PERCEPTION OF THE AMES DISTORTED ROOM AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

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PERCEPTION OF THE AMES DISTORTED ROOM AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

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Abstract of Thesis

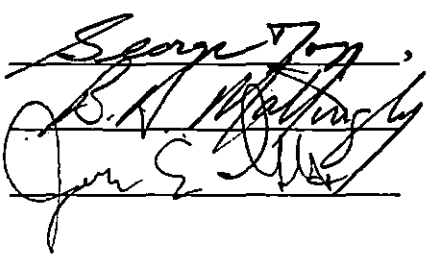
The purpose of the present study was to examine the role of self-produced movement in the formation and transfer of new percepts using the Ames distorted room. Sixty volunteers from undergraduate psychology classes were utilized as subjects. Subjects were randomly assigned to four groups. Two experimental groups were tested for perception of distortion in the distorted room and in a normal room before and after training. For one group, training consisted of manipulating a wand inside the distorted room (Active group). For the other group, training consisted of simply viewing the distorted room for a comparable length of time (Passive group). The other two groups served as control groups, neither receiving any form of training in the distorted room. One control group was tested before and after

a rest period in both the normal and distorted rooms (Passive Control group). The other control group was tested only in the normal room. Perceived distortion was measured using both verbal reports and a disc matching task.

Analysis of the verbal report data indicated that the active training group perceived significantly greater distortion in both the distorted- and the normal- room following training than any of the other groups. This finding suggests that active training may have resulted in perceptual learning which transfers to similar environments.

Analysis of the disc matching data indicated that the Active group perceived a smaller illusion in the distorted room than the other groups following training. However, the Active group did not differ significantly from the other groups in disc matching in the normal room following training. This finding is inconsistent with the verbal report results and suggest that active training in the distorted room does not result in formative perceptual learning.

Accepted by:



, Chairman

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Chapter I

INTRODUCTION

Perception is often defined differently depending on the theoretical orientation of the researcher. Thus, a universally accepted definition of perception does not exist (Leibowitz, 1965). However, a common approach, as reported by Levine and Shefner (1981), defines perception as the interpretation of sensory information (information picked up by the various senses). Processing and interpretation of sensory information are regarded by some researchers to be an active process (Forgus, 1966; Gregory, 1978). Gregory, (1978, p. 13), for example, suggests the perceiving individual is actively and dynamically "searching for the best interpretation of the available data". Gibson (1966), however, from a psychophysiological standpoint, suggests that an active and, at times, conscious interpretation of sensory information is not necessary for perception to occur. That is, perception is sometimes a passive, automatic process of sensory interpretation and only becomes an active process when the stimulus is unfamiliar. Gibson maintains that perception, whether active or passive, is

based on the detection of information through the senses or "perceptual systems". This interpretation of information from the environment occurs within the individual and is thus an inferred process or construct (Epstein, 1967, p.8).

The way in which an observer perceives a stimulus may be influenced by numerous variables such as personality traits, reinforcement, sex, and developmental stage of the observer (Dion & Dion, 1976; Gerace & Caldwell, 1971; Mandes & Swisher, 1980: Small, 1973; Stewart, 1974; Wittreich, 1952). Many theorists view interaction and experience with the environment as the basis for a potentially significant perceptual process; perceptual learning (Gibson, 1963; Held & Bosson, 1961; Held & Hein, 1963; Held & Schlank, 1959). Perceptual learning is often presented as the foundation for perceptual functioning and adaptability of the mature organism. This position, in keeping with Gibson's (1969, p. 29) definition, defines perceptual learning as "any relatively permanent and consistent change in the perception of a stimulus array following practice or experience with this array". According to this definition; two criteria must be met to consider perceptual change to be perceptual learning: (a) the change in perception or interpretation of a stimulus must be long lasting (not transient); and (b) the change must

have been the result of practice or experience with the stimulus.

Gibson (1963) also posits that before perceptual learning takes place, the individual may fail to respond to certain aspects of stimulation. However, following experience with that stimulus, the individual may learn to respond to specific features of the stimulus. Gibson terms this aspect of perceptual learning an increase in the specificity of responding. That is, specific responses are generalized to different features of the stimulus. Another aspect that is evident when perceptual learning takes place is the detection of distinctive features of a stimulus. A stimulus may be difficult to discriminate on the basis of a single feature, however, after practice or experience with this stimulus, the complex stimulus may be recognized on the basis of several distinctive features at the same time. Usually, a stimulus consists of certain invariant properties and patterns even when experienced in different settings. Perceptual learning facilitates the individual's ability to detect these invariant properties and patterns. Experience and practice constitute a major aspect of perceptual learning resulting in the individual's increased ability to detect, to recognize, and to respond to new stimuli. Although the various theories do not support a common definition of perception, most theories emphasize the role of learning in perception.

Perceptual learning changes the way in which a stimulus is perceived. When an individual detects a stimulus, perception functions to make the best estimate between what is really out there (distal stimulus) and the actual incoming sensory information (proximal stimulus). This estimation or subconscious guess is termed the perceptual hypothesis (Levine & Shefner, 1981, p. 239). Perceptual learning results in a higher probability of the acceptance of one particular perceptual hypothesis over another. Sometimes, however, the accepted perceptual hypothesis is inconsistent with the true state of the environment. Leibowitz (1965) terms this phenomenon an illusion. The question is, what factors in perceptual learning affect the acceptance or rejection of perceptual hypotheses in illusions? One theoretical approach to the study of illusions in perceptual learning is the transactional model of perception.

Transactional Model of Perception

The transactional model of perception has generated extensive research involving perceptual learning utilizing illusions (Ames, 1951; Ittleson, 1951; Kilpatrick, 1961). The major premise of the transactional model of perception is that the perception of an object and the object itself are preceived as parts of a total life situation. Neither the perception nor the object exist independently of that situation (Ittleson, 1951). Basically, the transactional model of perception asserts that there are certain characteristics of the object (cues) that influence the

particular interpretation or perceptual hypothesis that is accepted. Perhaps the most important perceiver characteristic is the set of assumptions derived through past experiences which the individual uses in interpreting sensory information (Ittleson, 1951). According to Kilpatrick (1961), these assumptions exist because perception is a creative process in which the perceiver constructs a personal world of experiences. These assumptions combine to comprise a "frame of reference" that the individual relies on to facilitate the intepretation of sensory information (Ittleson, 1951). Assumptions can be modified or new assumptions can be added if the object cues that are presented conflict with past experiences. The individual, through perceptual learning, modifies or develops a new frame of reference to account for the discrepancy.

Some support for the influence of past experiences on perception is revealed through cross cultural studies. Individuals who have not been exposed to a "carpentered world" (a high degree of rectangularity in the environment) are usually not susceptible to illusions that are based on lines and angles (Hautaluoma & Loomis, 1972; Stewart, 1974).

"Awareness in space, is based on action in space" was stated by Piaget (1961). The normal perception of

objects as facilitated by self-produced movement has been another area of investigation for the transactionalists (Allport, 1955). The importance of movement in perception has been substantiated by several studies conducted by Held and his co-workers (1959; 1961; 1963). One of Held's earlier studies (1961) investigated whether active or passive movement affected subjects' perceptions while wearing prisms that displaced the visual field. The findings indicated that visual stimulation alone (passive movement) was not adequate to produce adaptive perceptual change; that is, only the active subjects were able to function normally while wearing the prisms. A subsequent study by Held and Hein (1963) using dark reared kittens found that kittens receiving active interaction with the environment developed normal perceptual functions whereas kittens which received equivalent visual stimulation but were passive did not. Thus, self-produced movement has been shown to be a relevant variable not only in facilitating perceptual change, but also in the development of normal sensory and perceptual functioning. According to Gibson (1966) the visual and haptic (motor) systems appear to work spontaneously in the reduction of discrepancies between distal and proximal stimulation. Thus, visual simulation with the addition of self-produced movement should result in a more veridical perception of a stimulus object.

A problem in dealing with transactionalism is whether self-produced movements result in adaptation or learning (Harris, 1963). Held and his co-workers make a distinction between adaptation and learning. Adaptation is viewed as a more primitive process than learning. Both Gibson (1963) and Hebb (1961) consider adaptation as a form of learning; however, Hebb suggests that learning and adaptation may represent two processes. Learning as defined here is long lasting (relatively permanent) and adaptation is more transient. In the studies involving self-produced movement, it is not clear whether a direct modification (learning) has taken place or simply an indirect compensation (adaptation) to that particular situation. One approach to the problem of determining whether self-produced movements result in adaptation or learning would be to give direct active experience in a strictly controlled environment and then assess the change in perception.

Perceptual Learning in the Ames Distorted Room

One such controlled environment is the Ames distorted room (Ittleson, 1952). The distorted room, when viewed monocularly, appears to be a normal rectangular room, when in fact the room is trapezoidal. The left side of the distorted room is twice as distant from the observer as the right rear corner thus the left side of the distorted room gives the same sized proximal stimulus as the right side.

The rear corners appear, but are not, equidistant from the observer. Due to the cues present in the room, any similar sized objects placed in the rear corners of the room appear to be at the same distance; thus, the subject perceives a difference in size. According to Ittleson (1951), the subject has constructed through experience a frame of reference regarding rectangular rooms. The subject then assumes the distorted room is rectangular.

Kilpatrick (1961) was one of the first researchers to systematically study the learning processes affecting perception of the distorted room. According to Kilpatrick, two types of perceptual learning, reorganizational and formative, have been found to occur in the distorted room. Reorganizational learning is a new way of organizing previously established cue-percept relationships; that is, reweighting already present cues in the distorted room such as "give-away" cues. The transactionalists would define this type of learning as simply the modification of the subjects' assumptions that not all rooms are rectangular. Reorganizational learning is dependent upon the give-away cues in the room and is, therefore, room specific and does not transfer to a similar, but normal room. Formative learning, however, is an actual learned alteration in the way a given stimulus is perceived; the observer actually reinterprets the perceptual cues forming a new perception. The subject develops assumptions and a new frame of

reference about similar rooms. Subjects who experience formative learning transfer the new percept to a similar room; that is, the subject perceives a normal room as distorted.

In Kilpatrick's (1961) study, subjects were first asked to describe the shapes of two distorted rooms and a third rectangular room. The two distorted rooms were the common "L" (left side expanded) and the "T" rooms (top expanded). All three rooms projected the same proximal stimulus. Subjects were then divided into either active or passive training groups. Active training consisted of the subjects actively exploring the "L" room by manipulating a wand inside the room. Passive subjects watched the experimenter manipulate the wand. No control group was used. All subjects after training were asked to describe the "L" room.

Kilpatrick found through verbal reports of perceptual change that both the active and passive groups reported changes in the direction of the veridical shape of the "L" room. When Kilpatrick retested subjects in the normal room, some of the subjects reported many of the "L" room features such as a sloped floor or ceiling, regardless of training, thus presenting evidence for formative learning. These results seem to be at variance with Held's (1959; 1961; 1963) hypothesis in that simply observing the room without

active physical interaction with the room should have produced little or no change in the perception of the room.

A similar study to that of Kilpatrick's (1961) was conducted by Osborne, Dyer, and Applegate (Note 2) who investigated the role of active vs. passive training using an additional control group which simply observed the room for a comparable length of time. Also, these researchers attempted to quantify the magnitude of the illusion instead of relying on verbal reports of perceptual change. The magnitude of the illusion was quantified by a disc matching task utilized by Hunt (Note 1). Black metal discs were mounted halfway up each rear corner of the room. The disc on the right was the standard and always the same size. The disc on the left could be varied from smaller to larger than the standard therby giving the point of subjective equality (PSE). Assuming the subject had good size constancy, if the room appeared rectangular, the subject should choose a test disc twice as large as the standard. If the subject perceived the true shape of the room, a test disc the same size as the standard would be chosen.

The results indicated that active subjects (subjects who manipulated a wand inside the room) displayed a small but nonsignificant decrease in the size of the illusion. Both the passive group (subjects who viewed the experimenter

manipulate the wand) and the control group (subjects who viewed the room for a comparable length of time) actually perceived an increase in the size of the illusion. Active training appeared to prevent the illusion from increasing. Verbal reports were also taken and revealed no differences between groups. Due to the differences between the quantitative measure and the verbal reports, it was concluded that verbal reports reflected the subject's knowledge of the true shape of the room, while quantitative measures revealed the subject's actual perception. This conclusion was consistent with Hochberg's (1972, p. 506) statement that "verbal reports of what is perceived do not always agree with performance in the environment". This discrepancy between the verbal reports and the disc matching task may explain Kilpatrick's findings that active interaction with the distorted room was not necessary for formative learning; that is, passive subjects may have reported the normal room as distorted but may have actually perceived the room as normal.

Although the Osborne et al. (Note 2) study indicated that active training prevents an increase in the illusion, it is not clear why this occurred. For example, a study conducted by Osborne, Dyer, and Koch (Note 3) investigated the role of active vs. passive training combined with varied light intensity. By increasing light intensity in the distorted room, give-away cues became more prominent,

whereas by decreasing light intensity, give-away cues were masked. The results indicated that the strength of the illusion was inversely proportional to the level of intensity during the training phase. This effect persisted only for the high intensity group receiving active training during the distorted room posttest. Apparently, the high illumination level summated with active training in the maximum detection of distortion in the perception of the distorted room. The decrease in the distorted room illusion as a consequence of active training persisted into the normal room posttest, however, the effect of light intensity did not.

Another study that investigated the role of active vs. passive training in the distorted room was conducted by Osborne, Koch, and Dyer (Note 4). Active and passive training conditions were combined with binocular and monocular viewing during the distorted room training phase. The results indicated that, overall, active training resulted in a decrease in the illusion during the distorted room posttest regardless of binocular or monocular viewing during the training phase. Binocular viewing did result in an immediate decrease in the illusion during the training phase, however, this decrease did not persist throughout the distorted room posttest or the normal room posttest. The results of the above studies are

ambiguous as to whether active training transfers to the normal room. In both studies, significant differences were found between the normal room pre- and posttest, however, it is not clear if the differences were due to previous training in the distorted room or whether the perceptions of the normal room simply change over time because a control group that did not view the distorted room was not employed.

Statement of Purpose and Hypotheses

The purpose of the present study was to determine the role of self-produced movement in the formation of new percepts utilizing the Ames distorted room and the transfer of the new percept to the normal room. Specifically, the hypotheses are:

1) Active training in the distorted room will result in a decrease in the size of the illusion, whereas passive training or no training will result in no effect on the size of the illusion; and

2) Active training in the distorted room will result in formative learning which will transfer to the normal with no difference being found between passive training or the control groups in the perception of the normal room.

Chapter II

METHOD

Subjects

Subjects were 60 volunteers from freshman level psychology classes at Morehead State University. There were 27 males and 33 females. For participation, subjects received additional course credit. All subjects were required to meet a criterion of right eye distance acuity of 20/25. Each subject was randomly assigned to one of four experimental or control conditions, resulting in 15 subjects per condition.

Apparatus

A Bausch and Lomb modified Ortho-Rater (Model Number 71-21-31-01) was used for visual screening of subject's right eye distance acuity.

The distorted room was a 3/4 size Ames laboratory "L" distorted room. Optically, the room represented a .9 m cube, however, the left corner was twice as tall and twice as distant from the observer as the right corner. The dimensions of the distorted room were .9 m wide by 1.2 m high by 1.2 m deep by 1.8 m long. Wooden dowels with attached magnets were mounted halfway up each rear corner and aimed at the viewing aperture. Black metal

discs which varied in size could be attached to the magnets. The standard disc was 30.2 mm in diameter and was attached to the right dowel. The variable discs ranged in size from 25.4 to 63.5 mm in 24 equal increments and were attached in succession to the left dowel. As can be seen in Figure 1, the distances from the viewing aperture to the left and right dowel were 1.3 m and .65 m respectively, resulting in a 2:1 ratio.

The viewing aperture was covered by a small curtain whenever the subject was not viewing the room. The curtain was raised and lowered by means of a pulley system.

The interior of the room was flat white with the exception of the windows and a simulated plank floor which were flat brown. Illumination was provided by three incandescent light bulbs. Intensity at the disc sites as measured by a MacBeth Illuminometer (Leeds and Northrup Model 267) was 160 lx. Shadows were minimized by a plastic diffuser system. The front of the Ames room was covered by a large piece of plywood that contained the viewing aperture. A small door (21.6 cm by 22.9 cm) was installed in the front cover to permit access to the interior of the room by the subject. A 1.3 m wooden wand was used during the active training condition for exploration of the room.

The normal room was similar to the distorted room except that all dimensions were a .9 m cube. As can be

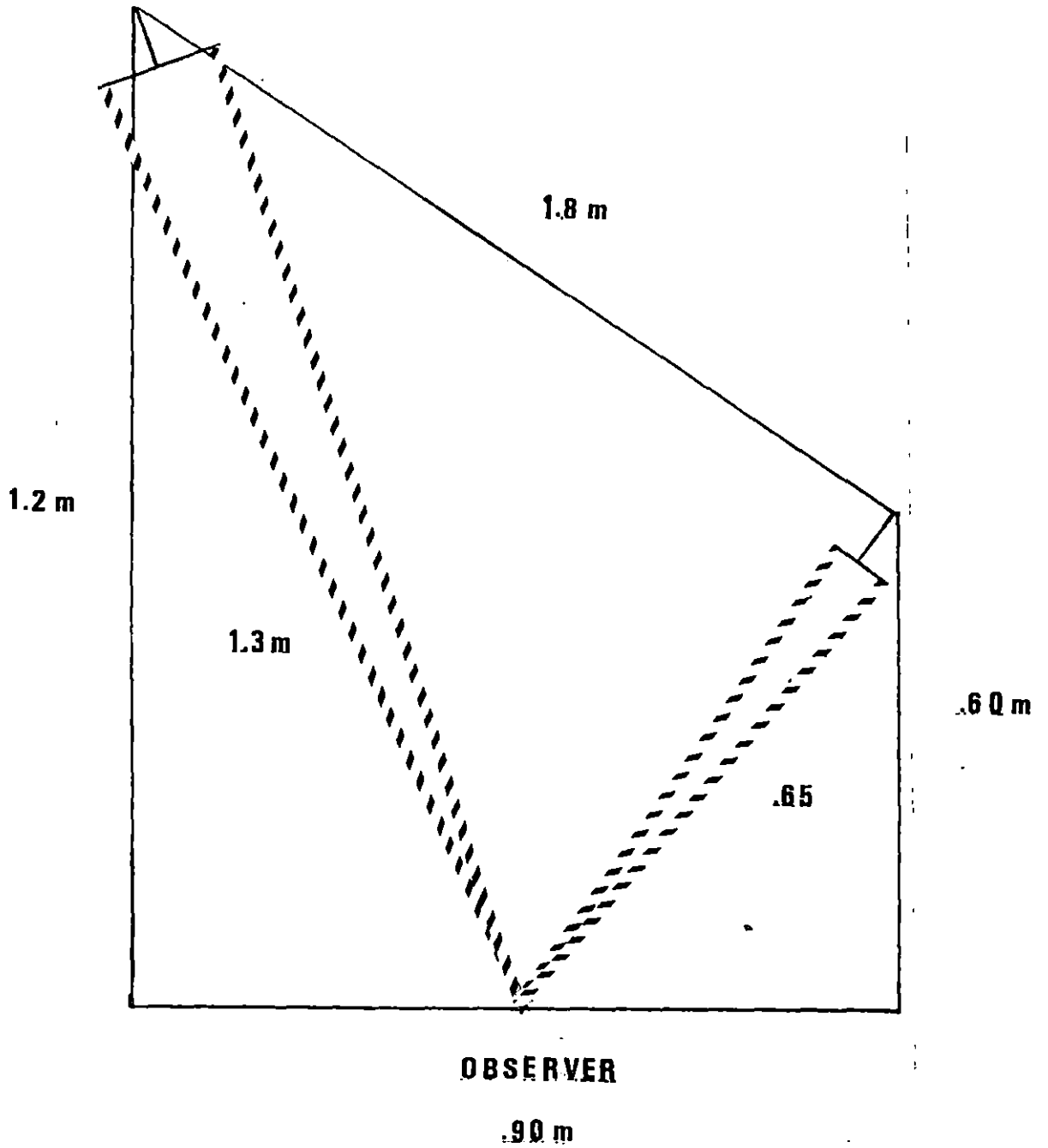

Figure 1. The distances from the viewing aperture to the left and right dowels in the distorted room.

seen in Figure 2, it was impractical to maintain the same 2:1 distance ratio due to the cubical structure of the room. The left side dowel was mounted halfway up the rear corner as in the distorted room and was 1.0 m from the subject's right eye. The right side dowel was mounted in the middle of the right wall and .58 m from the subjects right eye; thus, the distance ratio was 1.71:1 in the normal room. A separate set of discs was used in the normal room that varied in size from 22.5 mm to 63.5 mm in 26 equal increments. The two smallest discs were not needed in the distorted room due to the strength of the illusion which generally influenced the subjects to choose larger discs.

Design and Procedure

The experiment was run in six phases: 1. Screening and visual acuity; 2. Normal room pretest (NRPRE); 3. Distorted room pretest (DRPRE); 4. Distorted room training; 5. Distorted room posttest (DRPOST); and 6. Normal room posttest (NRPOST). The conditions consisted of two training conditions; Active (A) or Passive (P), and two control conditions; Passive Control (PC) and Normal room Control (NRC). For clarity, comparisons between phases and experimental conditions have been presented in Table 1. The six phases were as follows:

1. Screening and Visual Acuity. Upon arrival at the laboratory, subjects were asked to complete an informed

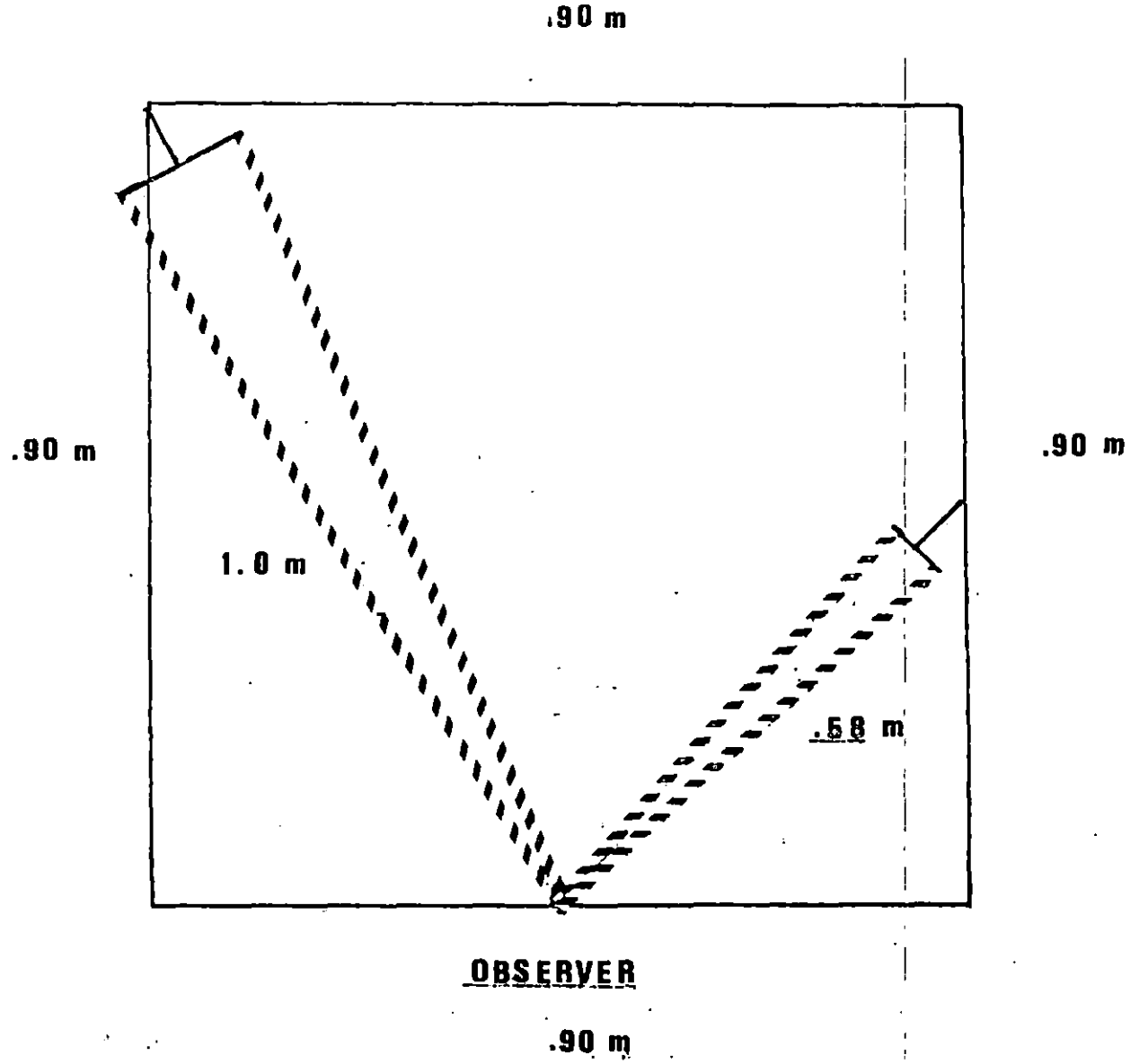

Figure 2. The distances from the viewing aperture to the left and right dowels in the normal room.

Table 1

Observed Phases as

Experienced by Experimental Groups

Groups	Phases					
	Screening	NRPRE	DRPRE	Training	DRPOST	NRPOST
Active	X*	X	X	Xa**	X	X
Passive	X	X	X	Xp***	X	X
Passive Control	X	X	X		X	X
Normal Room Control	X	X				X

Note: *An "X" indicates that a particular group experienced this phase of the experiment

**"Xa" refers to active training

***"Xp" refers to passive training

consent form (See Appendix A for the Protocol for Use of Human Subjects Form). After the Informed Consent Form was completed, subjects were tested for right eye distance acuity on the Ortho-Rater. If criterion level of 20/25 was attained, subjects then proceeded to the normal pretest phase. If the criterion was not attained, the subjects were debriefed, then excluded from the remainder of the experiment. All groups participated in this phase. Immediately after the screening for visual acuity, subjects were randomly assigned to one of the four experimental or control conditions.

2. Normal Room Pretest. In the normal room pretest phase, the subject was asked to cover the left eye with an eye patch and was seated in front of the viewing aperture. The experimenter then raised the curtain and the subject was asked to describe the size and shape of the dowels, floor, ceiling, windows, back wall, and side walls (See Appendix B for a description of the verbal report questions). After the completion of the verbal report, a quantitative measure of the subject's perceptions of the room was taken. The standard disc was placed on the right dowel and the variable or test disc was placed on the left dowel. Subjects were requested to indicate whether the test disc was larger or smaller than the standard disc. Each of the normal room phases and distorted room phases contained two trials counterbalanced (ABBA) over phases. A trial

consisted of a series of test disc judgments until the point of subjective equality (PSE) was attained. Trials either began with the largest or smallest test disc depending on the order of the trial within the phase. The PSE of the test disc judgments was used to quantify the subject's perceptions of both the normal and distorted rooms. All four groups participated in this phase.

3. Distorted Room Pretest. The distorted room pretest was identical to the normal room pretest except that the distorted room was employed. The Active, Passive, and Passive Control groups experienced this phase.

4. Distorted Room Training. Subjects who were not assigned to control conditions experienced either active or passive training in the distorted room.

A. Active training consisted of the subject actively manipulating a wand inside the distorted room. The subject touched the centers of both back windows, traced the perimeter of the back wall, touched between the windows on both the right and left walls, and finally touched both dowels. This comprised a single trial which the subject repeated four times. Only the Active group participated in this portion of the training phase.

B. Passive training consisted of subjects who simply viewed the room for a comparable length of time to that of the Active group. The Passive group experienced this training phase and did not physically

interact or view the experimenter physically interact with the distorted room at any time.

5. Distorted Room Posttest. The distorted room posttest was identical to the normal room pretest. Only the Active, Passive, and Passive Control subjects participated in this phase.

6. Normal Room Posttest. The normal room posttest was identical to the normal room pretest. All groups experienced this phase. After the completion of the normal room posttest, all subjects were debriefed, then dismissed.

Summary of Groups. The groups were:

1. Active. The Active group experienced all six phases and active training in the distorted room.

2. Passive. Passive subjects experienced all six phases and passive training in the distorted room.

3. Passive Control. The Passive Control subjects did not experience training in the distorted room which resulted in exposure to only five phases of the study. Subjects remained in the laboratory for a comparable length of time to that of the Active and Passive groups during training.

4. Normal Room Control. Normal room Control subjects did not view the distorted room at any time during the experiment. Subjects, after screening for visual acuity proceeded to the normal room pretest and waited in the

laboratory for a comparable length of time to that of the distorted room phases and then were exposed to the normal room posttest. The Normal room Control subjects experienced three phases of the experiment.

Data Transformation

Subjects were asked to respond to a set of questions at the beginning of each phase in order to assess subjective reported distortion (See Appendix C). These verbal reports were quantified on a 0-8 point scale for each phase.

All disc matching scores were converted to Brunswik ratios in order to compare data from different sized and shaped rooms (Smith, Smith, Zimmerman, & Geist, 1977). For example, if the illusion of the distorted room led the subject to underestimate the distance of the left rear corner relative to the right rear corner, then an equivalent test disc would have appeared smaller than the standard disc. If no illusion was detected, then the same sized test disc as the standard would have been chosen. A subject who perceived a perfectly rectangular room due to the illusion present in the distorted room, would have chosen a test disc twice the size of the standard disc. A smaller Brunswik ratio represented a larger illusion for the subject (See Appendix D).

Chapter III

RESULTS

The results of this study will be presented in two major sections. First, analysis of the verbal reports will be presented for the Active (A), Passive (P), and Passive Control (PC) groups during all phases to determine the effect of training on reported distortion, and then for all four groups, including the Normal room Control group (NRC), during the normal room phases to determine if training results in transfer from the distorted room to the normal room. In the second section, the disc data will be presented for the Active, Passive, and Passive Control groups during all phases and, finally, for all groups during the normal room phases. The raw data from which these analyses were performed are listed in Appendix E.

Verbal Reports

Verbal reports were defined as subjective responses to a series of questions at the beginning of each phase. Subjects' responses were then quantified on a 0-8 scale resulting in a measure of subjective distortion for each phase. A higher score reflected a greater amount of perceived distortion than a lower scale.

Figure 3 depicts the mean verbal reports for the Active, Passive, and Passive Control groups over trials (pre vs. post) in both rooms. Generally, it appears that all subjects reported more distortion when viewing the distorted room than when viewing the normal room. As may be seen, the Active group appeared to report more distortion than the Passive and Passive Control groups in both the distorted and normal rooms before and after training. The Passive and Passive Control groups appeared comparable in reported distortion in the distorted room trials, but the Passive Control group reported greater distortion than the Passive group during the normal room trials.

To determine whether statistically significant differences exist between the above comparisons, a three-factor mixed analysis of variance with training (A, P, PC) as the between factor, and room (normal vs. distorted) and trials (pre vs. post) as the two within factors was preformed. (See Table 2, Appendix F for the analysis of variance summary table.) Overall, the results indicated that the Active group reported signficantly more distortion than the other groups, training effect, $\underline{F}(1, 42) = 5.82$, $\underline{p} < .01$. Further, less distortion was reported for the normal room than for the distorted room, room effect, $\underline{F}(1, 42) = 129.21$, $\underline{p} < .01$. Although the trial effect was not significant, $\underline{p} > .10$, the Training

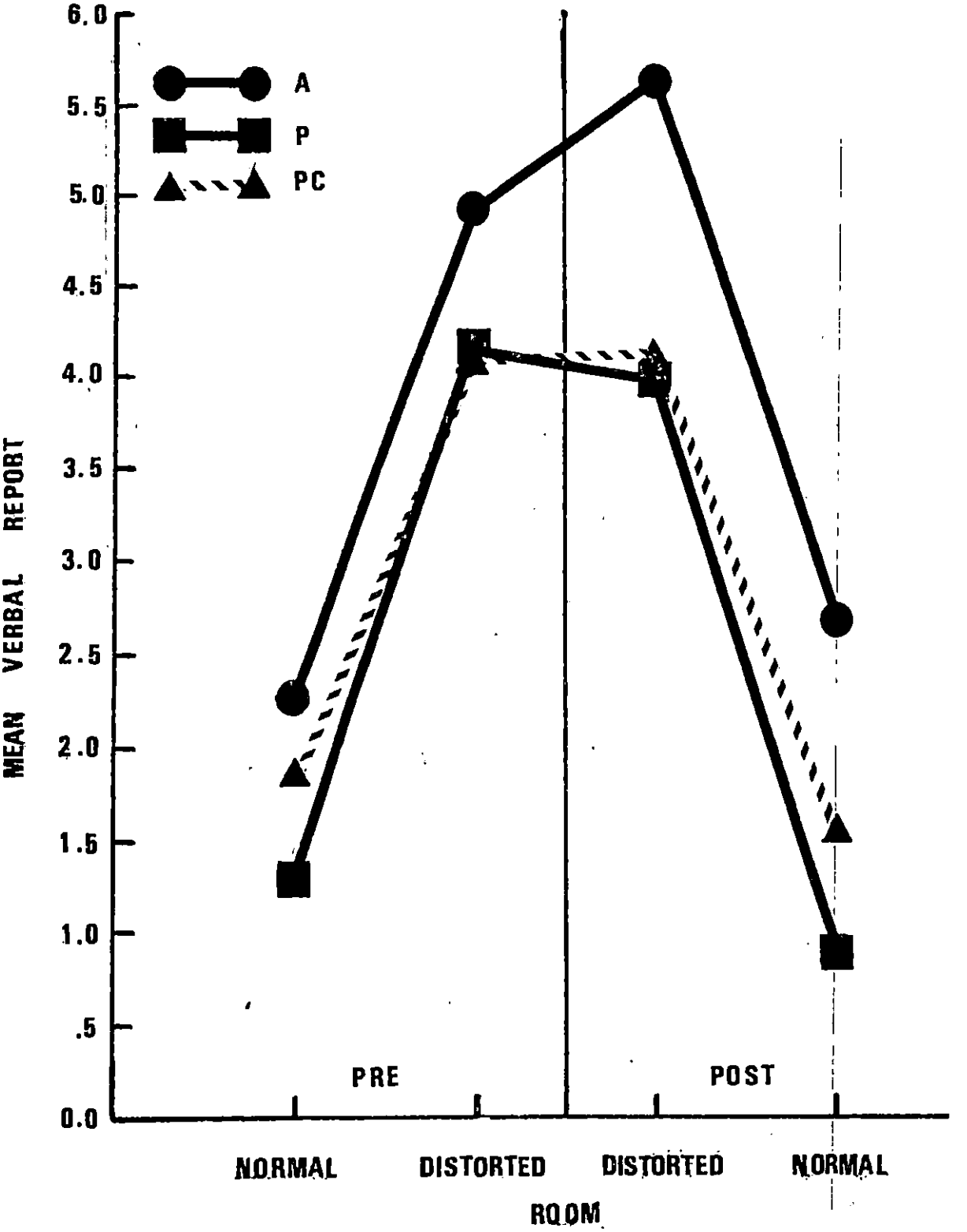

Figure 3. Mean verbal report as a function of training for pre- to post-training trials for both rooms.

X Trial interaction was significant, $F(2, 42) = 4.58$, $p < .05$. Figure 4 represents the mean verbal report as a function of the Training X Trial interaction. Analysis of this interaction using Tukey tests (Kepple, 1982) revealed that all three groups differed significantly during the pretest, $p < .05$ in all comparisons, but only the Active group differed from the other groups in reported distortion during the posttests, $p < .05$ in all comparisons. Further comparisons indicated that reported distortion did not significantly change from the pre- to post-training tests for any of the three groups, $p > .05$ in each comparison.

Although the Active group perceived more distortion than the other groups, this difference in reported distortion existed during the pretests prior to any training in the distorted room. Thus, to determine if training had an effect on reported distortion in the distorted room, a one-way analysis of covariance using the distorted room pretest scores as the covariate was performed. A summary of the results of this analysis is presented in Table 3, Appendix G. The results indicated a significant training effect, $F(2, 41) = 8.91$, $p < .05$. Analysis using Tukey tests indicated that the Active group differed significantly from the Passive and Passive Control groups, $p < .05$, whereas the Passive and

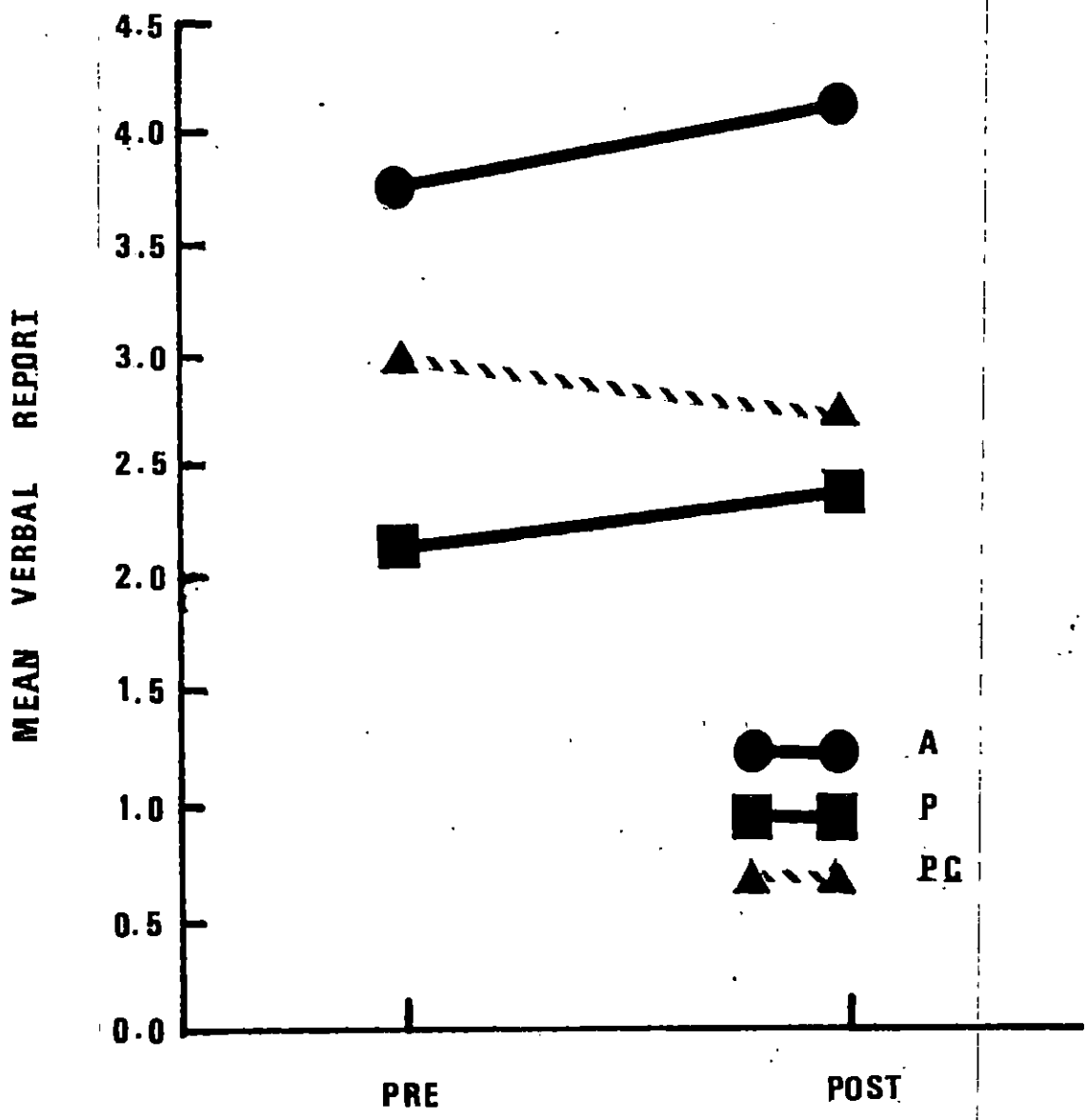

Figure 4. Mean verbal report as a function of the Group X Trial interaction.

Passive Control groups did not differ, $p > .05$. (Figure 5 shows the adjusted mean verbal report as a function of training.) Thus, although a portion of the difference between groups in reported distortion in the distorted room was probably due to initial differences, the results of this analysis of covariance indicated that the active training group displayed signficantly greater perceived distortion than either the Passive or Passive Control group.

Figure 6 represents the mean verbal report as a function of training over normal room trials. Subjects who received active training in the distorted room appeared to report more distortion than the other groups during both the normal room pretest and posttest. The Passive Control and Normal room Control groups appeared comparable.

In order to determine whether training in the distorted room exerted an effect on reported distortion in the normal room, a two-factor mixed analysis of variance with training (A, P, PC, NRC) as the between factor and normal room trials (pre vs. post) as the within factor was preformed. (See Table 4, Appendix H for the analysis of variance summary table.) The results indicated a significant training effect, $F(3, 56) = 2.91$, $p < .05$. The verbal reports of the normal room pretest did not differ from those of the normal room posttest for any group, trial effect, $p > .05$. Subsequent analysis

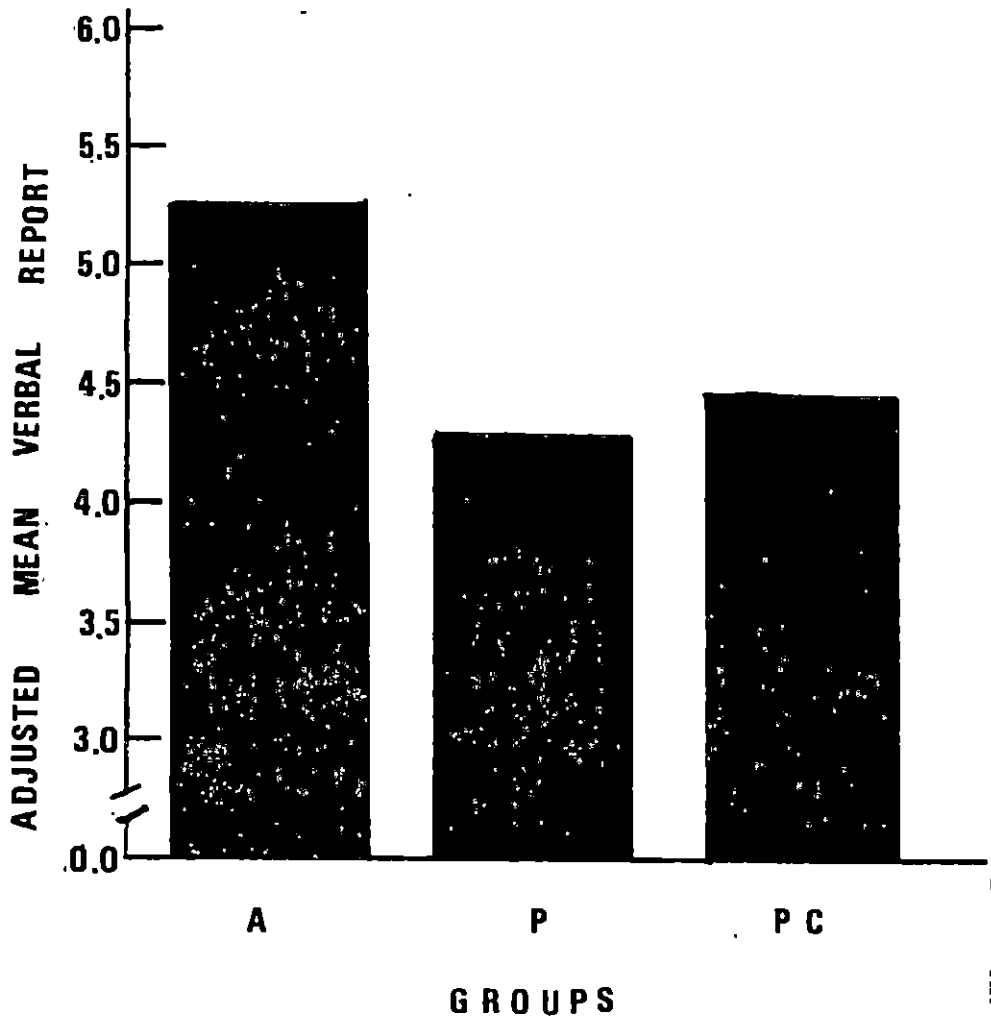

Figure 5. Adjusted mean verbal report as a function of training during the distorted room posttest.

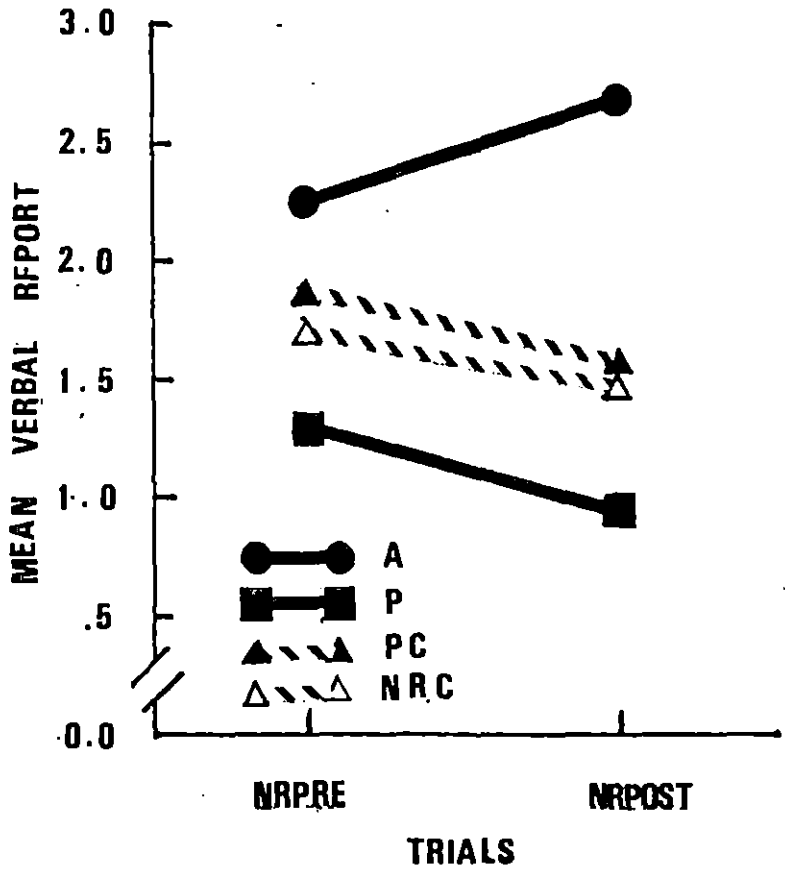

Figure 6. Mean verbal report as a function of training over normal room trials.

of the training effect using Tukey tests revealed that the Active group differed significantly from the Passive group, $p < .05$. No other comparisons were significant, $p > .05$ in each case.

As the results indicated, the Active group perceived more distortion during the normal room trials than the Passive group. However, this difference in reported distortion was evident in the pretests before any training in the distorted room. Thus, to determine if training resulted in an effect on reported distortion in the normal room, a one-way analysis of covariance using the normal room pretest scores as a covariate was performed. (See Table 5, Appendix I for the analysis of covariance summary table.) The results of this analysis indicated a signficant training effect, $F(3, 55) = 6.05$, $p < .01$. Further analysis of this effect using Tukey tests revealed that the Active group reported significantly more distortion during the normal room posttest than the Passive group, $p < .05$. Comparisons between the Passive Control group and the Active group approached conventional levels of significance, $p < .10 > .05$, and differences between the Normal room Control group and the Active group also approached significance, $p < .01 > .05$. The Passive, Passive Control, and the Normal room Control groups did not differ, $p > .10$ in each case. (Figure 7 shows the adjusted mean verbal report as a function of training

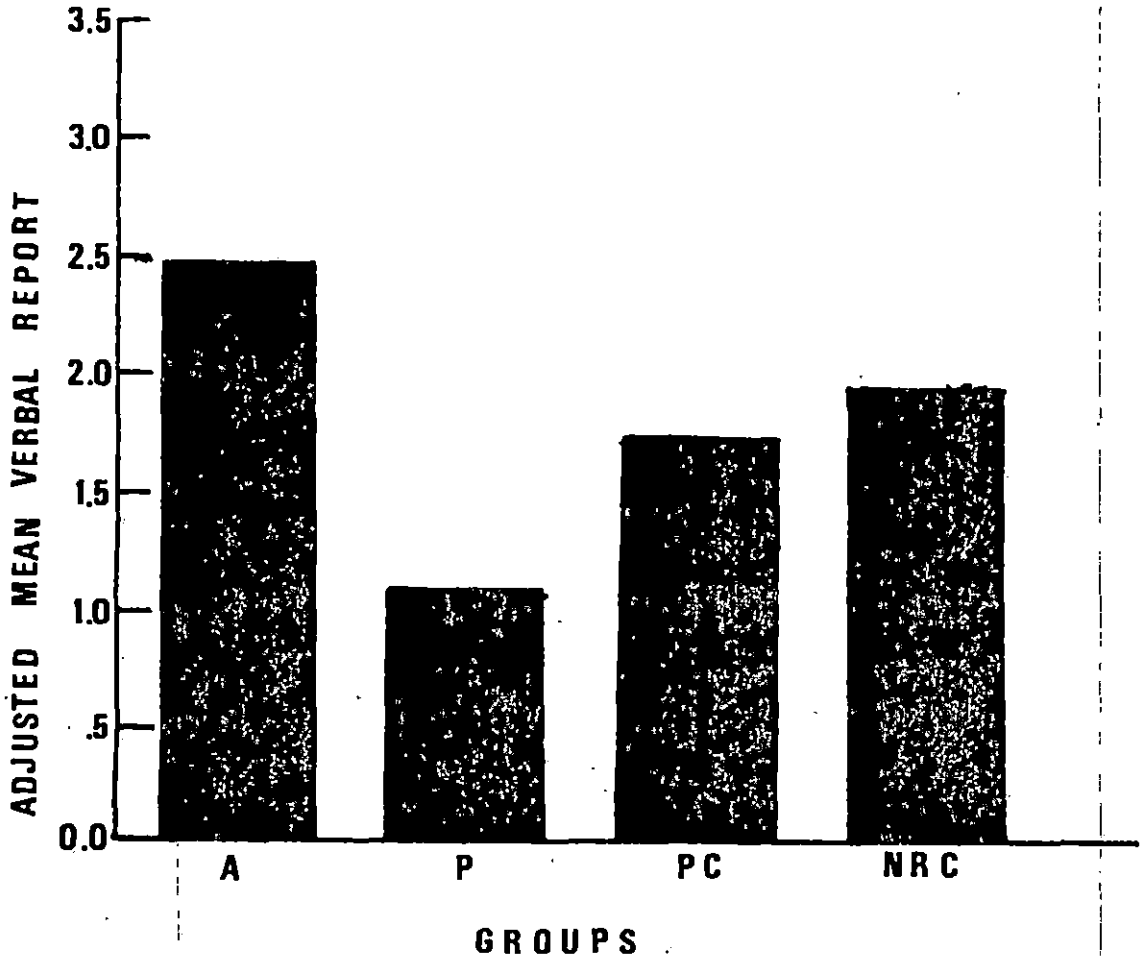

Figure 7. Adjusted mean verbal report as a function of distorted room training on the normal room posttest.

over normal room trials.) Thus, although some of the differences between groups in reported distortion in the normal room was paritally due to initial differences, the results of this analysis of covariance indicated that active training significantly increased the subject's perceptions of distortion in the normal room relative to passive exposure to the distorted room or the passage of time.

Disc Data

All disc matching scores were converted to Brunswik ratios (Smith, Smith, Zimmerman, & Geist, 1977). A lower Brunswick ratio (BR) indicated an illusion of higher magnitude. Thus, an inverse relationship exists between the size of the illusion and the BR. Figure 8 represents the mean BR as a function of training (A, P, PC) over trials (pre vs. post) for both rooms. During the normal room pretest, all groups appeared comparable, however, during the distorted room pretest, the Passive group seemed to evidence a smaller BR than the Active or Passive Control groups. The groups appear to diverge during the distorted room posttest with the Active group reflecting the largest BR, however, all groups appeared comparable during the normal room posttest.

In order to determine if training affected the size of the illusion, a three-factor mixed analysis of variance with training (A, P, PC) as the between factor and room

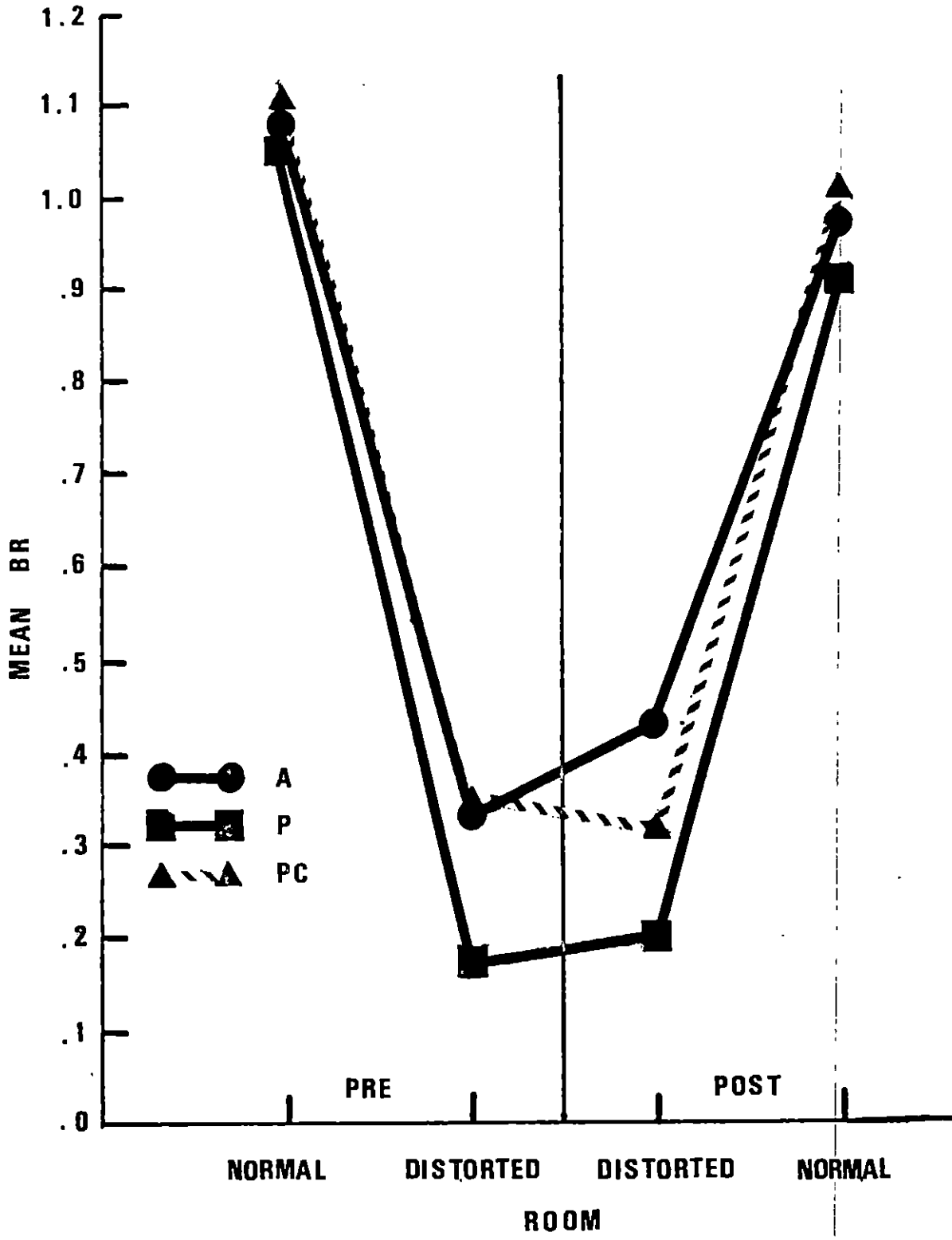

Figure 8. Mean BR as a function of training over trials (pre vs post) for both rooms.

(normal vs. distorted) and trials (pre vs. post) as the two within factors was performed. (See Table 6, Appendix J for the analysis of variance summary table.) The results indicated that the Passive group had an overall lower BR than the other groups, training effect, $F(1, 42) = 5.95$, $p < .01$, the rooms were perceived differently, room effect, $F(1, 42) = 741.02$, $p < .01$, and the BR changed over trials, trial effect, $F(1, 42) = 17.39$, $p < .01$. In addition, the Room X Trial interaction was significant, $F(1, 42) = 56.04$, $p < .01$. This interaction is presented in Figure 9. Analysis of this interaction using Tukey tests revealed that the mean BR significantly decreased from the normal room pretest to the normal room posttest, $p < .05$, whereas the mean BR in the distorted room did not change, $p > .05$. Further comparisons indicated that the BR's for the normal and distorted room differed significantly both during the pretest and posttest, $p < .05$ in each case.

Although the Active group showed significantly larger BR's during the distorted room posttest, this difference existed during the distorted room pretests before training. Thus, to determine if training exerted an effect on the BR, a one-way analysis of covariance using the distorted room pretest scores as a covariate was performed. (A summary of the analysis of covariance is presented in Table 7, Appendix K.) The results

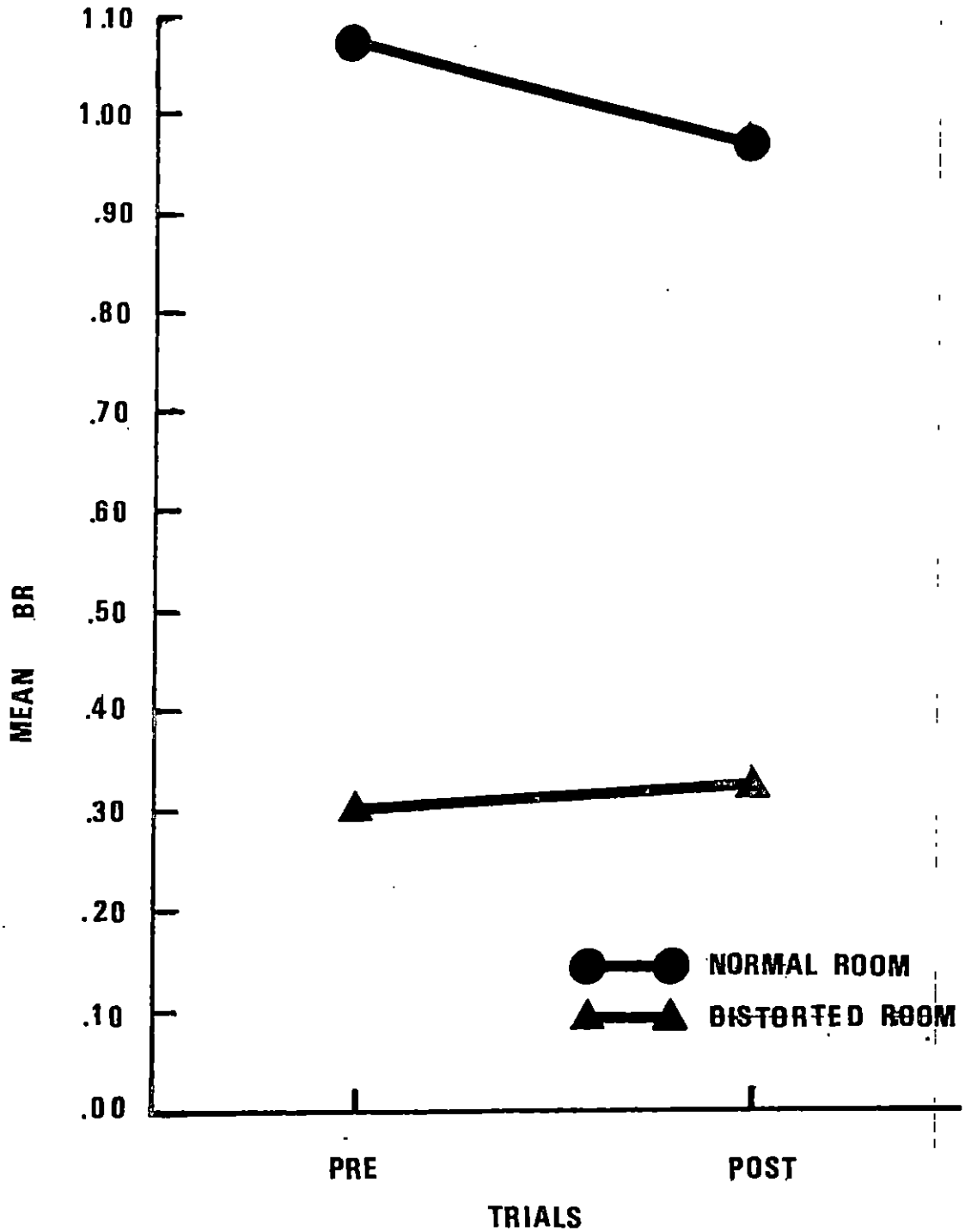

Figure 9. Mean BR as a function of the Room X Trial interaction.

indicated a significant training effect, $F(2, 41) = 36.95$, $p < .01$. (Figure 10 shows the adjusted mean BR as a function of training over distorted room trials.) Analysis of the main effects of training using Tukey tests revealed that the Active group showed a significantly larger BR than the Passive and Passive Control groups, $p < .05$. The Passive and Passive Control groups did not differ, $p > .05$. Thus, although some of the difference between groups' mean BR was partially due to initial differences, the results of this analysis of covariance indicated that active interaction in the distorted room led to perceptions of the distorted room that were in the direction of veridical shape of the room.

Figure 11 represents the mean BR as a function of training over normal room trials. The groups appeared comparable during the normal room pretests and all groups appeared to decrease during the normal room posttests. In order to determine whether training in the distorted room exerted an effect on the perceptions of the normal room, a two-factor mixed analysis of variance with training (A, P, PC, NRC) as the between factor and trials (pre vs. post) as the within factor was performed. (See Table 8, Appendix L for the analysis of variance summary table.) The results of this analysis indicated that training in the distorted room did not affect the perceptions of the normal room, training effect,

$F(3, 56) = 1.12$, $p > .10$. However, the trial effect was significant, trials effect, $F(1, 56) = 46.09$, $p < .01$ indicating that the groups BR's decreased from pretest to posttest. Thus, active training in the distorted room or passive exposure to the distorted room did not affect subsequent perceptions of the normal room.

Chapter IV

DISCUSSION

Active interaction with the environment has been suggested as an important factor in the formation of perceptions through perceptual learning. Indeed, Held and his co-workers (1959; 1961; 1963) have stated that a necessary condition for normal perceptual development and perceptual learning is physical interaction (self produced movement) with the environment. However, Kilpatrick (1961) reported that active interaction was not necessary for subjects to perceive distortion in the Ames distorted room. In a study similar to Kilpatrick's, Osborne, Dyer, and Applegate (Note 2) found no differences in reported distortion as a function of active vs. passive training. This finding is at variance with Held's hypothesis. However, when subjects' perceptions of the distorted room were measured by a quantitative disc matching task, the group which received active training displayed a decrease in the size of the illusion, whereas groups receiving passive or no training displayed an increase in illusion magnitude. Thus, this latter finding, using a quantitative behavioral measure, is consistent with Held's hypothesis (Osborne, Dyer, & Applegate, Note 2). In the present study, the role of active vs. passive training in perceptual learning

in the distorted room was further investigated using both subjective (verbal reports) and objective (disc matching) measures of perceptual change.

The results revealed that the groups differed in both verbal reports of distortion and disc matching (BR's) in the distorted room prior to any training in the distorted room. Consequently, analyses of covariance were necessary to determine the effects of training.

The results of the analysis of covariance performed on verbal reports indicated that the group which received active training reported significantly more distortion during the distorted room posttest than the Passive and Passive Control groups. This finding supports Held's hypothesis that physical interaction with the environment is necessary for perceptual learning. Perhaps the active subjects were better able to detect those distinctive features of the distorted room that are not congruent with a normal rectangular room. This finding, however, is a variance with the findings of Kilpatrick (1961) and Osborne et al. (Note 2), which revealed no differences between verbal reports of active and passive training groups. A procedural difference that may account for the discrepancy is the type of verbal report measurements that were used. Both Kilpatrick and Osborne et al. utilized a categorical measure (all or none) to determine whether a subject perceived distortion or not. In contrast,

the present study measured disortion on a 0-8 point scale. This measure was perhaps a more sensitive measure than the categorical measure.

Kilpatrick (1961) found an increase in reported distortion after both active and passive training. He attributed this increase to reorganizational learning. Kilpatrick maintained that continued viewing of the distorted room makes the give-away cues more evident. As the cues become more noticeable, the subject's perception of the room is modified which can result in an increase in reported distortion. However, the present study indicated that only the Active group significantly increased in reported distortion during the distorted room posttest, and thus would appear to be the only group that benefited from reorganizational learning.

The analysis of covariance performed on the disc matching data revealed that the Active group showed significantly higher BR's (i.e., a smaller illusion) than the Passive or Passive Control subjects. Kilpatrick utilizing a different method of assessing perceptual change concluded that active interaction was not necessary to modify perception of the distorted room. The present study suggests, however, that active interaction is necessary for perceptual change as measured by both subjective reports of distortion and disc judgments. The findings of the present study tend

to support Held (1959; 1961; 1963) and are not congruent with Kilpatrick's results.

One of the important aspects of Kilpatrick's (1961) research was the emphasis on how new percepts are formed. Kilpatrick termed this process formative learning. Formative learning involves not the modification of already existing assumptions, but the "formation" of new assumptions concerning a stimulus. In order for formative learning to be demonstrated, transfer of the new percept must be shown.

The analysis of variance performed on the verbal reports to determine if active training resulted in transfer of the perception in the distorted room to the normal room indicated that the Active group reported, overall, more distortion during both the normal room pre- and posttests. Due to the initial group differences before training, an analysis of covariance was performed using the normal room pretest scores as the covariate. The results of this analysis indicated that the Active group reported significantly more distortion in the normal room posttest than the Passive group. The Active group also reported more distortion than the two control groups but this difference did not reach conventional levels of significance. The two control groups did not significantly differ from the passive training group in reported distortion. Kilpatrick (1961) found that, regardless of training, many of the

subjects reported the normal room as distorted and that active interaction was not necessary for formative learning; that is, continued viewing was adequate for the formation of new percepts. The present verbal report findings are inconsistent with those of Kilpatrick in that only active training resulted in the transfer of the distorted room percept. These findings are, however, consistent with Held's view that perceptual learning and perceptual development depend upon self-action in the environment.

In contrast to the verbal report data, analysis of the disc data revealed that training in the distorted room exerted no effect on the perception of the normal room. That is, although there was a significant decrease in BR's from the pretests to posttests in the normal room, this decrease was the same for all groups. This finding suggests that the perception of the normal room changes over time.

The results of the disc matching task and the verbal reports are not congruent and may represent two separate tasks which are measuring two different processes. As reported in the Osborne, Dyer, and Applegate study (Note 2), the verbal report questions may influence the subject to attend to peripheral stimuli such as the walls, floor, and corners of the room. During the disc matching task, the subject may be ignoring the peripheral stimuli and attending

only to the discs. The verbal report results indicate that the Active group may evidence formative learning. However, when measured by the disc matching task, formative learning does not occur. Assuming that the disc matching task is a more reliable measure of perception than subjective reports, the present results would suggest that active interaction in the distorted room does not result in formative learning.

The transactional model of perception stipulates that the perceiver and the perceived object transact in a total life situation and neither can exist independently. Each perceiver has a personal set of past experiences that influences future perceptions. The results of the present study revealed group differences during the distorted room pretests prior to training. A transactional approach would maintain that the differences were due to individual differences in past experiences; therefore, each subject has a slightly different interpretation of the distorted room.

After parcelling out the initial differences between groups, the results indicate that active training results in increased detection of distortion and a decrease in the magnitude of the illusion. When a subject first views the distorted room, the perceptual hypothesis accepted is that the distorted room is rectangular. However, active interaction with the distorted room serves to create a

discrepancy, therefore, the subject accepts a different perceptual hypothesis. The present study may demonstrate that self-produced movement facilitates reorganizational learning, but due to the lack of transfer, formative learning was not shown. Apparently, active interaction does change the perception of the distorted room but the change or modification is in the set of already existing assumptions.

A difficulty with the present study and an earlier study (Osborne, Dyer, & Applegate, Note 2) was that initial differences were found during the distorted room pretest. One suggestion for future research would be to match subjects on the basis of the distorted room pretest performances. This procedure would allow for more reliable assessment of training effects without the initial variation. Another question arising from the present study is whether the modification in perception of the distorted room is due to processes of perceptual learning or some type of perceptual-motor compensation to that environment. A suggestion for future research in this area would be to retest subjects in the future to determine if the change in perception is realtively permanent or transitory. Perhaps one problem in the lack of group differences during the normal room posttest was due to the limited training times employed in this study. Another avenue for future research would be to give subjects longer

training time in which to explore the distorted room. Most individuals have a lifetime of experiences with rectangular rooms. To form a new percept concerning the nonrectangularity of the distorted room may require more time and practice than allowed in the present study.

Reference Notes

1. Hunt, S. R. Effects of binocular discrepancies on stereoscopic discrimination. Unpublished Doctoral Dissertation, Syracuse University, Syracuse, New York, 1964.

2. Osborne, F. H., Dyer, A. B., and Applegate, E. B. Perception of the Ames distorted room as a function of training and response measure. Paper presented at the annual meeting of the Kentucky Academy of Science, Lexington, 1980.

3. Osborne, F. H., Dyer, A. B., and Koch, C. E. The role of "give-away" cues in the perception of the Ames distorted room. Paper presented at the annual meeting of the Kentucky Academy of Science, Murray, 1981.

4. Osborne, F. H., Koch, C.E., and Dyer, A. B. Perceptual learning in the Ames distorted room as a function of active-binocular training. Paper presented at the annual meeting of the Kentucky Academy of Science, Murray, 1981.

References

Allport, F. H. Theories of perception and the concept of structure. New York: Wiley, 1955.

Ames, A. Visual perception and the rotating trapezoidal window. Psychological Monographs. 1951, 65.

Dion, K. L., and Dion, K. K. The honi phenomenon revisited: Factors underlying the resistance to perceptual distortion of one's partner. Journal of Personality and Social Psychology, 1976, 33, 170-177.

Epstein, W. Varieties of perceptual learning. New York: McGraw-Hill, 1967.

Forgus, R. H. Perception. New York: McGraw-Hill, 1966.

Gerace, T. A., and Caldwell, W. E. Perceptual disortion as a function of stimulus objects, sex, naivete, and trials using a portable model of the Ames distorted room. Genetic Psychology Monographs, 1971, 84, 3-33.

Gibson, E. J. Perceptual learning. Annual Review of Psychology, 1963, 14, 29-56.

Gibson, E. J. Principles of perceptual learning and development. New York: Appleton-Century-Crofts, 1969.

Gibson, J. J. The senses considered as perceptual systems. Boston: Houghton Mifflin, 1966.

Gregory, R. L. Eye and brain. (3rd ed), New York: McGraw-Hill, 1978.

Harris, C. S. Adaptation to displaced vision: Visual, motor or proprioceptive change. Science, 1963, 140, 812-813.

Hautaluoma, J. E., and Loomis, R. J. Perception of visual illusions in a sample of Afgan boys. Journal of Social Psychology, 1972, 87, 143-144.

Hebb, D. O. Discussion (Symposium or sensory deprivation: Facts in search of a theory). Journal of Nervous Mental Disease, 1961, 132, 40-43.

Held, R., and Bossom, J. Neonatal deprivation and adult rearrangement: Complementary techniques for analyzing plastic sensory-motor coordination. Journal of Comparative and Physiological Psychology, 1961, 54, 33-37.

Held, R., and Hein, A. V. Movement produced stimulation in the development of visually guided behavior. Journal of Comparative and Physiological Psychology, 1963, 56, 872-876.

Hochberg, J. Perception. In Woodsworth and Schlosberg's Experimental Psychology. (3rd ed), New York: Rinehart, Winston, 1972, 1.

Ittleson, W. H. The constancies in perceptual theory. Psychological Review, 1951, 58, 285-294.

Ittleson, W. H. The Ames demonstrations in perception. Princeton: Princeton University Press, 1952.

Kepple, G. Design and analysis. (2nd ed), Englewood Cliffs, N. J.: Prentice-Hall, 1982.

Kilpatrick, F. P. Exploration in transactional psychology. New York: University Press, 1961.

Leibowitz, H. W. Visual perception. New York: Collier-Macmillan, 1965.

Levine, M. W., and Shefner, J. M. Fundamentals of sensation and perception. Reading, Mass.: Addison-Wesley, 1980.

Mandes, E., and Swisher, C. W. Effects of age and angle size on decrement in the Muller-Lyer illusion as related to adaptation effects. Perceptual and Motor Skills, 1980, 50, 903-906.

Piaget, J. Les mecanismes percetifs. Paris: Presses Universitaires de France, 1961.

Small, M. M. Modification of performance on the rod-and-frame test. Perceptual and Motor Skills, 1973, 36, 715-720.

Smith, O. W., Smith, P. C., Zimmerman, R. R., and Geist C. Brunswik ratios: A ratio scale for comparative analyses of size constancy data from different experiments. Perceptual and Motor Skills, 1977, 45, 1255-1258.

Stewart, V. M. A cross-cultural test of the "carpentered world" hypothesis using the Ames distorted room illusion. International Journal of Psychology, 1974, 9, 79-89.

Wittreich, W. J. The honi phenomenon: A case of selective perceptual distortion. Journal of Abnormal and Social Psychology, 1952, 47, 705-712.

APPENDIX A

COMPLIANCE WITH HUMAN SUBJECTS REGULATIONS

MOREHEAD STATE UNIVERSITY
IRBPHS Form 1-A

PROTOCOL FOR USE OF HUMAN SUBJECTS FORM

Date: April 27, 1982

To: Institutional Review Board for Protection of Human Subjects

From: Tona Dyer
Principal Investigator or Project Director

Psychology
Department

Subject: Research Project Title Perception of the Ames Distorted Room as a Function of Training and Transfer of Formative Learning

Duration of Research Project: May 4th or 11th to May 11th or 14th
Mo. Day Year Mo. Day Year

	Yes	No
I. Biomedical procedures are to be used. (If answer is "no," proceed to Section II.)		x
1. Are procedures established, accepted and necessary to meet the needs of the subject?		
2. Are procedures potentially harmful?		
3. Has a qualified M.D. participated in planning the research project?		
4. Have provisions been made for emergency medical care?		
5. Will the risks to subjects be outweighed by the potential benefits?		
6. Will subjects below the age of 18 years be used?		
7. Will parental or institutional consent be obtained?		
8. Are procedures for obtaining informed consent described?		
9. Has a copy of the informed consent document been submitted in the review package?		
II. Behavioral procedures that may alter the status of subjects are to be used. (If answer is "no," proceed to Section III.)		x
1. Are procedures established, accepted, and necessary to meet the needs of the subjects?		
2. Are procedures potentially harmful?		
3. Have provisions been made to correct any harmful or adverse conditions that may arise?		
4. Will the risks to subjects be outweighed by the potential benefits?		
5. Will subjects below the age of 18 years be used?		
6. Will parental or institutional consent be obtained?		
7. Are procedures for obtaining informed consent described?		
8. Has a copy of the informed consent document been submitted in the review package?		

	Yes	No
III. Procedures to elicit information (for example: tests, questionnaires, inventories, surveys, observations) are to be used. (If answer is "no," proceed to Section IV.)	x	
1. Are the procedures considered established and accepted?	x	
2. Will the procedures cause any degree of discomfort?		x
3. Will confidentiality of all information be maintained?	x	
4. Will subjects below the age of 18 years be involved?		x
5. Will parental or institutional consent be obtained?		x
6. Are procedures for obtaining informed consent described?		x
7. Has a copy of the informed consent document been submitted in the review package?	x	
8. If informed consent or knowledge of participation is not required, have reasons been documented?	n/a	

IV. The following abstract of the research project, which includes any possible risk(s), is submitted. This may be typed on a separate page(s) entitled research project abstract.

Two kinds of perceptual learning, reorganizational and formative operate in the distorted room. From past investigations it was found that reorganizational learning is stimulus specific whereas formative learning may transfer to another similar stimulus. Sixty subjects from Morehead State University will be used to investigate the possibility of transfer of formative learning in the distorted room.

The research project described was planned to adhere to the University's policies regarding the use of human subjects. University review is requested.

Antoinette B. Dyer	601 Ginger Hall
Principal Investigator or Project Director (type or print)	Address (Campus)
Antoinette B. Dyer	783-3250
Signature	Telephone Number

Faculty members should have their protocol read by the appropriate department head or director. Student protocols should be reviewed and approved by their thesis or research advisor and department head.

I/we have read and am aware of the protocol for this investigation or study.

Dr. George S. Tapp	UPO 874
Department Head/Director (type or print)	Address (Campus)
	2187
Signature	Telephone Number
	2187
Thesis or Research Advisor (type or print)	Address (Campus)
Signature	Telephone Number

CC: School Dean

MOREHEAD STATE UNIVERSITY
IRBPHS Form 2

REPORT OF REVIEW COMMITTEE DECISION FORM

Date: May 4, 1982

To: Antoinette B. Dyer, Principal Investigator or Project Director

George S. Tapp, Department Head

George S. Tapp, Thesis or Research Advisor

From: Institutional Review Board for Protection of Human Subjects

Subject: Research Project Proposal Involving use of Human Subjects

Research Project Title Perception of the Ames Distorted Room as a Function of Training and Transfer of Formative Learning

Initial Review x Continuing Review ____

The above proposed research project has been reviewed in accordance with the University's policies related to the use of human subjects.

The proposed research project conforms in all respects to established policies and institutional assurances. Yes x No ____

The following recommendations are offered to the principal investigator or project director for compliance with the established policies and institutional assurances.

None

MOREHEAD STATE UNIVERSITY
IRBPHS Form 1-C

INSTRUMENT FORM

Date: April 27, 1982

To: Institutional Review Board for Protection of Human Subjects

From: Antoinette B. Dyer
Principal Investigator or Project Director

Psychology
Department

Subject: Research Project Title Perception of the Ames Distorted Room as a Function of Training and Transfer of Formative Learning

The following are examples of written instruments to be used in the research project. (Copies of the written instruments must be attached. If copyrighted written instruments are to be used, representative examples must be attached.)

None

MOREHEAD STATE UNIVERSITY
IRBPHS Form 1-B

INFORMED CONSENT FORM

Date: April 27, 1982

To: Institutional Review Board for Protection of Human Subjects

From: Antoinette B. Dyer
Principal Investigator or Project Director

Psychology
Department

Subject: Research Project Title Perception of the Ames Distorted Room as a Function of Training and Transfer of Formative Learning

This is to certify that I, _____ (print), hereby give permission to volunteer in a research project (experiment, program, study) as an authorized part of the educational and research program of Morehead State University under the supervision of

_____
(Principal Investigator) (print)

This investigation and the participant's part in the investigation have been defined and fully explained by _____ (print) and I understand his/her explanation. The procedures of this research project and their risks are described on the back of this form and have been discussed in detail with me.

I have been given an opportunity to ask whatever questions I may have had and all such questions and inquiries have been answered to my satisfaction.

I understand that I am free to deny any answer to specific items or questions in interviews or questionnaires.

I understand that any data or answers to questions will remain confidential with regard to the identity of the participant.

I certify that to the best of my knowledge and belief, I have (the child has) no physical or mental illness or weakness that would cause risk during participation in this investigation.

I further understand that I am free to withdraw consent and terminate participation at any time.

_____ _____
Date Participant's Signature

APPENDIX B

VERBAL REPORT QUESTIONS

Verbal Report Questions

1. Do you see the two dowels or black dots in the room?
2. Are the dowels the same size or is one smaller or larger than the other?
3. Now look at the floor, is the floor level or slanted?
4. Is the ceiling level or slanted?
5. Do you see the two windows in the back of the room?
6. Are these two windows the same size, or is one larger or smaller than the other?
7. What is the shape of the two back windows?
8. What is the shape of the back wall?
9. Now, look at the right side wall and then the left side wall. Are the walls the same size or is one larger or smaller than the other?
10. Is the left rear corner the same distance or is it farther or closer to you than the right rear corner?

Note: Questions 1 and 5 were not included in the quantification of the verbal reports and served only to direct the subject's attention to certain aspects of the room.

APPENDIX C

DATA SHEET

Experimenter: _____

Date: _____

Professor: _____

Name: _____

Ortho-Rater: _____

Corrective Lenses: _____ (yes or no)

Verbal Description	NR Pretest	DR Pretest
1. Dowel Size (L-R)	eq sm lg	eq sm lg
2. Floor	level slanted	level slanted
3. Ceiling	level slanted	level slanted
4. Back Window Size	eq sm lg	eq sm lg
5. Back Window Shape	rect slanted	rect slanted
6. Back Wall Shape	rect slanted	rect slanted
7. Side Walls Size	eq sm lg	eq sm lg
8. Left/Right Corner	eq far close	eq far close

A	D		A	D	
40	40		40	40	
39	39		39	39	
38	38		38	38	
37	37		37	37	
36	36		36	36	
35	35		35	35	
34	34		34	34	
33	33	Mean PSE	33	33	Mean PSE
32	32		32	32	
31	31	———	31	31	———
30	30		30	30	
29	29		29	29	
28	28		28	28	
27	27		27	27	
26	26		26	26	
25	25		25	25	
24	24		24	24	
23	23		23	23	
22	22		22	22	
21	21		21	21	
20	20		20	20	
19	19		19	19	
18	18		18	18	
17	17		17	17	
16	16		16	16	
15	15		15	15	
14	14		14	14	

Training

1. Active
2. Passive
3. Passive Control

Verbal Description	DR Posttest	NR Posttest
1. Dowel Size (L-R)	eq sm lg	eq sm lg
2. Floor	level slanted	level slanted
3. Ceiling	level slanted	level slanted
4. Back Window Size	eq sm lg	eq sm lg
5. Back Window Shape	rect slanted	rect slanted
6. Back Wall Shape	rect slanted	rect slanted
7. Side Walls Size	eq sm lg	eq sm lg
8. Left/Right Corner	eq far close	eq far close

A	D
40	40
39	39
38	38
37	37
36	36
35	35
34	34
33	33
32	32
31	31
30	30
29	29
28	28
27	27
26	26
25	25
24	24
23	23
22	22
21	21
20	20
19	19
18	18
17	17
16	16
15	15
14	14

A	D
40	40
39	39
38	38
37	37
36	36
35	35
34	34
33	33
32	32
31	31
30	30
29	29
28	28
27	27
26	26
25	25
24	24
23	23
22	22
21	21
20	20
19	19
18	18
17	17
16	16
15	15
14	14

APPENDIX D

RAW DATA CONVERSION

Raw scores were first converted to Brunswik ratios. The formula that was used consists of: BR=(R-S)/(A-S) where R was the test disc chosen as a match to the standard disc; S was the test disc size to produce a perfect retinal stimulus match; and A was the disc size that was necessary for a perfect match of the standard disc size. Brunswik ratio values range from 0.00 to 1.00. A Brunswik ratio of 1.00 represents perfect size constancy (Smith, Smith, Zimmerman, & Geist, 1977).

APPENDIX E

CODEBOOK AND RAW DATA

CODEBOOK

Column	Variable Name and Code
1-2	Subject number
3	Corrective lenses
	1 Yes
	2 No
4-5	Ortho-Rater
6	Group
	1 Active
	2 Passive
	3 Passive Control
	4 Normal room Control
7	Normal room Verbal Report (Pre)
8-11	NRPRE
12	Distorted room Verbal Report (Pre)
13-16	DRPRE
17	Distorted room Verbal Report (Post)
18-21	DRPOST
22	Normal room Verbal Report (Post)
23-26	NRPOST
27	Experimenter
28	Sex
	1 Female
	2 Male

```
011081220.5232.5532.5122.011
021081219.0334.0532.0321.011
031091119.0533.0730.0222.512
041091221.5734.0732.5422.542
052111616.5732.5731.5517.531
061091217.5433.0429.0319.511
071111417.0526.0524.5218.511
081081117.5534.0632.5020.531
091081314.5425.9325.5216.032
102112019.0434.5533.5019.011
111092119.5135.0334.5121.512
122092318.5434.5433.0319.511
132112020.5435.5435.0122.512
141122017.5435.5535.5019.531
151092016.5436.0134.5020.512
161122216.5633.0633.0120.521
171082116.0434.0235.0121.511
182092216.0635.0633.5216.512
192103017.5531.5530.0021.011
202103117.5626.0626.0223.022
211113017.0525.5426.0018.511
221123417.5335.5237.0018.511
232113217.5335.0336.0319.011
241103117.5332.0233.0218.031
251103217.0630.5632.0020.012
261083016.5534.0633.0019.012
271093218.5333.0233.5420.531
282114119.5           121.011
291113117.0           115.512
301114016.5           317.521
312114017.5           016.541
322104321.5           123.541
332124118.0           020.511
341104320.5           220.011
351094218.5           118.012
361084016.5           017.511
371094018.0           120.512
382124416.0           419.012
392093214.0427.0427.5215.542
402113020.0231.0228.0019.511
411113118.0535.5536.0118.011
421082219.0736.0336.0121.541
431112120.0434.5436.0123.512
442122019.5533.0433.0019.011
452081317.5530.5631.0421.012
462104219.5           318.511
472091216.0420.5621.5217.511
482092316.5532.5431.0117.011
492113117.0429.0331.0020.512
502123718.5728.0727.0518.512
```

```
511114415.5          116.012
522104316.5          115.542
532103414.5334.5435.0413.511
542102119.5334.5335.0020.511
552102417.5334.0632.0019.011
562101016.5535.5533.0018.511
571111319.0535.0535.0515.012
582111117.0430.0625.0118.012
592101315.5727.0724.5516.541
602091217.0627.0627.0320.512
```

APPENDIX F

ANALYSIS OF VARIANCE SUMMARY TABLE FOR REPORTED DISTORTION AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

Table 2

Analysis of Variance Summary Table For
Reported Distortion as a Function
of Active vs. Passive Training

Source	df	SS	MS	F
Group (A, P, PC)	2	53.6333	26.81	5.82**
Room (N vs. D)	1	347.2222	347.2222	129.21**
Group x Room	2	2.4111	1.2055	0.45
Trial	1	0.0888	0.0888	0.12
Group x Trial	2	6.8777	3.4388	4.58*
Room x Trial	1	0.5555	0.5555	0.59
Group x Room x Trial	2	0.1444	0.0722	0.08
Subject (Group)	42	193.6666	4.6111	
Room x Subject (Group)	42	112.8666	2.6783	
Trial x Subject (Group)	42	31.5333	0.7507	
Room x Subject (Group)	42	39.8000	0.9476	

Note. A refers to Active, P refers to Passive, and PC refers to Passive Control.
*$p < .05$
**$p < .01$

APPENDIX G

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR REPORTED DISTORTION AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

Table 3

Analysis of Covariance Summary Table
For Reported Distortion as a Function
of Active vs. Passive Training

Source	df	SS	MS	F
Group (A, P, PC)	2	24.57777	12.29	8.91*
DRPREV	1	34.0104	34.1014	24.67**
Error	41	56.5228	1.3786	

Note. A refers to Active, P refers to Passive, and PC refers to Passive Control.
*$p < .05$
**$p < .01$

APPENDIX H

ANALYSIS OF VARIANCE SUMMARY TABLE FOR REPORTED DISTORTION IN THE NORMAL ROOM AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

Table 4

Analysis of Covariance Summary Table
For Reported Distortion in the Normal Room
as a Function of Active vs. Passive Training

Source	df	SS	MS	F
Group (A, P, PC, NC)	3	31.3666	10.36	2.91*
Trial	1	0.8333	0.8333	0.86
Group x Trial	3	2.9666	0.99	1.02
Subject (Group)	56	201.0000	3.59	
Trial x Subject (Group)	56	54.2000	0.97	

Note. A refers to Active, P refers to Passive, PC refers to Passive Control, and NC refers to Normal room Control.
*$p < .05$

APPENDIX I

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR REPORTED DISTORTION IN THE NORMAL ROOM AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

Table 5

Analysis of Covariance Summary Table
For Reported Distortion in the Normal Room
as a Function of Active vs. Passive Training

Source	df	SS	MS	F
Group (A, P, PC, NC)	3	26.7333	8.91	6.05**
NRPREV	1	40.2056	40.2056	27.30**
Error	55	80.9943	1.47	

Note. A refers to Active, P refers to Passive, PC refers to Passive Control, and NC refers to Normal room Control.
**$p < .01$.

APPENDIX J

ANALYSIS OF VARIANCE SUMMARY TABLE FOR THE MEAN BRUNSWIK RATIO AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

Table 6

Analysis of Variance Summary Table for the Mean Brunswik Ratio as a Function of Active vs. Passive Training

Source	df	SS	MS	F
Group (A, P, PC)	2	0.5436	.27	5.95**
Room (N vs. D)	1	22.9967	22.9967	741.02**
Group x Room	2	0.1777	0.09	2.86
Trial	1	0.1027	0.1027	17.36**
Group x Trial	2	0.0196	0.009	1.66
Room x Trial	1	0.2710	0.2710	56.04**
Group x Room x Trial	2	0.0170	0.008	1.86
Subject (Group)	42	1.9199	0.05	
Room x Subject (Group)	42	1.3034	0.03	
Trial x Subject (Group)	42	0.2486	0.005	
Room x Trial x Subject (Group)	42	0.1928	0.004	

Note. A refers to Active, P refers to Passive, PC refers to Passive Control, N refers to Normal, and D refers to Distorted.
**$p < .01$

APPENDIX K

ANALYSIS OF COVARIANCE SUMMARY TABLE FOR THE MEAN BRUNSWIK RATIO AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

Table 7

Analysis of Covariance Summary Table for the Mean Brunswik Ratio as a Function of Active vs. Passive Training

Source	df	SS	MS	F
Group (A, P, PC)	2	0.3961	0.1980	36.95**
DRPRE	1	0.9096	0.9096	169.71**
Error	41	9.2197	0.0053	

Note. A refers to Active, P refers to Passive, and PC refers to Passive Contol.
**$p < .01$

APPENDIX L

ANALYSIS OF VARIANCE SUMMARY TABLE FOR THE MEAN BRUNSWIK RATIO AS A FUNCTION OF ACTIVE VS PASSIVE TRAINING

Table 8

Analysis of Variance Summary Table for the Mean Brunswik Ratio as a function of Active vs. Passive Training

Source	df	SS	MS	F
Group (A, P, PC, NC)	3	0.1041	0.0347	1.12
Trial	1	0.3405	0.3405	46.09**
Group x Trial	3	0.0345	0.0115	1.56
Subject (Group)	56	1.7428	0.0311	
Trial x Subject (Group)	56	0.4137	0.0073	

Note. A refers to Active, P refers to Passive, PC refers to Passive Control, and NC refers to Normal room Control.
**$p < .01$