather than globally. In addition, the situations in which

these behaviors have been investigated for the most part have been ones in which behavior was rather highly constrained.

Descriptive Evidence

Aiello and Jones (1971) described the relationships between distance and body orientation in same-sex dyads on a school playground. They found that Black and Puerto Rican children tended to stand significantly closer to each other than did Whites, but did not face each other as directly as Whites. Again, increased proximity was accompanied by decreased directness of body orientation and vice versa, which both supported the model and extended it to the level of the cultural group rather than merely the level of individual behavior.

Watson and Graves (1966) found that when seating themselves, pairs of American or Arab students revealed that as proximity to each other increased, directness of orientation to each other decreased. For American students, an increase in directness of body orientation was related to decreased eye contact; further, eye contact increased for American students. Neither of these findings applied to Arab students.

Patterson (1973) found that generally the behaviors of approach distance, eye contact, approach orientation and body lean of subjects in relation to an experimenter (which he termed immediacy behaviors) supported the model. In his review, he further reported that the stability or consistency of both spatial approach and body orientation were quite high for individual subjects over both 25-minute and 1-week periods. Intraindividual consistency was less impressive with regard to patterns of eye contact and body lean.

While the above-mentioned studies presented support for the Equilibrium Model, the evidence was correlational rather than experimental, and looked at the establishment of initial equilibrium rather than at the process of compensation. That is, as two individuals enter into a conversation or other interaction, they establish initial distance, body orientation, and other positions. Interaction is, however, a dynamic process, and during its course, individuals change position, etc., and may create disequilibrium which in turn will evoke compensatory responses. The descriptive support has tended to focus on the establishment of equilibrium, and is therefore limited. Interestingly, in all of the previously-mentioned studies, there was some type of verbal interaction between the subject and confederate, subject and experimenter, or between subjects. The experimental invasion studies, on the other hand, differ in that they characteristically do not involve any verbal interaction between subjects and either the experimenter or the confederate.

Experimental Evidence

Experimenter Invades Subject. Leibman (1970) suggested that three general classes of behaviors could be classified as personal space invasions. These were (1) inappropriate physical distance, (2) inappropriate body positions, and (3) behaviors resulting in inappropriate symbolic distance. Violation of cultural norms in each of these areas can take the form of either too much or too little. However, for practical purposes, most research has looked at situations in which an invader has positioned him/herself inappropriately close to a subject.

Baxter (1970) reported that in natural settings, Anglo adult pairs stood at a nose-to-nose distance from each other of from 2.33 to 2.72 feet. This pattern of interpersonal distancing varies with variations in cultural or ethnic or racial group, and specific norms are culturally transmitted. Children are permitted to approach each other and adults much more closly than older individuals are. The age at which one is perceived as invading another's personal space has been described by Fry and Willis (1971) as between 5 and 10 years. Younger children may come close to adults and not be perceived as violating personal space barriers.

In a pair of classic personal space invasion experiments, Felipe and Sommer (1966) investigated the responses of seated subjects to intrusion. The first of these took place on the grounds of a mental hospital, using patients as subjects; the second was in a university library. Though one might expect differences in behavior between these two groups, mental patients and college students were remarkably similar.

Invasions in the close condition involved shoulder-to-shoulder distance between subject and experimenter of 12 inches, and differed significantly in its effects on subject behavior from the other conditions. Distances in the other four conditions ranged from 2 feet to 5 feet. Intrusion in the close condition caused flight from the situation significantly more frequently than in the far condition. While flight latency was the dependent measure in these two studies, other responses were noted. These included blocking with arms or objects, changing the angle of orientation, or making the chair into a barrier.

While no attempt was made to assess interobserver reliability in either of these studies, it is unlikely that an observer would have difficulty making the discrimination between the presence or absence of the subject (i.e., flight latency). However, these studies might be faulted on the basis of their possible bias due to the use of only one experimenter in each study. The possible effects of the particular experimenter carrying out the invasions on subject behavior were not acknowledged.

The library invasion study was replicated by Patterson, Mullens and Tomano (1971) and measures of specific compensatory behaviors were examined. These included cross glancing (poorly defined, but seemingly glances in the direction of the invader which were not eye contact, or attempts at eye contact), leaning away from the invader, and blocking, as well as flight latency. It was found that with increasing physical immediacy, there was a significant and linear increase in cross glances, leaning, and blocking responses. There were many fewer flight responses than occurred in the Felipe and Sommer study. While this study took into account a greater variety of behavior than other invasion studies, all invasions were done by two female college students. Again, it is possible that results were biased by responses to these particular confederates rather than being indicative of the general class of responses to be expected. Further, while attention was paid to reliability of recording behavior, this was ignored after the training phase, and only one observer at a time was utilized.

Mahoney (1974) replicated the above study, again in a library

setting, but with the addition of a control condition in which observations were carried out of a subject in a no-invasion condition. To control for the effects of any other person being present at the same library table, regardless of distance, it was believed that this control was necessary. It was found that only one subject left the library during an invasion period, a substantial decrease from prior studies. There were no effects for glancing, though when the subject was across from the invader, there was more leaning behavior than when the subject was next to the invader. This pattern was also found for blocking.

Patterson (1975), however, criticized the study, suggesting that the research was not methodologically sound, as it used inadequate procedures for measuring leaning and blocking, and it used no measure for response duration, only for response frequency.

In still another library invasion study, Krail and Leventhal (1976) examined sex differences in response to invasions. They found that response latency decreased with increasing immediacy, and that when subject and invader were of the same sex, there was a shorter latency of response.

Again in a college library, Fisher and Byrne (1975) found that affect, environmental perceptions and attributions of intent were negative when a stranger sat across the table from males or adjacent to females. Barriers were erected by males when the invader was across from them, and by females when the invader was adjacent to them.

In an analogous series of five field experiments, Ellsworth,

Carlsmith and Henson (1972) looked at staring, rather than inappropriately close proximity, as the cause of flight reactions. They stared at pedestrians or automobile drivers while they were stopped at traffic lights. The dependent measure was the speed of crossing the intersection after the light changed. Those individuals who had been stared at crossed significantly faster than those who were not stared at. While other behaviors were not recorded systematically, it was noted that in the stare condition, subjects exhibited a variety of "nervous" behaviors, including frequent glances at the traffic signal, fidgeting with their clothing, or increased talking with passengers. They speculated that when a flight response was not possible, these other behaviors may have served to reduce the discomfort produced by that type of symbolic invasion.

Following this line of research, Konecni, Libuser, Morton and Ebbesen (1975) carried out four field experiments which examined both responses to personal space invasions of pedestrians stopped at street corners, and helping behavior of subjects toward the violator who had "lost" something. Personal space violations had the same effect that staring had, and those whose personal space had been invaded were less likely to help the invader recover an object he "lost" while crossing the street. In addition, sixty per cent of the subjects in the closest condition (1 foot) moved at least 1 foot farther away from the invader while waiting for the traffic signal to change. While the Equilibrium Model was not used to explain this behavior, the findings clearly supported the model.

Subject Invades Experimenter. In an invasion study by Buchanan, Juhnke and Goldman (1976), subjects were required to violate the personal space of either a male or a female in order to push floor buttons in an elevator. Both males and females preferred to violate the personal space of the female standing close to one of the two panels (a male was stationed close to the other panel). When given a choice of violating or not violating personal space, both males and females tended to avoid the violation. This indicated that there may be sex differences in willingness to engage in personal space violations as well as the differences in response to having one's space violated which were noted above.

In a study by Barefoot, Hoople and McClay (1972), subjects had to violate the personal space of either a male or a female experimenter in order to drink from a water fountain. Subjects were males only, and it was reported that they were less likely to approach the water fountain when the experimenter was within 1 foot of it than when the experimenter was either 5 or 10 feet from it. This was true regardless of the sex of the experimenter.

Using male confederates, Knowles (1972) reported that cross-sex dyads moved to avoid invasions more frequently than same-sex dyads. Walker and Borden (1976) also considered the permeability of the dyadic boundary. Their study involved the positioning of a dyad of confederates on a sidewalk. Frequencies were tallied to the number of passersby who passed through rather than around the dyadic boundary. They reported that male dyads were least likely to be invaded, and that males and females were equally likely to invade.

Only one observer recorded behavior in this situation; however, it is not likely that the results were biased by the lack of another observer as the discrimination between walking between or around the members of the dyad was easily made.

In summary, there is support for the Equilibrium Model, although not unqualified support. Responses to spatial invasions were varied, different responses were assessed from study to study, and most of these studies took place in situations where behavior was highly constrained. Subjects on elevators or at street corners were studied while in transit from one place to another. Those in elevators were prevented from leaving until the doors opened, and those at street corners were discouraged from leaving the intersection prematurely by the traffic signal. Those in libraries had settled at tables in order to read or study. The desire to reach a particular place, or the desire to study, is likely to influence the behavior emitted by a subject when invasions of personal space occur.

CHAPTER III

RELIABILITY OF OBSERVATIONS

In studies where behavioral assessments are done by human observers, a critical issue is that of observer reliability. This issue is too often ignored, which may account for some of the discrepancies in research findings. Although there are numerous horror stories about the inabilities of eyewitnesses to a crime to agree on exactly what happened to whom and in what order, somehow in the realm of the psychological experiment, that characteristic unreliability of the human observer is often ignored or inadequately dealt with.

In most of the studies cited above, data were coded in real time situations, without benefit of film or video-tape recording. Inter-observer reliabilities were reported only in a few of these studies. Of those which reported reliability, some were concerned with observer agreement in training sessions, and not during data-gathering. O'Leary and Kent (1973) suggested that the human observer is a rather poor cumulative recorder. They presented data indicating that reliability was inflated when raters knew that an assessment of reliability was being made, and also when they were aware that a particular assessor would be gathering data with which theirs would be compared. When raters were not aware that reliability was being assessed, there was a drop from .77 (with a known assessor) to .33 (covert assessment), indicating that a rater operating independently and not having his/her

judgments compared with those of other raters may produce seriously biased ratings. In addition to the depressed reliability coefficient, when unaware that reliability was being assessed, raters coded particular target behaviors only 80 per cent as frequently as when they were aware that assessments were being carried out (p. 80).

O'Leary and Kent (1973) further examined several other sources of error in observations by human raters. They may cheat to obtain higher reliabilities by communicating with each other during recording sessions, by modifying coded data, or by making computational errors. Subtle changes in category definition were also mentioned as a possible source of error.

It was suggested that accuracy of recording increases when at least two observers record data independently and simultaneously, and their behavior is checked covertly throughout the study. As a check against drift in category definition and coding, a third observer, trained with the original category system, might do his/her initial recordings at some time during the middle of the data-gathering process. Finally, utilizing only those behavioral categories which require a minimum of interpretive judgment on the part of the observer lead to increased reliability.

This area requires much more serious attention both narrowly in the area of personal space investigations, and in a larger sense in any investigations of phenomena which use human observers as recording and/or measuring instruments.

CHAPTER IV

THE PROBLEM

The study reported here examined responses of human subjects to spatial violations in a situation where the subject had voluntarily stopped and was not prevented from leaving. Additionally, subjects were standing and thus more free to move about than seated subjects would have been. The study took place in a natural setting, and compensatory aspects of personal space violation were examined. The hypotheses which were tested are presented below.

It was hypothesized that as distance decreased between subject and confederate (invader), the following would be found:

A. Behavior designated as "blocking" would increase. As indicated in previous research, there would be a tendency on the part of the subject in the closer invasion condition to interpose objects or parts of the body between him/herself and the invader.

B. Leaning away from the confederate would increase. Although Patterson (1973) indicated that while the behavior of leaning away from the invader is readily seen in seated personal space invasions, leaning is more difficult in a standing position. However, as there was a fence in the setting used, it was expected that in this setting leaning would be possible, and would occur more frequently in the close condition.

C. Movement away from the confederate would be more likely, and

would cease as a comfortable distance was reached by the subject. This behavior was hypothesized as likely to occur most frequently in the closest condition and unlikely to occur at all in the far condition.

D. Flight latency would be shorter. In was expected that subjects in the closest condition would leave the area more quickly than those in the far condition.

E. Angle of body orientation would be less direct. As indicated in the literature, as the invader was closer to the subject, there was a greater tendency on the part of the subject to turn away from the intruder.

F. The number of glances at the confederate would increase. While the Equilibrium Model predicts that eye contact will decrease with increasing proximity, it was thought that eye contact differed from the type of glancing anticipated. As previously noted, Patterson, et al.(1976) reported an increase in cross-glancing as distance decreased. This glancing in the direction of the invader may have been an attempt on the part of the subject to draw attention to the inappropriateness of the invader's behavior. It was predicted that while the number of glances in the direction of the confederate would increase with decreasing distance, eye contact would be avoided at all distances, as avoidance of eye contact with strangers in public places is normative behavior in this culture.

G. A larger number of the behaviors being coded would be employed by subjects in the closer condition. That is, subjects invaded in the close condition would employ more different compensatory

behaviors than would subjects in the control (far) condition.

H. To allow for differences between males and females in their responses at any of the distance manipulations, the design allowed for this variation. However, due to the lack of prior sufficient evidence in any direction, specific preditions regarding male-female differences were not made.

CHAPTER V

METHOD

Subjects

The subjects in this study were 162 pedestrians (81 female and 81 male) in a shopping mall in Portland, Oregon. Any adult Caucasian male or female stopping at the fence overlooking a skating rink (one level below) and watching the skaters below was a potential subject. Because interactions taking place around the perimeter of the viewing area for the ice-skating rink were visible from a long distance away, no verbal interactions took place with any subject in order that the integrity of the experimental design be maintained. Any obvious verbal interacting between a subject and the confederate (invader) might alert approaching potential subjects and confound the results of the study. This could take place in several ways; however, the major anticipated problem centered around the possibility that a potential subject would notice the confederate conversing and would wonder about the confederate's activities. Further, as the measures to be employed were unobtrusive, and intrusion was not more extensive than that commonly experienced by pedestrians in that setting, it was believed that participation in the study would in no way damage any subject. Subjects were not informed of their participation in the study.

Location

The study took place in a large shopping mall in Portland, Oregon. The mall contains an ice-skating rink on the lower level, and the area directly above the ice is open through the floor above. Around the opening there is a fence, and it is common for shoppers to pause at the fence to watch the skaters. Figure 1, which is appended (see Appendix A) shows the details of the setting. Subjects were observed in that part of the fenced area designated as the experimental area for this study. Observers were positioned at the level of the skating rink, which provided an unobstructed view of the pedestrians along the fence one level up and directly across.

Confederates

The confederates (invaders) were recruited from undergraduate psychology classes, except that one confederate was a friend of the author, and was not a student. All were between the ages of 21 and 35. To control for possible bias due to any particular invader, 5 female and 5 male invaders were contacted and agreed to participate in the study. One of the male invaders was unable to participate at the last minute, however, and at that point in the study it was impossible to replace him. Data were gathered utilizing the remaining nine invaders. Invaders were trained so that all invasions were standardized. Training sessions took place with each invader individually and involved teaching them to stand at the correct distance from subjects. In addition, invaders were instructed to avoid eye contact and verbal interaction with subjects. Each invader was

instructed in and practiced the appropriate body orientation and posture.

Observers

Observers were the experimenter and one other individual. It was originally planned that a third observer be trained and code data with the other two observers during the middle portions of the study in order to assess observer category drift. However, the third person, who was initially trained, was unable to continue for personal reasons and there was not sufficient time to train another observer to take her place. The observers were trained in the experimental setting until at least 80 per cent agreement for each behavior being coded was reached. Training consisted of coding behavior of target subjects independently followed by discussion of the behavior coded and resolution of any ambiguities which existed. Training continued until the criterion of 80 per cent agreement was reached for behavior coded sequentially. The following formula was used for calculating agreement, given that the sequential nature of the observations was followed (Johnson & Bolstad, 1973):

$$\frac{\text{number of agreements}}{\text{number of agreements + disagreements}}$$

Procedure

As a potential subject stopped in the designated research area to watch skaters, the invader approached the subject, stopping either 1 foot, 2 feet or 5 feet from the subject. To qualify as a potential subject, an individual had to be adult, alone, Caucasian, and in the designated area (see Figure 1, Appendix A). He or she additionally

had to be at least 5 feet away from the nearest other individual in that area. After approaching the subject and stopping in the designated area, the invader watched the skaters, avoiding looking in the direction of the subject.

Each confederate invaded the personal space of three males and three females in each of the two experimental conditions (1 foot and 2 feet) and also in the control condition (5 feet), for a total of 18 subjects per invader, or 162 subjects altogether. The order of subjects and conditions was determined in a quasi-random fashion suggested by Ellsworth, et al. (1972) as follows: each confederate was provided with 18 jelly beans in six different colors, with three of each color. Each color represented a specified sex of subject and distance, and these designations were memorized by the invader prior to the beginning of the experimental session. Prior to each trial, the invader reached into his/her pocket, removed one jelly bean, noted the color, and ate the jelly bean.

The invader then waited until an individual meeting the proper criteria and of the proper sex entered the designated area and stopped at the fence. After a brief delay (approximately 10 seconds) to allow the subject to settle him/herself at the fence, the invader approached, stopping at the proper distance.

When the invader stopped at the fence, the observations began. Observers coded for a period of three minutes or until the subject left the area, whichever was first. One observer was equipped with a timer which clicked at ten-second intervals. The timer, fabricated for this experiment, was the size of a cigarette case, and delivered

the signal via earphone to the observer. The observer equipped with the timer signalled to the other observer at each click. The observers recorded behavior independently, and as it occurred through time. The specific compensatory behaviors coded were blocking, leaning, movement away from the invader, flight latency, head-shoulder orientation (turning away), and glancing. Definitions of these categories and the symbols coded are included in Appendix B. The observations were coded on forms prepared with 10-second time blocks (see Appendix C). At each signal from the timer, coding began in a new 10-second block. This method permitted maximum attention to the behavior of the subject while permitting estimations of the duration of coded behaviors to be made.

Following the observation period, the invader moved away from the fence area, gazed about calmly as though waiting for someone, and waited for the next subject to enter the area. The interval between subjects ranged from a minimum of approximately 3 minutes to a maximum of approximately one hour. In general, invaders had to wait for longer periods of time for appropriate female subjects to enter the area than for male subjects, as females tended more frequently to be in dyads.

CHAPTER VI

RESULTS

Reliability

Inter-observer reliabilities for all coded behaviors were calculated for all observations, with the exception that one of the observers also served as an invader for one set of observations. The data on reliability are presented in Table 1 below.

TABLE 1

Reliability of Observations

Behavior	Number of Agreements	Total No. Recorded	Per Cent Agreement
Glancing	1018	1136	90
Turning Away	176	190	93
Movement Away	42	56	75
Blocking	145	159	91
Leaning Away	137	152	90

As can be seen, reliabilities for all behaviors exceeded 90 per cent agreement, except that for movement away from the invader, for which only 75 per cent agreement between observers was obtained. To increase the rigorousness of this method of calculating reliability, agreements and disagreements were tallied as they occurred sequen-

tially through the observational record. An agreement was tallied only when both observers had recorded the same behavior as occurring at the same point in time.

Analysis of Dependent Measures

The number of subjects engaging in each of the target behaviors was tallied, and the results presented in Table 2. As can be seen, all subjects glanced toward the invader at least once, and about two-thirds of the subjects blocked. The presence of a fence to lean on may explain in part the high percentage of subjects blocking. Movement away from the invader and head-shoulder orientation away from the invader occurred less frequently, and leaning away was seen in only a very few subjects.

TABLE 2

Percentage of Subjects Engaging in Each of Target Behaviors

Behavior	Per Cent of Subjects
Glancing Toward	100
Blocking	67
Movement Away	23
Turning Away	17
Leaning Away	7

For the behaviors of blocking, leaning away and head-shoulder orientation (turning away), scores were generated for each subject ranging from 0 to 100, which represented the percentage of time the subject engaged in each particular behavior. These scores were

generated by tallying the amount of time during which the behavior occurred and dividing by the total time the subject was being observed (up to and including 180 seconds). Movement away was scored as the number of steps that the subject moved away from the invader, up to and including 5 steps away. People moving farther than that were considered to have left the area. Flight latency was the number of seconds (up to 180) that the subject remained at the fence in the designated area after being approached by the invader.

A rate of glancing score was generated which represented number of glances corrected for the amount of time the subject remained in the target area. This was done by dividing the total number of glances toward the invader by the number of 10-second periods during which the subject was present and being observed. This kind of score was necessitated by the large number of short-duration glances which were coded; the notational system was not sensitive enough to permit accurate judgments from the recorded data regarding duration of glancing behavior.

A 2 (sex of invader) x 2 (sex of subject) x 3 (distance) analysis of variance using unweighted means for unequal cell frequencies (Winer, 1962) was computed for each of the dependent measures hypothesized (blocking, leaning away, movement away, flight latency, turning away, glancing toward, and total number of categories coded). Source tables for these analyses are appended (see Appendix D through Appendix J). For the behavior of blocking, a main effect for sex of subject was found. Females ($\bar{X}$ = 75.71) were more likely to engage in blocking than were males ($\bar{X}$ = 47.5, $p < .001$). These are presented in

Table 3 below.

TABLE 3

Mean Values for Time Blocking

Sex of Subject	Mean	Standard Deviation
Male	47.5000	47.823
Female	75.7083	42.223

An additional main effect was found for sex of subject for the measure of total number of coded categories per subject. Again, females ($\bar{X}$ = 3.27) engaged in a greater variety of the possible target behaviors than did males ($\bar{X}$ = 2.90, $p < .01$). This was also true regardless of sex of invader. That is, female subjects tended to exhibit a greater number of different responses than did males. This is presented in Table 4 below. The possible range of scores for this category was from zero to 5. This tendency did not interact with the

TABLE 4

Variety of Behaviors Emitted by Subjects

Sex of Subject	Mean	Standard Deviation
Male	2.901	0.810
Female	3.284	0.903

distance of the invader from the subject, but an additional main effect was found with respect to this dependent measure for distance of invader from subject ($F = 3.01$, $p = .05$). A Newman-Keuls analysis

of the differences between all pairs of means was done, and it was found that subjects in the 1-foot distance condition engaged in a greater variety of the target behaviors (blocking, leaning away, movement away, turning away and glancing toward the invader) than did subjects in the 5-foot control condition. Neither of these differed significantly, however, from the mean for subjects in the 2-foot distance manipulation. These results are presented in Table 5 below.

TABLE 5

Mean Variety of Behaviors Emitted at Various Distances

Distance	Mean	Standard Deviation
1 Foot	3.315	0.886
2 Feet	3.037	0.889
5 Feet	2.926	0.821

It was interesting to note that while there were main effects for both sex of subject and distance, there was no interaction between these factors. Mean values for variety of behaviors emitted overall for male and female subjects regardless of sex of invader, at various distances of the invasion manipulation are presented in Table 6 below. All other results of the study were non-significant, and failed to support the hypotheses of the study.

TABLE 6

Mean Variety of Behaviors Emitted by Subjects at Various Distances

Distance	Sex of Subject	
	Female	Male
1 Foot	3.556	3.074
2 Feet	3.074	3.000
5 Feet	3.222	2.630
Total	3.284	2.901

CHAPTER VII

DISCUSSION

The pattern of significant results in this study was one not predicted by the Equilibrium Model, but provides important insights into the behavior of women and men. Generally, in this setting, the behavior of women was more variable than that of men, and more specifically, women engaged more often than men in behavior labeled blocking. The reason for the differences found is not clearly apparent; however, it may reflect a tendency on the part of women to be more anxious in the presence of others, and to reduce anxiety they move about more than men. On the other hand, it could be that there are no differences in anxiety levels, but the behavioral differences reflect the greater permission given to women in this society to reveal their emotional state. Males have traditionally been taught to mask their emotions, and therefore might present less evidence of discomfort than women, even nonverbally.

In terms of the greater blocking activity, it was possible that women have selected that particular response from the available repertoire because it is a more subtle way of compensating for disequilibrium in a variety of circumstances than any of the other target behaviors would have been. Movements involving larger portions of the body, such as turning away, moving away, or leaning away are perhaps more obvious, although this is an empirical question and could

profitably be examined.

Though female behavior in general was more varied than male behavior, it was found that both males and females engage in more compensatory behavior when the invader is at a distance of 1 foot from the body than when the intervening distance was 5 feet. Perhaps the lack of other significant findings was attributable to the lack of sensitivity of the measures involved, or it may have been due to other factors.

It was abundantly clear from the data that this study failed to provide more than minimal support for the Equilibrium Model proposed by Argyle and Dean (1965). Both the independent and dependent variables which were selected for study were suggested by prior research, and considerable support for the model has been generated. It may be that the cases in which the model was not supported have not found their way into the literature as often as would be appropriate.

While the body of research cited previously in this paper was specifically related to the manner in which personal space invasion studies have supported the model, in a broader sense the model was postulated to account for the emission of various behaviors indicating intimacy (i.e., distance, eye contact, etc.).

Many of the personal space invasion studies fall at one end of the intimacy continuum, representing the case in which an experimenter has caused two individuals, who have no expectation of interaction with each other, to be in close proximity to one another. Typically, one of these individuals has been a confederate and the other a subject. Also typically, confederates' behavior has been neutral,

except for the actual invasion.

Given that Argyle and Dean (1965) did not specify the context(s) for which the Equilibrium Model should be appropriate, it has apparently been assumed by many investigators that it should be true regardless of context. Most invasion studies in the literature do not significantly alter this assumption. However, when behavior is monitored resulting from both verbal and nonverbal interactions involving situations in which a certain amount of self-disclosure or intimacy is appropriate, findings have contradicted the model (i.e., Jourard & Friedman, 1970). In some cases, then, behavior reflecting increasing intimacy is reciprocated (more eye contact, moving closer, etc.) rather than compensated for.

Based on findings such as those presented by Jourard and Friedman (1970), Patterson (1976) proposed an alteration of the model to account for the effects of context, and specifically postulating a relationship between the presence of others, physiological arousal, the labelling of that arousal, and resultant behavior.

This model is presented as Figure 2 (Patterson, 1976, p. 240) below. The model is relatively simple, proposing that as Person A alters his/her intimacy behaviors, arousal will be created in Person B, leading to an affective labelling of that arousal as either positive or negative. If the labelling is negative, then compensatory behaviors will be found, and in the case where labelling is positive, reciprocity will occur. That is, if you get close to me and I like you, I will reciprocate and increase eye contact, smiling at you, etc., rather than compensating by avoiding eye contact, moving away,

etc. This modification allows for the effects of cognitive processes in the labelling of arousal, but does not specify what these processes are or exactly how they influence the labelling process. In terms of explaining existing data, however, this model can account for a greater portion of behavior resulting from the physical closeness of two people than can the Equilibrium Model.

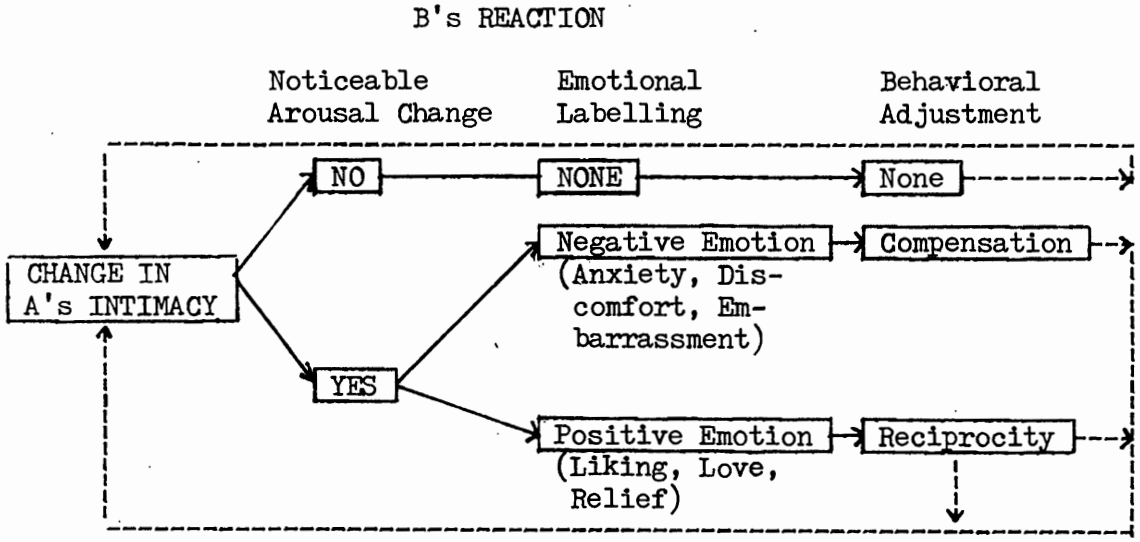

Figure 2. Diagram of the arousal model of interpersonal intimacy (Patterson, 1976, p. 240)

However, even with the modifications proposed by Patterson to the Equilibrium Model, and the presentation of an alternate model which subsumes the Equilibrium Model, there is a failure to account for the data presented in this study.

It is therefore proposed that in addition to the notion of arousal, and emotional labelling of arousal, this model be amended to include a further step mediating the labelling of arousal. This additional step was one originally considered by Schachter and Singer (1962) and was very simply the notion that situational or contextual

cues would be used to aid the labelling of arousal. Patterson, however, has failed to allow for the effects of situational cognitions regarding environmental events other than the possible change in A's intimacy behaviors in relation to B. As amended, the model would include or allow for the effects of other contextual cues. This revision is presented as Figure 3 below.

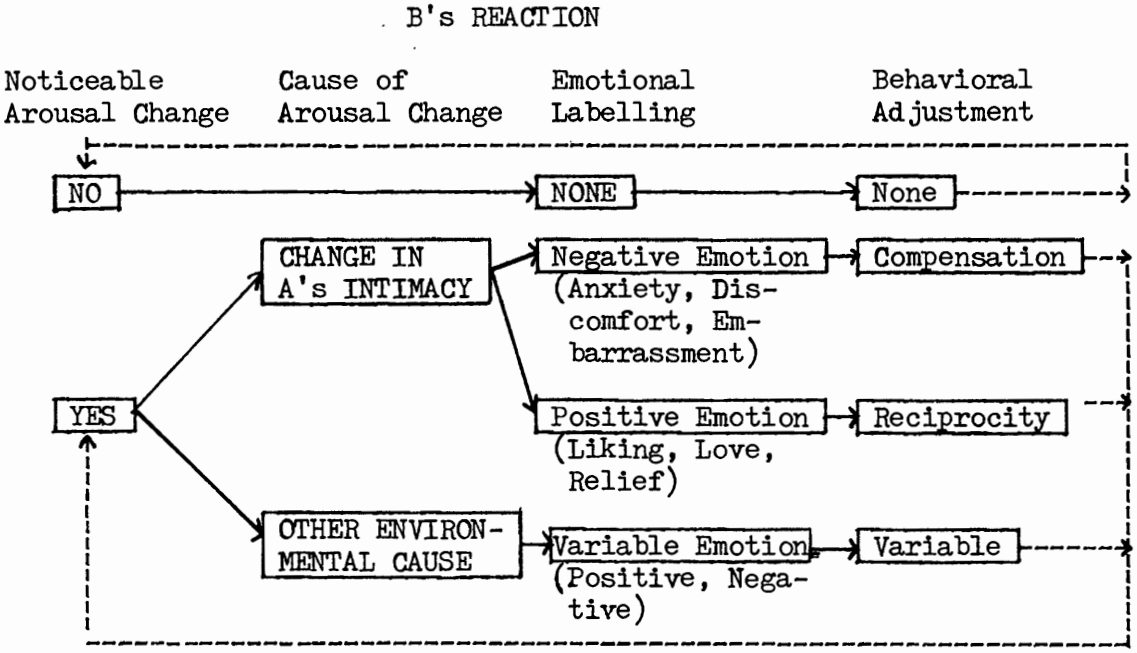

Figure 3. Diagram of the arousal model of interpersonal intimacy as revised

How does a subject respond to spatial invasions when he or she has already been aroused prior to the appearance of the invader and has already attributed this arousal to properties of the environment? The crucial question then becomes one of the temporal sequence of events, as well as one of magnitude of effects. That is, when one is standing in the path of an avalanche, one is hardly likely to attribute any physiological arousal to the appearance of a spatial invader

one foot away. It is suggested that arousal in the presence of a particular set of environmental circumstances is likely to be attributed to those circumstances rather than to subsequent events.

In a study by Efran and Cheyne (1974) it was predicted that subjects who had to invade the space shared by two conversants in a hallway would experience greater affective arousal than subjects who were not forced to intrude. In fact, just prior to intruding or not intruding, subjects were notified via intercom that the experimenter was waiting to talk to them in a room at the other end of the corridor. As subjects walked down the corridor, one of three conditions existed. They walked down an empty corridor, passed by two confederates, or passed between two confederates. It was found that for all subjects there was an average 42 per cent increase in heart rate. The mere fact that they were called by the experimenter was proposed to account for this overall increase, and any potential heart rate increases due to the required invasion would have been masked by this overall substantial increase. Unfortunately, subjects were not asked to account for their physiological arousal. It was an important beginning, however, in examining this aspect of response to spatial invasions.

To further apply this approach to prior research, perhaps an assessment of the experimental setting relative to its arousal-inducing properties would facilitate predictions about responses of subjects to personal space invasions. Most prior research has taken place in field settings, with the college library being the most popular, and elevators and street corners also represented. The

presence of an invader in the library, particularly one in which a subject has a table to him/herself, must be a noticeable situation, and is highly likely to be arousing. In fact, it is unlikely that any arousal could be attributed to circumstances other than the presence of the invader, under ordinary conditions. Because violation is contrary to social norms, the label attached to this is likely to be negative, and compensatory responses are then likely to occur.

In elevators or at street corners, the presence of others is also likely to precipitate arousal, and to be viewed negatively. However, in the field setting selected for this study, a feature of the environment which may have mediated subjects' responses was the skating rink.

Subjects had stopped to watch skaters, and it might be assumed that they did so because they enjoyed watching skaters. At any rate, the activity of watching skaters at a rink located in the center of a large metropolitan shopping center is likely to be accompanied by physiological arousal. Further, the emotional labelling of this arousal is most likely to be positive. The arousal model (Patterson, 1976) would predict that following positive emotional labelling, reciprocity would be engendered. However, in this study, the invader did not look at or otherwise interact with the subject, thus limiting available reciprocity. Given a positive affective response to the skaters, any negative effects due to the presence of the invader still perhaps was not sufficiently negative to change the overall affective labelling from positive to negative. Many subjects, therefore, might not be sufficiently negatively affected to engage in

compensatory behaviors.

While this discussion is highly speculative and not supported by currently available data designed to test the arousal hypothesis, it is suggested that the arousal model is better fitting to the data than the Equilibrium Model alone. When allowances are made for the labelling of arousal, more accurate predictions of subjects' behavior may be possible. Clearly there is a dearth of research using physiological measurements of subjects' arousal, and future research is critical.

CHAPTER VIII

CONCLUSIONS

Human social behavior is a complex phenomenon, and the responses of human subjects to invasions of personal space represent only a very small portion of that behavior. It is apparent that there are specific patterns of responses to the physical presence of another person, but the conditions under which specific responses occur still need clarification. Further research is needed in the areas of applying physiological measures across situational variables; second, the relationship between arousal and affective labelling in interpersonal encounters needs further specification with respect to distancing, eye contact, etc.; and third, research is needed which examines the effects of sequence and intensity of stimulation variables on affective labelling of arousal. That is, we need more and better information about how human beings respond to events as they occur through time, taking into account the intensity of these events.

The role that affective labelling plays in responses to spatial invasions should help guide advances in the areas of both method and theory with regard to responses to invasion of personal space.

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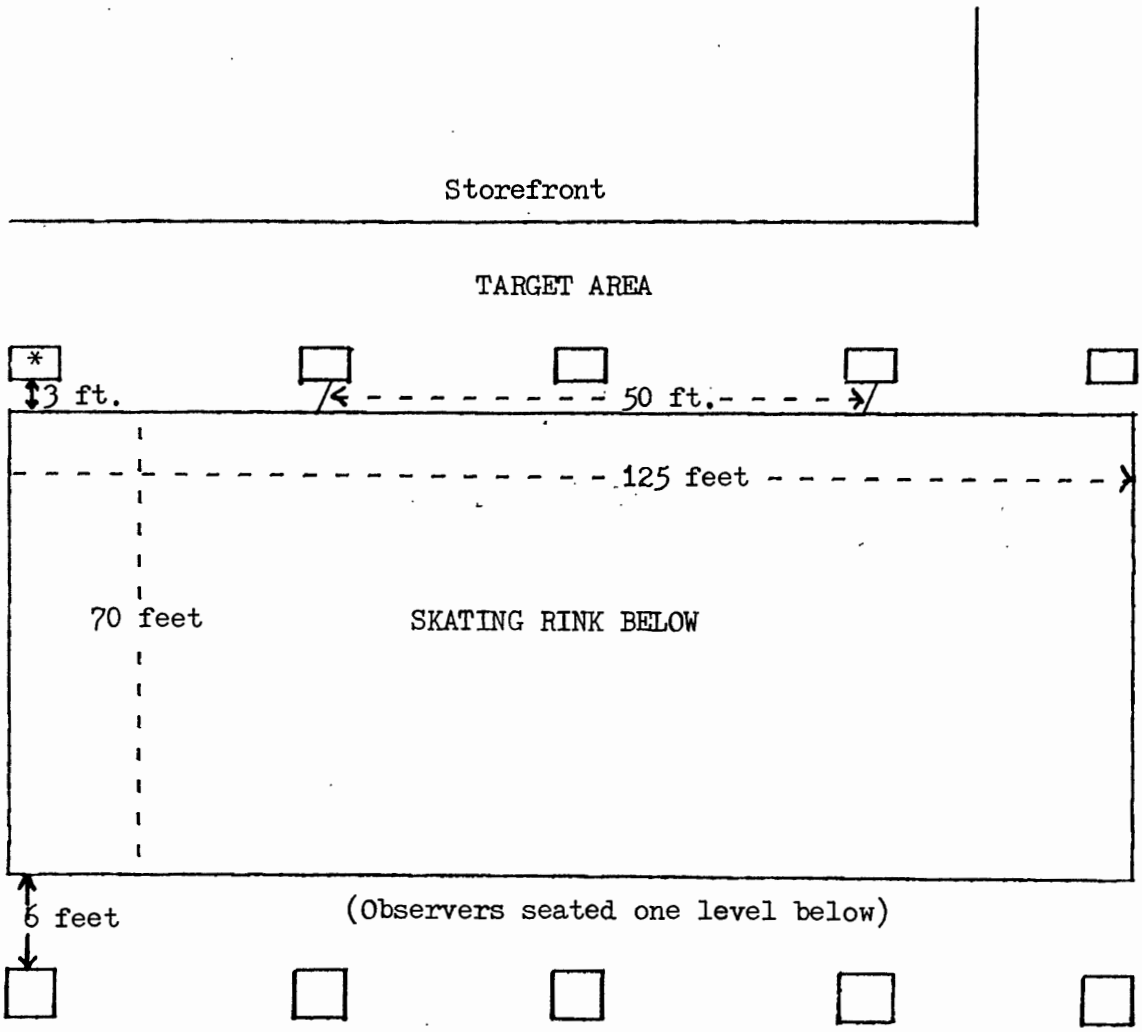
APPENDIX A



*Pillars

Figure 1. The Experimental Setting

APPENDIX B

BEHAVIORAL CATEGORIES AND DEFINITIONS

Symbol Coded	Behavior	Definition
Bl	Blocking	Placing a part of the body or an object between the subject and the confederate, as a barrier. When leaning on the fence, this included any arm positions on the side of the invader which subtended an angle from the vertical toward the invader.
Nb	Not Blocking	The termination of blocking behavior as defined above; the lack of any blocking.
>	Glancing	Turning the head in the direction of the invader. Any movement of the head past the center point, looking across the ice rink, was coded in this manner.
<	No Glance	All other head positions than those in the above definition of glancing.
$\sim_3$	Movement Away	Stepping away from the invader; subscript indicates the number of steps the subject moved away from the original distance established by the invader.
α	Leaving	Flight latency, recorded when subjects left either the target area, or the immediate vicinity (touching distance) of the fence.
i.e., $\underline{\cdot}$	Turning	Head-shoulder orientation (SFP axis, Hall, 1963); in all cases the invader was stationary, so only the position of the subject was coded. Position of the dot indicated direction subject was facing.
\	Lean Away	Any lean, particularly from the hips upward, away from the vertical, and away from the invader.
|	No Lean	Any other posture, particularly of the trunk.

APPENDIX C

CODING FORM

Date _____ Density _____

Name of Observer _____ Invader # _____

Subject # _____ Sex of Invader _____

Sex of Subject _____ Distance _____

10	20	30
40	50	60
70	80	90
100	110	120
130	140	150
160	170	180

APPENDIX D

BLOCKING, ANALYSIS OF VARIANCE SOURCE TABLE

Source	M.S.	D.F.	F-Ratio	P
Treatments	4972.516	11		
Sex of Invader	746.304	1	.3676	.55
Sex of Subject	31,828.403	1	15.6772	.0003
Distance	2,374.919	2	1.1698	.31
Invader x Subject	50.625	1	.0249	.87
Invader x Distance	1,408.895	2	.6940	.51
Subject x Distance	2,073.401	2	1.0213	.36
Invader x Subject x Distance	5,178.956	2	2.5509	.08
Error	2,030.232	150		
TOTAL	2,231.258	161		

APPENDIX E

LEANING, ANALYSIS OF VARIANCE SOURCE TABLE

Source	M.S.	D.F.	F-Ratio	P
Treatments	301.084	11		
Sex of Invader	5.057	1	.0105	.92
Sex of Subject	43.635	1	.0905	.76
Distance	811.027	2	1.6820	.19
Invader x Subject	814.005	1	1.6882	.19
Invader x Distance	162.879	2	.3378	.72
Subject x Distance	238.316	2	.4943	.62
Invader x Subject x Distance	12.390	2	.0257	.98
Error	482.172	150		
TOTAL	469.799	161		

APPENDIX F

MOVEMENT AWAY FROM THE INVADER

ANALYSIS OF VARIANCE SOURCE TABLE

Source	M.S.	D.F.	F-Ratio	P
Treatments	.615	11		
Sex of Invader	1.701	1	2.3736	.12
Sex of Subject	.453	1	.6327	.57
Distance	1.400	2	1.9537	.14
Invader x Subject	.248	1	.3463	.56
Invader x Distance	.239	2	.3329	.72
Subject x Distance	.347	2	.4842	.62
Invader x Subject x Distance	.194	2	.2712	.77
Error	.717	149		
TOTAL	.710	160		

APPENDIX G

FLIGHT LATENCY, ANALYSIS OF VARIANCE SOURCE TABLE

Source	M.S.	D.F.	F-Ratio	P
Treatments	4356.246	11		
Sex of Invader	4064.704	1	.9451	.67
Sex of Subject	11563.778	1	2.6888	.10
Distance	720.621	2	.1676	.85
Invader x Subject	498.593	1	.1159	.73
Invader x Distance	3779.880	2	.8789	.58
Subject x Distance	7333.954	2	1.7053	.18
Invader x Subject x Distance	4061.361	2	.9443	.61
Error	4300.790	150		
TOTAL	4304.579	161		

APPENDIX H

HEAD-SHOULDER ORIENTATION, ANALYSIS OF VARIANCE SOURCE TABLE

Source	M.S.	D.F.	F-Ratio	P
Treatments	657.355	11		
Sex of Invader	820.727	1	1.1758	.28
Sex of Subject	855.216	1	1.2252	.27
Distance	575.980	2	.8251	.56
Invader x Subject	271.858	1	.3895	.54
Invader x Distance	177.741	2	.2546	.78
Subject x Distance	1674.641	2	2.3990	.09
Invader x Subject x Distance	213.188	2	.3054	.74
Error	698.045	149		
TOTAL	695.248	160		

APPENDIX I

GLANCING, ANALYSIS OF VARIANCE SOURCE TABLE

Source	M.S.	D.F.	F-Ratio	P
Treatments	1.241	11		
Sex of Invader	.462	1	.4785	.50
Sex of Subject	.080	1	.0828	.77
Distance	2.134	2	2.2090	.11
Invader x Subject	.738	1	.7639	.61
Invader x Distance	.929	2	.9621	.61
Subject x Distance	2.515	2	2.6034	.08
Invader x Subject x Distance	.609	2	.6305	.54
Error	.966	150		
TOTAL	.985	161		

APPENDIX J

NUMBER OF CATEGORIES CODED

ANALYSIS OF VARIANCE SOURCE TABLE

Source	M.S.	D.F.	F-Ratio	P
Treatments	1.417	11		
Sex of Invader	.581	1	.8026	.62
Sex of Subject	5.432	1	7.5093	.01*
Distance	2.175	2	3.0072	.05*
Invader x Subject	.210	1	.2902	.60
Invader x Distance	.049	2	.0672	.93
Subject x Distance	1.244	2	1.7192	.18
Invader x Subject x Distance	1.214	2	1.6784	.19
Error	.723	147		
TOTAL	.772	158		