BENEFICIAL AND DETRIMENTAL EFFECTS OF SOCIAL OBSERVATIONAL MODELING ON GENERALIZED CREATIVE RESPONSE PRODUCTION

by

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Abstract

Typically, "creativity" in the person has been viewed as an individual trait, manifesting itself in various forms and measurable behaviors. However, there exist literature reports analysing influences capable of enhancing creative production through various applied, external forces. Specifically, these are attempts to "train" the individual to yield greater and more unique creative products through various diverse methods. As such, these attempts all strive to alter creative production in the direction of enhancement, through the application of educational or direct training procedures congruent with the various existing notions of creativity.

The present study attempted to demonstrate the effects of social observational modeling on creative production, without resort to any deliberate "strategy-taught" educational or direct reinforcement procedures. It was postulated that such effects may not be only beneficial to the subsequent productive tendencies of the subject where creative responses are concerned, but that effects detrimental to creative behaviors may also occur in the presence of highly

uncreative models.

Experiment 1 assessed these modeling effects concurrently across two different figural and verbal tasks attempting to elicit creative responses. One hundred and twenty female introductory university students were randomly divided into 3 groups. Group 1 observed a model (experimenter) producing highly creative response objects on identical figural items (Repeated Figures tasks of the Torrance Tests of Creative Thinking, 1966) which Ss had performed on in an initial pre-test condition. Group 2 observed similar model responses, but which were highly uncreative in nature. A third control group did not observe model performances. In a completely counterbalanced design, alternate forms of these tasks were presented to Ss in a subsequent post-test condition.

Results showed significant modeling effects generalized over the two different figural tasks. Relative to control conditions, Ss' post-task responses were found to be congruent in direction with the model's creative (or uncreative) levels of response. These results were analysed in terms of total creativity and the component creativity elements of fluency, flexibility, originality, and elaboration as outlined by the Torrance tests.

To assess whether the modeling effects in the figural modality were generalizable to the verbal modality, the verbal (Unusual Uses) tasks of the Torrance Tests were also presented concurently in the identical counterbalanced conditions that the tasks of the figural modality had been presented. However, no model performances were presented between the pre-task and post-task conditions. Generalization from the figural to the verbal modality was not found to have occurred.

It was concluded that observational learning had an effect on creativity in the figural modality, exerting both beneficial and detrimental influences on creative production. Failure to generalize to the verbal modality indicated some specificity of modeling influence in creative production. It was suggested that where educational goals are aimed at increasing creativity in many forms and across many modalities, the model or educator must himself display all his behaviors in creative and unique manners across many different modalities to be effective.

Experiment 2 attempted to assess whether true modeling effects had taken place, or whether simple "mimicry" of model responses had occurred. Four peer judges were

found to have independently labelled, about equally, responses of Ss who had and who had not seen prior model performances, as having simply been copied to the model displays of the study. This indicated that model displays resembled in nature responses Ss would normally make without model influence, varying only in degree of creativity. Simple copying was therefore not judged to have occurred to any greater degree in responses of Ss after model exposure than to responses where indeed no model had as yet been presented. A subsequent measure of interjudge reliabilities was found to be very low, indicating little inter-judge agreement as to what constituted similar or copied creative or uncreative acts, and reflecting the complexity of what is to be defined as creative.

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INTRODUCTION

Rationale for the Investigation of Component Forces in Creativity

"Creativity" is a term applied widely to many psychological behaviors, yet it has been recognized from as early as 1898 (Torrance, 1962; Yamamoto, 1964) that this proposed trait lacks any one comprehensive, broadly adopted definition and any one general theoretical hypothesis of the concept. Current literature (Barron, Dement, Edwards, Lindman, Philip, Olds & Olds, 1965, pp. 1-46; Vernon, 1973, pp. 1-14) continues to postulate hypothesis and produce data that address the proposed trait in a diverse number of ways. Each finds support for some aspect of the trait at best, and as such none has the total corner on the market of experimental significance. It has been postulated (Dudek, 1974) that approximately fifty such diverse definitions of the term are currently in use. Some psychologists, such as Ausubel (1968), have even come to state creativity to be of the most ambiguous, confused, and vaguest terms in the entire fields of psychology and education. Subsequently, the problem of establishing any employable operational definition is thus parallelled by an equally diverse set of theoretical postuations.

The consensus is that no unitary parameter can be sufficiently interpretive of the creative act. Thus, it is accepted that various different parameters actually play various different roles (Hinton, 1968), each shown to have some significant effects. The various approaches have led to its postulated role in psychoanalytic theory (as a product of ego funtioning, see e.g., MacKinnon, 1963, pp. 251-278), its analysis from a dimensional notion (e.g., Guilford, 1950, whereby "associational" and "ideational fluency, originality, adaptive flexibility, uniqueness," and "divergent and convergent thinking" are proposed as factors on which creativity is dependent), or from a general learning aspect emphasizing connections to the person's associational processes (e.g., Mednick, 1962).

Each set of theories produces its own set of component implications which consequently may, or may not be independent of one another. The knowledge that creativity encompases no single parameter (Poulson, 1975), that it yields numerous implications and takes various forms (Davis, 1975), and that it is subject to multitudinous forces (such as inhibition of motivation, e.g., Smith, 1973), leads the current research to investigate the existence and constancy of any one particular integral portion at a time (Treffinger & Poggio, 1972), rather than to presently look at the constancy of a general creativity per se. It is with

this emphasis that this paper proceeds, dealing with one proposed force upon creativity, or the production of creative response——that of social observational modeling.

State-trait Approaches to Creativity

Typically, creativity has been viewed as a human ability or personality trait (Bennett, Madans & Doppelt, 1964; Guilford, 1970, p. 182; Harms, 1946; Hitt & Stock, 1965; Kettner, Guilford & Christensen, 1959; Mackler & Schontz, 1965; Merrifield, Gardner & Cox, 1964). Being defined as such implies that creativity be a relatively enduring behavioral "consistency", or enduring way in which the given individual will vary from any other chosen one (Guilford, 1959, p. 6). The trait is then seen as both existing as a "psychological reality" having place as a concrete type of structure within the individual (as any other proposed individual trait, Mischel, p. 5, 1968), and as the underlying cause of his behavior (Allport, 1966; Cattell, 1950). One would thus expect creativity, if viewed indeed as truly and only a pure trait, to manifest itself with relative consistency over several testing or tapping situations, given the measures or tapping procedures themselves are proven valid and reliable. Conversely, if it could be

demonstrated in some manner that the production of creative-type responses are largely state dependent, at least under certain given situations, the conception of creativity must at the minimum incorporate state-type theories. The notion that certain individuals are non-creative only because they have been so endowed, or otherwise, is then demonstrated a misconception.

It is widely assumed (Molony, 1972) that learning occurs by way of a perpetual course of interaction between the individual and the environment about him. No one exists in a total vacuum, and any interpretation of an individual's actions or behaviors must therefore be analysed in a contextual manner in relation to probable interactions with these environmental factors. Such factors are numerous, and may involve historical or current psychological, physical, physiological, and/or sociological aspects. For instance, it is common knowledge that a developing individual is raised and influenced according to his own cultural upbringing (see, e.g., Broom & Selznick, 1973, pp. 56-85). In the observation and analysis of his current behaviors, therefore, one may enquire into and consider the implications of past interaction between him and the members

individual's behaviors via this hypothetical perceptual-cognitive channel. The individual, furthermore, does not even have to make any form of overt responses at the time of the aquisition of such learning (Deutsch & Deutsch, 1966).

Bandura (1962, pp. 211-219) maintains that much of the information we aquire can only be through the observational process, and at times necessity itself may dictate that learning be through observational means only. Such instances occur, for example, when mistakes can produce lethal outcomes. Potential events such as these are common in everyday life (the training of pilots to fly and parachutists to jump), so much so that explanations utilizing trial-and-error reinforcement theories are easily seen as inadequate. Given that the role of observational learning is of importance in at least some demonstratable human functioning, it is likewise proposed that the production of creative (or conversely, uncreative) responses may, at least in part, be the influential results of social observational modeling. This reasoning is unlike interpretations purporting to investigate creativity as a single, pure trait based on some intrinsic quality of the individual per se. That is to say, underlying

principles that yield creative products (or even principles detrimental to creative production) may in fact be learned observationally, through modeling, internalized by the individual, and subsequently utilized in his own "creative" productions. No overt responding on the part of the individual is necessary. Neither are any direct strategy-taught training procedures required. The latter is of potential importance because neither the model nor the observing individual may be aware that the learning process is taking place. As such, the model's behaviors could have enhanceable effects on the individual's own behaviors, or conversely, have unanticipated detrimental effects. This is discussed at greater length in following sections of the present paper.

Research into the effects of modeling has investigated the organization of available response components into unique behavioral patterns, and concluded that novel modes of responding can occur simply by way of imitation (Bandura, Ross & Ross, 1963). In language, for example, an individual may combine available linquistic sounds to create entirely novel verbal utterances, such as "skippy dipping" ("skipping" + "dipping") or "participaction" ("participation" + "action"), in which it is highly unlikely that such

articulations by more than one individual would ever occur were they not modeled from the unique original. Similarly, unique modes of response may be observationally learned in the absence of any overt practice responding on the part of the subject, as demonstrated in studies whereby individuals are capable of behaviorally reproducing responses observed of models on some initial, single test measure (e.g., Bandura, 1965, pp. 1-55; Flanders, 1968). If such novel responses can be extended to include recognized creative parameters, then potential modeling paradigms may be applied to the production of creative responses. It is proposed that the observer may come to learn observationally, or model, underlying principles (and not simply to mimic specific responses per se) that yield creative products. Social learning theory would then conceptualize the effect of the model stimuli as the serving of a source of response information, thereby guiding the observer's own response patterns. The model, in effect, would then be an informational transmitter, conveying the characteristics of given responses to the observer. This information would pertain to modes of creatively organizing response elements, and could exist in numerous forms. Such forms,

for example, may be verbal or written (the production of a unique, creative novel, for instance), pictorial (the production of creative art), or through actual model demonstrations of a line of response sequences. The latter, for example, might include step-by-step model demonstration of a creative or unique dance sequence.

It has already been noted that the term "creativity" has been variously applied to a multitude of psychological behaviors, which in turn has led to the lack of any one comprehensive theoretical hypothesis of the concept. Many proposed underlying principles mediating creative production have been set forth, some of which have gained prominance over others. Much emphasis, for example, has been placed on processes labelled as "convergent" and "divergent" thinking (Guilford & Merrifield, 1960). The former refers to a mode or type of thinking leading to the contraction of alternatives toward one resultant solution, and the latter to thinking leading to the discovery of many acceptable (and some possibly supreme) creative alternatives. One test of a group of general creativity tests proporting to measure in some part divergent/convergent thinking components is the "Circles" (Repeated Figures) task of Torrance Tests of Creative Thinking (1966). In the task, subjects are requested to make objects or

pictures using circles pre-drawn on the test form (Figure 1), making the circles themselves a main part of their finished products within a given time limit. A set of normal responses (having statistically average probability of response pattern occurrence on any given test group) for this task is shown in Figure 2. That is to say, the author of the measure found such free responses to occur, on an average, much less than other more frequently occurring responses, yet much more than some other rarer, more unique ones over various groups of individuals that he measured (a wide range of American school students from kindergarten on through graduate school).

One mode of responding on the circles or repeated figures task which was found to be statistically rare and considered to indicate a strong and original power to assimilate (Torrance, 1966, p. 25 of Figural Test, Booklet B) occurred when the subject(s) combined or converged a number of circles (or a complete page of these) into a single picture, as in Figure 3. The present paper reasons that subjects who have an opportunity to observe a model who produces products in unique manners will themselves come to produce products according to the manners of the model. Using Figure 3, for example, one might reason that an observer may come

to conclude that combining or using the circles in a convergent manner is a more unique or creative mode of operation than to a mode he would ordinarily use. Hence, it is proposed that the observer would come to incorporate this particular strategy in his own creative production, and whenever confronted with a similar set of test stimulus items, his creative output would continue to remain higher than had he not had an opportunity to observe this strategy; if, however, during an intervening period he was confronted with other models displaying other strategies, he could then learn other modes of operation, and continue to use this information on later occasions in the absence of a model.

The converse is also proposed. That is, an individual normally responding according to statistically average response patterns who observes a model producing responses considered to have a high statistical probability of occurring (i.e., considered non-creative or non-original; see Figure 4) will come to likewise model those patterns. In this sense, the observation and internalization of such responses may be considered detrimental to the future creative productions of the observer.

It is to be noted, however, that the aforementioned strategies are mere examples of a much larger, probably infinite, set of possible strategies to the approach of

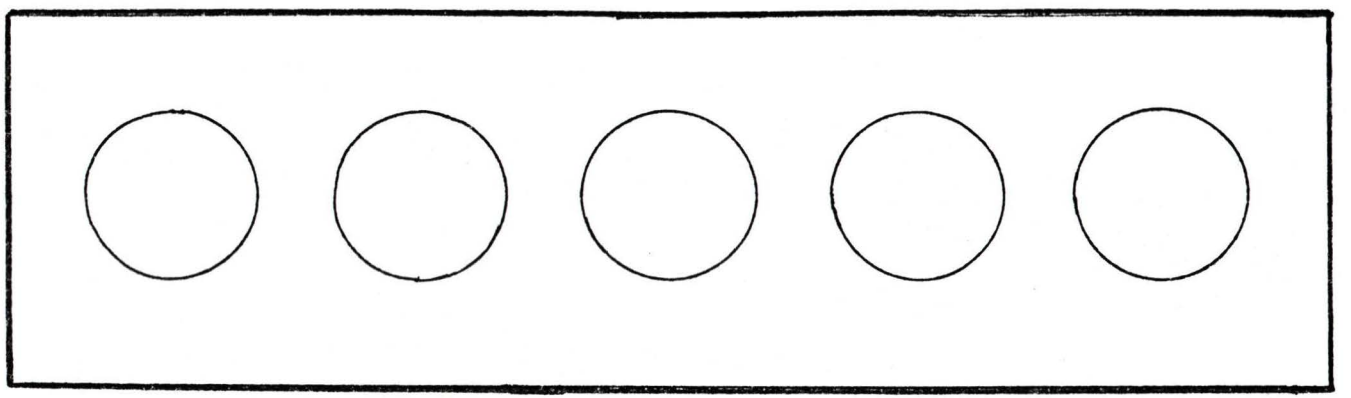

Figure 1. Sample set of 5 stimulus circles appearing in the Repeated Figures task, Torrance Tests of Creative Thinking, Figural Test, Booklet B (1966)

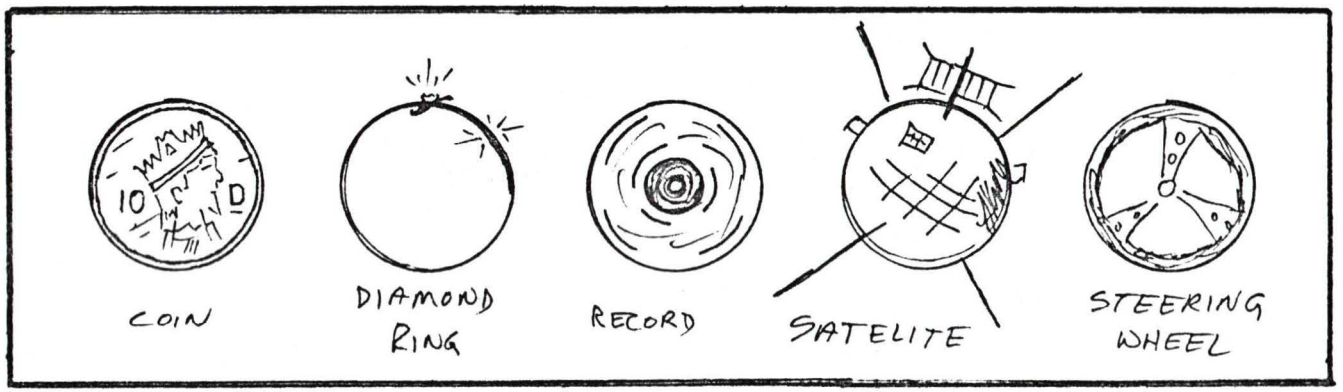

Figure 2. Sample set of statistically average response patterns for the Repeated Figures task, Torrance Tests of Creative Thinking, Figural Test, Booklet B (1966)

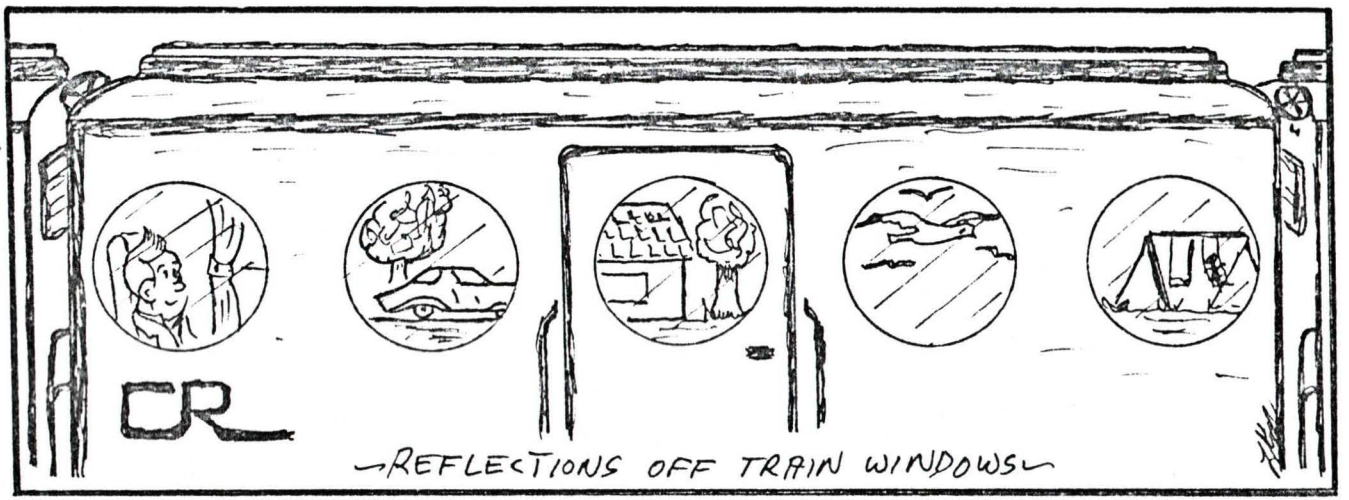

Figure 3. Sample of one statistically rare pattern of responding on the Repeated Figures task, Torrance Tests of Creative Thinking, Figural Test, Booklet B (1966), considered to have greater creative potential than those responses appearing in Figure 2.

Figure 4. Sample set of responses shown to have a high probability of occurrence, and therefore considered non-creative, for the Repeated Figures task, Torrance Tests of Creative Thinking, Figural Test, Booklet B (1966)

the stimulus sets. The incorporation of a number of circles into one large pattern may be considered as only one mode of operation or idea-getting strategy which can be modeled. The observer may well incorporate any number of possible strategies or underlying modes of operation towards a creative production that a model might display, and divergent/convergent thinking are only a few of the underlying principles of which the total number any model may display are too numerous to identify in entirety. Guilford, for example (1971, p. 255), warns that creativity is too frequently linked with exclusively one mode of thinking, such as "divergent thinking". Since creativity is a multifaceted concept, as previously noted, and since any number of underlying principles or strategies may be involved in creative production, a logical method to test the effects on the creative production of observers would thus be to simply present the creative <u>products</u> of typically produced responses of models and to allow the observer to utilize whatever strategies he comes to use. <u>In this manner, modeling of creative responses may be proven without reference to any specified "strategy-taught" methods.</u> This mode of operation is analogous to a person who can come to

discriminate which artist painted what picture hanging on a museum wall solely by looking at the picture and noticing which combination of painting techniques (be they characteristic brush strokes, texture uses, depth characteristics, modes of color combinations, or whatever) belong to past works of the artist, even though this observer may not even be able to identify the specific strategies by name. In a similar manner, a spectator or observer may notice that a creative model has utilized such strategies as the breaking of habit-bound thinking sets or structures, has utilized divergent, convergent, or lateral (de Bono, 1969) thinking strategies, has broken line boundaries in the stimuli he is working with, has used multiple frames of reference, has noticed that he often magnifies his stimulus sets, or has noticed any other number of other possible modes of operation, but the observer himself can come to utilize or model these same principles as means or sources of information toward his own creative production. Since all individuals are to some degree unique in their creative behaviors, it may well be inappropriate to restrict their concentration to a large portion of certain types of the model's response modes that are displayed. A better set of model displays, then, is

not one where the model provides stimuli which he/she considers creative (or uncreative), but to provide creative/uncreative stimuli which representative subjects typical of the present observers, have normally produced in the past. Response objects, and the underlying principles subjects typically utilize to produce these products, whould therefore more likely be included in the model's actions or response behaviors than were the model to be the sole dictator of these response behaviors. It is therefore of less concern what underlying principles the observer learns from the model here, but simply that modeling of creative or uncreative behaviors takes place, since every individual may be modeling a different and unique principle. And, because it is the underlying principles that are the sources of imitation, and not the specific resultant products per se, these should readily be incorporated to other stimulus sets. That is to say, the modeling which is proposed to occur should not represent simple mimicry, and generalization to other stimulus sets would be seen as a logical consequence.

Some Implications of the Research

There are several implications in the proposal of modeled effects in the area of creativity. Creativity

as an ability or trait is not discounted on the whole, but rather, it is contended that statements implying creativity to be an expression of the self (e.g., Cottle, 1973, p. 164) may not be providing the entire perspective on the topic. When creativity is being assessed or measured, the tapping procedure may in fact be extracting a portion which truly may be of an inner-rooted ability, but still another portion tapped is proposed to be of a historically-based, modeled or learned origin, in so far as the subject may have acquired many principles with which to increase the creative nature of his achievements through social observational learning. There is no logical basis to the assumed rationale that behavioral phenomena be classifed as entirely trait-dependent or as entirely state-dependent, and "creativity" should be no exception. Creativity itself is a multidimensional process and as such is subject to many external forces and internally based determinants.

A related implication argues against a hard and fast notion that the process of creative production can result only from thinking and behavior which departs from the usual (e.g., Moustakas, 1967, Foreward). The present author maintains that while the end-products or

actual behaviors must depart from the conventional to be creative, the process or underlying principles by which they are produced may be very systematic. In the present case, this may indeed involve some form of systematic contact (social observational modeling) with creative acts. (Similar arguments not related to social observational modeling specifically, but which emphasize systematic approaches to creativity can be located in DuFresne-Tasse, 1975).

A third implication of importance to the construction of measures of the trait or current state of creativity in the individual, has already been introduced. This involves the caution that items of such measures may well simply reflect the extent of subjects' abilities to react to a test-constructor's mode of thinking. Simply, the test-constructor hypothesizes that high scores on his test reflect high creativity. But, such an assumption would actually require subjects to utilize similar modes of thinking to the constructor's in order to gain high scores. High scorers would therefore be those individuals who respond to the measure items in a similar way to what the test-constructor considers creative. Other individuals responding in their own unique way different from the test-constructor's conception of creativity

would not be properly assessed or represented. Again, where social observational learning theories are concerned, the test-constructor's conceptions of creative response items can be equated with a model's own choice of principles as to what is to be presented as highly creative or uncreative model responses. Such a choice of model responses is inferior to a choice of model responses demonstrated to be typically produced by a representative group of highly creative, average, or low creative subjects in the past. The assumption of the latter then, is simply that the underlying principles utilized by the criterion group (the past subjects) are no different from those of the current sample. The assumption as to what is and what is not truly creative need not be made, since the model/test-constructor does not define this domain. It is defined by the past samples' own free responses or productions.

A final class of implications involves a historical role approach. Previous exposure to environmental factors is a determinant force in creative production, in that it determines (or limits) what information is to be stored and utilized in creation, thereby itself structuring the behavioral creative content. It has been noted that these forces are multiple: physical, sociological, cultural, previous experiential, and so

forth, and that learning in effect occurs through a process of constant interaction between the individual and the environment about him. In this context, then, the creative learner may selectively utilize or model past observations in his creative fabrications which have themselves been selectively determined by environmental forces. An individual having a history of exposure to productions utilizing divergent thinking modes, for instance, may well come to produce products themselves showing the results of such thinking.

Related to historical factors are influences concerning the cultural upbringing of the individual. It is suggested that modeling influences play a large cultural role in the transmission of creative strategies, as well as limiting the scope of them. A European composes creative European music; a native Hawaiian, Hawaiian music; an American creates American music. Perhaps the best such example of the effects of culturally determined modeled behavior, is the ease of transmission of language to the child of any given culture. He or she learns the specific language or languages to which contact through other members of the community are made.

The present research also relates to the "training" aspects of creativity, or the heightening of creative

thought by way of educational experiences (see, e.g., Kirst & Diekmeyer, 1971, and Ott, 1971, for interesting and practical approaches). It is suggested that modeling influences leading to creative production could provide a very efficient method in the direction of such a goal. An observer could accelerate the total output of his own creative acts simply by acquiring the informative principles yielding such results from modeled works, or from the live demonstrating model himself (again, each unique individual acquiring his own informative principles). There has been some question as to whether instructors or leaders should themselves be creative if creativity is a desirable goal in pupils. Some studies (Morrison, 1973; Torrance, 1970) relate characteristics of teachers (other then creativity) and their behavioral consequences as helpful to fostering creative production of students—accepting, humanistic, tolerant and allowing of students to expand their interests as much as possible, et alii. Others (Feldhusen & Treffinger, 1976; Mohan, 1973) suggest the need for creative course training for instructors, maintaining that teacher behavior compatible with the goals of the educational process will foster better pupil creativity. Again, the present research suggesting

modeling influences supports the view that a leader demonstrating creative output principles himself, consciously or otherwise, will serve as an effective model for the transmission of such principles, and will certainly be more effective than one simply allowing only greater freedom of expressive behaviors in pupils. A number of studies (e.g., Strom & Engelbrecht, 1974; Williams, 1973) furthermore place value on creative peer teaching or synergistic approaches toward more educationally creative atmospheres. Peer influences, whereby pupils come to learn through a helping of one another, again implicates the use of verbal and visual demonstration methods on the part of peers, and the learning of creative principles and techniques through social observational modeling by the student.

General Conceptual Hypothesis

It is proposed that the production of creative responses will be influenced by the effects of social observational modeling, without resort to any deliberate "strategy-taught" or educational methods. The effects are hypothesized to occur in the direction of the model's presented behavioral responses, and as such will show both enhanced or diminished effects

in creativity. Where observers attend to displays of high creative model responses, their own creative production is expected to be enhanced. Conversely, the observance of low creative model responses is hypothesized to be detrimental to the subjects' normal creative production.

Choice of Measures of Creative Performance

There are many available measures purporting to assess general creativity. These report various degrees of reliability and validity and employ a number of different methods in their assessment attempts. However, there is as yet no consenses as to which, if any, represent one comprehensive measure of the trait. All are to some degree susceptible to small or large situational changes where in fact prediction was that stability or consistency should hold. The present study reduces this problem somewhat in that the completely counter-balanced design predicts apriori changes of creativity in two opposite directions (an enhancement of creativity after the presence of high creative model responses, and a diminishing effect after the presence of low creative model responses). If it is assumed that situational error effects will influence all responses randomly, then those effects will be the same on all model conditions in the counter-

balanced design. Thus, any predicted opposite changes in scores will more likely be due to the experimental manipulation itself.

Literature reviews on five of the most widely adopted and available tests attempting to assess creativiy (Davis & Belcher, 1971) served as the basis of choice for the potential creativity measures. Of primary concern in the review of the measures was a search for an assessment procedure allowing free creative-type responses to stimuli or items. Thus, a checklist measure would not be appropriate. The basis for such a concern stemmed from the aforementioned argument that different individuals may utilize different, unique operating principles in their potential creative productions. Thereby, a measure allowing such free responses would permit individuals to operate in whatever way they could in order to display maximal creativity on the given stimulus items.

The Unusual Uses and Repeated Figures portions of the Torrance Tests of Creative Thinking (TTCT; Torrance, 1966) were chosen to serve as the measures of creative performance, for the following reasons:

I. General Choice of the TTCT:

a) The TTCT is a widely accepted test (McCormack, 1975). It is one of the five most

widely adopted and available tests attempting to measure creativity (Davis & Belcher, 1971), and was chosen over the other four on two main grounds:

i) the R.A.T., or Remote Associates Test (see Mednick, 1967; Mednick & Mednick, 1967) A) places too great an emphasis on verbal intelligence (see Davis, 1975, p. 76), and

B) appears to penalize answers which show some creative imaginations (ibid.);

ii) the TTCT contains components and tasks which are similar to and purports to measure creativity in some similar ways to those of the other widely used tests of creative thinking: Guilford's measures of consequences (Christensen, Merrifield & Guilford, 1958); Unusual Uses (Wilson, Guilford & Christensen, 1953); and the Alpha Biographical Inventory (ABI; Institute for Behavioral

Research in Creativity, 1968a, 1968b; see, e.g., Davis & Belcher, 1971, for correlations and comparisons with the TTCT, including sex divisions).

b) The tests of the TTCT are multi-variable and appraise the dimensions in Guilford's (Guilford & Merrifield, 1960) original "structure of intellect", related to creative thinking —— fluency, flexibility, originality, elaboration (Treffinger, Renzulli & Feldhusen, 1971).

c) The TTCT is a comprehensive test of creativity, stated to be widely eclectic, having extracted from many theoretical sources during its construction (ibid.).

d) The tests present normative data for and have been useful over a wide range of age levels (Verbal Forms - Grade 4 through graduate school and adults; Figural Forms - Kindergarten through graduate school and adults; see McCormack, 1975, p. 88; Torrance, 1968, p. 174). This allows potential statements of generalization across age and education levels for the

purposes of this study.

e) Comparable norms have been presented across the sexes (e.g., Torrance, 1966, p. 54; Torrance & Aliotti, 1969), again allowing potential statements of generalization.

f) There exists a wide range of evidences reporting favorable reliabilities (inter-judge, test-retest) and validities for the TTCT (cf., Cropley, 1971; Davis, 1975; Holland, 1968; Torrance, 1966, 1968, 1972).

g) The test has comparable alternate equivalent forms (see III. a). below).

II. Use of Figural and Verbal Sub-tests:

a) Although the TTCT is a pencil-and-paper test, it makes use of two primary modalities: verbal and figural.

b) The test reports some favorable inter-correlations between these two modalities (see Torrance, 1966, pp. 82-87). This provides some opportunity to assess potential generalization effects across such conceivably different modalities with actual data findings.

III. Utilization of "Unusual Uses" and "Repeated Figures":

a) The test was constructed in two comparable alternate equivalent forms (Forms A and B), allowing parallel tasks (under Unusual Uses [Verbal]: Cardboard Boxes and Tin Cans; under Repeated Figures [Figural]: Parallel Lines and Circles to be utilized in pre- and post- test circumstances (if counterbalanced properly), as can serve the purposes of this study.

b) The tasks closely resemble those of Guilford's original tasks of creativity (for example, the Unusual Uses, Verbal Forms A [Cardboard Boxes] and B [Tin Cans] are substitudes of Guilford's Brick Uses Test; Torrance, 1966, p. 12), but more closely approximate "real-world" situations (e.g., Torrance felt more creative responses could be elicited from "tin cans" and "cardboard boxes" than "bricks" as the latter are less familiar objects to individuals; ibid.).

IV. Inter-rater Reliability

The scoring of a very large number of

Torrance tests can be a highly time-consuming, tedious task (Davis, 1975, p. 76), requiring a certain degree of proficiency. The tests purport to have high inter-rater reliability values, however (e.g., Treffinger, Speedie & Brunner, 1974, p. 24, report all $\underline{r} > +.90$ in their study; Torrance, 1966, pp. 18-20, reports all mean $\underline{r} > +.85$, with frequent inter-scorer values as high as $\underline{r} = +.99$ between various score components), thereby allowing the use of only one experienced scorer, with confidence of reliable results. Scoring of the TTCT involves locating manual-listed categories of responses and assigning statistically predetermined "weights" to such responses. Thus, for the most part, scoring is simply a manual process requiring no extensive judgements on the part of the scorer. However, to avoid unforeseen, potentially systematic errors, the scoring was performed blind as to the experimental conditions the specific tests had been completed under.

V. Potential Shortening of Total Test-taking Time

Because the TTCT allows free-type responses to as many repeated, unchanging stimuli as a subject

can or wishes to utilize, the specific subtests of the TTCT could be shortened in total test-taking time if needed (such an instance might arise when one wishes to administer many tests on a single or group of subjects and when the overall test-taking time is too long to yield feasibly representative results). In the present measure, Torrance (1966) himself notes that certain time limits (see p. 14, for instance), were in practice greater than the majority of children or adults tested would make use of, the remainder using the time remaining only to elaborate on their original responses. Thus, minor time reductions would not involve significant loss of relative performance on the tasks. Limitation of the total test-taking time was suggested in the present study in order that subject interest level remained constant and would not enter into the experiment as an error factor (see Procedure section). However, since the experimental design was, in addition, completely counterbalanced and involved apriori predicted hypothetical changes in two opposite directions (one for high and one for low creative

model conditions), any potential error effects due to shortening of the test-taking times would be assumed to have the same effects across all these conditions. If these errors were not random, significance of differences between the two hypothesized directions would none-the-less be more difficult to attain.

VI. Further Analysis Potential

Because results of the TTCT are divisible into several components — verbal, figural, fluency, flexibility, originality, elaboration — further apriori hypothesis and aposteriori analysis of where significance/non-significance of results lie, and discussion thereupon, is made possible.

Experiment 1

METHOD

Subjects

One hundred and twenty female[1,2] introductory psychology and education students from the University of Victoria served as subjects. They were recruited from psychology volunteer subject-pool lists, classrooms, and the university student telephone directory. Subjects were simply informed they would be taking part

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[1]The choice to use female subjects was somewhat arbitrary. It appears that the majority of research evidence is inconclusive on the superiority of one sex over the other regarding creative productivity (e.g., Klausmeier & Wiersma, 1965; Simon, Clark & Galway, 1967; Torrance, 1965). Some studies have implicated other variables, such as "defensiveness" in young males and a stronger "susceptibility" to influences of interpersonal contexts regarding task performances in young females. These studies have hypothesized that defensive males perform less well on unfamiliar tasks, but young females, being "sensitized" more to social contexts and working thereby less persistently at a particular task, also perform less well when cognitive functions are required (see Kogan, 1974, for a more comprehensive analysis of the topic). In this sense, females might have "more to gain" by observing social models performing creative tasks in this study, than males. But again, this is largely based on conjecture.

[2]It was not the purpose of the present study to assess sex as an additional variable. For comparison of potential sex differences of performance on the TTCT subtasks, the reader may wish to refer to norms in the Torrance, 1966, manual. For the purpose of the present study, and for proper statistical analysis, the extraction of sex as a factor would require at least 10 Ss per sex per cell group to avoid inflation of α-levels, thereby requiring a total of 20 Ss per group (10 Ss for each sex), or 240 Ss in entirety.

in a study involving "thinking up new ideas and writing these down" and that the primary purpose of the study was not to "test" them (Ss) on "something", but rather that a "theory" was being investigated. Prior to experimentation, subjects were randomly divided into 12 groups of 10 individuals each. Four groups (40 Ss) would serve in each of three experimental conditions, and subjects were tested 2 to 4 at a time depending on their availability on scheduled times between classes. A breakdown of the resultant sizes of groups tested at any one time under one of the 3 experimental conditions is presented in Table 1. This smaller breakdown (of 2 to 4 subjects per testing) also served to reduce any effects of systematic errors. Were any such operating, they would do so on a smaller subject sample (of size 2 - 4 individuals) rather than a larger one (of 10 subjects per group).

Model Responses

Responses originating in nature from past (peer) performances on the Torrance (1966) Tests of Creative Thinking were employed as model responses. Model responses were thus derived from the previous norms presented in the TTCT scoring guide manuals.

Model

The experimenter (male, age 23) served the role of

Table 1

Resultant Number of Groups of Given Size Tested at One Time for Each of The Three Experimental Conditions

	Group Size (number of individuals per group)			
Experimental Condition	2	3	4	n
High Creative Model	9	2	4	40
Low Creative Model	4	4	5	40
Control	7	6	2	40
$\sum n$				120

the "model response" presentator.[3]

Experimental Design

The study was conducted in three separate phases: I. Pre-test: All Ss completed one figural (Repeated Figures) and one verbal (Unusual Uses) portion of the TTCT.

II. Exposure to Model: Subjects were either:

1) (Experimental Condition 1 - HIGH CREATIVE MODEL) exposed to the model displaying high creative production content on the same figural (Repeated Figures) task the Ss had performed in the pre-test condition,
2) (Experimental Condition 2 - LOW CREATIVE MODEL) exposed to the model displaying low creative production content on the same figural (Repeated Figures) task the Ss had performed in the pre-test condition, or
3) (Control Condition) exposed to no model, with an approximate half-minute time

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[3]The choice of experimenter as model was necessitated by the overall length of actual experimentation (47 sittings of approximately 1 hour each) and extensive familiarity with the TTCT measures and procedures.

interval pause between pre- and post-measurements.

III. Post-test: All Ss then completed the alternate form of the verbal (Unusual Uses) and figural (Repeated Figures) tasks of the TTCT to which they had been exposed to in the pre-test condition.

Table 2 displays the completely counter-balanced experimental paradigm. Subjects were randomly assigned to serve in the 12 groups (see Group numbers in Table 2), thereby automatically serving randomly in one of the three conditions of Control, High, or Low creative model exposure. Subjects were measured in groups of no more than 4 and no less than 2, completing the Pre-test—Model Exposure—Post-test conditions in one sitting.

Procedure

Each group of Ss were presented with initial instructions similar to those appearing in the TTCT manual (see Appendix A for the Preliminary Orientation instructions, and Appendix B for the Initial General Instructions), and further instructions to complete the appropriate verbal (Unusual Uses) and figural (Repeated Figures) tasks during the pre-test condition. Instructions for completion of the Unusual

Table 2

Counterbalanced Experimental Design

	Group	Pre-test		Model Exposure	Post-test		n
		TTCT Verbal (Unusual Uses) Task[a]	TTCT Figural (Repeated Figures) Task[b]	TTCT Figural (Repeated Figures) Task	TTCT Alternate Form Figural (Repeated Figures) Task	TTCT Alternate Form Verbal (Unusual Uses) Task	
High Creative Model (Experimental Condition 1)	1	TC	L	L	C	CB	10
	2	CB	L	L	C	TC	10
	3	TC	C	C	L	CB	10
	4	CB	C	C	L	TC	10
Low Creative Model (Experimental Condition 2)	5	TC	L	L	C	CB	10
	6	CB	L	L	C	TC	10
	7	TC	C	C	L	CB	10
	8	CB	C	C	L	TC	10
No Model (Control Condition)	9	TC	L	L	C	CB	10
	10	CB	L	L	C	TC	10
	11	TC	C	C	L	CB	10
	12	CB	C	C	L	TC	10

[a]The TTCT Verbal (Unusual Uses) tasks include:
Form A: Cardboard Boxes (CB)
Form B: Tin Cans (TC)

[b]The TTCT Figural (Repeated Figures) tasks include:
Form A: Lines (L)
Form B: Circles (C)

Uses tasks appear in Appendix C for Cardboard Boxes and Appendix D for Tin Cans; instructions for the Repeated Figures tasks appear in Appendix E for Lines and Appendix F for Circles. Time limits were 5 minutes each per task.

After completion and collection of the pre-test tasks (one verbal and one figural task, as presented in the design of Table 2) and prior to the Exposure to Model condition, the same Ss were presented with the explanations appearing in Appendix G, pertaining to the model's presence and display of performed tasks, but in no way was any reference to any "instructed strategies" for the completion of those tasks presented. Subjects were then exposed to the live model performing on the same figural (Repeated Figures) task the Ss had been instructed to complete in the pre-test condition, and in approximately the same time limit (per model display) that the Ss had had. The appropriate model displays for each condition are outlined in the following section. The model performed these tasks on a large, black classroom-size chalk-board on which a set of circles and parallel lines had been previously and permanantly painted in white. Figure 5 presents the approximate dimensions

of the board, in proportion to the actual test-measure stimuli that subjects were presented with on paper. Two removeable paper covers (Figures 6 and 7) allowed the model to display only the relevant pre-task stimuli to the group (i.e., either the parallel lines or the circles stimuli, depending on which the subjects had performed during the pre-test condition). All appropriate model displays were drawn with chalk over the stimuli in the same manner that Ss would respond with a pencil or pen to the stimuli on paper before them. Model displays could then be erased after each presentation, and the board could be re-used for later groups.

Model display presentations were performed in full view of the seated Ss, without further instructions to Ss other than those appearing in Appendix G. Figure 8 presents a drawing of the model during performance, with 4 Ss observing from their desks.

After exposure to the model, Ss were asked to complete the alternate form of the respective verbal (Unusual Uses) and figural (Repeated Figures) tasks they had completed in the pre-test condition, according to the experimental design as again presented in Table 2.

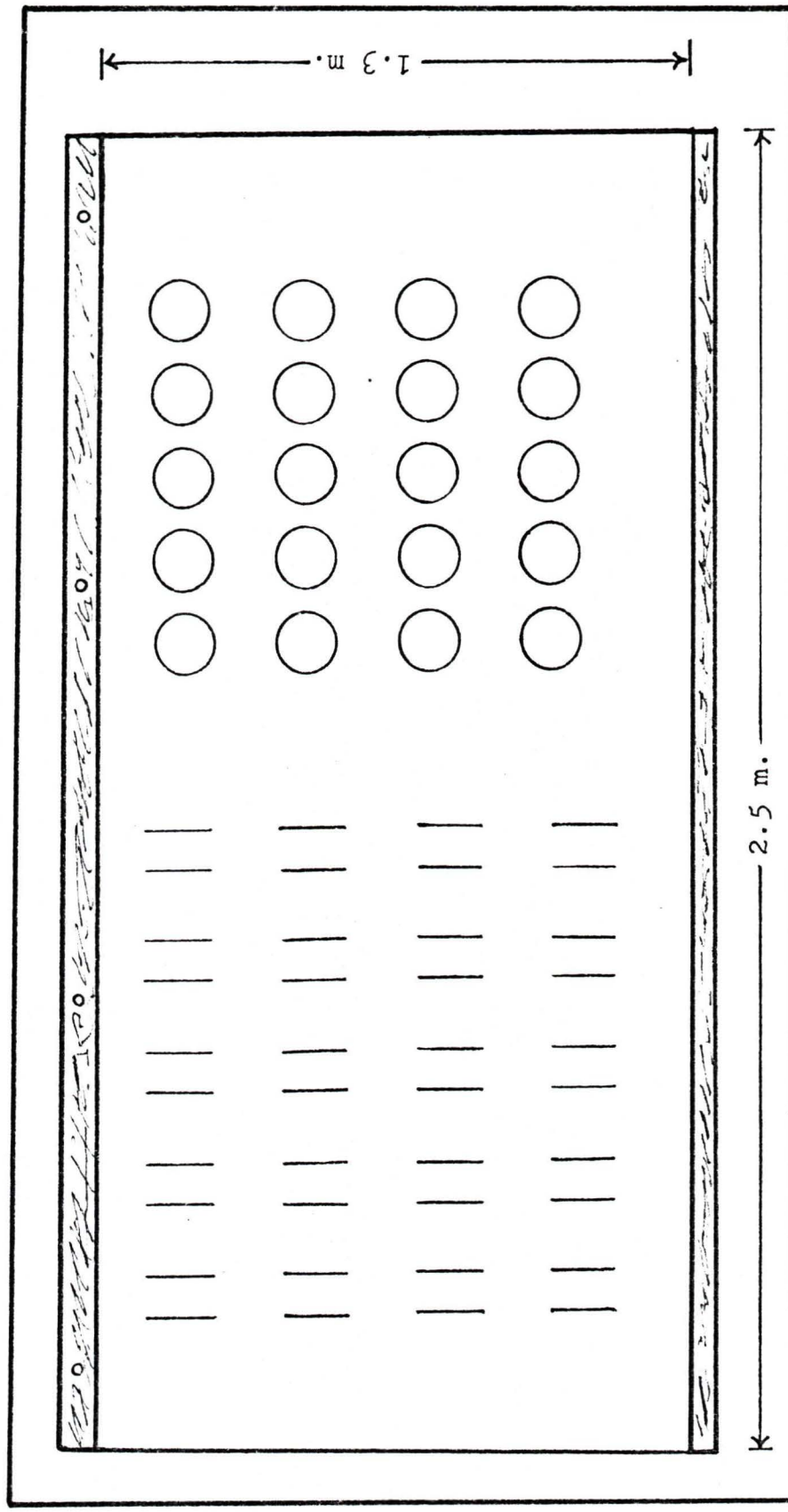

Figure 5. Approximate dimensions of black classroom chalkboard on which model displays were presented. The stimulus sets were painted permanently in white paint on the black background, and model displays drawn over these with eraseable chalk.

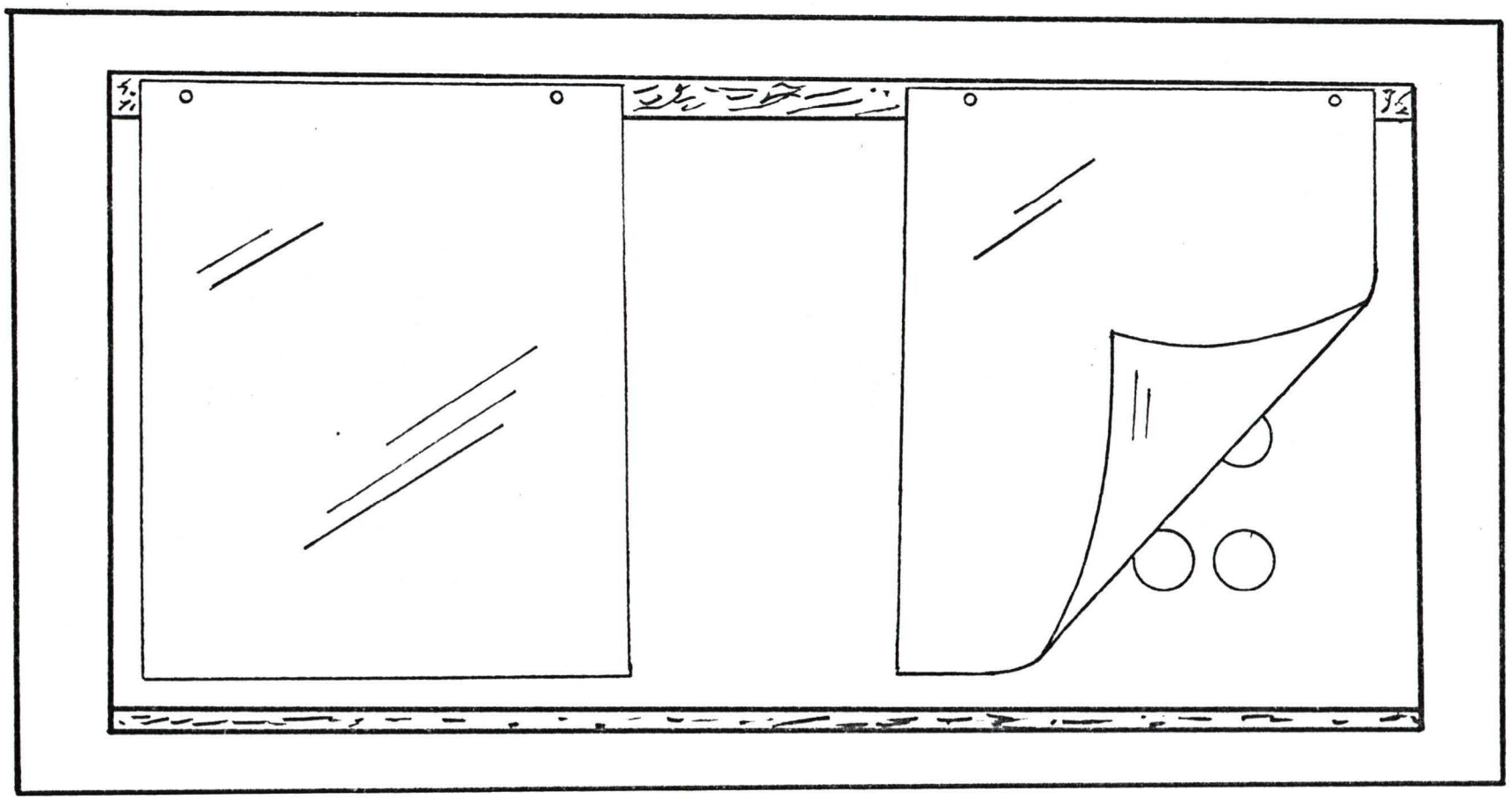

Figure 6. Chalkboard covered with two removable sheets of construction paper. Both stimulus sets are covered during pre-test conditions, and the one cover appropriate to the experimental task is removed during the model display.

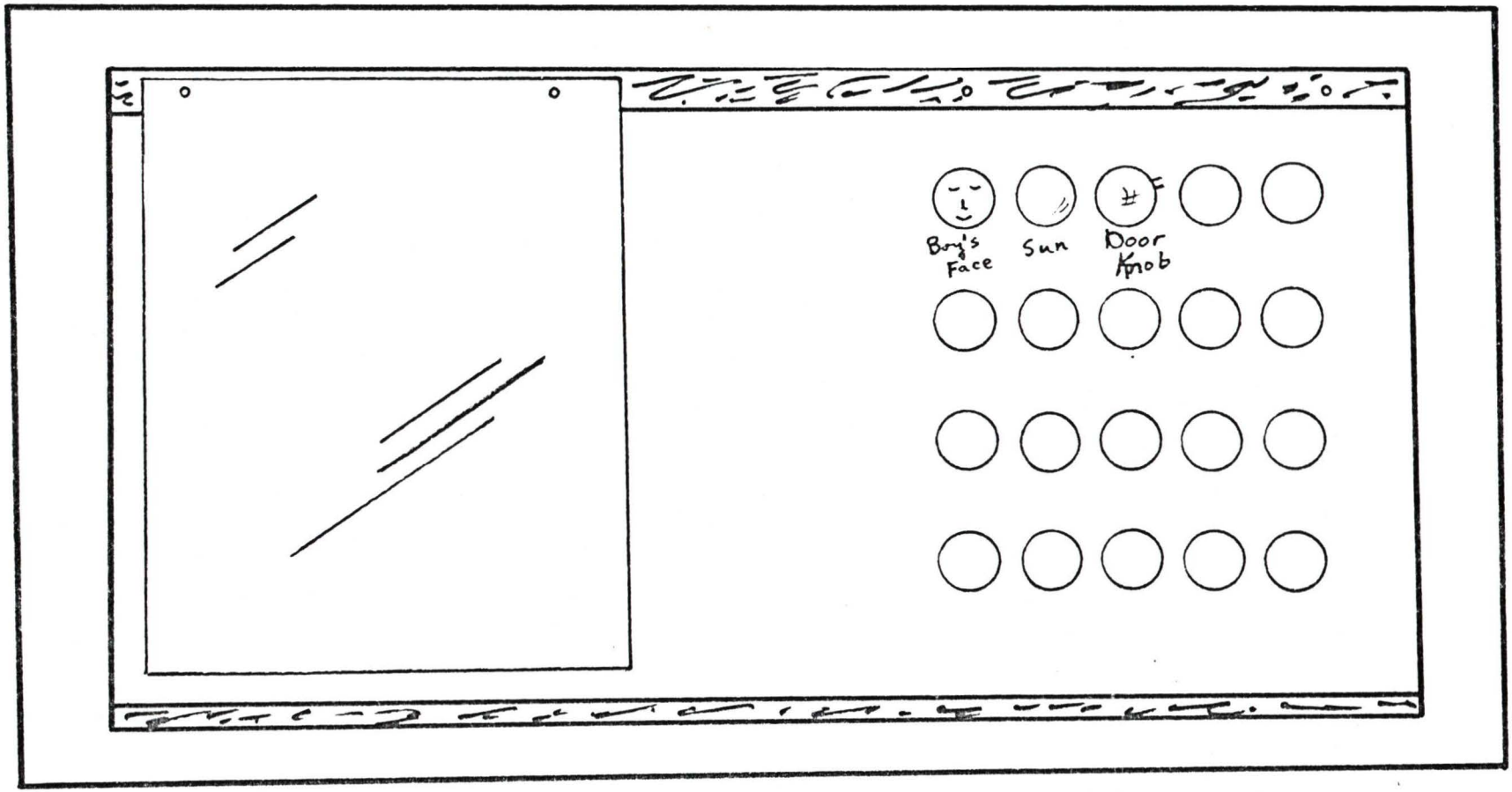

Figure 7. Chalkboard presenting one stimulus set for the model to perform on. The other stimulus set remains covered. Here, model items were started for the Circles task.

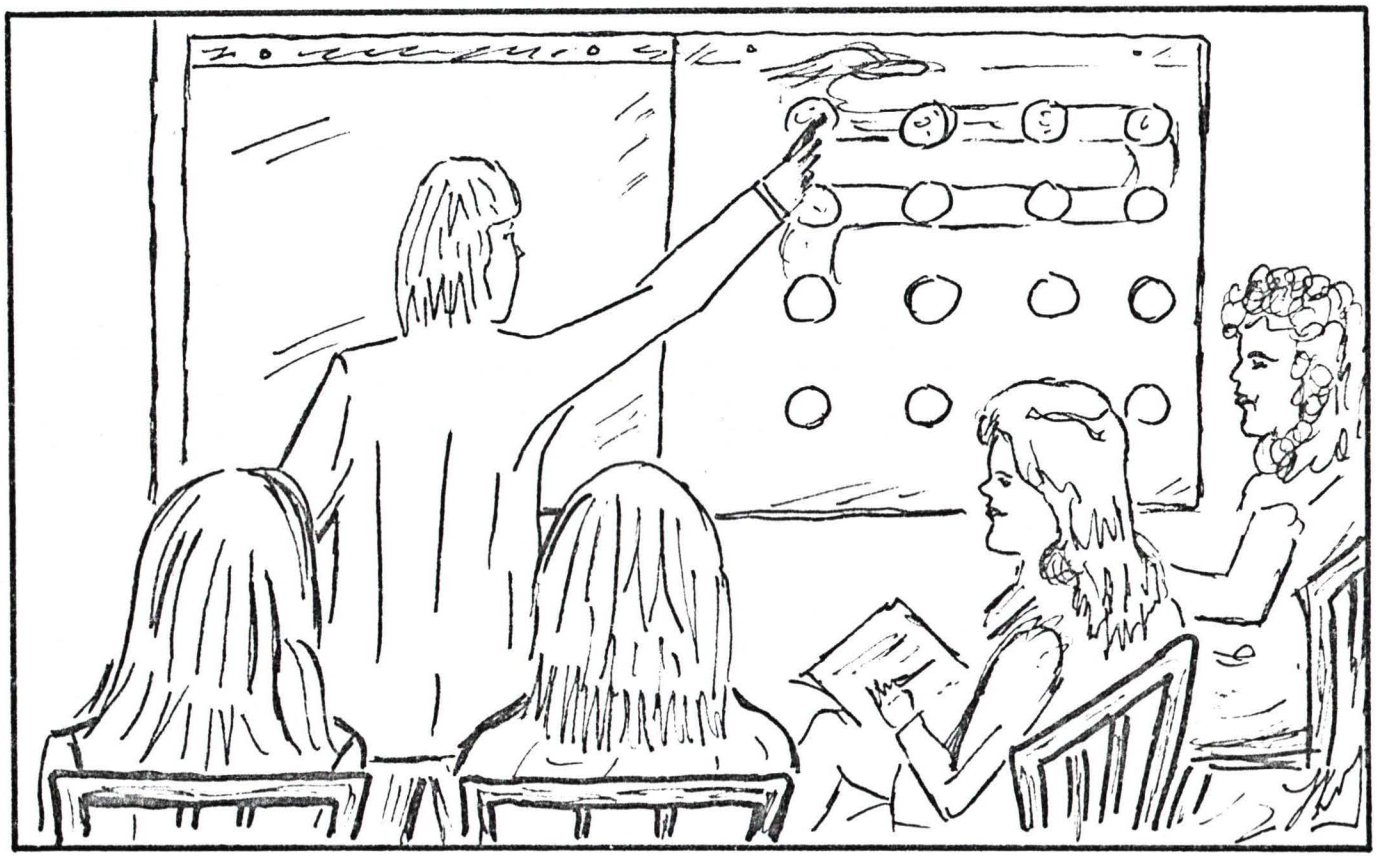

Figure 8. Sketch of the experimental room, subjects, and model during performance. Here the model is seen during high creative performance on the circles task. 4 seated subjects are observing at their desks.

Model Displays

The figures (Repeated Figures) displays the model will reproduce for the Lines task appear in Appendix H for the High Creative Model condition, and Appendix I for the Low Creative Model condition. The figural (Repeated Figures) displays the model will reproduce for the Circles task appear in Appendix J for the High Creative Model condition and Appendix K for the Low Creative Model condition.

The origin of the model displays was based on the following criteria.

Because at least a given number of items would be required to be displayed in order that potential modeling influences become effective, an attempt was first made to keep the total number of different stimulus items as classified in the scoring guides of the TTCT constant between the high and low model conditions of each of the two figural (Lines and Circles) tasks. This presents an initial problem working against possible modeling effects because one defined component of creative thought as presented and defined by the TTCT is that of (1) fluency - i.e., a measure of the total number of items produced within a given time limit. This would thus tend to make results on general creativity and fluency scores

conservative, as differences between conditions will be reduced somewhat on these component measures.

Specific item contents were determined by drawing items tending to get maximum (2) originality points (based on past norms presented in the TTCT) for the High Model Condition displays, and minimum originality points for the Low Model Condition displays. Specific items were also varied greatly on the High Model Condition displays [(3) Flexibility] again according to presented categorical norms based on previous results on the TTCT. Specific items in the Low Model Condition displays were not varied much (see, e.g., Appendix K where many items on the circles tasks are "faces").

High Model Condition displays also contained much (4) elaboration, or magnification of stimulus sets, whereas Low Model Condition displays were less magnified.

Thus, both high and low model condition displays contained high (1) fluency of presented items (total number of pertinent responses made), but all high model displays contained high (2) flexibility (total number of different types of responses made based on different categories), high (3) originality (statistical "rarity" of items based on previous norms, and high (4) elaboration (degree of response detail) of presented

items. All low model displays contained low flexibility, originality, and elaboration components of presented items.

Specific Component Hypothesis

I. Figural Tasks

According to the nature of the preceding model displays described, it is expected that post-test scores obtained on both the Lines and Circles tasks should differ systematically from pre-test scores according to the 3 conditions of control, high and low model response observation.

1. Total Mean General Creativity Difference Scores (general creativity scores are composite scores derived by summing the above 4 component scores; see Torrance, 1966, Norms-Technical Manual, p. 72)- These are expected to be significantly greater for the high model condition over the control condition, which in turn is expected to be significantly greater than those attained under the low model condition. (H>C>L)
2. Mean Fluency Difference Scores - Since the low model condition displays (Appendixes I & K) contain many "simple" but uncreative items over those in the high creative model displays (Appendixes

H & J, which are complex and elaborate) and over the control condition (containing no displays), it is predicted that the mean difference fluency scores obtained under the low condition will be significantly greater than those obtained under both the high and control conditions. (L > H,C)

3. Flexibility and %-Flexibility Scores - Flexibility scores are in actuality a function of fluency scores (i.e., the greater the increase in the number of responses, or fluency of scores during the post-test over the pre-test, the potentially greater the flexibility scores. Compare the following hypothetical results:

	Pre-test			Post-test		
	Fluency	Flexibility	%Flexibility	Fluency	Flexibility	%Flexibility
Subject 1	10	5	50	20	6	30
Subject 2	5	4	80	3	3	100

Subject 1 increases in fluency during the post-test by completing 20 items over his original 10. His flexibility score increases also from 5 to 6. However, of his original 10 items in the pre-test condition, only 5 obtained flexibility points (i.e., ½ of the 10 items). In the post-test condition, only 6 of the 20 possible were "flexible" (i.e.,

6/20). Thus, although flexibility scores were enhanced, proportionately Subject 1 became less flexible in the post-test condition than he was in the pre-test condition. The converse was true of Subject 2, whose flexibility score decreased from 4 to 3. But, since all his items were "flexible" in the post-test condition, his %-Flexibility score rose to 100 over his pre-test %-Flexibility score of 80. Thus, %-Flexibility is the true indicator of flexibility change scores (see Torrance, Norms-Technical Manual, p. 73), since "Flexibility" alone is more a funtion of fluency. Because of the latter statement, mean difference flexibility scores are predicted to show the same significant relationship as fluency scores did (L>H,C) , but the mean difference %-Flexibility scores should be significantly greater for the High Creative Model group compared to control values, and should be significantly lower for the Low Creative Model group compared to control group values. (H> C>L)

4. Originality and %-Originality Scores - Originality scores are obtained by determining their statistical rarity of occurrence. Torrance presents such

normative "weights" for particular items which subjects have produced in the past, and the scorer applies these weights to present test-measure responses. But originality scores are a function of fluency scores in the same manner as flexibility scores were described to be a function of fluency scores. Thus, a %-Originality score was also constructed in the same manner as the %-Flexibility score (%-Originality = [Originality Points / Total Possible Originality Points] X 100) and the predicted relationship for %-Originality was therefore the same as that for %-Flexibility. (H>C>L)

Mean difference originality scores themselves were predicted to be significantly higher for data obtained from the high modeling condition over both the control and low modeling conditions, as the criterion for the construction of the high model displays (Appendixes H & J) involved items chosen primarily for their originality (see preceding Model Displays section). On the other hand, because originality scores are largely dependent on total fluency scores (which is not the case for %-Originality scores), values obtained under

the low model and control conditions need not be significant. (H>L,C)

5. Elaboration Scores - are predicted to vary appropriately according to the model conditions under which they are presented. Thus, mean difference elaboration scores should show the relationship of H>C>L, as High Model Condition display Appendixes H & J contain high "elaboration" of stimulus items, and Low Model Condition display Appendixes I & K contain low "elaboration" of stimulus items according to TTCT specifications.

II. Verbal Tasks

A second purpose of the study was to determine whether potential effects of high or low creative model observation of figural objects would generalize to stimuli presented verbally. The two verbal tasks of the TTCT include the (1) Unusual Uses of Cardboard Boxes task and (2) the Unusual Uses of Tin Cans task. Appropriate instructions for these tasks are presented in Appendixes C (for Cardboard Boxes) and D (for Tin Cans), and the tasks are administered in the pre- and post-test situations according to the experimental design of Table 2. The tasks assess exactly the same presented creativity components as do the figural tasks, and are thus scored in similar ways. Since it is predicted

that the effects of having observed creative or uncreative model performance on the figural measures will generalize to performance on the verbal tasks (without any subsequent observance of model performance on any of the pre-test verbal measures), all the predictions of effects will be in the same direction for the verbal tasks and their measures of component parts of creative thought, as they were for the figural tasks and their components.

RESULTS

I. Figural Tasks

Because of the complete counter-balanced nature of the design (Table 2), and for the purposes of potential statements of generality, subjects never completed the same verbal and figural tasks in the post-test condition that they had completed during the pre-test condition. The post-test condition stimuli were always the alternate equivalent (verbal and figural) forms of the TTCT stimuli administered during the pre-task conditions. Thus, to make comparisions meaningful, all component creativity scores (those of general creativity, fluency, flexibility, and elaboration) were converted to T-score units (Torrance, Norms-Technical Manual, pp. 57-76). %-Flexibility and %-Orginality component scores were not converted as they already shared a common denominator (percentage).

All pre-test scores provided the bases of the normative T-score conversions, and post-test scores were converted to the respective T-scores obtained from these pre-task distributions.

Comparision 1

The data of the pre-test circles and the pre-test lines tasks were separately converted to T-score

units (collapsed over the 3 model conditions of High, Low, and Control), and then both of these figural tasks were collapsed over one another. (Post-test conversion values based on pre-task equivalents were also calculated on each of the figural tasks, but %-Flexibility and %-Originality values were not converted to T-scores). Table 3 of Appendix L presents the results. The data show that the conversion of the raw data to T-score units (except for percentage values) served the function of equilizing pre-task mean values to approximately 50 and standard deviation values to approximately 10. Median values were also calculated and all were found to fall within 2 T-score units of the mean value of 50, demonstrating lack of skewness in the distributions.

All post-test T-score mean values were found to be generally higher than pre-score mean values, indicating increased performance between testings (possibly due to practice effects). This condition supported the necessity of the conversion of fluency and flexibility scores to percentage values in order to later assess any true fluency or flexibility score increases or decreases.

Comparison 2

Pre-test data from Table 3 was then separated according to tasks (Lines versus Circles) and compared to assess whether the T-distributions between the figural tests, Lines and Circles, were similar over each of the creativity components (Model Conditions continued to remain collapsed). Table 4 of Appendix L presents side-by-side results of the Lines and Circles data on each creativity component. Mean values and standard deviation values across the Lines and Circles tasks were all found to be less than 1 T-score unit apart.

Additionally, graphs (Appendix M) were constructed to assess whether the T-distributions between the figural tasks, Lines and Circles, were similar over the total creativity scores (Figure 13), and the component scores of Fluency (Figure 14), Flexibility (Figure 15), Originality (Figure 16), and Elaboration (Figure 17). Visual inspection of these graphs indicated relative normality and similarity of distributions over the 2 tasks.

Comparison 3

Because of the similarity of operating characteristics between the lines and circles tasks, as evidenced in Table 4 and Figures 9 - 13, the Figural

Lines and Circles scores were collapsed over each other, and the High, Low and Control Model conditions were separated. These then formed the core data for the statistical tests of modeling effects (Appendix L, Tables 5 - 7). Table 5 presents the relevant descriptive statistics for the high model figural observational effects, Table 6 those pertaining to low model figural observational effects, and Table 7 presents the data obtained from the control condition.

Figure 9 presents the mean results graphically for the Total Figural Creativity component, and Figure 11 for the %-Originality component. Appendix N shows reconstructed portions of pre- and post-task responses supporting increased general creativity trends after model observance during the High Creativity condition. Appendix O shows reconstructions of portions of pre- and post-task responses supporting decreased general creativity trends (relative to the control condition) after model observance during the Low Creativity condition (especially in the %-Flexibility and %-Originality components) and increased fluency.

The conservative Scheffé Multiple Range Test for the $p < .05$ level was then applied to the data over

each level of model condition (SPSS Computer Program, 1975). This test thus assessed the significance of difference scores over the three experimental conditions of High, Low and Control Model observations (Appendix P, Tables 8 - 14). Table 8 presents the results and locations of significance for the Total Creativity difference scores. Significant effects were found under the high modeling conditions only, whereas the order of predicted effects had been H>C>L. Table 9 presents the effects on the Fluency component. Results were as predicted, where low modeling conditions produced significantly greater response items (fluency of items) over both the high and control condition results.

Table 10 represents modeling effects on the Flexibility score components. Again, the results were in the same direction as the Fluency component score results. The order of significance in Table 11 (Originality difference score results) was H over (L,C), as predicted, and of Table 12 (Elaboration), (H,C)>(C,L). Apriori prediction of the latter had been H>C>L and thus results were clearly in the same direction, but neither the low (L) or high (H) groups were significantly greater than the mean control group (C) difference

scores. They were however, significantly far apart from each other.

Tables 13 (on the %-Flexibility component) and 14 (on the %-Originality component) also produced results in predicted directions. The %-Flexibility component scores contained a significant effect on high modeling observance over that of low modeling, the latter being significantly lower than control group results. The %-Originality component scores were also in the predicted relationship of H>C>L.

II. Verbal Tasks

To determine whether the figural modeling effects had generalized to the verbal tasks, the verbal data was treated in exactly the same manner as the figural data. Table 15 of Appendix Q presents the descriptive statistics for the T-score verbal data collapsed over tasks and conditions. Again, the conversion of raw score data to T-score units served to equalize pre-test means and standard deviations (again, percentage scores were not transformed). Table 16 of Appendix Q presents the side-by-side results of the Cardboard Boxes and Tin Cans pre-test summary data on each creativity component. Mean values across the Cardboard Boxes and Tin Cans tasks were found to all be less than

5 T-score units apart from one another, and their standard deviations less than 2 T-score units apart. The Cardboard Boxes and Tin Cans tasks were then collapsed over each other (corresponding distributions are plotted in Figures 18-22 of Appendix R for each verbal component), and the model conditions held separate (Appendix Q, Table 17 for the High Model condition, Table 18 for the Low Model condition, and Table 19 for the control condition).

The SPSS Scheffé Multiple Range Test was then applied to each creative thought component over the 3 model conditions. Tables 20, 21, 22, 23, 24, 25, and 26 of Appendix S present the significance test results for the Total Creativity values, and for the Fluency, Flexibility, Originality, Elaboration, %-Flexibility, and %-Originality component values respectively.

Figures 10 and 12 present the corresponding results graphically for the Total Creativity and %-Originality components.

No significant effects were found on the verbal Total Creativity, Fluency, Flexibility, %-Flexibility, and %-Originality Components. Significant effects were found on the Originality component, whereby high modeling condition influences were found to be significantly higher than control values, but this

significance was confounded by a lack of significance between the high and low modeling conditions.

Significant effects were also found on the Elaboration component. These were in the direction predicted, but although the High modeling and Low modeling values were significantly different from each other, neither differed significantly from control condition values.

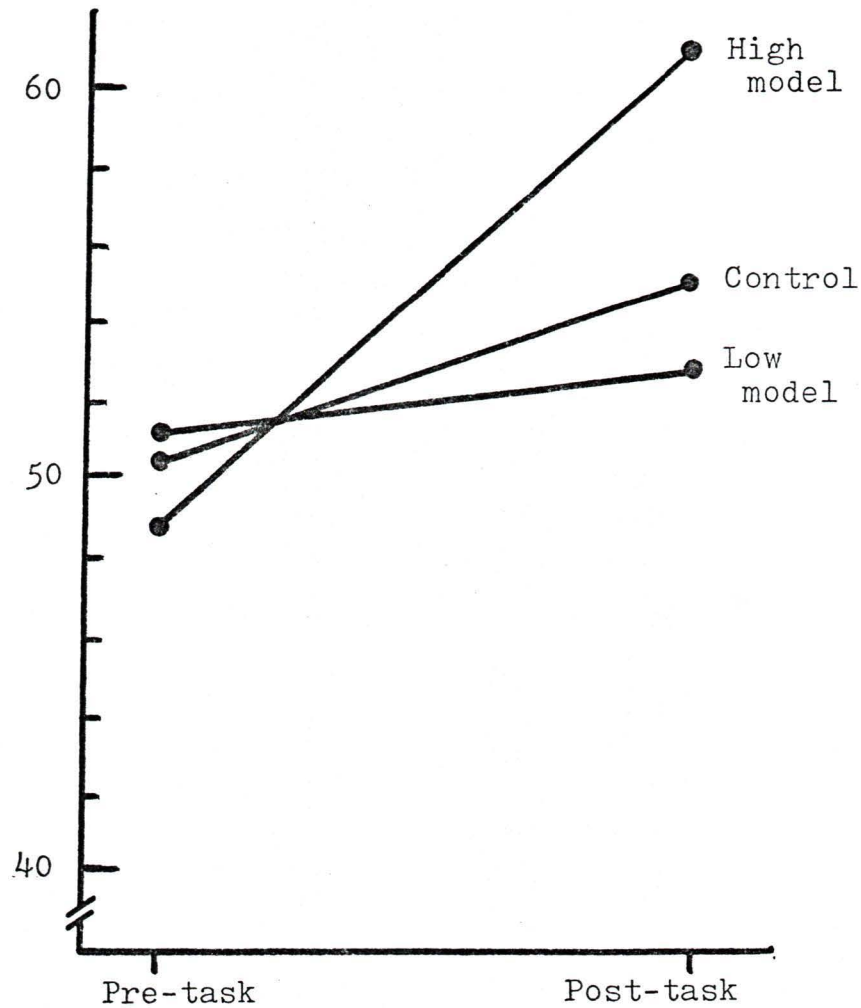

Figure 9. Change in mean Total Creativity, Figural data.

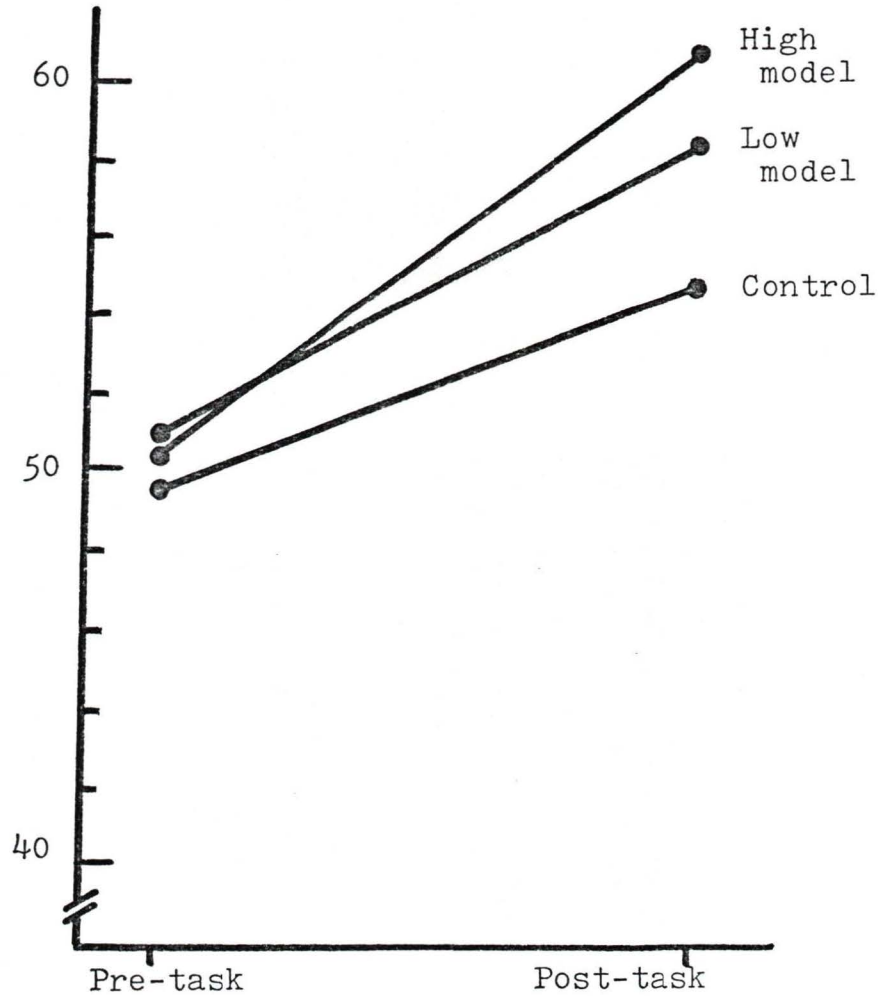

Figure 10. Change in mean Total Creativity, Verbal data (Non-significant).

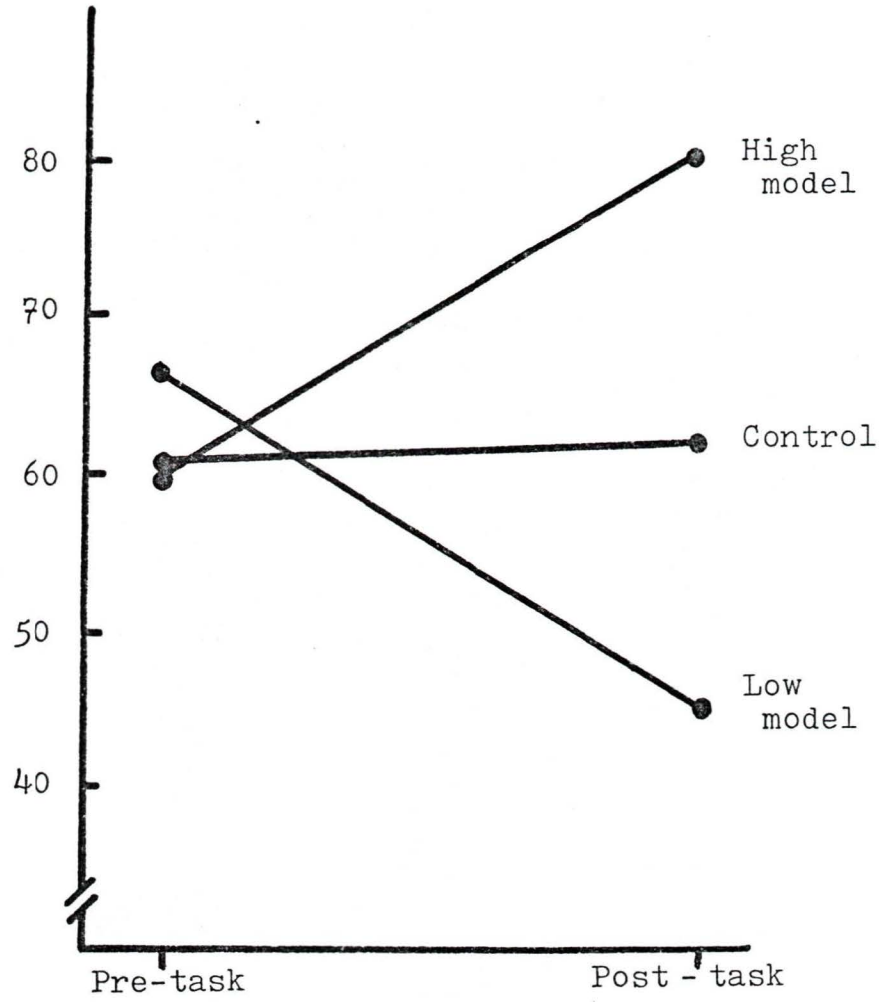

Figure 11. Change in mean %-Originality, Figural data.

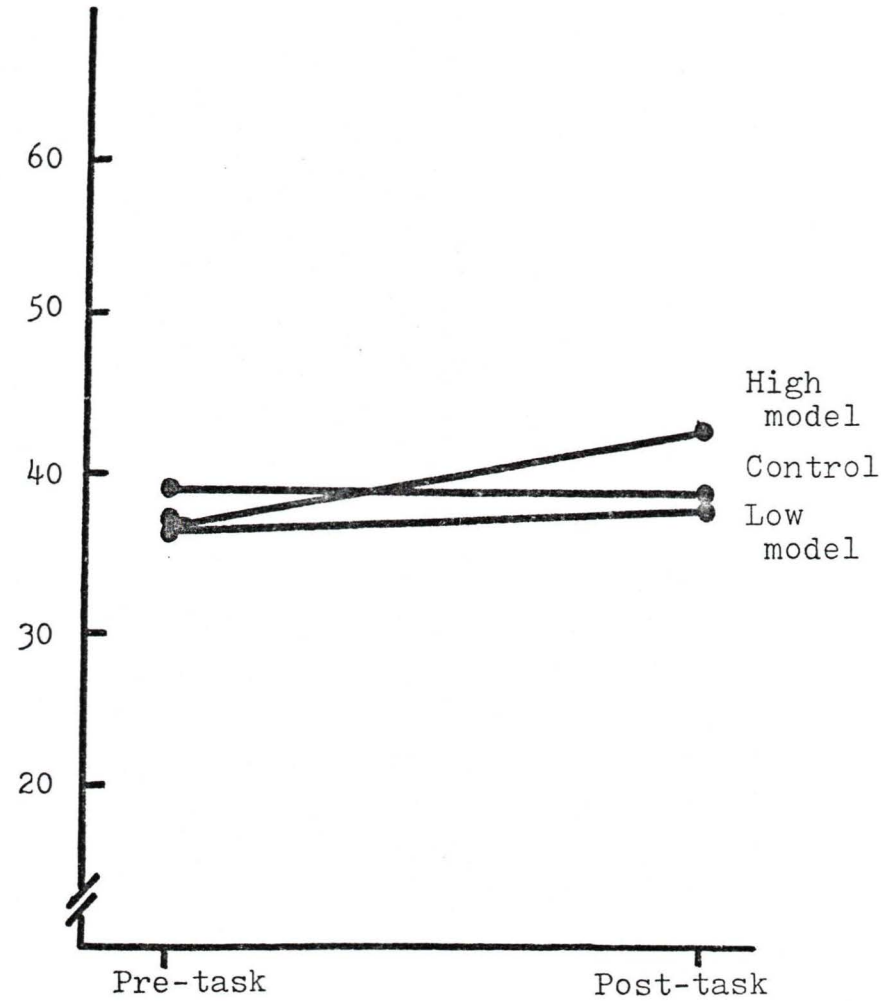

Figure 12. Change in mean %-Originality, Verbal data (Non-significant).

Experiment 2

METHOD

There was some question as to whether the post-task Figural responses of subjects represented true generalized modeling effects on creativity, or whether simple "mimicry" of the model responses presented in Appendices H through J had taken place. It was argued that information valuable to this issue could be obtained by having judges like those of the original subject sample rate responses as to whether or not they felt these had simply been copied from the model responses presented to the original sample (albeit Ss would then be copying a Lines or Circles model response and then transfering it to the alternate Circles or Lines stimuli).

It is to be recalled that during pre-task responses, Ss had as yet seen no model perform. If a large percentage of the pre-task responses were also rated as having been probably copied (when in fact they could not have been), then it is argued that the nature of the model figures are not "that-far-off" from responses Ss would have made anyway (varying only in amount of general "creativity").

But, if High and Low Creative Model post-task responses are largely rated as having probably been copied while

High and Low pre-task responses and both pre- and post-task responses of the control group (where Ss have never come into contact with model performances) are rated as generally not having been copied, mimicry would be demonstrated to have taken place.

Judges.

Four judges were obtained in the same manner and from the same population that subjects in Experiment 1 had been obtained (none were Ss from the original experiment).

Procedure.

Judges performed alone. They were presented with instructions to "globally" rate the responses of the original Ss by placing completed pages of these into one of three piles (labelled Probably Copied, Probably Not Copied, and May or May Not Have Been Copied). Instructions given to judges are presented in Appendix T, along with a diagram of the experimental materials.

One half of the judges independently rated all Parallel Lines responses, the other half independently all Circles responses. Judges were randomly assigned to these tasks.

RESULTS

Table 27 (Appendix U) presents the raw-score results subsequently divided into the 3 model conditions. Table 28 (Appendix U) presents these values in terms of percentages. Although 35% of the High Model condition post-task response sheets were globally rated as having probably been copied, and although approximately 37% of the Low Model condition post-task response sheets were likewise rated, pre-task response values were respectively approximately 28% (High Model) and 36% (Low Model). Control condition values were approximately 38% of pre-task responses and 25% on post-task responses. Thus, a large number of responses of Ss who had never even seen model performances made were rated as copied. Since these latter values were not functionally zero and at least one exceeded the percentage values in the post-task, High and Low Model conditions, further statistical analyses were considered meaningless.

Simple copying was therefore not judged to have occurred to a greater degree after model exposure than to responses where indeed no model had as yet been presented.

Appendix V presents 2 Parallel Lines responses of "buildings" resembling somewhat the Model response of Appendix H, Item 2. Yet, these Ss had not seen

this type of response made before (one is a pre-task response, the other a post-task response after having observed a model perform on the Circles task. Note that none of the Circles task Model responses of Appendices J and K contain a response mode similar to that of this subject).

Measured inter-rater reliability was found to be low, $r = .03$, $df = 134$ (non-significant) for the pair of judges rating Circle task responses, and $r = .22$, $p < .01$, $df = 140$ (significant) for the pair of judges rating Parallel Lines task responses.

Thus, it was simultaneously demonstrated that some model responses resembled those of subject's original responses, even though Ss had never seen these model responses made, and that there was little inter-judge agreement as to what constituted similar or copied creative or uncreative acts. As such, the inter-rater reliability values reflect the complex nature of what is to be judged similar or dissimilar to creative (or uncreative) responses, or simply error due to this.

DISCUSSION

The role and effects of social observational modeling on creativity in the figural modality have been clearly demonstrated. The information which the model and his responses had presented to subjects produced effects both beneficial and detrimental to subject creativity in general, and to component creativity scores. Where subjects had viewed highly creative figural model responses, they themselves subsequently increased and generalized their creativity to a new and different stimulus set. Where a model displaying low creativity was present, subject creativity had conversely been diminished. Resultant behaviors had thus been demonstrated to have been acquired simply through the observational capabilities of the individual, without resort to any direct reinforcement administration or any direct training procedures. Where this model information was beneficial, increased creative production had resulted —— where model information was detrimental to creative production, a general decrease in performance relative to control conditions had occurred.

Whereas the information learned from the observance of model productions was significant in the figural modality, generalization of responses

to the verbal modality, where no model responses were presented, did not occur. The failure of such generalization to have taken effect can lead to several potential conclusions.

If this failure indeed represents a true state of affairs (that is, that modeling effects in creativity act primarily on given behaviors which subjects pay attention to), then implications of such effects are important, for instance, whenever educational goals in general are desired. In the present study, subjects paid specific attention to figural model responses, but verbal models were not included. In educational settings, on the other hand, many variables during classroom instruction come into play, and observers are not necessarily limited to teacher/model displays which are only figural in nature. Many behaviors are presented to students from various different modalities (instructor-visual demonstration, selected media-visual demonstration, instructor-verbal informative, etc.), and the student/observer may focus on any number of these or their component parts.

If, however, the educational requirements placed on the student are congruent with the specific behaviors being modeled from the instructor, subsequent student performance will be in part a function of the specific information conveyed to him. Thus, if a task requirement involves the figural or visual modality only, and an educator presents all his instructional materials in creative and unique manners across many different modalities, then the student who models the instructor's behaviors specific primarily to the figural modality will best achieve his educational requirements. If the responses modeled are primarily verbal in nature, and again congruent with the educational goals, the student may also achieve the requirements placed on him, this time in the verbal area. Conversely, if the instructor presents information in one modality detrimental to the student's goals, all requirements in that modality will be met with inferior performance.

Thus, the failure to find generalization of effects across two different modalities indicates the specificity of modeled effects regarding creativity. But then, only specific model responses were presented (specific to one modality), whereas

the "real" world presents continuous information (both detrimental and beneficial) in a multitude and variety of forms. As such, specific information from different forms may be modeled, and whenever these are then congruent with educational goals in general, the quality of what is modeled becomes important.

The effectiveness of this arguement can only be tested through a replication of the study, but with a reversal of the modalities modeled. If the verbal modality then demonstrates the same specificity of modeling effects as the figural had, the evidence will be supportive of this conclusion.

The evidence of specificity of modeling effects also reflects the need for an unrestricted definition of observable behaviors. That is, the demonstrator or model must not define, and therefore restrict the subject to specific modes of observational operation eventually leading to the production of creative products. Different individuals must be allowed to utilize their own, unique operating principles, both in model observance and creative response production. If the model restricts observation to given strategies, he restricts any potential modeling effects only to those individuals who utilize operating principles congruent with his.

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APPENDIX A

Preliminary Orientation instructions similar to those presented in the Torrance (1966) Tests of Creative Thinking

"This is an exercise whereby you will have a chance to think up new ideas and express them in forms of pictures or in writing. They will call for all of the imagination and thinking you have, and this exercise is designed in such a way that it is hoped you will actually enjoy doing some of these activities. So, we hope you'll do your best thinking and that you'll enjoy yourselves at the same time."

APPENDIX B

Initial General Instructions presented to subjects prior to pre-test measurements

"The activities in the sheets that will be passed to you will give you a chance to use your imagination in thinking up ideas and putting them together in various ways. There are no 'right' or 'wrong' answers like there are in some classroom exercises. We want you to see how many ideas you can think of. In each activity, we want you to use what ever means you can to try to think of the most interesting, unusual, and clever ideas you can —— something that no one else might think of.

There are four different things to do and you will be given a time limit on each activity, so make good use of your time. Work as fast as you can without rushing. If you run out of ideas before time is called, wait until instructions are given before going on to the next activity. Sometimes, if you will just sit and think, more ideas will come to you and you can add those.

If you have any questions after we start, don't speak out loud. Raise your hand, and I will come to you and try to answer your questions."

APPENDIX C

Instructions presented to subjects for the completion of the Unusual Uses of Cardboard Boxes (Verbal) task of the Torrance (1966) Tests of Creative Thinking

"Most people throw their empty cardboard boxes away, but they have thousands of interesting and unusual uses. In the spaces below and on the next page, list as many of these interesting and unusual uses as you can think of. Do not limit yourself to any one size of box. You may use as many boxes as you like. Do not limit yourself to the uses you have seen or heard about; think about as many possible new uses as you can.

There are five minutes for this task. Are there any questions. Allright, you may begin."

APPENDIX D

Instructions presented to subjects for the completion of the Unusual Uses of Tin Cans (Verbal) task of the Torrance (1966) Tests of Creative Thinking

"Most people throw their tin cans away, but they have thousands of interesting and unusual uses. In the spaces below and on the next page, list as many of these interesting and unusual uses as you can think of. Do not limit yourself to any one size of can. You may use as many cans as you like. Do not limit yourself to the uses you have seen or heard about; think about as many possible new uses as you can.

There are five minutes for this task. Are there any questions? Allright, you may begin."

APPENDIX E

Instructions to subjects for the completion of the Repeated Figures — Lines (Figural) task of the Torrance (1966) Tests of Creative Thinking

"In this next section of the booklet, again use your imagination to think up ideas that no one else might think of. After you think of an idea, keep adding to it and build it up so that it will be most interesting and exciting as possible.

Please turn to the next page and again follow the instructions as I read them aloud.

In 5 minutes see how many objects or pictures you can make from the pairs of straight lines below and on the next pages. The pairs of straight lines should be the main part of whatever you make. With your pencil or pen add lines to the pairs of lines to complete your picture. You can place marks between the lines, on the lines, and outside the lines — whatever you want to in order to make your picture. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can. Add names or titles below the objects.

There are five minutes for this task. Are there any questions? Allright, you may begin."

APPENDIX F

Instructions presented to subjects for the completion of the Repeated Figures —— Circles (Figural) task of the Torrance (1966) Tests of Creative Thinking

"In this next section of the booklet, again use your imagination to think up ideas that no one else might think of. After you think of an idea, keep adding to it and build it up so that it will be most interesting and exciting as possible.

Please turn to the next page and again follow the instructions as I read them aloud.

In 5 minutes see how many objects or pictures you can make from the circles below and on the next pages. The circles should be the main part of whatever you make. With your pencil or pen add lines to the circles to complete your picture. You can place marks inside the circles, outside the circles, or both inside and outside the circles —— whatever you want in order to make your picture. Again, try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can into each one. Make them tell as complete and as interesting a story as you can. Add names or titles below the objects.

There are five minutes for this task. Are there any questions? Allright, you may begin."

APPENDIX G

Explanations to subjects pertaining to the model's presence and display of performed tasks prior to the "Exposure to Model" Condition

EXPLANATIONS: REPEATED FIGURES —— LINES

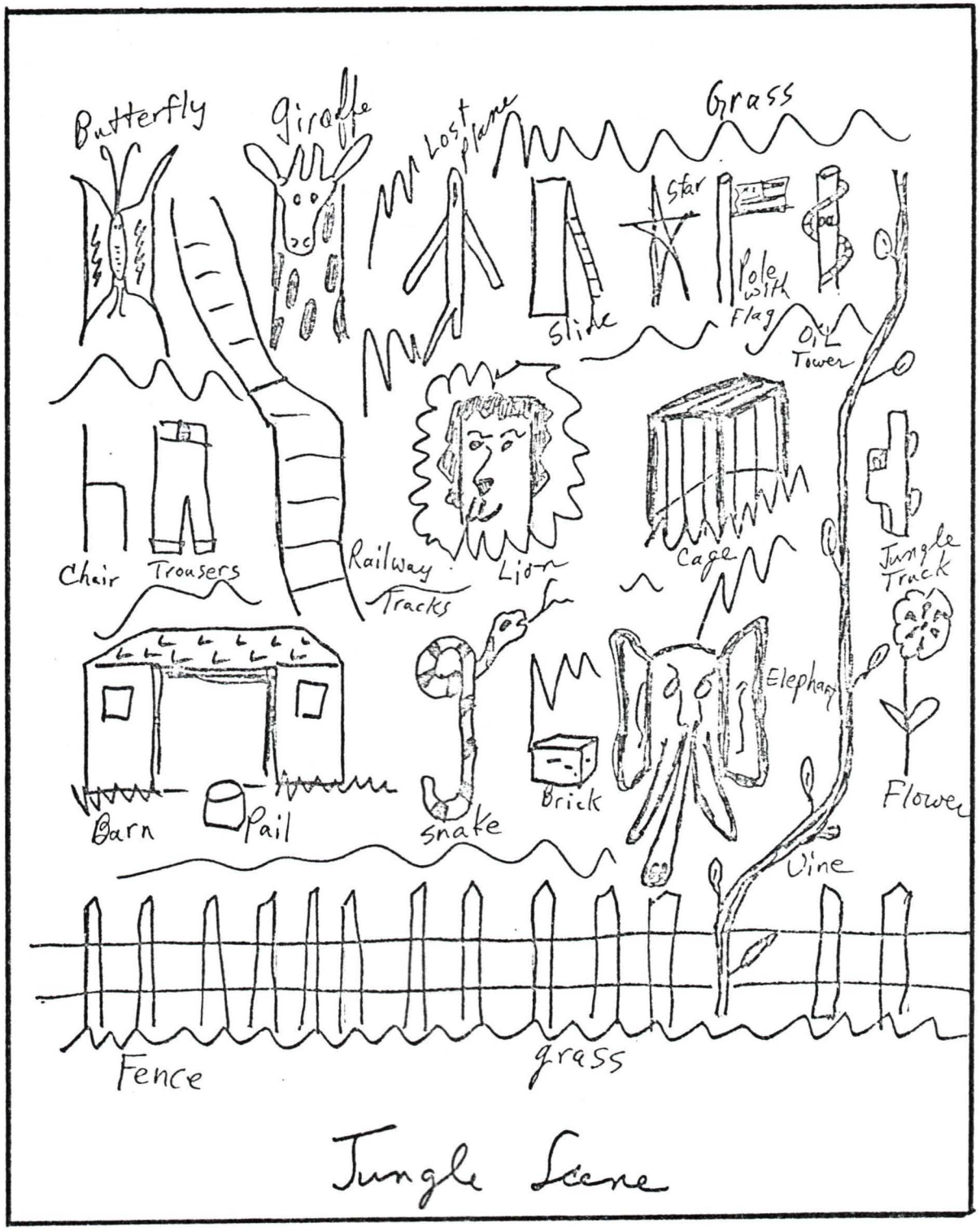
"In this part of the exercise, I'm going to demonstrate some of the possible objects or pictures that can be made from the same pairs of straight lines that you have been using, along with some names or titles. Again, the pairs of straight lines are the main part of whatever is made."

EXPLANATIONS: REPEATED FIGURES —— CIRCLES

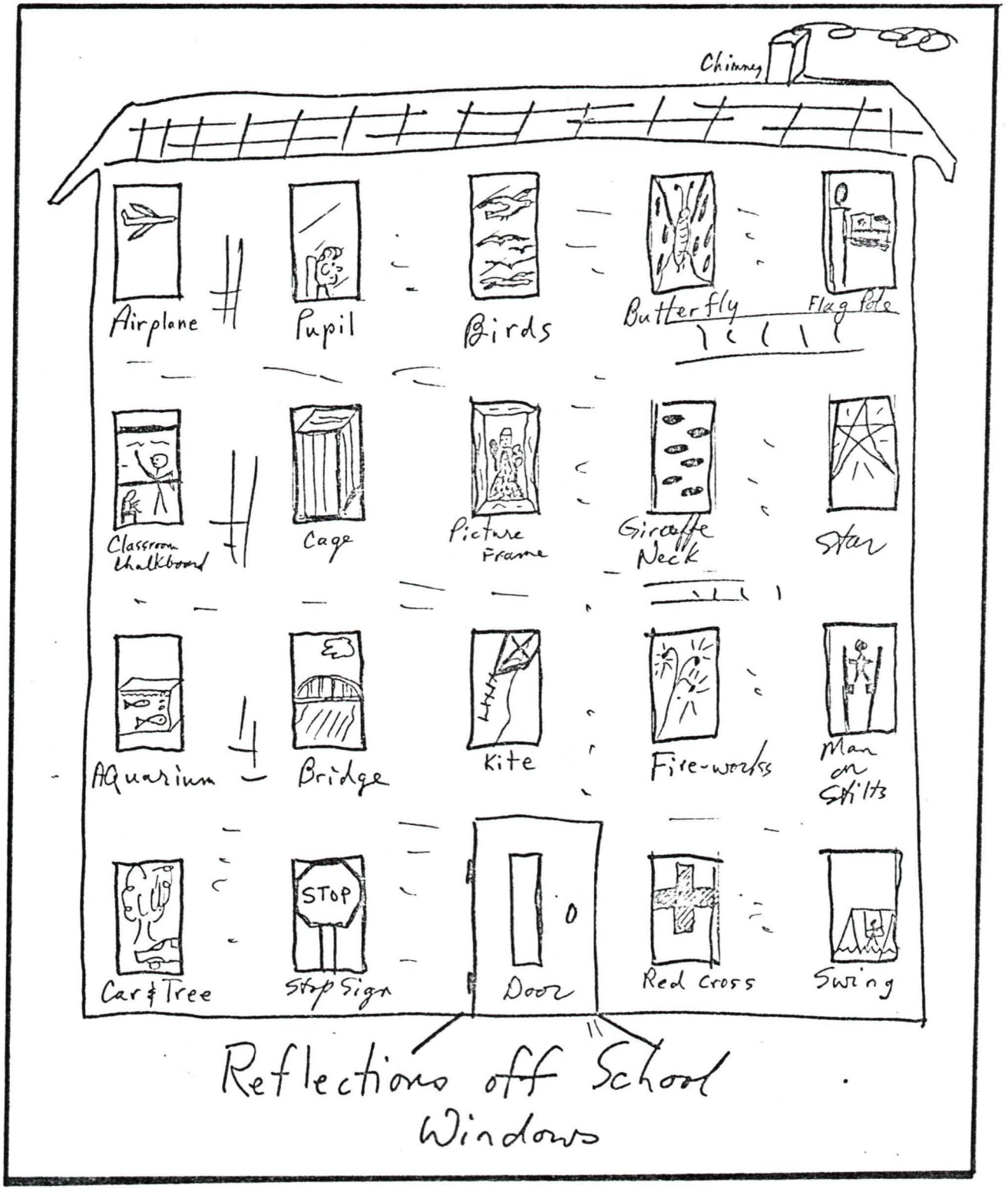
"In this part of the exercise, I'm going to demonstrate some of the possible objects or pictures that can be made from the same circles that you have been using, along with some names or titles. Again, the circles are the main part of whatever is made."

APPENDIX H

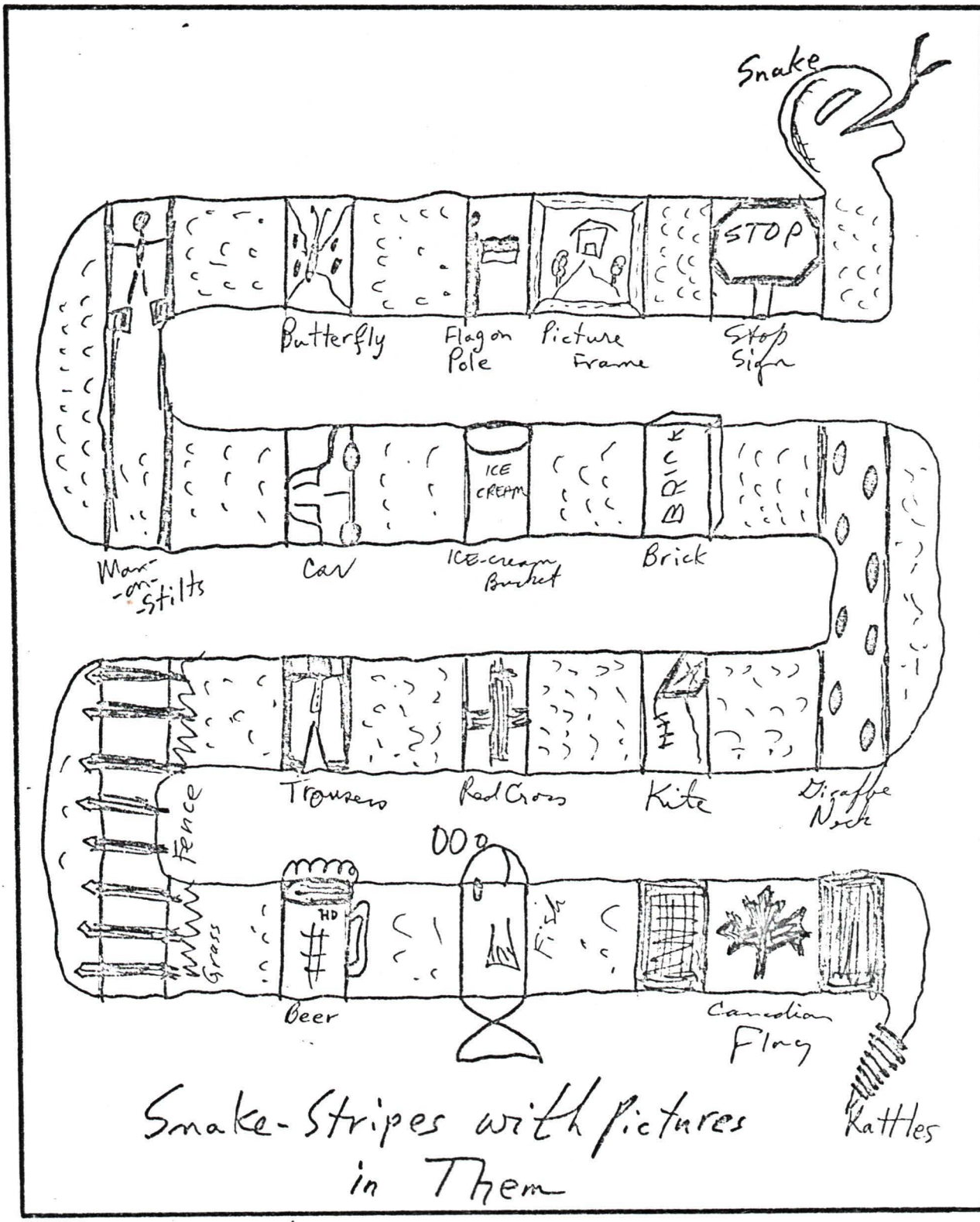
Model display items for the Figural (Repeated Figures) — Lines task of the Torrance (1966) Tests of Creative Thinking, High Creative Model Condition


Butterfly
Giraffe
Lost plane
Grass
Star
Pole with Flag
Slide
Oil Tower
Chair
Trousers
Railway Tracks
Lion
Cage
Jungle Track
Barn
Pail
Snake
Brick
Elephant
Flower
Vine
Fence
grass
Jungle Scene

Item 1.


Chimney
Airplane
Pupil
Birds
Butterfly
Flag Pole
Classroom Chalkboard
Cage
Picture Frame
Giraffe Neck
Star
Aquarium
Bridge
Kite
Fire-works
Man on Stilts
Car & Tree
STOP
Stop Sign
Door
Red Cross
Swing
Reflections off School Windows

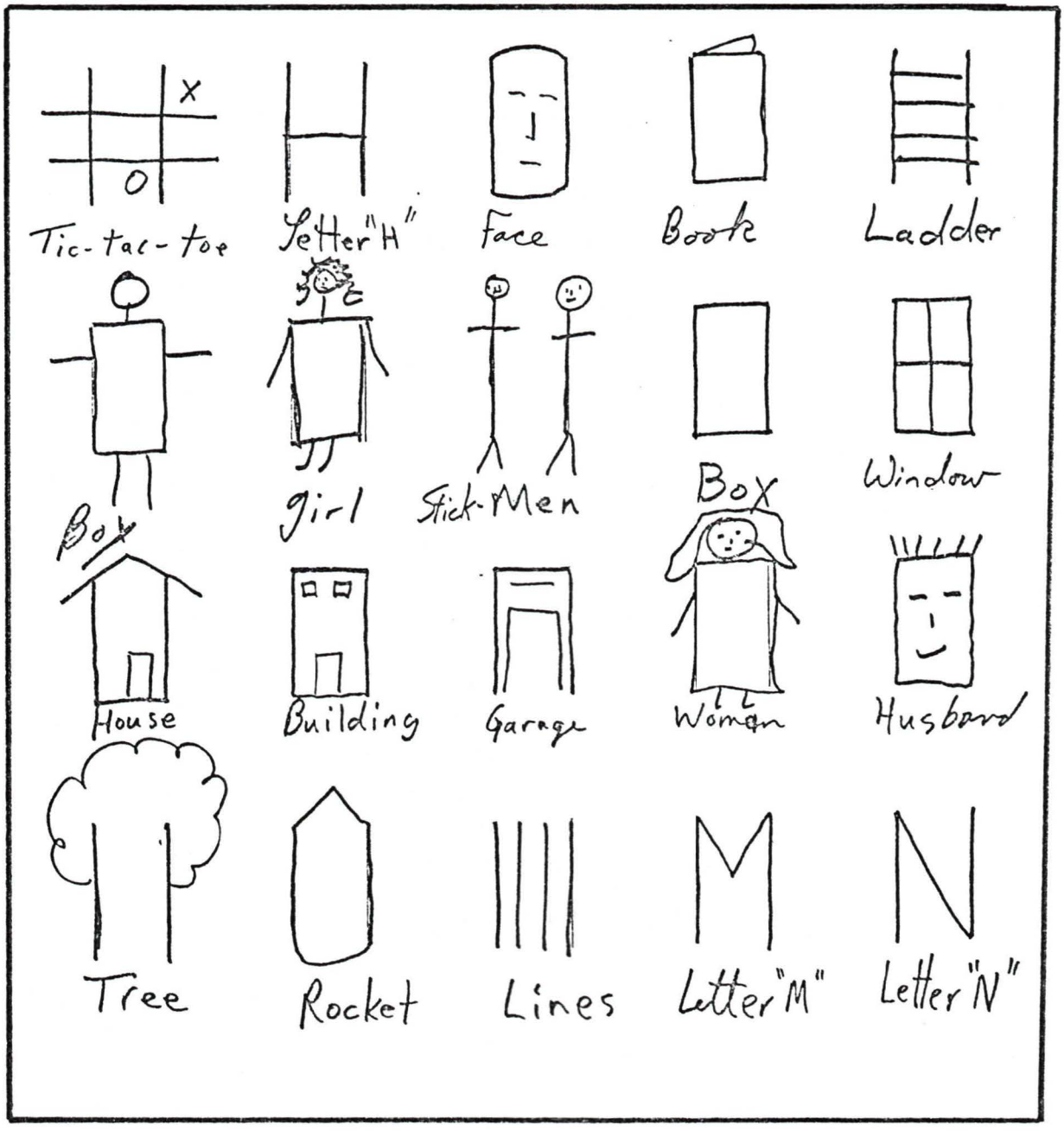
Item 2.


Snake
STOP
Butterfly
Flag on Pole
Picture Frame
Stop Sign
ICE CREAM
Man-on-Stilts
Car
Ice-cream Bucket
Brick
Trousers
Red Cross
Kite
Giraffe Neck
Fence
Grass
HD
Beer
Fish
Canadian Flag
Rattles
Snake-Stripes with Pictures in Them

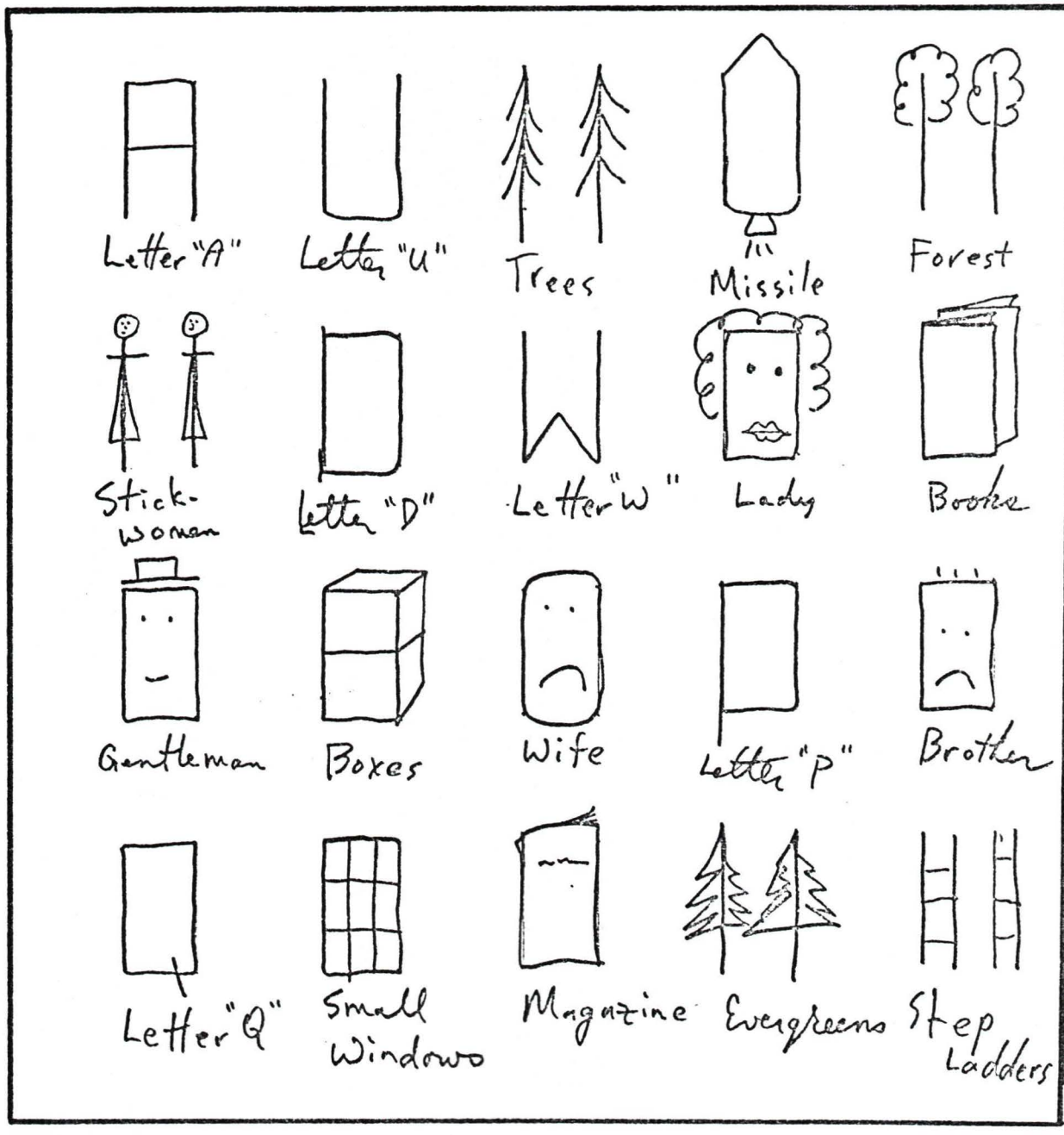
Item 3.

APPENDIX I

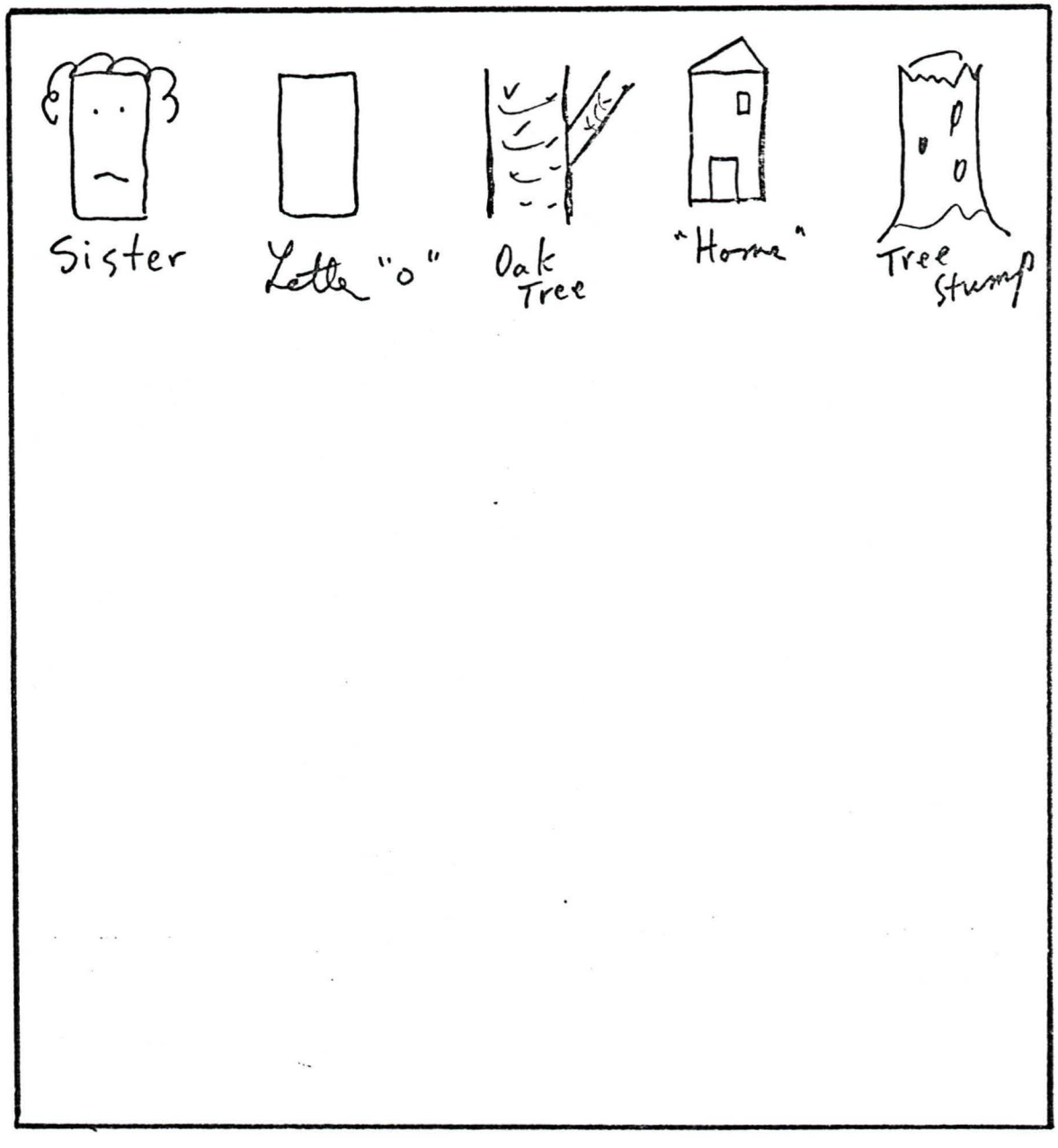
Model display items for the Figural (Repeated Figures) —— Lines task of the Torrance (1966) Tests of Creative Thinking, Low Creative Model Condition


X
O
Tic-tac-toe
Letter "H"
Face
Book
Ladder
Girl
Stick-Men
Box
Window
Box
House
Building
Garage
Woman
Husband
Tree
Rocket
Lines
Letter "M"
Letter "N"

Item 1.


Letter "A"
Letter "U"
Trees
Missile
Forest
Stick-woman
Letter "D"
Letter "W"
Lady
Books
Gentleman
Boxes
Wife
Letter "P"
Brother
Letter "Q"
Small Windows
Magazine
Evergreens
Step Ladders

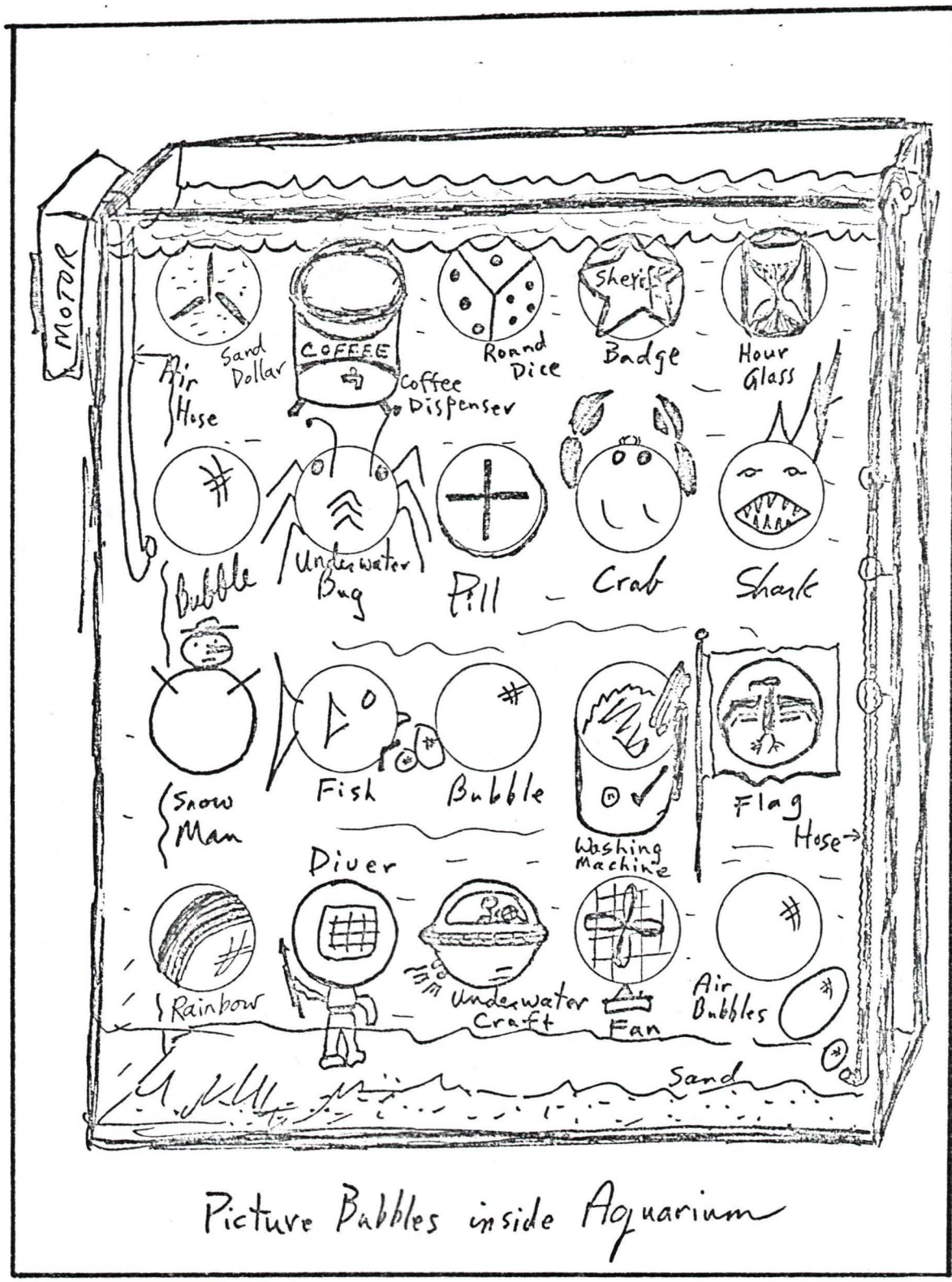
Item 2.



Item 3.

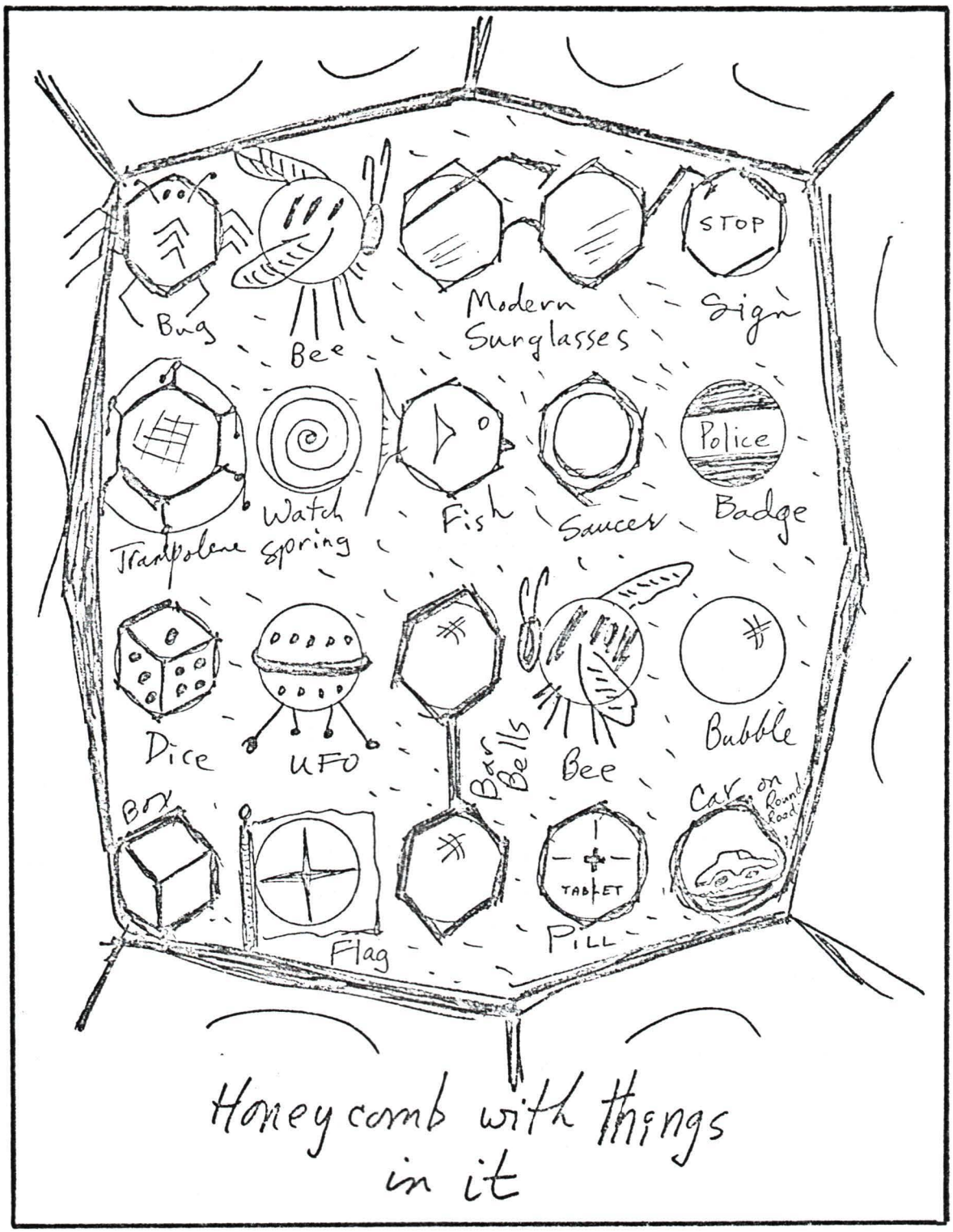
APPENDIX J

Model display items for the Figural (Repeated Figures) —— Circles task of the Torrance (1966) Tests of Creative Thinking, High Creative Model Condition.

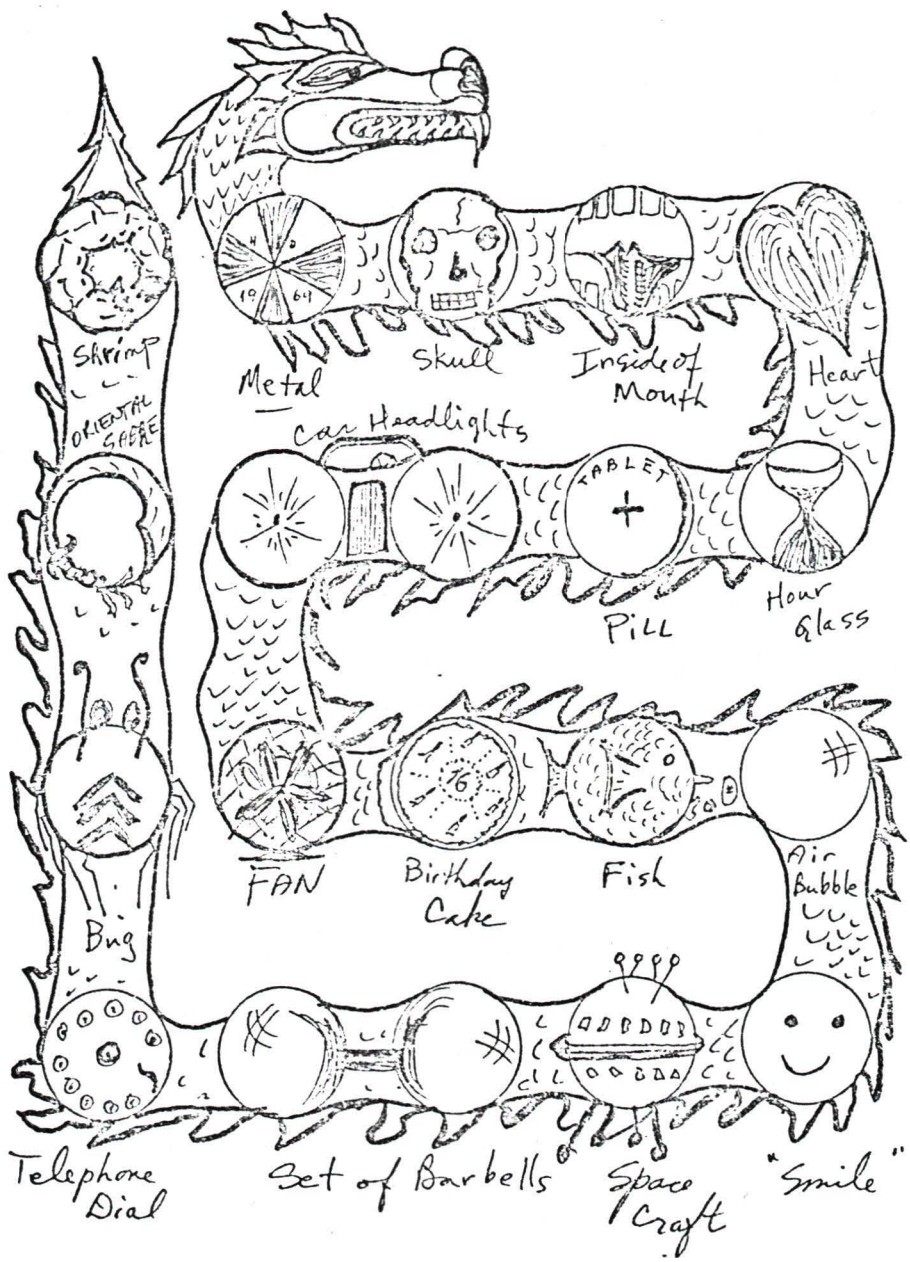


Picture Bubbles inside Aquarium

Item 1.


Bug
Bee
Modern Sunglasses
STOP
Sign
Trampolene
Watch spring
Fish
Saucer
Police
Badge
Dice
UFO
Bells
Bee
Bubble
Box
Flag
TABLET
Pill
Car on Round Road
Honeycomb with things in it

Item 2.

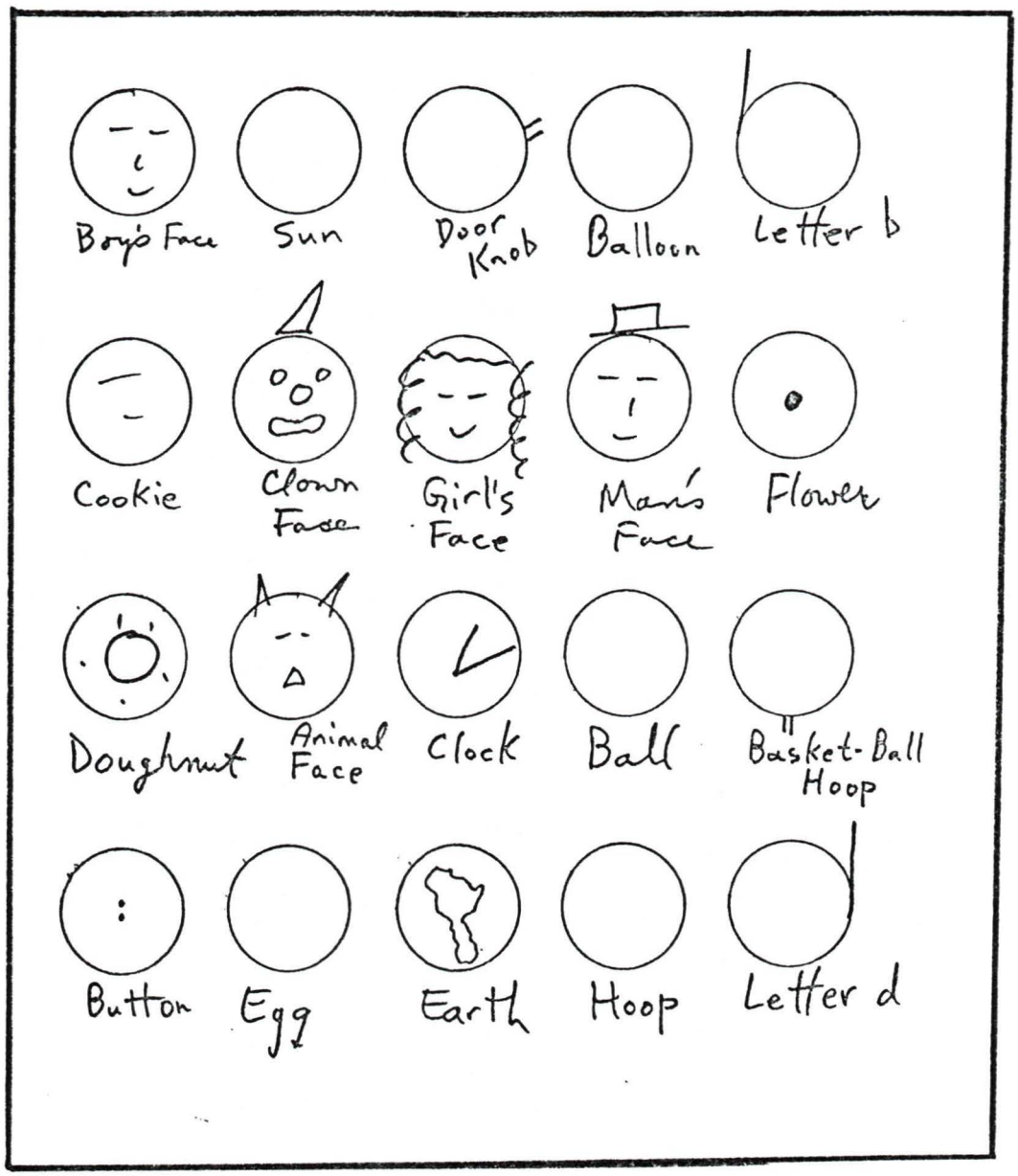


Colorful Dragon

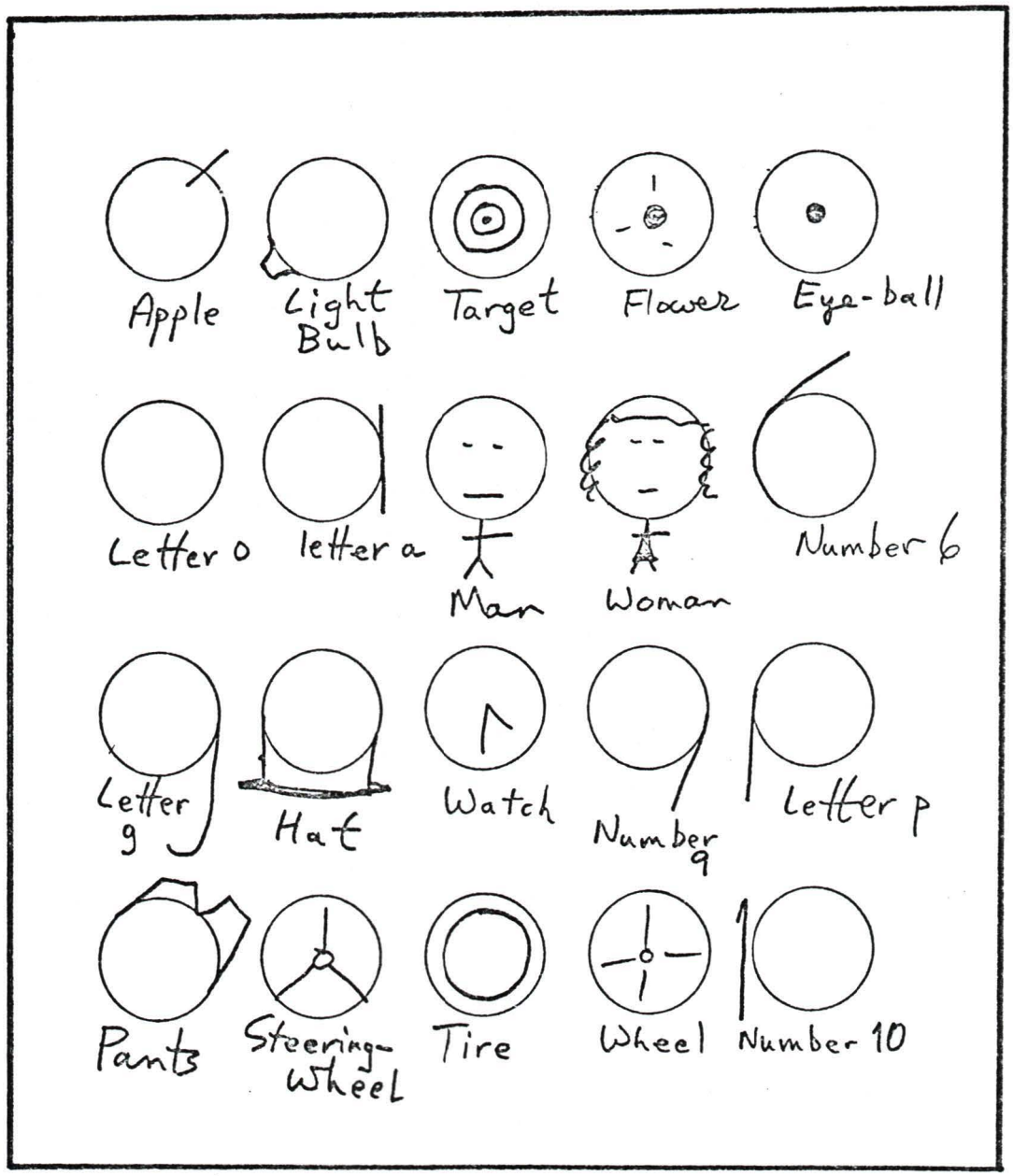
Item 3.

APPENDIX K

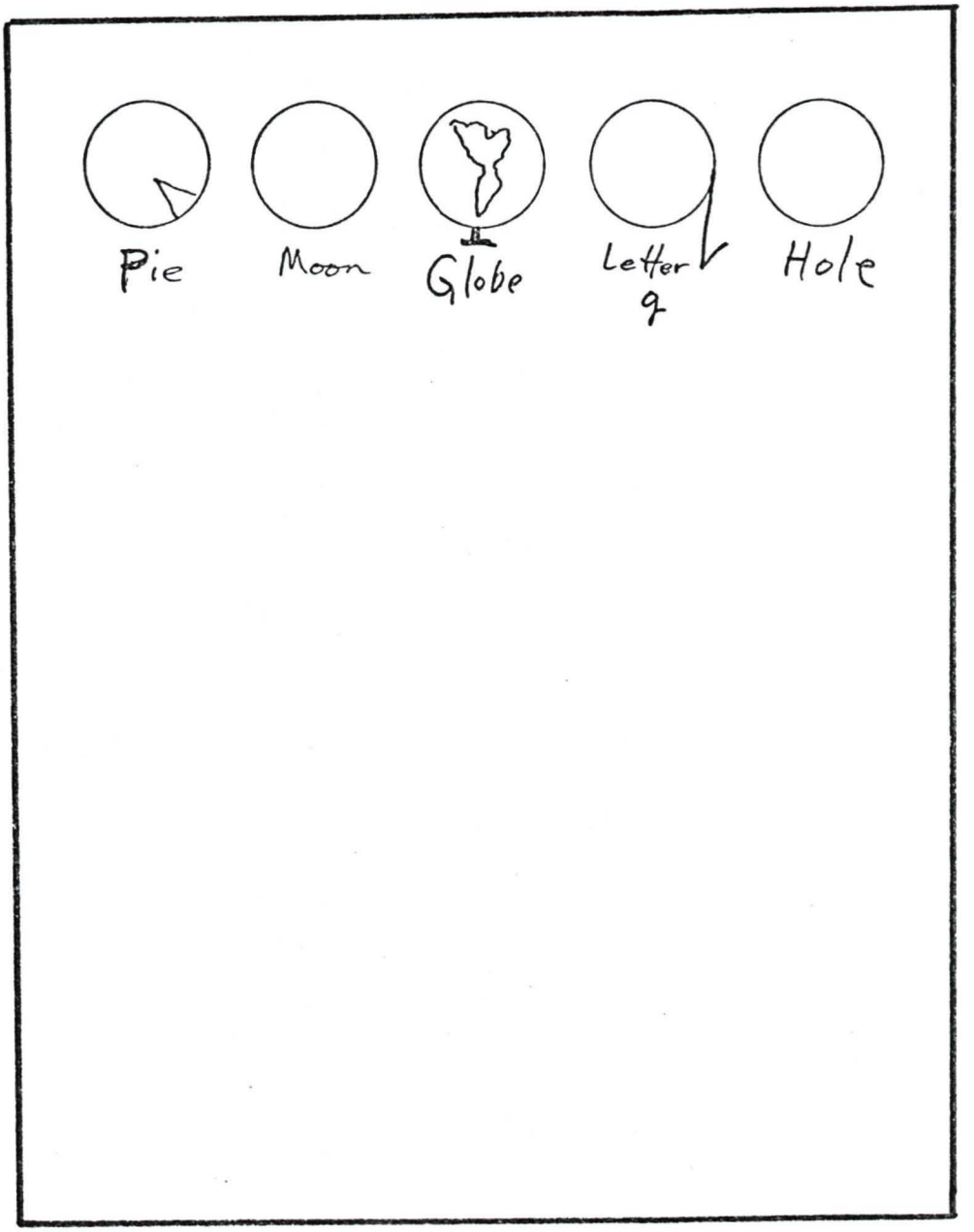
Model display items for the Figural (Repeated Figures) —— Circles task of the Torrance (1966) Tests of Creative Thinking, Low Creative Model Condition


Boy's Face
Sun
Door Knob
Balloon
Letter b
Cookie
Clown Face
Girl's Face
Man's Face
Flower
Doughnut
Animal Face
Clock
Ball
Basket-Ball Hoop
Button
Egg
Earth
Hoop
Letter d

Item 1.


Apple
Light Bulb
Target
Flower
Eye-ball
Letter o
letter a
Man
Woman
Number 6
Letter g
Hat
Watch
Number 9
Letter p
Pants
Steering-wheel
Tire
Wheel
Number 10

Item 2.



Item 3.

APPENDIX L

Descriptive statistics for the T-score

Figural data

Table 3

Descriptive Statistics for T-score Figural Data

Collapsed over Tasks and Model Conditions

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.02	55.91	49.91	59.80	50.03	57.03
Median	48.17	54.25	48.70	56.64	49.88	56.30
Standard Deviation	9.98	9.96	10.00	14.22	10.06	12.71
Variance	99.60	99.24	100.03	202.06	101.21	161.57

	ORIGINALITY		ELABORATION		%-FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	49.94	56.09	50.05	50.67	85.29	81.64
Median	47.00	54.10	48.70	49.50	87.79	82.93
Standard Deviation	9.93	12.11	10.04	8.50	15.76	17.97
Variance	98.61	99.24	100.87	72.30	248.38	322.82

	%-ORIGINALITY	
Test measure	Pre-	Post
Mean	61.55	61.79
Median	62.50	64.00
Standard Deviation	21.20	22.53
Variance	449.34	507.66

Table 4

Descriptive Statistics for Pre-test T-score Figural Data with Tasks Held Separate and Model Conditions Collapsed

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY		ORIGINALITY		ELABORATION	
Figural Task	Lines	Circles	Lines	Circles	Lines	Circles	Lines	Circles	Lines	Circles
Mean	50.00	50.03	49.95	49.87	50.03	50.03	49.95	49.93	50.05	50.05
Median	48.00	48.50	47.83	49.50	50.75	48.75	46.32	47.75	48.36	49.50
Standard Deviation	10.06	9.99	10.07	10.02	10.10	10.11	9.99	9.95	10.10	10.07
Variance	101.12	99.76	101.44	100.32	101.97	102.17	99.85	99.05	101.98	101.47

Table 5

T-score Figural Summary Data for the High Model Observation Condition

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	48.38	60.83	50.13	56.03	50.68	53.75
Median	46.83	61.00	49.17	54.50	50.50	52.50
Standard Deviation	10.48	9.33	11.05	9.76	9.86	13.75
Variance	109.73	87.02	122.11	95.20	97.25	189.17

	ORIGINALITY		ELABORATION		%-FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	48.93	65.83	48.03	52.33	84.83	92.25
Median	47.00	65.00	45.83	51.83	88.00	99.73
Standard Deviation	9.93	12.60	9.92	7.65	15.61	13.52
Variance	98.64	158.81	98.33	58.48	243.64	182.76

	%-ORIGINALITY	
Test measure	Pre-	Post-
Mean	58.60	79.45
Median	58.50	80.50
Standard Deviation	19.39	14.96
Variance	375.83	223.69

Table 6

T-score Figural Summary Data for the

Low Model Observation Condition

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.65	53.93	49.35	70.93	48.63	63.73
Median	46.50	52.25	49.75	71.50	48.50	65.53
Standard Deviation	9.99	8.39	10.17	14.91	10.66	10.16
Variance	99.87	70.33	103.41	222.17	113.52	103.13

	ORIGINALITY		ELABORATION		%-FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.53	51.10	51.13	47.35	85.83	66.40
Median	47.50	48.50	49.00	46.00	89.50	63.50
Standard Deviation	9.86	7.94	11.15	6.40	18.55	16.40
Variance	97.23	63.07	124.37	40.95	344.25	268.96

	%-ORIGINALITY	
Test measure	Pre-	Post-
Mean	67.20	44.60
Median	66.50	42.50
Standard Deviation	21.46	18.72
Variance	460.62	350.45

Table 7

T-score Figural Summary Data for the Control Condition

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	51.03	52.98	50.25	52.45	50.80	53.60
Median	49.50	50.50	47.17	49.83	49.75	50.36
Standard Deviation	9.49	10.38	8.90	10.11	9.75	11.47
Variance	90.08	107.82	79.22	102.20	94.99	131.63

	ORIGINALITY		ELABORATION		%-FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.38	51.35	51.00	52.33	85.23	86.28
Median	46.75	49.50	50.83	51.00	86.10	86.50
Standard Deviation	10.17	8.95	8.88	10.21	13.02	12.55
Variance	103.42	80.13	78.77	104.28	169.46	157.59

	%-ORIGINALITY	
Test measure	Pre-	Post-
Mean	58.85	61.33
Median	58.50	60.50
Standard Deviation	22.03	18.75
Variance	485.46	351.71

APPENDIX M

T-Distributions between the *Figural Lines* and *Circles* tasks on the component creativity scores

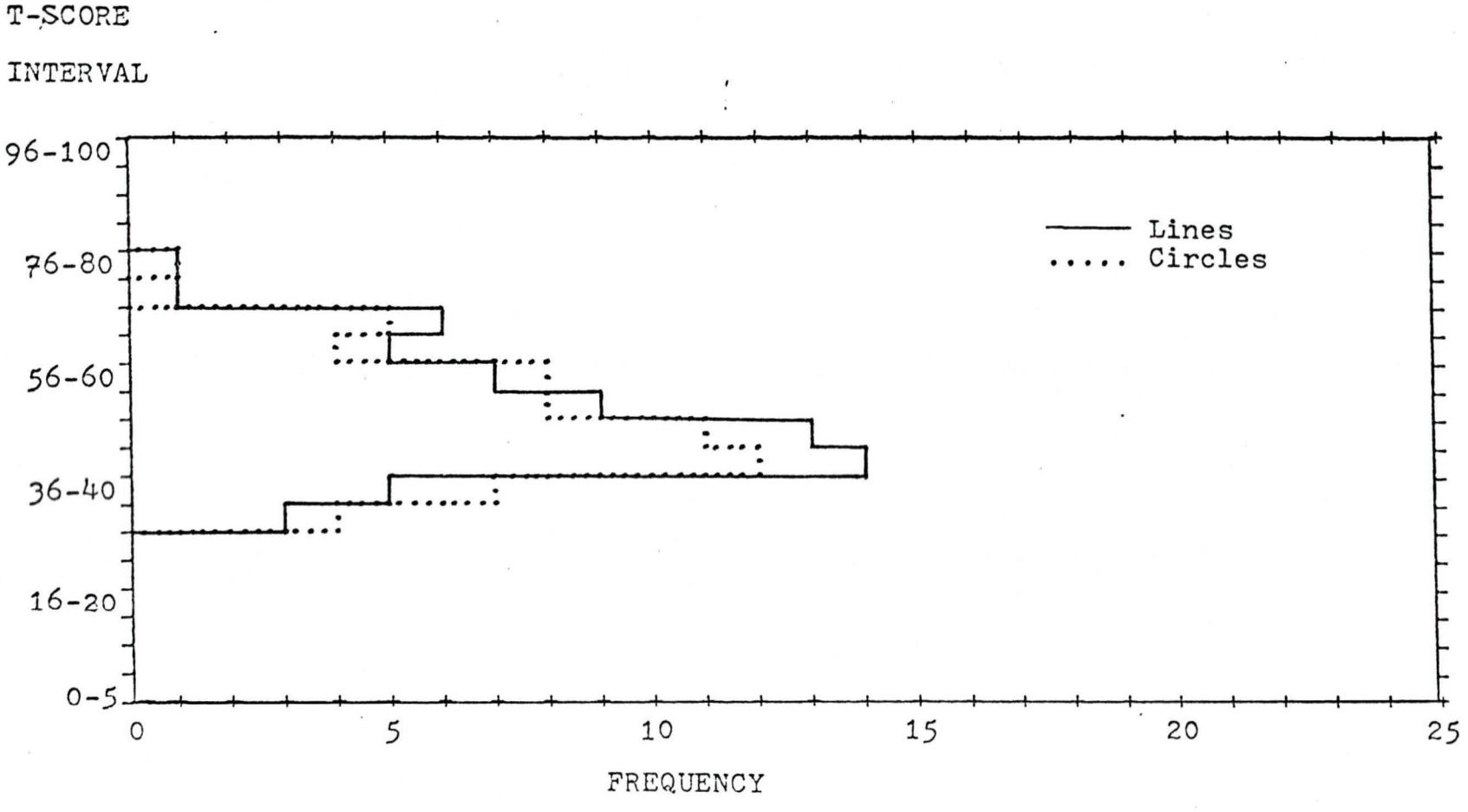


Figure 13. T-Distributions between the figural tasks on the Total Creativity component.

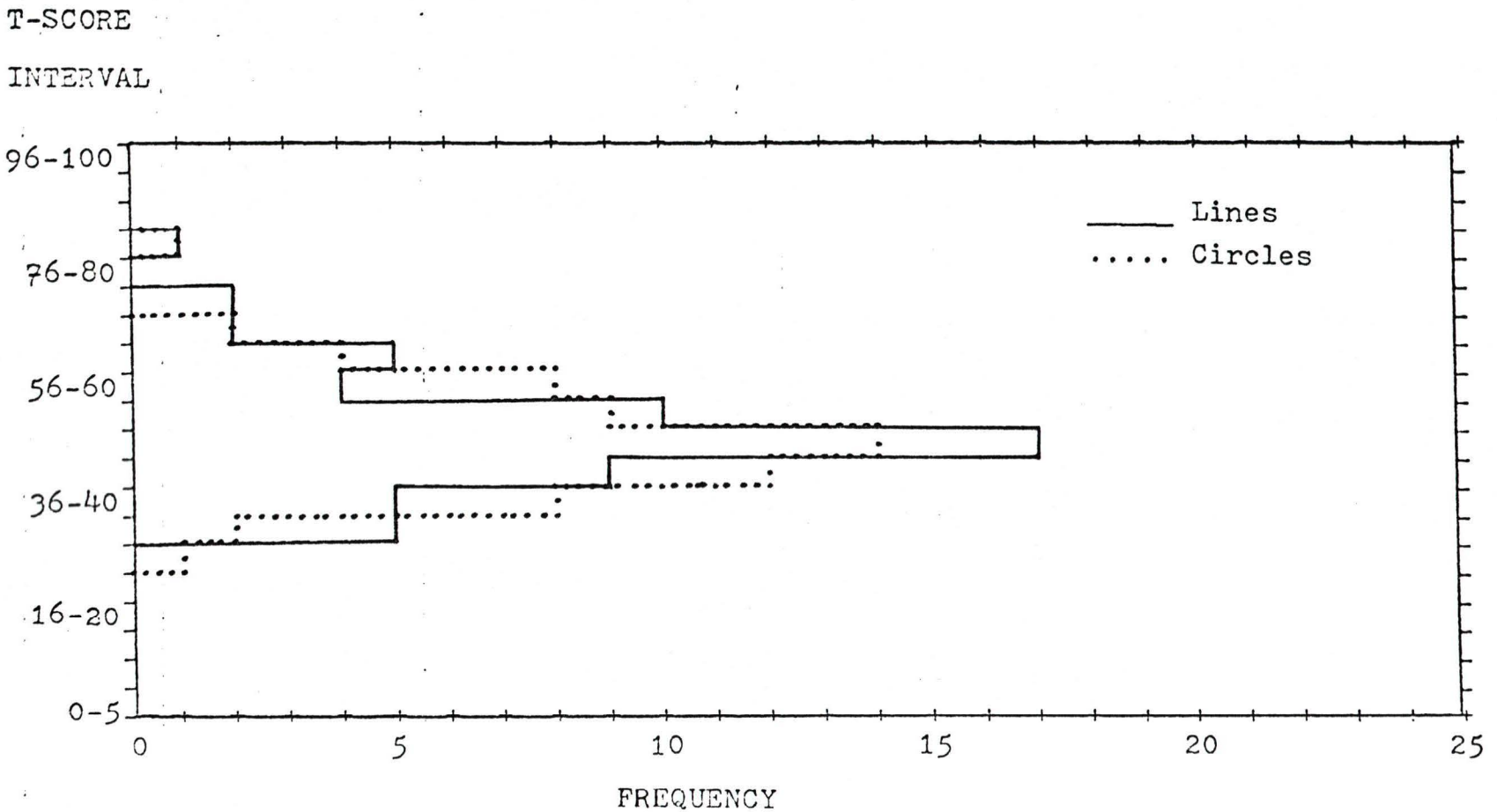


Figure 14. T-Distributions between the figural tasks on the Fluency component.

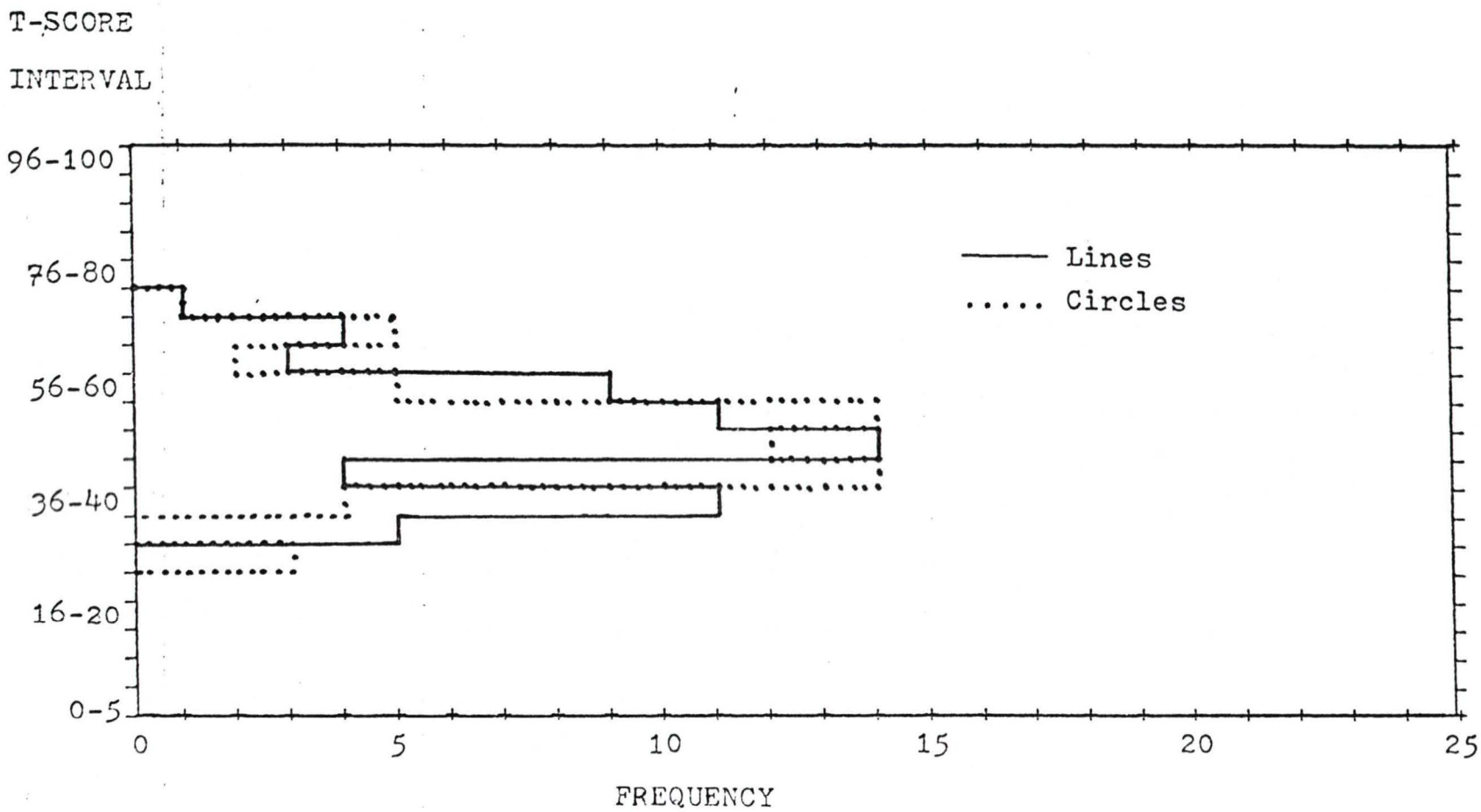


Figure 15. T-Distributions between the figural tasks on the Flexibility component.

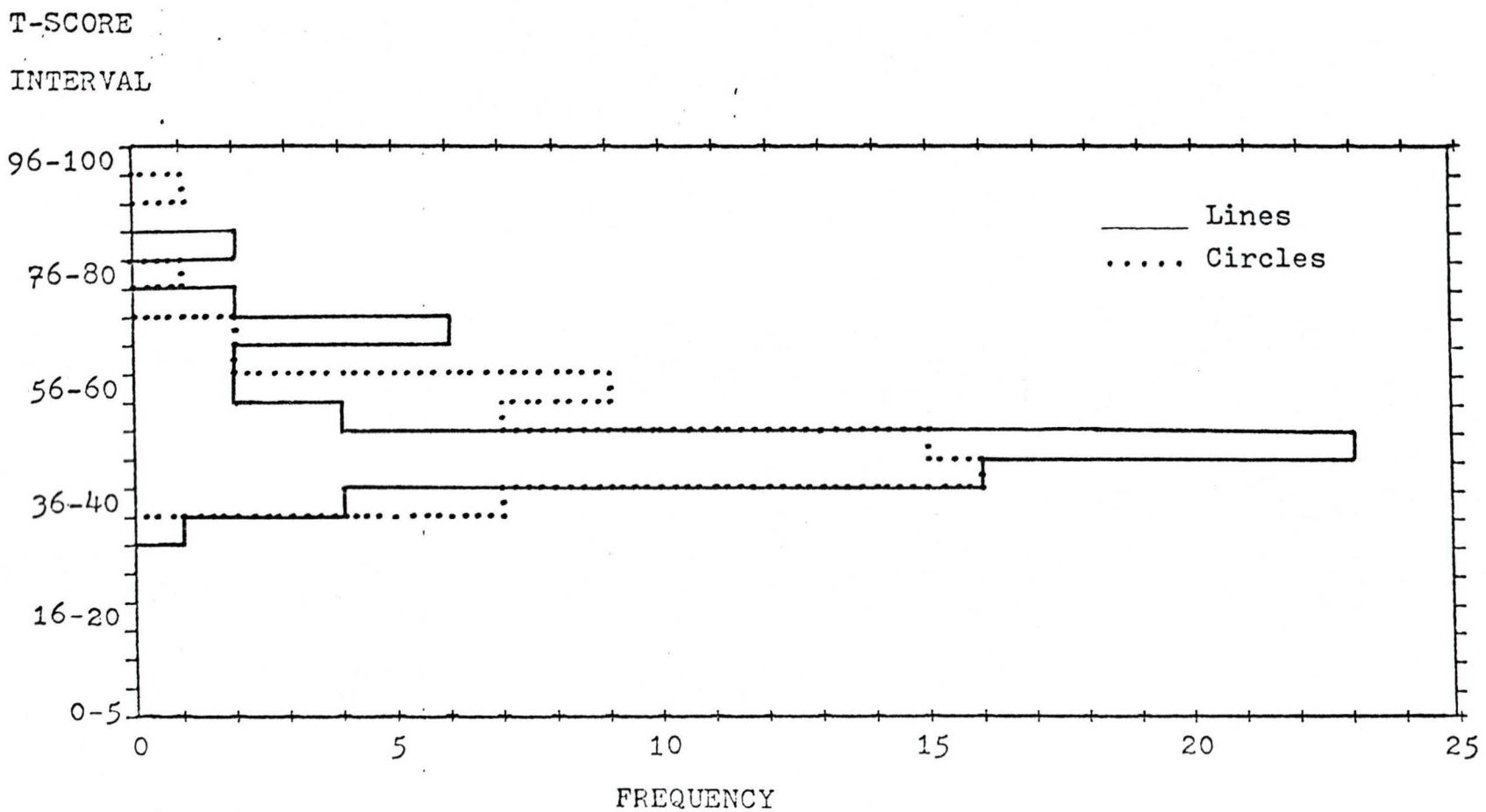


Figure 16. T-Distributions between the figural tasks on the Originality component.

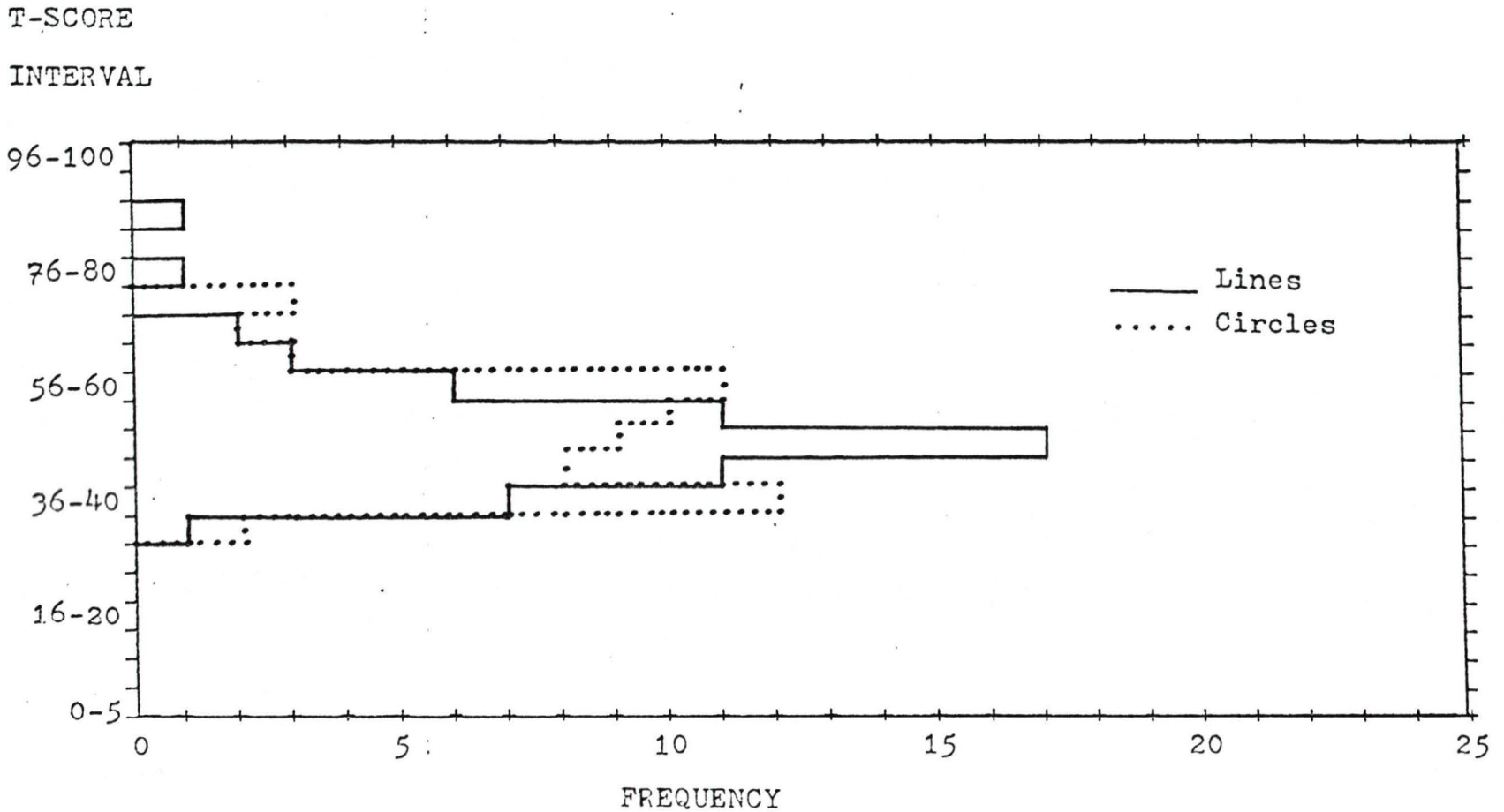
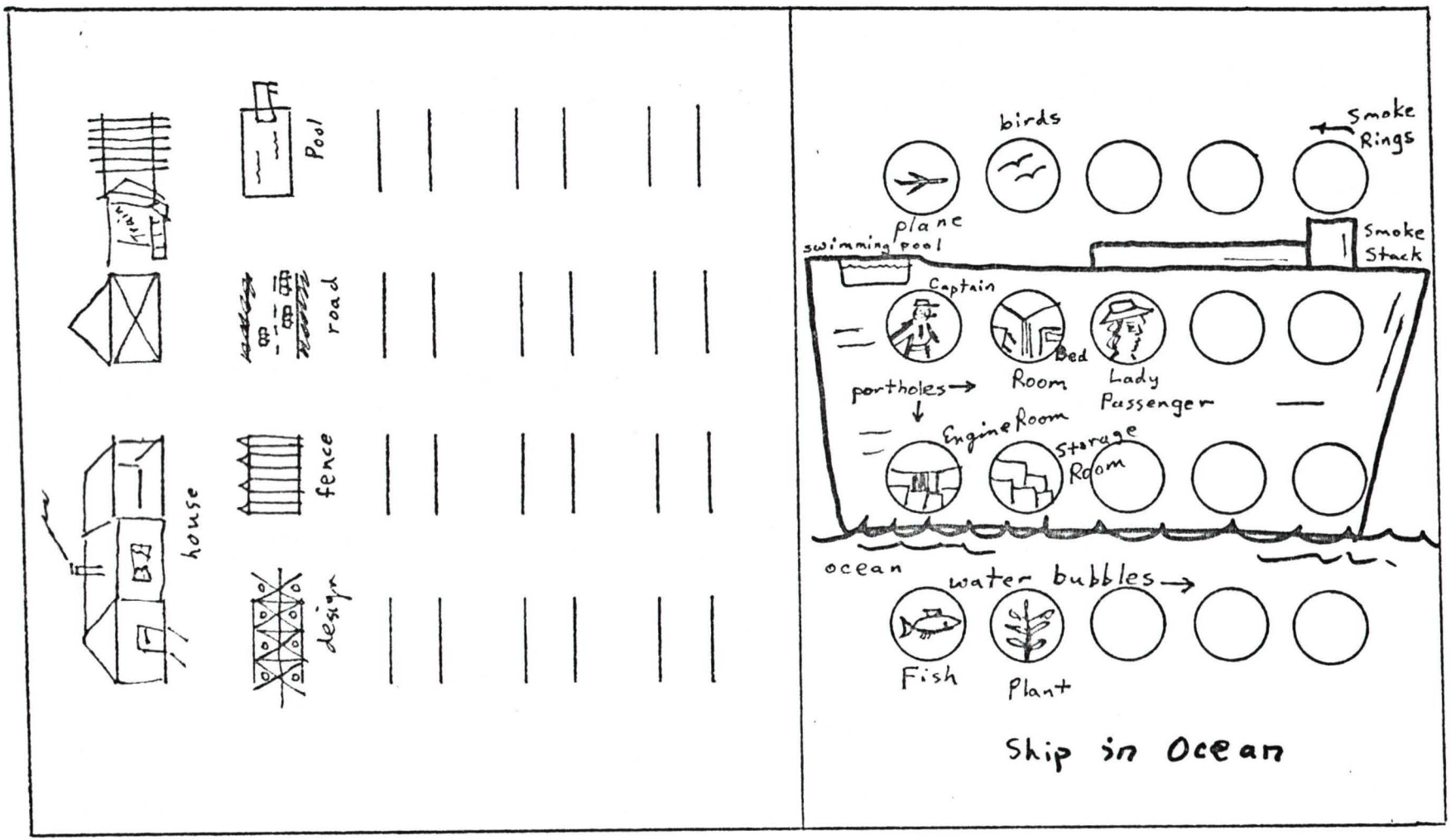


Figure 17. T-Distributions between the figural tasks on the Elaboration component.

APPENDIX N

Reconstructed portions of pre- and post-task Figural responses showing increased general creativity after model observance during the High Creativity condition

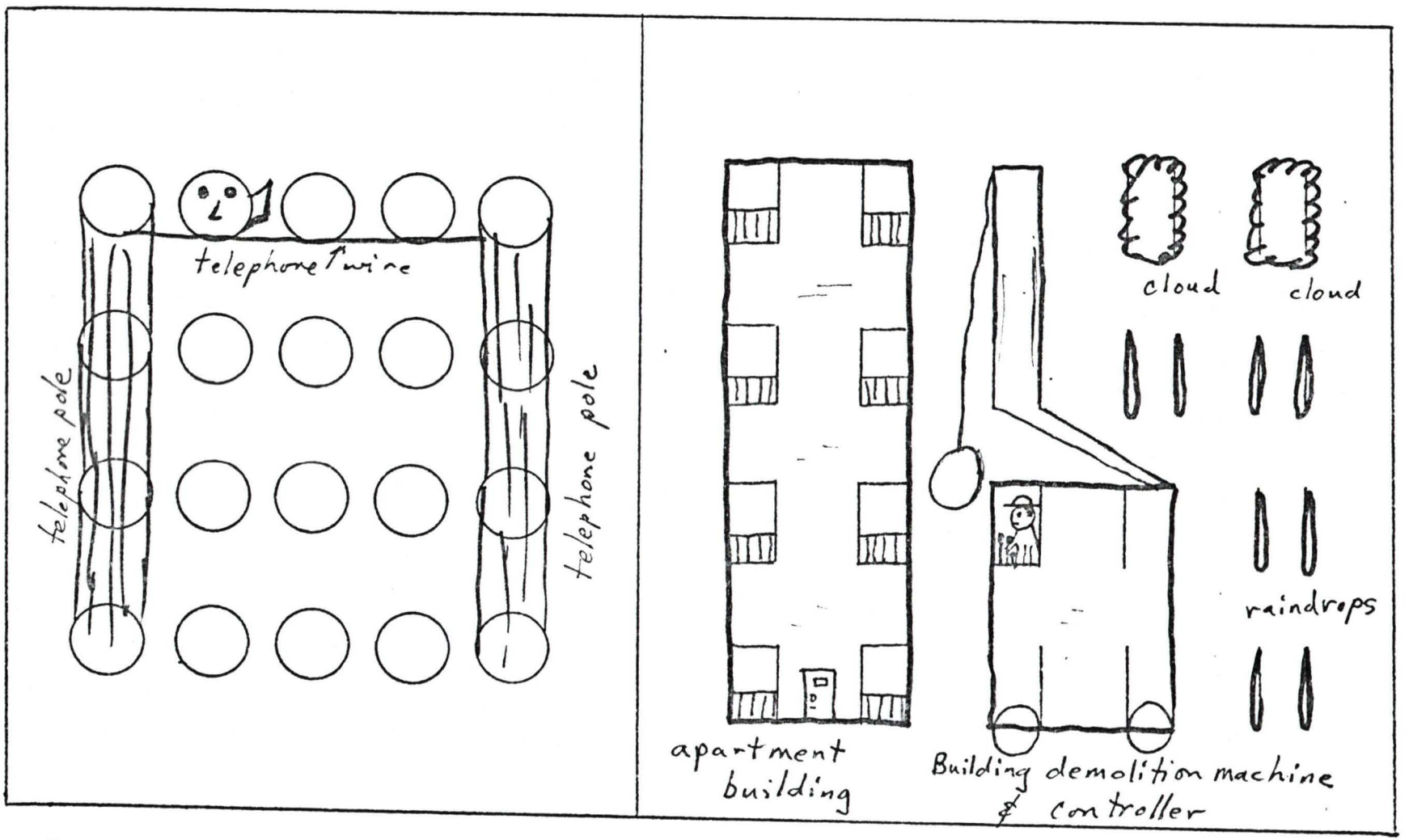
(15% original size reduction of stimulus figures)



Pre-task responses

Item 1.

Post-task responses



Pre-task responses

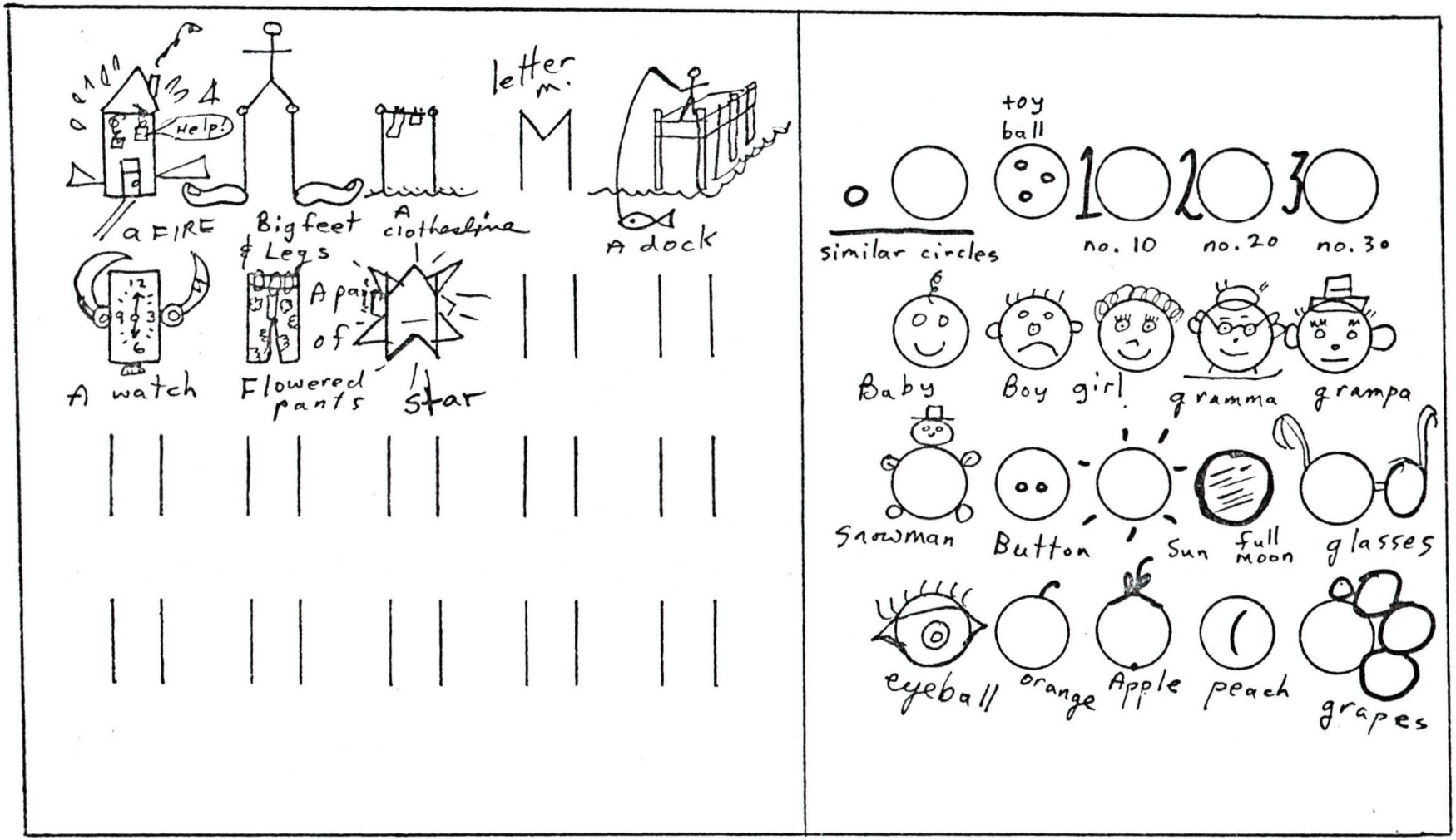
Item 2.

Post-task responses

APPENDIX O

Reconstructed portions of pre- and post-task Figural responses showing decreased general creativity after model observance during the Low Creativity condition

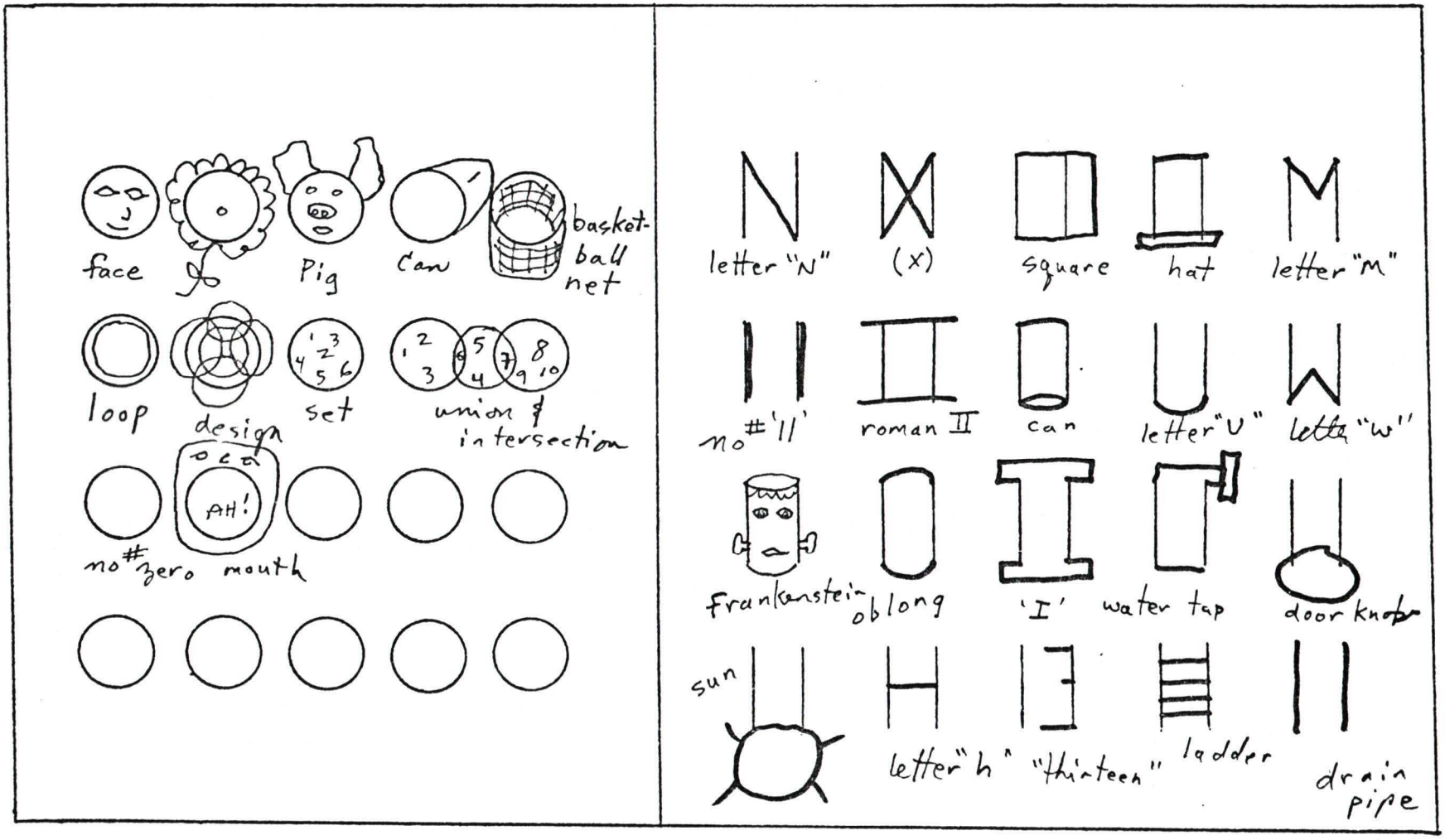
(15% original size reduction of stimulus figures)



Pre-task responses

Post-task responses

Item 1.



Pre-task responses

Item 2.

Post-task responses

APPENDIX P

Results of the Scheffé Multiple Range Test for the $p < .05$ level of significance on the component Figural difference scores across the High, Low, and Control Model Conditions

Table 8

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Total Creativity (Figural) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	2615.81	1307.91	14.24	$p < .001$
Within	117	10745.78	91.84		
Total	119	13361.59			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	12.45	3.28	1.95	Between H and (L,C)

Table 9

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Fluency (Figural) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	8463.81	4231.90	39.54	$p < .001$
Within	117	12521.79	107.02		
Total	119	20985.59			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	5.90	21.58	2.20	Between L and (H,C)

Table 10

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Flexibility (Figural) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	3946.21	1973.11	13.41	$p < .001$
Within	117	17216.78	147.15		
Total	119	21163.00			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	3.08	15.10	2.80	Between L and (H,C)

Table 11

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Originality (Figural) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	6936.47	3468.47	33.36	$p < .001$
Within	117	12166.36	103.99		
Total	119	19103.30			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	16.90	0.58	0.98	Between H and (L,C)

Table 12

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Elaboration (Figural) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	1334.22	667.11	6.06	$p < .05$
Within	117	12884.15	110.12		
Total	119	14218.36			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	4.30	-3.78	1.33	Between (H,C) and (L,C)
				Between H and L

Table 13

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the %-Flexibility (Figural) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	15743.83	7871.91	20.57	$p < .001$
Within	117	44783.46	382.76		
Total	119	60527.30			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	7.43	-19.43	1.05	Between (H,C) and L

Table 14

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the %-Originality (Figural) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	38057.29	19028.65	41.83	$p < .001$
Within	117	53222.70	454.89		
Total	119	91279.94			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	20.85	-22.60	2.48	Between H and C and L

APPENDIX Q

Descriptive statistics for

the T-score Verbal

data

Table 15

Descriptive Statistics for T-score Verbal Data

Collapsed over Tasks and Model Conditions

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.01	57.63	49.98	57.53	49.94	54.78
Median	49.40	57.17	48.67	55.77	48.72	53.30
Standard Deviation	9.97	13.76	9.91	13.80	9.98	10.18
Variance	99.34	189.26	98.17	190.54	99.59	103.53

	ORIGINALITY		ELABORATION		%-FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.03	57.14	49.98	52.42	71.48	67.69
Median	46.50	53.90	48.50	50.79	71.13	67.40
Standard Deviation	9.94	15.42	9.93	11.12	15.12	14.90
Variance	98.74	237.89	98.55	123.59	228.74	222.08

	%-ORIGINALITY	
Test measure	Pre-	Post-
Mean	37.36	39.33
Median	35.33	38.50
Standard Deviation	15.56	15.74
Variance	242.03	247.58

Table 16

Descriptive Statistics for Pre-test T-score Verbal Data with Tasks Held Separate and Model Conditions Collapsed

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY		ORIGINALITY		ELABORATION	
Verbal Task	Tin Cans	Card-board Boxes	Tin Cans	Card-board Boxes	Tin Cans	Card-board Boxes	Tin Cans	Card-board Boxes	Tin Cans	Card-board Boxes
Mean	49.43	50.58	50.05	49.92	50.37	49.52	51.30	48.77	47.75	52.22
Median	49.33	49.50	48.83	47.17	49.30	48.10	48.70	46.10	46.25	51.50
Standard Deviation	10.18	9.80	10.83	8.99	9.99	10.03	10.42	9.34	9.57	9.85
Variance	103.64	96.04	117.27	80.72	99.86	100.63	108.59	87.30	91.65	96.99

Table 17

T-score Verbal Summary Data for the

High Model Observation Condition

Test measure	TOTAL CREATIVITY Pre-	TOTAL CREATIVITY Post-	FLUENCY Pre-	FLUENCY Post-	FLEXIBILITY Pre-	FLEXIBILITY Post-
Mean	50.15	60.08	51.20	59.18	51.50	55.20
Median	49.50	59.50	49.50	56.17	49.00	53.50
Standard Deviation	9.39	15.16	9.56	14.16	9.88	9.31
Variance	88.23	229.81	91.40	209.12	97.64	86.63

Test measure	ORIGINALITY Pre-	ORIGINALITY Post-	ELABORATION Pre-	ELABORATION Post-	%-FLEXIBILITY Pre-	%-FLEXIBILITY Post-
Mean	50.63	61.20	48.20	53.08	72.50	66.83
Median	46.17	58.70	46.50	51.00	71.50	67.50
Standard Deviation	10.66	17.36	8.64	11,16	17.55	16.02
Variance	113.57	301.39	74.57	124.64	308.15	256.56

Test measure	%-ORIGINALITY Pre-	%-ORIGINALITY Post-
Mean	36.13	42.15
Median	31.50	44.00
Standard Deviation	15.02	14.58
Variance	225.70	212.64

Table 18

T-score Verbal Summary Data for the

Low Model Observation Condition

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.73	58.10	50.78	60.25	49.95	56.63
Median	49.50	55.50	47.50	58.50	48.50	56.50
Standard Deviation	11.37	15.26	10.75	15.52	10.71	11.68
Variance	129.33	232.91	115.62	240.91	114.61	136.39

	ORIGINALITY		ELABORATION		%-FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	50.15	57.80	50.88	50.05	69.85	66.25
Median	46.50	54.50	49.00	48.00	68.85	66.25
Standard Deviation	10.49	17.64	11.77	11.10	12.88	15.78
Variance	110.13	311.24	138.63	123.28	165.77	248.96

	%-ORIGINALITY	
Test measure	Pre-	Post-
Mean	36.60	37.23
Median	35.17	37.75
Standard Deviation	16.02	17.87
Variance	256.60	319.46

Table 19

T-score Verbal Summary Data for the Control Condition

	TOTAL CREATIVITY		FLUENCY		FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	49.15	54.73	47.98	53.15	48.38	52.53
Median	49.00	55.50	46.17	51.10	48.70	52.50
Standard Deviation	9.18	9.99	9.29	10.07	9.31	9.17
Variance	84.23	99.74	86.23	101.31	86.60	84.00

	ORIGINALITY		ELABORATION		%-FLEXIBILITY	
Test measure	Pre-	Post-	Pre-	Post-	Pre-	Post-
Mean	49.33	52.43	50.88	54.13	72.08	70.00
Median	49.00	51.50	48.83	52.83	73.50	69.30
Standard Deviation	8.76	8.55	9.09	10.96	14.83	12.80
Variance	76.69	73.07	82.63	120.01	219.87	163.74

	%-ORIGINALITY	
Test measure	Pre-	Post-
Mean	39.35	38.60
Median	40.50	38.50
Standard Deviation	15.81	14.50
Variance	249.98	210.09

APPENDIX R

T-Distributions between the Verbal Tin Cans and Cardboard Boxes tasks on the component creativity scores

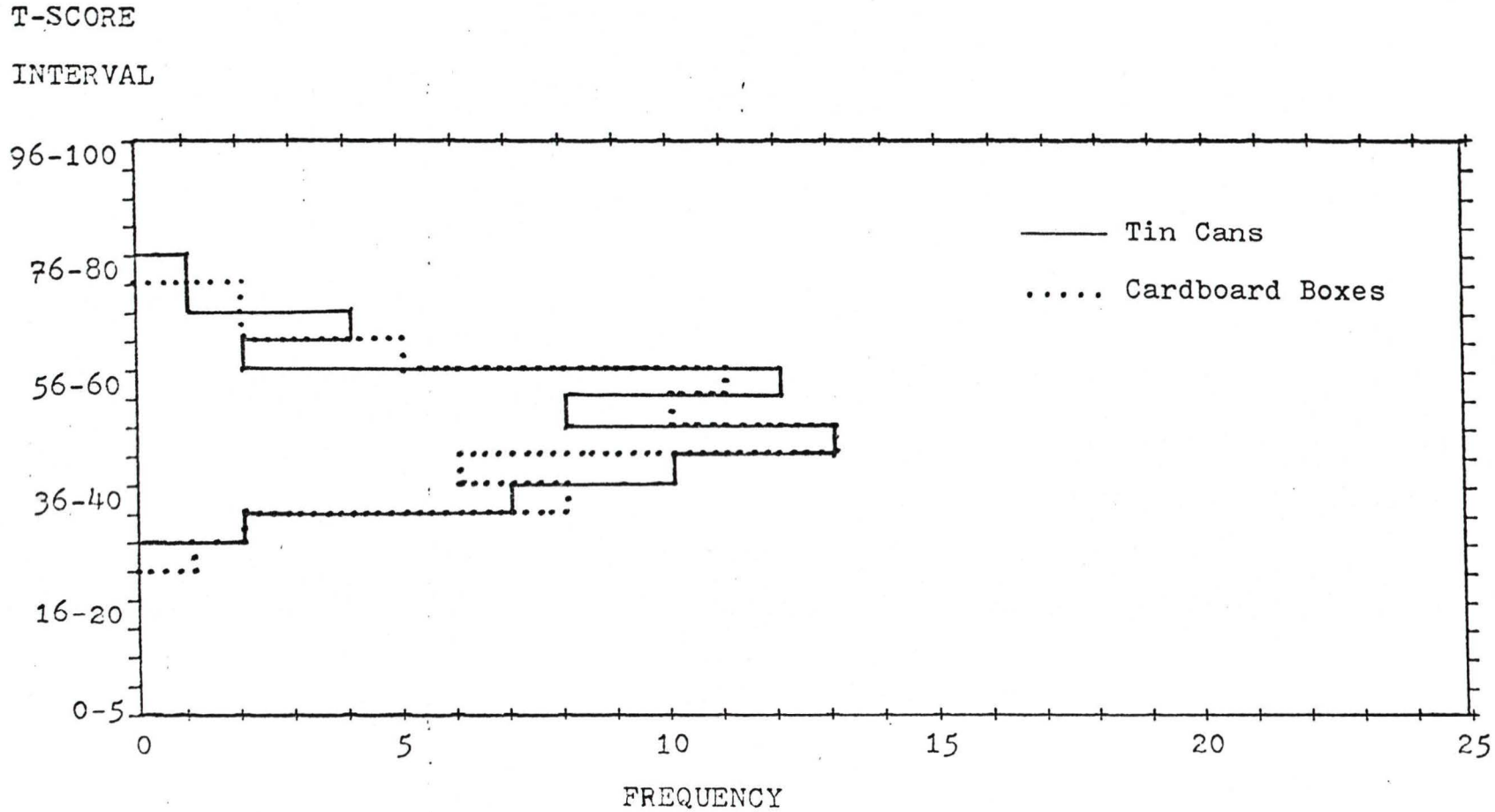


Figure 18. T-Distributions between the verbal tasks on the Total Creativity component.

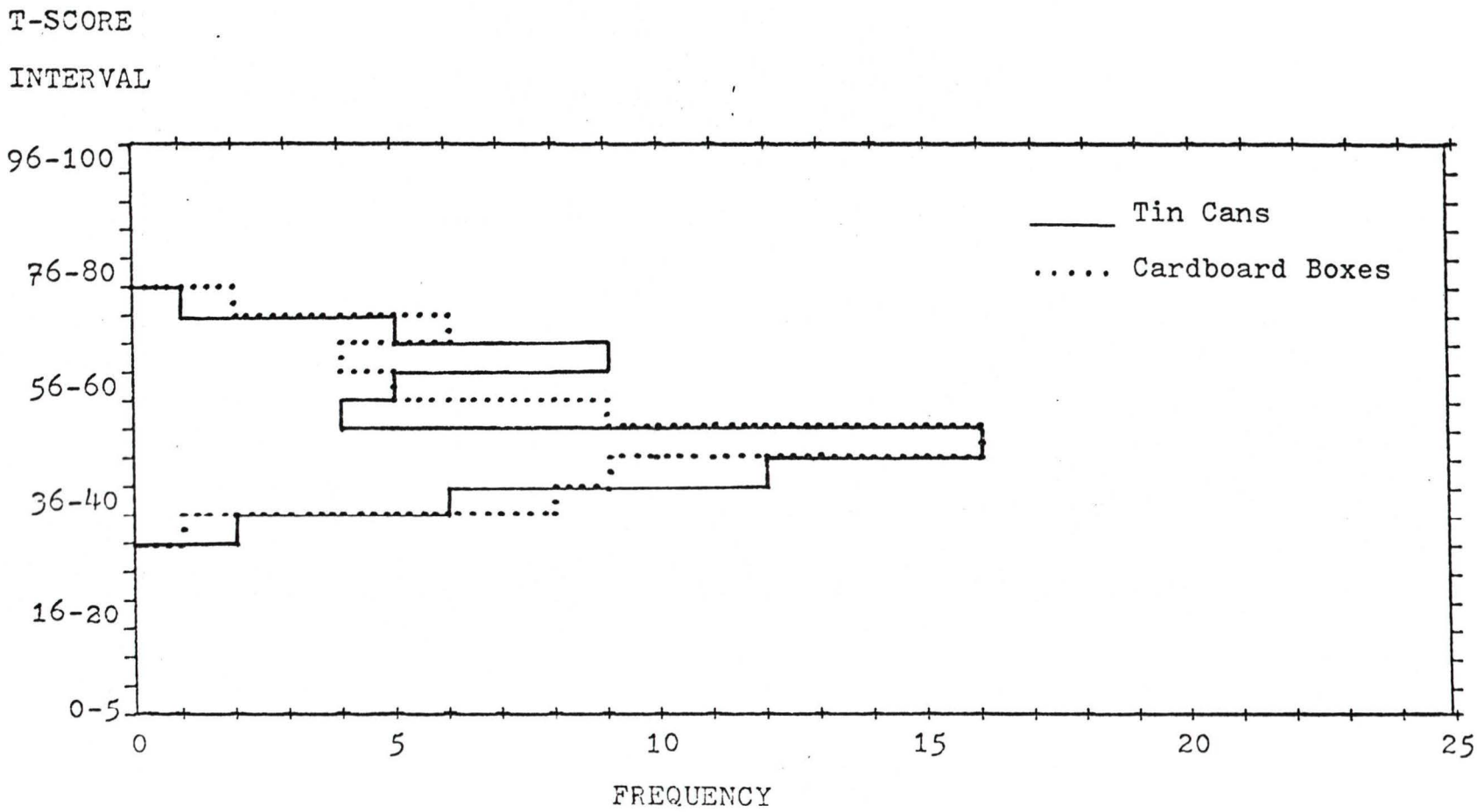


Figure 19. T-Distributions between the verbal tasks on the Fluency component.

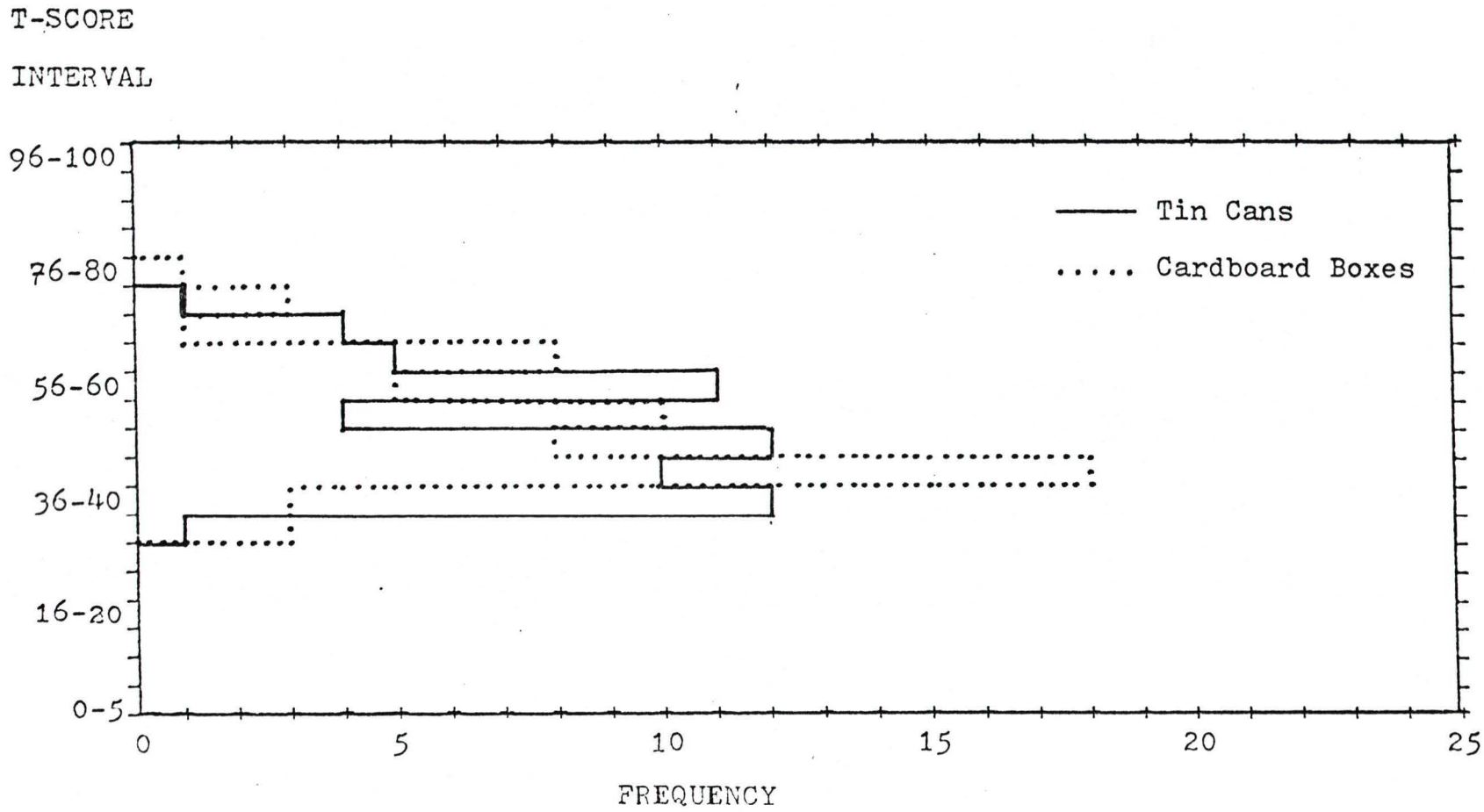


Figure 20. T-Distributions between the verbal tasks on the Flexibility component.

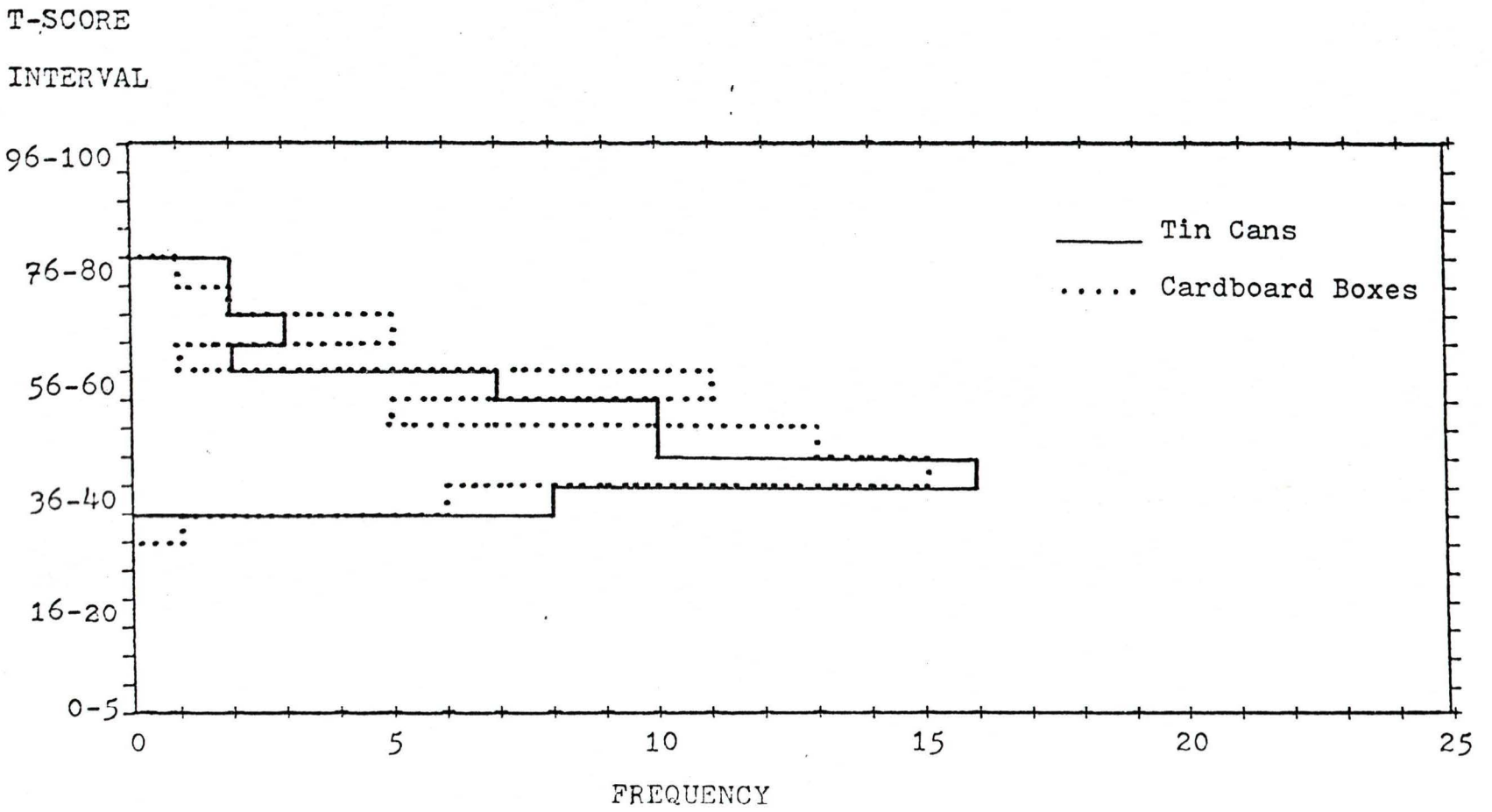


Figure 21. T-Distributions between the verbal tasks on the Originality component.

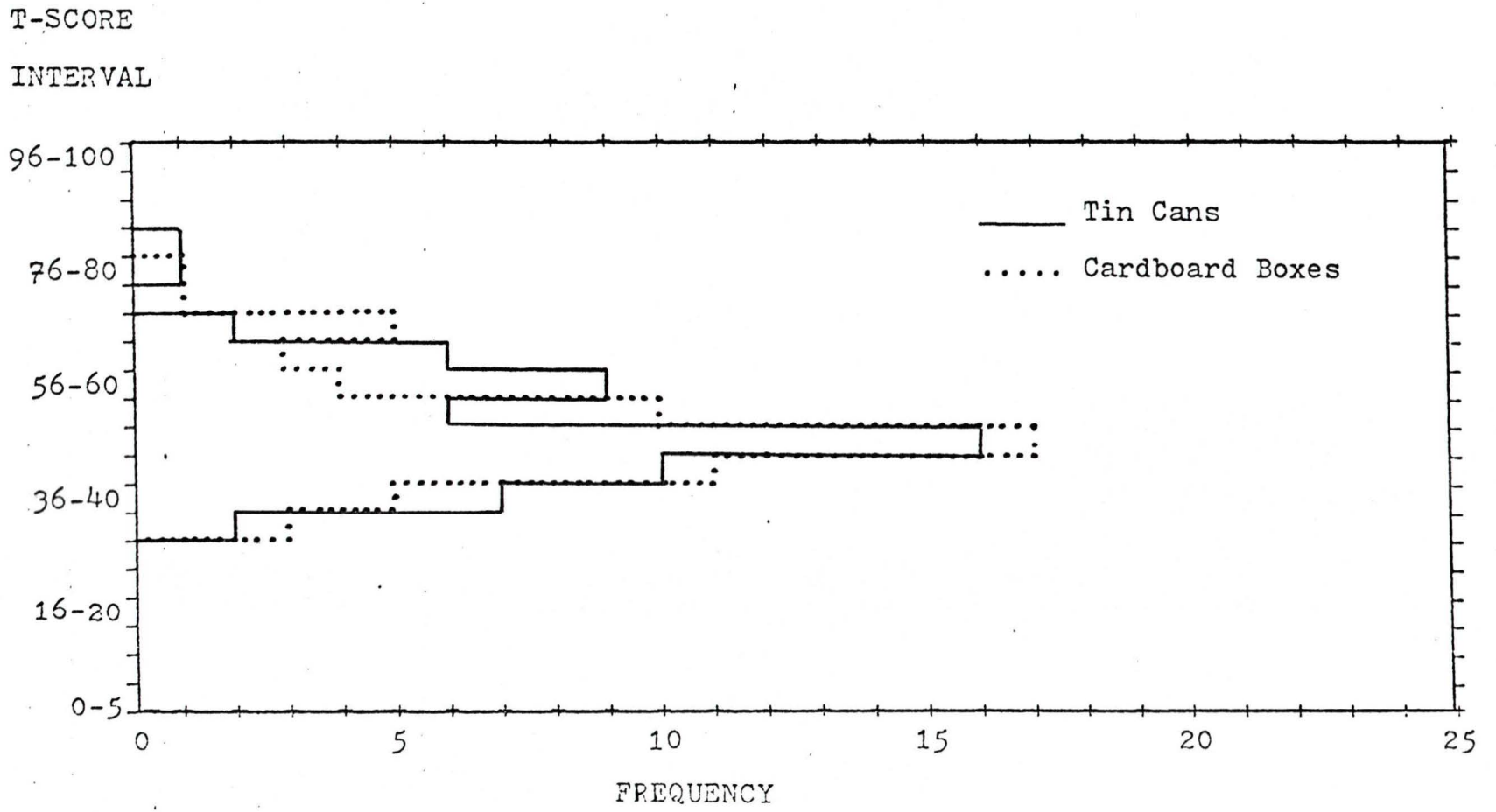


Figure 22. T-Distributions between the verbal tasks on the Elaboration component.

APPENDIX S

Results of the Scheffé Multiple Range Test for the $p < .05$ level of significance on the Verbal difference scores across the High, Low, and Contol Model Conditions

Table 20

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Total Creativity (Verbal) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	382.20	191.10	1.52	$p < .50$
Within	117	14725.93	125.86		
Total	119	15108.13			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	9.93	7.38	5.58	None

Table 21

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Fluency (Verbal) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	381.06	190.53	1.86	$p < .50$
Within	117	11968.73	102.30		
Total	119	12349.80			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	7.98	9.48	5.18	None

Table 22

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Flexibility (Verbal) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	205.72	102.86	0.92	$p < .50$
Within	117	13062.27	111.64		
Total	119	13267.99			

Required range between group means	Group mean difference values			Location of significant differencs
	H	L	C	
3.49	3.70	6.68	4.15	None

Table 23

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Originality (Verbal) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	1135.11	567.56	3.17	$p < .05$
Within	117	20972.48	179.25		
Total	119	22107.59			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	10.58	7.65	3.10	Between (H,L) and (L,C)

Table 24

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the Elaboration (Verbal) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	689.82	344.91	4.06	$p < .05$
Within	117	9945.65	85.01		
Total	119	10635.46			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	-0.83	4.88	3.25	Between (H,C) and (C,L)

Table 25

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the %-Flexibility (Verbal) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	261.22	130.60	0.34	$p < 1.00$
Within	117	45587.15	389.63		
Total	119	45848.36			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	-5.68	-3.60	-2.08	None

Table 26

Results of the Scheffé—Multiple Range Test for the $p < .05$ Level of Significance on the %-Originality (Verbal) Difference Scores Component

Source	d.f.	SS	MS	F	p
Between	2	1026.02	513.01	1.06	$p < .50$
Within	117	56511.85	483.01		
Total	119	57537.86			

Required range between group means	Group mean difference values			Location of significant differences
	H	L	C	
3.49	6.03	0.63	-0.75	None

APPENDIX T

Instructions presented to independent judges in Experiment 2 and diagram of the experimental materials

"Placed before you on the wall, you will notice 8 sheets of paper.

On the far left, there is a sheet of paper with pairs of straight lines (circles) drawn on it. The center 6 papers are diagrams which were made from these same pairs of straight lines (circles). Some people had been asked to watch someone else drawing these 6 diagrams on a chalkboard. They were then given a sheet of the paper you see to your far right, which is a set of circles (pairs of straight lines), and they were asked to draw any pictures out of these circles (pairs of straight lines) as they could think of.

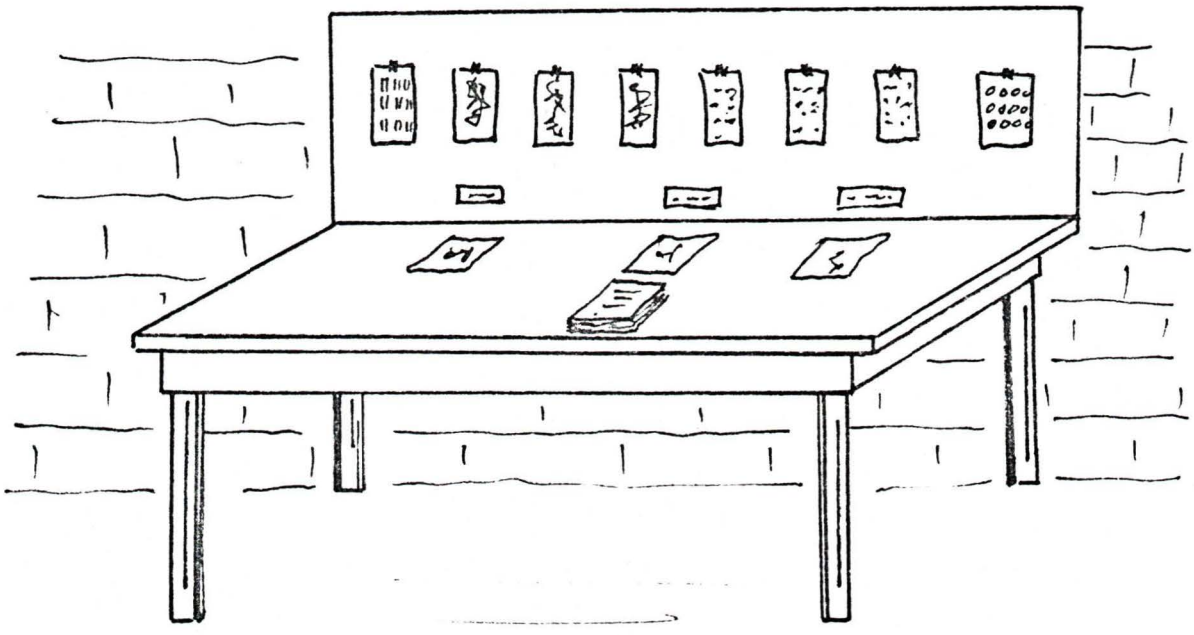
The drawings they made are in a pile on the table in front of you.

Now, using the 6 center diagrams as a reference, do you think that these people, on the whole, copied from any one of those 6 diagrams while they were drawing on the sheet of circles (pairs of straight lines), or not, even though their pictures were made from a set of circles (pairs of straight lines) and not a set of line pairs (circles)? Do not base your judgement on any one particular item in their page of responses or from any of the diagrams, but

rather, make a general, global-type of judgement on each of the sheets you judge. That is, does their sheet seem to be generally copied from any one of the reference sheets? Or not?

If you think that a sheet was more-or-less copied from any one of the 6 reference diagrams, place it in the 'Probably Copied' pile labelled on the table at the left. If you think that a sheet was all-in-all not copied from any one of the 6 reference diagrams, place it in the 'Probably Not Copied' pile labelled on the table at the right. If you are undecided, place it in the 'May or May Not Have Been Copied' pile in the middle.

There is no time limit. Are there any questions?"



Appendix T. Diagram of experimental table. 6 center sheets on wall are model responses. The outside 2 are stimulus item sheets. 3 labels on the wall below the model sheets are the categories "Probably Copied", "May or May Not Have Been Copied", and "Probably Not Copied". Large stack of subject response sheets on table are sorted below these labels by the judges.

APPENDIX U

Raw-score and percentage response judgement frequencies in Experiment 2

Table 27

Raw-score frequencies of response judgements in

Experiment 2

Model Condition	Judgement	Task: Pre		Task: Post	
HIGH	Probably Copied	24		35	
	May or May Not Have Been Copied	21		22	
	Probably Not Copied	41	N = 86	43	N = 100
LOW	Probably Copied	32		40	
	May or May Not Have Been Copied	26		34	
	Probably Not Copied	30	N = 88	34	N = 108
CONTROL	Probably Copied	33		22	
	May or May Not Have Been Copied	14		28	
	Probably Not Copied	39	N = 86	38	N = 88

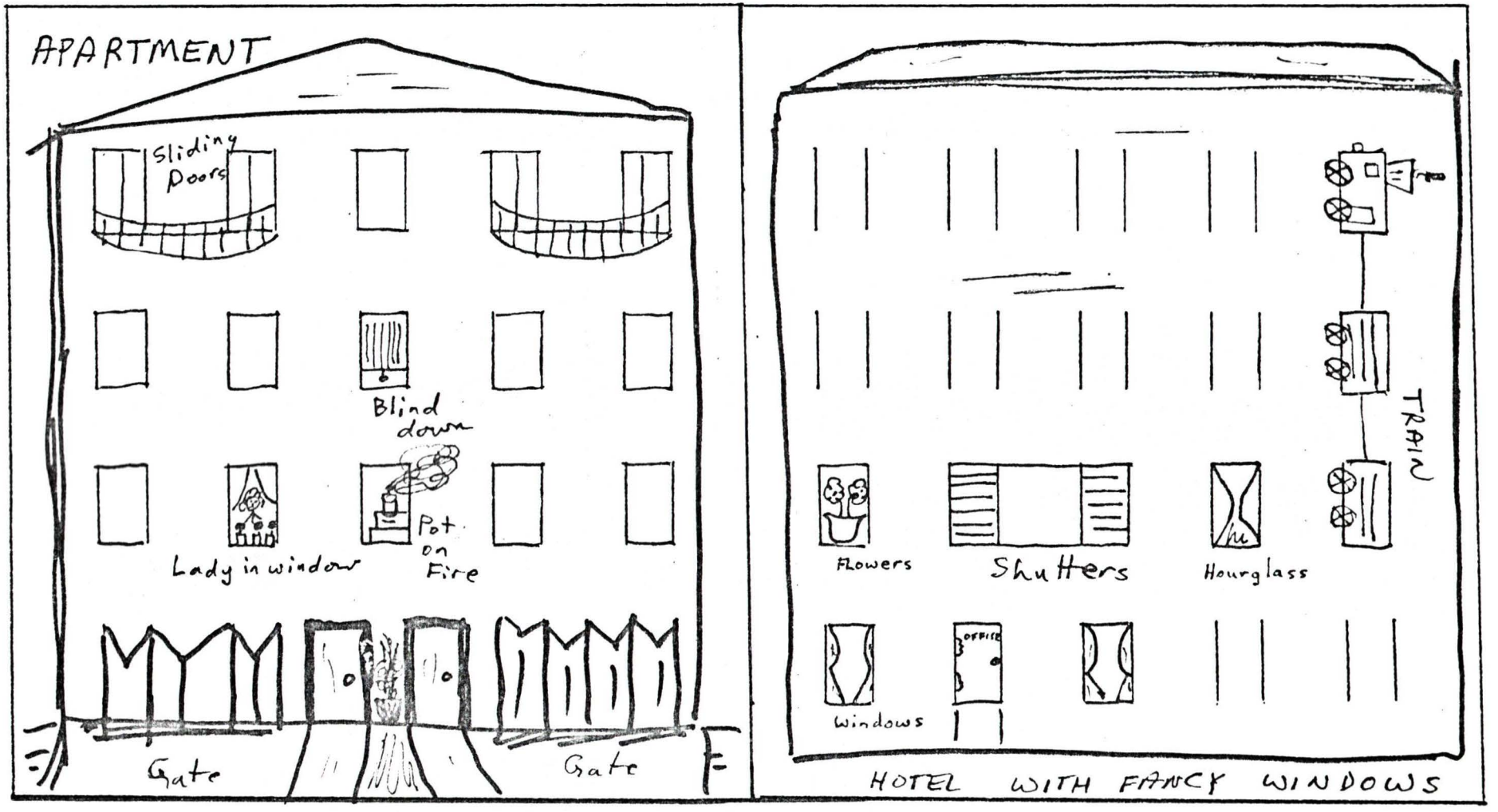
Table 28

Percent response judgements of Experiment 2

Model Condition	Judgement	Task	
		Pre	Post
HIGH	Probably Copied	27.91	35.00
	May or May Not Have Been Copied	24.42	22.00
	Probably Not Copied	47.67	43.00
LOW	Probably Copied	36.36	37.04
	May or May Not Have Been Copied	29.55	31.48
	Probably Not Copied	34.09	31.48
CONTROL	Probably Copied	38.37	25.00
	May or May Not Have Been Copied	16.30	31.82
	Probably Not Copied	45.35	43.18

APPENDIX V

Two unmodeled Parallel Lines responses resembling the Model response of Appendix H, Item 2



Subject 1 (Pre-task)

Subject 2 (Post-task)

VITA

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