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ABSTRACT

PLAY AND CREATIVITY: A FURTHER EXAMINATION OF THE ASSOCIATIVE FLUENCY HYPOTHESIS

By

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Recent research has found that children who are given an opportunity to play display more creativity, defined by the number of alternate uses for common objects, than children who are not. The explanation for this has been that play creates a mental set which permits the player to associate fluently. This associative fluency then enables the player to perform better on creativity tests.

These studies have been confined to examining verbal creativity. The question remains how play might affect nonverbal creativity and personality characteristics of creative persons, such as liking for complexity. The first purpose of the current study was to examine this question.

In addition, the associative fluency hypothesis does not explain what aspect of play contributes to the mental set. By a close examination of what children in

the play condition do, the current study proposed to answer this question and suggest a model to explain the relationship between play and creativity.

Ninety kindergarten aged children (45 boys, 45 girls) were randomly assigned to either the play, imitation, or control condition, in which they played with a set of toys, imitated the experimenter in certain tasks with toys, or colored pictures. They were then given a battery of creativity tests--verbal, nonverbal and liking for complexity--the order of which was systematically varied, and a measure of intelligence. The children in the play condition were also observed by observers who recorded at 15 second intervals the toys the child was playing with, the integration of the play, and the imaginativeness of the play, and rated the playfulness of the child.

It was hypothesized that (1) children in the play condition would perform better on the verbal creativity test, worse on liking for complexity, and the same on the nonverbal creativity test a s children in the other two conditions, even when intelligence was statistically controlled; (2) time spent playing with a toy would be unrelated to the number of uses for that toy; (3) complexity, integration, and imaginativeness in play would be related to creativity; and (4) playfulness

and creativity would be related, but not when intelligence was partialled out.

In general, the hypotheses were not confirmed. Girls in the play condition performed better on the verbal creativity test than girls in the other two conditions, but this was not true of the boys. There was a treatment by order interaction that indicated that children in the play condition performed best on the verbal creativity test when it was given second, while those in the other conditions performed best when it was given third. Time spent playing with an object was unrelated to the number or uses for that object. Complexity, integration, and imaginativeness were near significance when correlated with creativity. Playfulness and creativity were related, even when intelligence was partialled out.

A path analytic model that related playfulness play and creativity was proposed. Playfulness-fun had a strong positive relationship to shifts and complexity in play, while playfulness-intelligence had a strong negative relationship with shifts in complexity. Verbal and nonverbal creativity were weakly related to play.

The results of the current study indicate that the relationship between play and creativity is more complex than originally thought. Playfulness appears

to be a highly useful construct in describing a child's play and it probably has two aspects: fun and intelligence.

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CHAPTER I

INTRODUCTION

The purpose of the current study was to examine the relationship between play and creativity. Since creativity is considered by many researchers to be one of a number of cognitive skills, it seems best to examine first the relationship between cognition and play. What the relationship is is not easily agreed upon, as will be seen. By presenting the various theories and noting where they overlap and contradict each other it is hoped that some sort of resolution of this relationship can be proposed that will lead to an understanding of the relationship between play and a specific cognitive skill, creativity. Since much of the work on play and cognition originates with Piaget's work, it seems appropriate to begin with him.

The Cognitive Function of Play

Piaget's Theory

According to Piaget (1962) there are two biologically based ways in which we adapt to the environment: assimilation and accommodation. Assimilation, best exemplified by play, occurs when the child adapts

elements in the environment to fit existing schema. Accommodation, best exemplified by imitation, occurs when the child adapts schema to fit elements in the environment. Neither process exists alone, but each always interacts with the other. Play, thus, plays an important role in the development of the intellect by encompassing new objects and events--a point with which others agree (Klinger, 1969; Slobin, 1964).

Piaget classifies play into three types: practice, symbol, and rule. Practice games begin in the first months of life. They essentially involve sensori-motor activities which lead to the acquisition of skills. Symbolic games beginning about two years of age imply the representation of an absent object. This is the period of make-believe or pretend play. The third type, rule games, rarely appears before seven years. This type of play implies relationships with others.

Both practice play and symbolic games disappear with age, combining with other forms of play. Just as persons become more logical and reality oriented as they develop, so too their play becomes more reality based and gradually disappears (also see Piaget, 1965).

Sutton-Smith's Critique

Sutton-Smith (1966) offered perhaps the first major criticism of Piaget's theory of play, a criticism which presented a number of points in rebuttal to his theory. First, he felt that too great an emphasis is placed on imitation in Piaget's theory of cognitive development so that play becomes subordinate to imitation (a misinterpretation as Piaget [1966] points out). Second, he argued that Piaget places too much emphasis on play's relationship to reality based thought. "It would not be far-fetched to speculate, in fact, that if there is a relationship between play and thought, it is more likely with . . . divergent intellectual operations [i. e., creative thinking] than with the directed forms which concern Piaget" (Sutton-Smith, 1966, p. 107).

Piaget would disagree with this viewpoint. In discussing Groos's (1898) theory that certain play activities prepare or pre-exercise adult skills, Piaget (1962) concludes that symbolic games are not a pre-exercise of imitation for later imaginative thought, because imagination is not a cognitive skill, but a cognitive process (i.e., imagination can be equated with assimilation). Only indirectly can play lead to

imaginative thought. "Symbolic play will only achieve its final form of creative imagination provided it is as it were reintegrated in thought as a whole" (Piaget, 1962, p. 155).

Piaget suggests that the relationship between play and imagination is a very weak one. He maintains that symbolic games contribute to the cognitive process as a whole (ultimately as reality based thought), because, due to the child's egocentrism, the symbol expresses present reality.

Sutton-Smith's (1966) third criticism concerns Piaget's notion that play all but disappears in late childhood. By doing this Piaget ignores the influence of play on later development. In Sutton-Smith's view, play does not disappear but differentiates into other functions such as determining outcomes in counting out games, ritualizing dramas of success and failure in sports, and socializing adults into society's norms. However, to Piaget (1966) this differentiation is the same as disappearance, since play becomes more adaptive to reality.

Sutton-Smith (1967) has elsewhere elaborated his thoughts about play and cognitive development. Play is involved in such activities as consolidating learnings, preventing their disuse, producing creative ideas, categorizing and learning skills such as number

conservation. This involvement is tenuous because of the nature of play. Play would not be play if it were strictly utilitarian.

Sutton-Smith (1971), in replying to Piaget's (1966) response, marks a crucial difference between Piaget and himself. Because of his cognitive orientation Piaget tends to look for aspects in play which correspond to his theory. As a result, Piaget's approach to play has to be subordinate to that of cognitive development. Sutton-Smith, on the other hand, starts from play and moves from it in examining cognition. This difference in orientation plus Sutton-Smith's emphasis on the role of play in adolescent development are the major distinctions between Piaget's and Sutton-Smith's approaches to play and cognition.

Singer's Approach

Much of Singer's (1966, 1973) work parallels points made by Sutton-Smith. His examination of such topics as fantasy and daydreaming suggests that play has an important role in the years after childhood. In his view, play gradually becomes internalized, because of greater cognitive capacity, including memory, and pressures against fantasizing out loud. One common form of internalized play is daydreaming.

According to Singer (1966) daydreams can be categorized along three dimensions: simple-complex, reminiscent-planful, and personal-impersonal. The simple-complex dimensions refers to the intellectual intricacy of the daydream. The personal-impersonal dimension measures the degree to which the daydream involves the daydreamer. Most important for the purposes of the current study is the reminiscent-planful dimension which involves the degree to which the daydream is past- or future-oriented.

Instead of viewing daydreaming as wasteful, as it commonly is, Singer suggests that daydreams, when they are planful, can serve an important cognitive function, problem solving. Through daydreaming one attempts to pose solutions to matters that concern a person, whether in planning a dinner party or deciding what to do on a weekend.

One would expect that when problems increase so might daydreaming. A rise in daydreaming during adolescence could then be explained by the changes and the problems of this period (Singer & Antrobus, 1963).

It appears that there is a general agreement between Sutton-Smith and Singer that play has a role in cognitive development after childhood. The only difference is that Singer has emphasized one aspect of this play, daydreaming.

Vygotsky's Theory

Vygotsky (1967), outside the influence of Piaget's work on play, provides some insights that may help resolve the questions raised by Piaget, Sutton-Smith, and Singer. According to Vygotsky there are two important aspects of play: all play deals with imaginary situations and all play has rules. For Vygotsky each of these aspects implies the other. By this Vygotsky means that all play is somewhat removed from reality and within this play there are certain behaviors that are permitted or not permitted, even if they have not been formally prescribed.

In contrast to Piaget (1962), Vygotsky feels that play becomes less reality based during the period of childhood. This is important for cognitive development because the child learns not to rely solely on external objects in the environment. Meaning is no longer determined by an action (e.g., stomping one's foot does not have to signify anger, but can signify starting an imaginary motorcycle) or by an object (e.g., a stick can be a horse).

According to Vygotsky, play permits cognitive development in a manner similar to Piaget's notion of assimilation. Vygotsky agrees with Piaget (1965) that through play the child begins to distinguish physical

rules from moral rules, particularly rules of self-restraint. Finally, through use of imaginary situations the basis for abstract thought may be developed.

Resolution of Theories on the Cognitive Function of Play

From these theories the question is raised: how is play related to imaginative thought in the individual's life-span? Piaget proposes a weak relationship based upon the observation that there is less play as one grows older and that which occurs is more reality based.

The key word here is "observation." Less play is visually apparent as a child grows older, but what is occurring in the child's mind? A child's thoughts are less constrained by reality as the child grows older, a point with which even Piaget would agree (e.g., the ability to consider the possible rather than the actual in formal operations).

It does not seem likely that a set of behaviors, such as play, would just disappear, as Piaget suggests. A transformation seems more likely. Daydreaming, as Singer's work strongly suggests, may be one form of transformed play.

It is generally agreed upon that a relationship between play and cognition, in particular--imagination, exists. Play can aid imagination, but under what

conditions is unclear. Perhaps this can be resolved by examining experimental studies of play and cognitive functioning.

Empirical Support for the Cognitive Function of Play

The relationship between play and cognitive functioning has been examined in an indirect manner among socially disadvantaged children. Smilansky (1968) noted that children from underprivileged homes did not play properly: their play was either monotonously repetitious or disjointed, jumping from topic to topic without organization. Since these are the children who also have scholastic problems later on, Smilansky puzzled about the connection between these two kinds of problems.

To one group of these disadvantaged children Smilansky began teaching techniques of sociodramatic play, i.e., pretend games which involve real life situations. After nine weeks of treatment she found that these techniques brought about greater socio-dramatic play as well as greater persistence, social interaction, and communication.

It can be argued that the changes brought about by the sociodramatic training in Smilansky's study are not cognitive but social. However use of social and

cognitive in such dichotomized terms obscures the point that skills such as persistence, interaction, and communication have both social and cognitive implications. In addition Smilansky's study has influenced other researchers who have examined the effect of sociodramatic training on more strictly cognitive skills.

Several other studies (Freyberg, 1973; Rosen, 1974; Saltz & Johnson, 1974) have confirmed the lower levels of sociodramatic play among children from lower SES backgrounds. Training these children in the techniques of dramatic play has led to greater imaginativeness, positive affect, concentration (Freyberg, 1973), better performance on group cooperative tasks (Rosen, 1974), and improvement in intelligence and interpersonal perception (Saltz & Johnson, 1974).

A somewhat different approach to the cognitive function of play is demonstrated in a study by Sylva, Bruner, and Genova (1976). In their study children were required to remove a piece of chalk from a box which was more than an arm's length away. The solution was to clamp several sticks together, which could pull the box closer and remove the chalk.

Prior to this problem different training conditions were used: an observation condition, in which an adult constructed an elongated tool with clamps and sticks; a play condition, in which the children played

with clamps and sticks; an observe components condition, in which the children saw a puppet show with illustrated the techniques necessary for solution of the problem; a training of components condition, in which while manipulating the clamps and sticks the children were given specific instructions; and a no treatment condition.

Children in the play and observation conditions were more likely to solve the problem spontaneously than the other groups. Further analysis revealed differences between children in these two conditions. Children who played made more effective use of hints, varied their approach more, and this approach was varied more systematically. Sylva et al. attributed these differences to the fact that the children who played had to initiate the solution themselves.

From these studies it is clear that play is related to such cognitive skills as imagination and problem-solving. To clarify the relationship between play and creativity, however, two additional questions must be answered: (1) What is play? and (2) What kind of play is related to creativity?

What is Play?

The definition of play has frustrated many investigators of play. The wide diversity of activities

called play make such a definition seem so impossible that Garvey (1977) rephrased the question as "What are play?"

One way of avoiding the problems of defining play is to list commonly accepted features of play. These features include: (1) its purposelessness, i.e., it is an end, in and of itself; (2) the pleasure it brings; (3) that it is usually exhibited by immature organisms; and (4) that it involves some distance from reality. While these features appear useful, one can think of activities that would violate any one of these features and still be called play. (As a result, one should view these features as not very strict guidelines.)

With these features in mind, play will be defined in the current study as behaviors which are intrinsically motivated, engaged in for "their own sake," dominated by the organism--not outside forces, and accompanied by positive affect. This definition was chosen because it was consistent with the features of play. In addition, this definition conceptualizes play as non-utilitarian but allows play, at the same time, to have functional application to other skills, such as cognition. Thus play can be related to creativity but does not have to be. As a result, the current study can examine what aspects of play may be related to creativity.

What Kind of Play is Related to Creativity?

In contrast to the difficulty of defining play, categorizing types of play appears relatively easly. There is general agreement on three categories of play: practice play, symbolic games, and rule games (Piaget, 1962).

Before we can relate one of these categories of play to creativity it is important to compare creativity with other cognitive skills. Of those skills discussed thus far, creativity seems most similar to imagination. Certainly imagination is an important aspect of the creative process. From this it is reasonable to assume that the relationship between play and creativity should parallel that between play and imagination.

Of those types of play mentioned above, it should be apparent that symbolic games are closely related to imagination, especially in the studies on the effects of training children from lower SES backgrounds in techniques of sociodramatic play. If then creativity is related to symbolic games, it should be relatively easy to look at the amount of time spent in symbolic games and the type of symbolic games played and correlate them with creativity scores.

But problems immediately occur. What is creativity and how is it measured? Unless these questions are

effectively answered, conceptualizing a relationship between symbolic games and creativity will be difficult.

Creativity: Problems of Definition and Measurement

Since Guilford (1956) and his associates have been responsible for much of the recent research in the area of creativity, it is appropriate to begin a consideration of the definition and measurement of creativity with his work. According to Guilford's Structure of the Intellect Model there are three important attributes to any intellectual activity: the cognitive process, the context to which the process is applied, and the product of this process. Two kinds of cognitive processes are of interest here: convergent thinking, which involves focusing upon one correct answer, and divergent thinking, which involves searching for a number of answers in a broad based manner. Divergent thinking corresponds closely to Guilford's (1957) idea of creativity.

Much of the work of Guilford and his associates has been in developing tests to measure the attributes of intellectual activity, including divergent thinking. Three general divergent thinking abilities have been noted by Guilford: fluency, the ability to generate many ideas in a short time; flexibility, the ability to vary these over a wide range, i.e., not in one category;

and originality, the ability to generate unique or unusual ideas (see Wallach's [1970] review).

Torrance (1966a, 1966b) has adapted Guilford's concepts for testing with children. Two types of tests were developed--verbal and figural. In addition to the three general abilities noted by Guilford, Torrance has added a fourth--elaboration, the ability to add decorative, unnecessary aspects to the ideas generated.

Some problems developed with the use of creativity tests such as those devised by Guilford and Torrance. To argue for the existence of a skill one must show that it is distinct from other skills. In creativity research the distinction between creativity and intelligence has been an important one.

Getzels and Jackson (1962) sought to show such a distinction by demonstrating that differences existed between those high in creativity, low in intelligence and those low in creativity, high in intelligence. Reviewers of this study noted that here, as well as with many studies using Guilford's or Torrance's tests: (1) there was no common characteristic to creativity tests, intercorrelations were quite low (Thorndike, 1963); and (2) creativity tests correlated with intelligence tests as well as they did with other creativity tests (Burt, 1962).

An alternative view toward creativity has been developing. Mednick (1962) hypothesized that the creative thinker had a flat gradient rather than a steep one with respect to the likelihood of thinking of certain associates when given a task. This meant that the creative thinker is more likely to come up with remote or unusual associations of words or events. Thus, according to Mednick's theory, creativity is defined as an ability to associate previously unrelated ideas to produce a new and interesting object.

Building upon Mednick's theory Wallach and Kogan (1965) developed their own tests of creativity. Although similar to some of Guilford's tests, there were two important differences: (1) to aid the association process, no time limit was imposed; and (2) to contribute to the playful aspect of creativity, these tests were administered in a gamelike atmosphere on a one-to-one basis. Two scores were calculated for each tests: number (fluency) and uniqueness (originality). Correlations among creativity measures were quite good and the correlations between creativity and intelligence measures were quite low.

Despite the apparent success of Wallach and Kogan's research, some questions remained. Guilford (1971) argued that unlimited testing time allowed the children to develop strategies. Tests were tests and

should be administered as such. More valid is a point raised by Anastasi and Schaefer (1971): creativity and intelligence are multifaceted abilities and should overlap to some extent (not the near zero correlations of Wallach and Kogan's [1965] research).

These criticisms raise important points in defining creativity. A definition of a multifaceted skill like creativity should not be too restrictive, otherwise too much is lost. Defining creativity as an associative process, in which previously distinct elements are combined to produce a novel result, is useful, because such a definition can include the divergent thinking abilities noted by Guilford and Torrance. However, such a definition needs to include a number of personality characteristics, such as interest in change and a liking for complexity, which result from this associative process.

Therefore, for the purposes of the current study, creativity was defined as the association of elements, verbal and nonverbal, which were previously distinct, in a novel way which results in a novel product which fits in with and may also extend the bounds of reality. In turn this associative process over a period of time will manifest itself in a number of personality traits, such as playfulness, openness, and

a liking for complexity, which will further aid the associative process.

Such a definition was chosen for a number of reasons. Defining creativity as an associative process keeps it consistent with Mednick (1962) and Wallach and Kogan's (1965) work, and thus distinct from intelligence. Use of the words "verbal" and "nonverbal" emphasizes the point that creativity involves activity that is not always verbal. The second part of the definition permits a developmental perspective to creativity. Second, it notes that there are cognitive and personality aspects to creativity and that they are interrelated. This definition allows for a similarity between play and creativity both in the way objects are combined and in the playful attitude that results from creativity. At the same time this definition does not force play and creativity to be related just by definition.

Since the current study is concerned with play and creativity, the population under consideration is children. Are there specific problems in examining creativity in young children?

Creativity: Problems with Young Children

Starkweather (1964) has noted that further problems crop up when trying to measure creativity with young children. With adults one can attempt to measure

creative achievement, but with children one is forced to measure creative potential. Still these tests base performance on adult criteria. Also young children respond differently to these tasks than older children, e.g., they are less verbal. Finally, the different aspects of creativity (i.e., fluency, flexibility, originality and elaboration) may not be differentiated in young children.

Based upon these potential problems, Starkweather (1964, 1971) has developed her own measures of creativity. Her tests are questionable validity, since they have no tradition to fall back on. Since Starkweather denies that fluency, flexibility, originality, and elaboration are differentiated in early childhood, their validity cannot be seen by comparing them with Guilford's tests. Similarly there is no discussion of an associative process that would enable a comparison with Wallach and Kogan's. It would take a longitudinal study to confirm her tests' validity.

Despite the problems forecast by Starkweather, most studies of creativity with young children have employed Wallach and Kogan's (1965) tests of creativity, adapting some of the items for easier understanding by children (e.g., Singer & Rummo, 1973; Singer & Whiton, 1971; Ward, 1968, 1969). While these tests appear appropriate because they show an independence of

creativity from intelligence, they are not sufficient to consider all aspects of creativity.

All of Wallach and Kogan's (1965) tests require verbal responses. Torrance's (1966a, 1966b) work demonstrates a weak relationship between verbal and nonverbal creativity. In keeping with this finding and the definition of creativity as an associative process, involving verbal and nonverbal elements, studies of creativity among young children should be more broad-based.

Since a working definition of creativity has been arrived upon and the problems of measurement with kindergarteners resolved, the relationship between play and creativity can be examined in a systematic manner.

Play and Creativity: What Relation?

Art and Play

The idea that play and creativity are related is certainly not a new idea. This can be seen clearly in the early psychological writings about play, especially those dealing with the relationship between art and play. Groos (1898) noted that "all forces efficacious in artistic production are referable to the central idea of play" (p. 328). Similarly for Spencer (1899),

"the activities we call play are united with aesthetic activities" (p. 627).

Psychoanalytic theorists were concerned with the roots of art and saw it in play. "Perhaps we might say that every child at play behaves like an imaginative writer" (Freud, 1908-1959, pp. 173-174). Both art and play were seen as attempts to relate the id to reality. The theorist who best elaborated this relation was Ernst Kris.

Creativity as Regression in the Service of the Ego

According to Kris (1952) there are three stages in the development from play to art. In the first stage the child begins to distinguish between reality and make-believe. As a result, instead of doing what he/she wishes impulsively, the child can play at or pretend to do it.

The distinction between reality and make-believe becomes more durable. In the second stage the child can entertain two notions simultaneoulsy: a firm belief in the "reality of play" coexisting with the certainty that it is "only" play. In the third stage, the child can accept the fantasies of others as well as his/her own.

The other aspect to Kris's theory is that creativity is seen as an act of regression in the service of the ego. In other words, regression, the return to

earlier ways of existing, usually a defense mechanism, is controlled by the ego for a useful purpose. Through the preconscious there is a shuttling between id material and ego control, akin to the notions of inspiration and elaboration in creativity.

This theory has come under attack for not being specific enough. In Bellak's (1958) view creativity involves the relative reduction of certain adaptive functions in the service of synthetic ego functions. In Piagetian terms, this means less accommodation and more assimilation. For Bellak there is regression, but not total regression.

Weissman (1967) finds the use of the term "regression" inappropriate. Regression is a destructive process and using it with creativity perpetuates the myth that genius is related to insanity. He prefers the term "dissociative functions." In this way the ego can disrupt itself from established object relations and can consider new ones (note the similarity to Vygotsky's [1967] point about meaning becoming separated from the object during play). Using dissociative functions eliminates the overemphasis that Weissman feels Kris placed on inspiration in the creative process.

One can see that there are a number of problems with this theory. The problems increase when one tries to examine the relationships between play and

creativity, because it is never explicitly stated in Kris's theory. By inference it appears that during the creative process a person regresses so that he/she can combine or "play with" ideas, as one plays as a child. Play is then a necessary condition for creativity, but how much play or what kind of play will produce a creative person is not considered. In this way it becomes rather difficult to test this hypothesis empirically. This difficulty is further demonstrated in the lack of a relationship found between regression (as measured by the Rorschach test) and creativity (as defined by traditional measures such as the Torrance tests) (Lazar, Note 1).

Lieberman's Theory of Playfulness

A somewhat different approach to the relationship between play and creativity has been offered by Lieberman. Lieberman (1977) has noted that in several studies (e.g., Getzels & Jackson, 1962; Torrance, 1961) playfulness has been a trait differentiating highly creative persons from those less creative.

According to Lieberman, the child who enjoys play and is afforded the opportunities to play, under certain circumstances, will become playful. With the internalization of play in later childhood, described by Singer (1973), this playfulness survives and becomes

a personality trait. This playfulness enables one to combine disparate thoughts to produce something creative.

There are five elements to Lieberman's (1977) concept of playfulness: physical, social and cognitive spontaneity, manifest joy, and sense of humor. Based on these elements Lieberman has developed scales for kindergartners (Lieberman, 1965) and adolescents (Lieberman, 1967).

To support her theory, Lieberman (1965) rated 93 kindergarten children on her Playfulness Scale and tested them on three measures of creativity. There were significant correlations between the elements of playfulness and the fluency, flexibility, and originality scores on the creativity tests. A study of Durrett and Huffman (1968) replicated most of these findings, although there was no correlation between playfulness and originality.

One problem with Lieberman's scale is its failure to deal adequately with the two-dimensional character of playfulness. Lieberman alludes to but never directly confronts the issue that playfulness can be examined for its applied value to cognitive skills and for its own intrinsic or "fun" value. This duality is also seen in the elements of playfulness. For example, in sense of humor there is a cognitive component in order to

appreciate the joke as well as an affective component for the laughter and smiling that accompany it.

This dual nature has been noted in other aspects of play. Sutton-Smith (1967) has pointed out that play aids cognitive development in a number of ways. But if one looks only for what can be used from play, one misses the pleasure that play brings. Similarly in discussing the types of daydreams Singer (1966) distinguishes between future-oriented daydreams which are usually aimed at problem solving and past-oriented daydreams which are fanciful.

A second problem is that of the relationship of creativity and intelligence which resurfaces in these studies, especially Lieberman's (1965). When factor analyzing her data, Lieberman (1965) found that all the variables in her study, including intelligence, loaded heavily on one factor. This, as Sutton-Smith (1967) pointed out, poses the question whether creativity and playfulness are just two manifestations of intelligence. In fact, Singer and Rummo (1973) discovered that when mental age was partialled out, there was no relation between creativity and playfulness in Lieberman's (1965) study.

There are further questions about Lieberman's work. Although her theory about playfulness seems plausible, her methodology is open to question.

Lieberman (1977) demonstrated the validity of the Playfulness Scales by the fact that the five elements hang together, apart from such "dummy" variables as achievement orientation and attractiveness when factor analyzed. This type of analysis is not sufficient to establish validity.

Campbell and Fiske (1959) have suggested that the way to test the validity of a trait is by a multitrait-multimethod analysis. In the multitrait aspect of the analysis the researcher compares the hypothesized measure of the trait with established measures (usually at least one similar to and one theoretically unrelated to the hypothesized trait) to determine its independence. In the multimethod aspect of the analysis the researcher examines various ways to measure the trait to make certain that its existence is not an artifact of the method used. Certainly such an approach would be useful in validating the Playfulness Scales.

Dansky and Silverman's Associative Fluency Hypothesis

A different theory about the relationship between play and creativity which stresses the associative process in creativity has been offered by Dansky and Silverman (1975). According to this hypothesis play creates a mental set which enables the player to

generate associations to a variety of objects. Dansky and Silverman point to three studies to support their view.

Sutton-Smith (1967) had noted that children when asked what they could do with certain toys, arrived at more uses and more unusual uses for toys which they preferred. However, there was a confounding here, as noted by Dansky and Silverman (1973), between playfulness and exposure to the toys.

To eliminate this problem Dansky and Silverman (1973) presented a set of toys to two groups. One group was allowed to play with the toys, while the other group had to imitate the activity of the experimenter with these toys. A third group was given an irrelevant (drawing) activity. The children in these three groups were later asked to tell the experimenter all the different ways in which one of the toys could be used. The group who were permitted to play produced more standard and unusual uses for each of the toys than the other two groups. In a similar study Dansky and Silverman (1975) found that children who had played also produced more standard and unusual uses for toys they had not played with than the imitation and control groups.

There are certain similarities between this hypothesis and those mentioned above. This ability to

associate fluently is similar to Vygotsky's (1967) thoughts about the liberation of meaning from an object during play. The difference between Dansky and Silverman's (1975) and Lieberman's (1977) may only be time: If a mental set for associative fluency becomes long-lasting, it may become a personality trait called playfulness.

A possible link between these theories can be seen in a study by Feitelson and Ross (1973) that was done over a seven week period. Kindergarten children were assessed on several measures of creativity, including the Cincinnati Autonomy Test Battery and the Torrance Figural Tests. Two weeks after this assessment each child was randomly assigned to one of four treatments: play and tutoring; play, no tutoring; tutoring, no play; and no play or tutoring. Half-hour sessions of the treatment conditions were held twice a week for five weeks. Children were then reassessed on the creativity measures. Children who had been assigned to the play and tutoring treatment showed the greatest gains in creativity.

Two major questions are not answered by Dansky and Silverman's (1973, 1975) studies. Their definition of creativity is more restricted than the one developed in the current study. Creativity is defined by them as a verbal associative process. It can then be asked

whether play aids creativity in the broad sense as defined in the current study or only in the restricted sense as employed by Dansky and Silverman.

The second question involves the mental set that Dansky and Silverman (1975) hypothesized is created during play. It remains unclear from their discussion how play does this. By a closer examination of play this problem may be clarified. But at this point it is unknown what aspects of play contribute to this mental set. Among the aspects of play already discussed imaginativeness and playfulness are possibilities.

Other Studies of Creativity and Play

Hutt and Bhavani (1972) examined the relationship between style of play and creativity. They classified three- to five-year-old children into three groups: non-explorers, who looked at and approached a new toy but did not inspect it; explorers, who actively investigated the toy but did little else with it; and inventive explorers, who, after investigating the toy, used it in many imaginative ways. They then tested these children with the Wallach and Kogan (1965) creativity tests. They found that the inventive explorers scored higher on the uniqueness scale than the other groups.

J. E. Johnson (1976) had judges categorize the play of three- to five-year olds as either fantasy or

non-fantasy play. In addition, the fantasy play could be described as either social or non-social. He also administered intelligence tests and Ward's (1968) adaptation of the Wallach and Kogan creativity tests. There were significant correlations between the measures of intelligence and creativity and social fantasy, although greater for the measures of creativity. Neither intelligence nor creativity was related to non-social fantasy play.

Bishop and Chace (1971) examined the environmental conditions that promote creativity in children. Mothers were given a battery of personality inventories, while the creativity of their children was assessed by their play with geometric shapes. They found that children of more abstract mothers, who also provided a more playful environment, showed greater creativity in the complexity of the shapes chosen, the variety of colors used, and in the complexity in the final design created. The implication is that mothers who are more abstract are more likely to provide a playful environment which results in creativity in their children. But it can also be argued that creative children are more demanding about play, causing their mothers to become more abstract and to provide a more playful environment.

One other way of looking at the relationship between play and creativity has been through the study

of imaginary companions. In a series of studies of creativity among adolescents Anastasi and Schaefer (1969; Schaefer, 1969; Schaefer & Anastasi, 1968) have noted that creative high school students were more likely to have had imaginary companions as children than their less creative counterparts. However, Manosevitz, Fling, and Prentice (1977) found that young children who have imaginary companions are not more creative than those who do not. This difference in results may be due to the internalization of play that is necessary for creativity (cf. Singer, 1973).

In reviewing these studies two points should be noted. The first is that while these studies describe certain characteristics of play that are related to creativity, they do not answer the questions whether play aids creativity, when it is defined as other than a verbal associative process, and what aspects of play creates the mental set which leads to creativity.

The second point is conspicuous by its absence. No sex differences have been reported in any of the above mentioned studies. This is not surprising since these studies have tended to avoid tasks and toys that are stereotypically masculine or feminine. It is also noteworthy that sex differences in creativity are not usually found among children of ages tested in these studies. Maccoby and Jacklin (1974) have reported that

on verbal creativity tests girls begin to show superior performance about seven years of age, while on nonverbal creativity no clear pattern of sex differences has been found.

Design of the Current Study

It is clear that other studies of play and creativity do not answer the questions raised by Dansky and Silerman's (1973, 1975) studies. To answer the first question--whether play aids only verbal associative fluency, or other aspects of the creative process as well--required an experimental multivariate design. Given the time constraints of working with kindergarten aged children it was necessary that the creativity tests be few in number yet varied.

To meet this specification a pilot study was undertaken to determine the dimensionality of creativity for kindergarten aged children. Three creativity tests, the Alternate Uses Test (Wallach & Kogan, 1965), the Barron-Welsh Art Scale (Barron & Welsh, 1963), and the Torrance Figural Test (Torrance, 1966b), from which 13 scores were calculated, were administered to 60 kindergarten aged children. The scores were correlated and submitted to multidimensional scaling (see Kruskal, 1964).

From this scaling two dimensions emerged. The first dimension showed the Alternate Uses Test at one end of the dimension and the Barron-Welsh Art Scale at the opposite end of the dimension. The Torrance Figural Test was represented on an independent dimension. The flexibility scale from this test showed this most clearly. These three tests were chosen for examination in the experimental analysis.

In the current study Dansky and Silverman's (1973, 1975) examination of the relationship between play and creativity was applied to a broadbased view of creativity. Thus, children were assigned to the play, imitation, and control conditions for 10 minutes. But instead of being given one creativity test, the three mentioned creativity tests were administered, systematically controlling for order. In addition, a measure of intelligence was also administered in order to control for the effect of intelligence on creativity.

The second question remaining from Dansky and Silverman's (1973, 1975) studies--what aspects of play produce the mental set that results in creativity--required an exploratory, correlational analysis. It was hoped that this question would be answered by examining the children in the play condition and recording at 15 second intervals what these children did during play. In addition by rating these children on

Lieberman's (1977) Playfulness Scale further evidence was thought could be gained about its validity. Then measures derived from the observations of play and the Playfulness Scale could be used to propose a model for the relationship between play and creativity. Multidimensional scaling, although not the only way to build a model, seemed a logical first choice. Such a multidimensional scaling model could then be compared with one derived from Lieberman's (1964) data to determine the generalizability of the model.

Hypotheses

Using this design certain hypotheses could be formulated about the relationship between play and creativity. Dansky and Silverman (1973, 1975) have demonstrated that play aids verbal associative fluency. But it was unclear how play affects nonverbal creativity (as measured by the Torrance Figural Test) and liking for complexity (as measured by the Barron-Welsh Art Scale), since studies of play and creativity have not examined these aspects. However, there was information from the pilot study that liking for complexity appeared opposite of verbal associative fluency and that nonverbal flexibility was independent of verbal associative fluency. If these findings are applied strictly to Dansky and Silverman's (1975) associative fluency

hypothesis, it was expected that in response the first question raised from Dansky and Silverman's (1973, 1975) studies, children in the play condition would perform better on a measure of verbal associative fluency, worse on liking for complexity, and the same on nonverbal flexibility as children in the imitation and control conditions.

Hypothesis 1

> Children in the play condition should perform better on the Alternate Uses Test, worse on the Barron-Welsh Art Scale, and the same on the Flexibility Scale of the Torrance Figural Test as children in the imitation and control conditions.

Critics of studies on creativity have pointed out that many of these studies (e.g., Getzels & Jackson, 1962; Lieberman, 1965) have been confounded by the fact creativity is related to intelligence. It was therefore advisable to control statistically for intelligence in examining Hypothesis 1. But there is nothing in Dansky and Silverman's (1975) associative fluency hypothesis that assumes that intelligence influences the process involved. It was then expected that Hypothesis 1 would not change, when intelligence was statistically controlled.

Hypothesis 2

> Children in the play condition should perform better on the Alternate Uses Test, worse on

> the Barron-Welsh Art Scale, and the same on the Flexibility Scale of the Torrance Figural Test as children in the imitation and control conditions, even when intelligence is statistically controlled.

The next group of hypotheses involve the second question raised by Dansky and Silerman's (1973, 1975) studies--what aspects of play are related to what kinds of creativity. This was the exploratory part of the study and thus there was some uncertainty what the model, which related aspects of play with kinds of creativity, would look like. Nevertheless it was possible to hypothesize about the relationships between some of the variables.

Dansky and Silverman (1975), in discussing the finding that children in the play condition generated more alternate uses than children in the imitation and control conditions even for objects they had not played with, suggested that it is play itself that creates a mental set that enables one to generate uses for an object, rather than contact with that object. That suggested that the time spent playing with an object would be unrelated to the uses for that object.

Hypotheis 3

> Time spent playing with an object should be unrelated to the number and uniqueness of uses for that object.

A number of studies (e.g., Hutt & Bhavani, 1972; Sylva et al., 1976) have noted that how a child plays is related to the way the child creatively solves problems. It was, therefore, hypothesized that measures derived from the observation of play, which involved style of play, (e.g., complexity, integration, and imaginativeness) would be related to performance on creativity tests.

Hypothesis 4

> Complexity, integration, and imaginativeness of play should be related to creativity.

Finally, Lieberman's (1977) concept of playfulness required further examination. According to Lieberman playfulness through the internalization of play can be reflected in creativity. To support this view there have been studies that have found a positive relationship between playfulness and creativity (Durrett & Huffman, 1968; Lieberman, 1965). But in demonstrating the validity of her concept by factor analysis, mental age was found to load highly on the same factor as the items from her Playfulness Scale. This prompted Sutton-Smith (1967) to speculate that creativity and playfulness were related because they are both aspects of intelligence. Indeed, when Singer & Rummo (1973) reanalyzed Lieberman's (1965) data, they found the relationship between playfulness and creativity was dependent on mental age. It was, therefore, expected

in the current study that playfulness and creativity would be related, but not when mental age was partialled out.

Hypothesis 5

Playfulness should be related to creativity.

Hypothesis 6

When mental age is partialled out, playfulness and creativity should be unrelated.

CHAPTER II

METHOD

Subjects

The subjects were 90 kindergarten-aged children (45 boys, 45 girls) from the greater Lansing area. They ranged in age from 5.33 years to 7.17 years (median = 6.00 years). They all appeared to be from white middle-class families.

Measures

Four tests were administered to all children and a rating scale was used to describe children in one of the conditions.

The Alternate Uses Test (Wallach & Kogan, 1965) was used to provide comparability with Dansky and Silverman's (1973, 1975) studies. The Alternate Uses Test measures associative fluency: the child is asked to name all the uses for an object that he/she can think of. Four of these questions were asked. The test was not timed, but took approximately 10 minutes.

The Barron-Welsh Art Scale (Barron & Welsh, 1963), found to be opposite of associative fluency in the pilot study, consists of 86 drawings. Since artists

were found to like complex, asymmetrical drawings and to dislike simple, symmetrical drawings, the closer a person follows this pattern the more creative that person is considered. Although primarily used with adults, it has been administered to children (Ward, 1968). The test was untimed, but took approximately five minutes.

Figural flexibility was found to be independent of associative fluency in the pilot study. Figural flexibility is calculated from the Picture Completion and Lines parts of the Torrance Figural Test (Torrance, 1966b). However, each part is timed and takes 10 minutes. To reduce the testing time somewhat it was decided to use only one part of the Torrance Figural Test. Since in the pilot study the Flexibility score from the Lines part correlated better with the total Flexibility score ($r = .9119$) than did the Flexibility score from the Picture Completion part, only the Lines part was used.

The Peabody Picture Vocabulary Test is a measure of intelligence that is easily administered to kindergarten children. In the test a series of pictures are placed before the child. The tester reads a word and the child points to the picture out of 4 that corresponds with that word. The test takes a short time (approximately 10 minutes) and has been used in other

studis of play and creativity (e.g., J. E. Johnson, 1976; Lieberman, 1965).

The Playfulness Scale (Lieberman, 1977) was used to rate the play of the children. The scale measures five variables: physical spontaneity, manifest joy, sense of humor, social spontaneity, and cognitive spontaneity. Each child is rated for the quality and quantity of each variable. There are also ratings for such "dummy" variables as intelligence and attractiveness. The scale was adapted in this study, since children were tested individually and thus social spontaneity could not be rated.

Materials

For experimental conditions several toys were used. They included: approximately 30 paper clips, 15 blank 3 x 5 cards, 10 empty matchboxes, small corks, wooden spools, pipe cleaners, plastic clothes pins, pliers, paper towels, and paper cups. These toys were selected because they are not objects children typically play with, thereby fostering creativity, and because they have been used in previous studies (Dansky & Silverman, 1973, 1975). In addition a box of crayons was available for use by the child in various parts of the study.

Procedure

Part 1

Approximately one week before the testing began, the experimenter visited the classroom of the children to be tested for an hour to build up rapport. When the testing began, each child was randomly assigned to one of the three conditions. Thus 15 girls and 15 boys were assigned to each condition.

Each child was brought individually to the testing area. In the testing area there were a table with two chairs opposite each other and a divider behind which observers could sit and not be seen. On the table there were: paper clips, blank 3 x 5 cards, empty matchboxes, small corks, wooden spools, pipe cleaners, plastic clothes pins, and pliers.

Play Condition. The child was seated at the table and given the following instructions:

> I like to see what kinds of games children like to play. I like to help children to have fun. Today I brought the things that you see here on the table for you to play with. They may not look like toys, but I have seen that children can have a lot of fun playing with them. I would just like to let you have some fun and play with these things any way that you would like. Do whatever you want to do with them.

The child was then allowed to play for 10 minutes. This 10 minute period used in this and other conditions

was used to provide comparability with previous work (Dansky & Silverman, 1973, 1975).

Imitation Condition. The child was seated at the table and given the following instructions:

> I have some things for you to do today. Right now I would like you to watch me to see what I do. Then I will ask you to do what I have done. Remember, watch me carefully so that you will be able to do just what I do.

The experimenter demonstrated four tasks to the child which the child imitated after the experimenter demonstrated them. These tasks were: (1) attaching paper clips to a 3 x 5 card; (2) putting a pipe cleaner through the hole in a spool and twisting the ends together; (3) opening empty matchboxes and using the pliers to fill them with corks; and (4) clipping clothes pins end to end to form abstract configurations. The order of these tasks was varied. Each task took 2 1/2 minutes.

Control Condition. The child was seated at the table (the toys absent) with a box of crayons and four sketches. The child was then told to color these pictures in any way the child desired. The child was allowed to color for 10 minutes.

Post-Tests. After the treatment session, the child was given the three creativity tests (the Alternate Uses Test, the Barron-Welsh Art Scale, and the Lines part of the Torrance Figural Test) and the Peabody

Picture Vocabulary Test. The order of the creativity tests was randomized so that each test was first, second, and third an equal number of times. Thus five boys and five girls within each condition were assigned to each of the three orders. The Peabody Picture Vocabulary Test was always presented last.

During the Alternate Uses Test the children were asked to name all the uses for objects they may have had contact with (paper clip and matchbox) and those they had not (paper towel and paper cup). In all cases the children were permitted to see, but not handle the objects.

During the pilot study it was found to be quicker and easier to administer the Barron-Welsch Art Scale by pointing to each of the pictures and asking the children whether they liked or disliked the picture. The same procedure was followed here.

Administration of the Lines part of the Torrance Figural Test followed standard form. Children were asked to draw as many different kinds of pictures or objects as possible from the 30 pairs of lines in 10 minutes.

Part 2

During the play condition two judges were seated behind the divider from which they could observe the

child's behavior unseen. (In the other conditions the divider was in place without the presence of observers.) Once the child was told to play, the judges indicated on a prepared sheet (see Figure 1) at 15 second intervals noted by a beeper which of the eight toys the child made use of. If in that interval the child made use of more than one object, the judge noted whether that use had been separate (i.e., the child moved from contact with one toy to another without any connection between the two) or integrated (i.e., the toys were used together). Use of only one toy in an interval was, by definition, separate. Further, each judge had to decide whether the child's contact with the toy(s) was exploration (i.e., the child showed some uncertainty; affect was neutral or mildly negative; and the child's actions toward the toy(s) could have included: scanning the set, focusing on one toy; examining the toy(s) visually and physically), functional play (i.e., no uncertainty, positive affect, activity done for its own sake but bounded by the physical aspects of the toy(s)), or imaginative play (i.e., the same as functional play, except the activity involves pretending). (The above distinctions correspond to those noted by Singer [1973] and Weisler and McCall [1976].)

Figure 1

Recording Sheet

Time Inter	Paper Clips	3x5 Cards	Match Boxes	Corks	Spools	Cleaners	Clothes Pins	Pliers	Integ	Sep	Explo	Fun Play	Ima Play
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
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38													
39													
40													

After the play session each judge rated the child on the adapted version of the Playfulness Scale (see Figure 2).

As can be seen in Tables 1 and 2, interjudge reliabilities were quite high. Table 1 presents interjudge agreements on the objects and descriptions of the play behavior. In all cases percentages of agreement are over 95%, and in all cases but one reliabilities are over .90.

In Table 2 interjudge reliabilities on the Playfulness Scale are presented. In the first column are those reliabilities from Lieberman's (1964) study, in the second column are those from the current study. It can be seen by examining the two columns that the reliabilities are comparable. This is somewhat surprising given the amount of time spent observing the children in the two studies. In Lieberman's (1964) study the judges were two teachers who had observed the children over quite a period of time, while in the current study the two judges had observed the children for only 10 minutes!

I. A. How often does the child engage in spontaneous physical movement and activity during play?

This behavior includes hand clapping, moving in seat, turning head from side, and other movements of the whole body or parts of the body that could be judged as a fairly clear indication of exuberance.

Very Often	Often	Occasionally	Rarely	Very Rarely
5	4	3	2	1

B. How is his/her motor coordination during physical activity?

Excellent	Very Good	Good	Fair	Poor
5	4	3	2	1

II. A. How often does the child show joy in or during his/her play activities?

This may be judged by facial expression, such as smiling, by verbal expressions, such as saying "I like this," more indirect vocalizing, such as singing as an accompaniment of the activity, or by repetition or resumption of activity with clear evidence of enjoyment.

Very Often	Often	Occasionally	Rarely	Very Rarely
5	4	3	2	1

B. With what freedom of expression does he/she show joy? This may be judged by the intensity of loudness of a chuckle or sing-song, as well as by the child's ability to repeat or resume his/her activity by his/her own choice.

Very High	High	Moderate	Some	Little
5	4	3	2	1

Figure 2. Adapted Version of Playfulness Scale (Lieberman, 1977)

Figure 2 Continued

III. A. How often does the child show a sense of humor during play? By "sense of humor" is meant rhyming and "glint-in-the-eye" behavior, as well as the ability to see a situation as funny as it pertains to himself/herself or others.

Very Often	Often	Occasionally	Rarely	Very Rarely
5	4	3	2	1

B. With what degree of consistency is humor shown? This may be judged by its occurence across situations.

Very High	High	Moderate	Some	Little
5	4	3	2	1

IV. A. How often does the child show spontaneity during expressive and dramatic play?
Instances of such behavior include labeling objects with names other than commonly used, or changing those names in different situations, especially those with living beings.

Very Often	Often	Occasionally	Rarely	Very Rarely
5	4	3	2	1

B. What degree of imagination does the child show in his/her expressive dramatic play?
Instances of imagination include using toys for other than accepted usage, as well as incorporating nonexistent objects into the play situation.

Very High	High	Moderate	Some	Little
5	4	3	2	1

V. How bright is the child?
This is your estimate of the child's intelligence based on observed behavior or inferred potential.

Extremely Bright	Bright	Average	Moderately Bright	Not Too Bright
5	4	3	2	1

Figure 2 Continued

VI. How attractive is the child?
This is your evaluation of the child's physical appeal.

Beautiful	Attractive	Looking	Passable in Looks and Appearance	Somewhat homely and Unattractive
5	4	3	2	1

Table 1

Reliability of Judges on Play--Objects and Descriptions

	Percent Agreement	Reliability[a]
Paper Clips	97	.95
3 x 5 Cards	99	.94
Match Boxes	98	.97
Corks	96	.94
Spools	97	.96
Pipe Cleaners	98	.98
Clothes Pins	96	.96
Pliers	99	.96
Integrated-Separate	96	.91
Exploratory-Functional-Imaginative	97	.89

[a]Spearman-Brown prophecy formula

Table 2

Reliability of Playfulness Scale

		Lieberman (1964)	Current Study
Physical Spontaneity	A[a]	.83	.80
	B	.67	.76
Manifest Joy	A	.73	.72
	B	.70	.74
Sense of Humor	A	.66	.63
	B	.70	.63
Social Spontaneity	A	.74	-
	B	.67	-
Cognitive Spontaneity	A	.68	.82
	B	.67	.75
Intelligence		.74	.64
Physical Attractiveness		.72	.45
Total Scale[b]		.94	-
Total Scale (Without Social Spontaneity)		.93	.86
Total Scale (Without Intelligence and Physical Attractiveness)		.96	-
Total Scale (Without Social Spontaneity, Intelligence, and Physical Attractiveness)		.95	.86

[a]Spearman-Brown prophecy formula

[b]Cronbach's alpha

CHAPTER III

RESULTS

The Effect of Play on Creativity: Experimental Analysis

Seven creativity scores were calculated from the three creativity tests: number (AUN) and uniqueness (AUU) from the Alternate Uses Test (Wallach & Kogan, 1965); the Revised Art Scale score from the Barron-Welsch Art Scale (BWAS) (Barron & Welsh, 1963); and fluency (FLU), flexibility (FLEX), originality (ORIG), and elaboration (ELAB) scores from the Lines part of the Torrance Figural Test (Torrance, 1966b).

These scores were analyzed in a 3 (Treatment) x 3 (Order) x 2 (Sex) multivariate analysis of variance (Finn, 1974). The results from this analysis are displayed in Tables 3 to 9.

In Hypothesis 1 it was expected that play would aid performance on the AUN and the AUU, hinder performance on the BWAS, and have no effect on the FLU, FLEX, ORIG, and ELAB. As can be seen in Table 3 the multivariate F for the effects of treatment was not significant. In examining the effects on specific scores, alpha should be reduced to .007 to account for the multiple measures. As can be seen in Table 3, none of the

Table 3

Multivariate Analysis of Variance for the Effects of Treatment on Measures of Creativity

Multivariate F = 1.2493 df = 14,132 p < .2480

Variable	Univariate F	p	Stepdown F	p
AUN	.4556	.6360	.4556	.6360
AUU	.2784	.7579	.2188	.8040
BWAS	.2266	.7979	.3097	.7347
FLU	1.4238	.2476	1.5899	.2114
FLEX	5.0225	.0091	3.8586	.0259
ORIG	3.6855	.0300	2.2689	.1114
ELAB	.2511	.7787	.1074	.8984

Univariate df = 2,72

Table 4

Multivariate Analysis of Variance for the Effects of Order on Measures of Creativity

Multivariate F = .4094 df = 14,132 p < .9699

Variable	Univariate F	p	Stepdown F	p
AUN	.1804	.8354	.1804	.8354
AUU	.2750	.7604	.1755	.8394
BWAS	.8940	.4135	.8420	.4352
FLU	.3759	.6881	.3087	.7355
FLEX	.5198	.5969	.6450	.5279
ORIG	.9652	.3858	.5672	.5698
ELAB	.6009	.5511	.2259	.7984

Univariate df = 2,72

Table 5

Multivariate Analysis of Variance for the Effects of Sex on Measures of Creativity

Multivariate F = 1.3217 df = 7,66 p < .2542

Variable	Univariate F	p	Stepdown F	p
AUN	.6680	.4165	.6680	.4165
AUU	1.4599	.2309	1.7274	.1930
BWAS	1.5014	.2245	1.6640	.2014
FLU	.0668	.7969	.0002	.9894
FLEX	2.1630	.1458	3.5613	.0635
ORIG	.2036	.6533	1.2007	.2772
ELAB	.0359	.8504	.3710	.5446

Univariate df = 2,72

Table 6

Multivariate Analysis of Variance for the Effects of Sex by Order Interaction of Creativity

Multivariate F = .8521 df = 14,132 p < .6119

Variable	Univariate	p	Stepdown F	p
AUN	1.8600	.1631	1.8600	.1631
AUU	1.4766	.2353	.3937	.6761
BWAS	.0617	.9403	.0647	.9374
FLU	.1625	.8504	.0389	.9619
FLEX	.3311	.7193	.4136	.6630
ORIG	.0503	.9510	.0473	.9539
ELAB	2.4036	.0977	3.2945	.0433

Univariate df = 2,72

Table 7

Multivariate Analysis of Variance for the Effects of Treatment by Sex Interaction on Measures of Creativity

Multivariate F = 1.1103 df = 14,132 p < .3547

Variable	Univariate F	p	Stepdown F	p
AUN	2.6663	.0764	2.6663	.0764
AUU	3.1849	.0473	.5004	.6085
BWAS	1.4235	.2476	1.3912	.2556
FLU	1.5230	.2251	1.4488	.2420
FLEX	.7665	.4684	.5552	.5766
ORIG	1.0570	.3529	.4217	.6577
ELAB	.4664	.6292	.9502	.3919

Univariate df = 2,72

Table 8

Multivariate Analysis of Variance for the Effects of Treatment by Order Interaction on Measures of Creativity

Multivariate F = 1.3355 df = 28,239.3886 p < .1282

Variable	Univariate F	p	Stepdown F	p
AUN	2.0298	.0993	2.0298	.0993
AUU	2.1896	.0787	.5087	.7295
BWAS	.7004	.5943	.7471	.5633
FLU	.9339	.4494	.6778	.6097
FLEX	1.8831	.1227	2.1729	.0813
ORIG	.3408	.8496	1.1159	.3565
ELAB	1.7040	.1585	2.1613	.0813

Univariate df = 4,72

Table 9

Multivariate Analysis of Variance for the Effects of Treatment by Sex by Order Interaction on Measures of Creativity

Multivariate F = 1.0538 df = 28,239.3886 p < .3972

Variabe	Univariate F	p	Stepdown F	p
AUN	.4382	.7806	.4382	.7806
AUU	.5501	.6996	.2115	.9313
BWAS	.3863	.4767	.9455	.4431
FLU	.1399	.9699	.1318	.9703
FLEX	.3085	.8714	.6926	.5997
ORIG	1.3786	.2500	3.4080	.0135
ELAB	2.3498	.0623	1.6957	.1615

Univariate df = 4,72

univariate F's nor stepdown F's reach this level, although effects for flexibility (univariate F = 5.0225, df = 2,72, p < .0091) and originality (univariate F = 3.6855, df = 2,72, p < .0300) approached it. When the means for the groups were examined, it was found that children in the imitation condition performed better than those in the play and control conditions for both flexibility (I = 7.83, P = 4.77, C = 5.43) and originality (I = 17.33, P = 11.37, C = 10.37).

Further information about Hypothesis 1 pertaining to the effect of play on performance on the Alternate Uses Test can be seen by examining Table 7. There is a near significant treatment by sex effect for uniqueness (univariate F = 3.1849, df = 2,72, p < .0473) and number (univariate F = 2.6663, df = 2,72, p < .0764). Examination of the means revealed that the expectation in Hypothesis 1 that children in the play condition would do better on the Alternate Uses Test than those in the other two conditions was true for the girls (uniqueness: P = 8.47, I = 5.60, C = 2.93; number: P = 16.33, I = 12.93, C = 9.87) but not for the boys (uniqueness: P = 6.20, I = 6.47, C = 9.73; number: P = 13.47, I = 13.33, C = 16.53).

Examination of Tables 4, 5, 6, and 9 reveal little of interest with regard to the effects of order (Table 4), sex (Table 5), sex by order interaction

(Table 6), and treatment by sex by order interaction (Table 9), There are some interesting effects of the treatment by order interaction (Table 8), which were not hypothesized.

In Table 8 there are near significant effects of the treatment by order interaction for the number (univariate $F = 2.0298$, $df = 4,72$, $p < .0993$) and uniqueness measures (univariate $F = 2.1896$, $df = 4,72$, $p < .0787$) of the Alternate Uses Test. Examination of the means revealed that children in the play condition did best on the Alternate Uses Test when it was given second (uniqueness: 1 = 6.3, 2 = 11.6, 3 = 4.1; number: 1 = 13.7, 2 = 19.7, 3 = 11.3), while those in the imitation and control conditions did best when it was given third--imitation (uniqueness: 1 = 6.0, 2 = 5.7, 3 = 6.4; number: 1 = 13.1, 2 = 12.1, 3 = 14.2), control (uniqueness: 1 = 5.2, 2 = 4.2, 3 = 9.6; number: 1 = 12.3, 2 = 10.9, 3 = 16.4).

To test Hypothesis 2 that effects of mental age would not effect the predictions of Hypothesis 1, a multivariate analysis of covariance was carried out on the same data with mental age, calculated from the Peabody Picture Vocabulary Test, as a covariate. Since mental age did not interact with the independent variables ($F = .3236$, $df = 7,65$, $p < .9407$), it was legitimate to attempt this analysis. The results were much

the same as in Tables 3 to 9. This can be seen by comparing the multivariate F's in Table 10 with those in Tables 3 to 9.

Measures Derived From Observations of Play

The observer's judgments on each of the 30 children in the play condition were coded on the scoring sheet shown in Figure 1. For each of the 40 intervals the following scoring system was used: If the judges agreed that an object was not played with or a category was inappropriate, a zero was scored. If they agreed that an object was played with or a category was appropriate, a two was scored. If only one judge thought an object was played with or a category was appropriate, a one was scored. In this way there were 520 scores (40 intervals by 8 objects and 5 categories) for each child. (It should be noted that one child was inadvertently permitted to play for only 9 minutes and thus had 468 scores.)

A number of variables were created from these scores. First, for each of the 8 objects and 5 categories scores were summed across the 40 intervals to give total object and category use. (It should be noted that the integrated and separate categories, as well as the exploratory, functional and imaginative categories, are ipsative measures and total to 80.)

Table 10

Multivariate Analysis of Covariance for the Effects of Treatment, Order, and Sex of Creativity

Effect	Multivariate F	df	p
Treatment	1.2321	14,130	.2600
Order	.4005	14,130	.9727
Sex	1.3124	7,65	.2588
Sex by Order	.8884	14,130	.5729
Treatment by Sex	1.0977	14,130	.3658
Treatment by Order	1.3017	28,235.7830	.1499
Treatment by Sex by Order	1.0247	28,235.7830	.4362

The complexity of each child's play, or the number of objects being played with at a given period of time, was thought to be an important consideration and was calculated in the following way: Within each of the 40 intervals the scores for the 8 objects were summed. It was felt that complex play would only occur if the use of those objects were integrated. So the sum for the 8 objects was then multiplied by the integrated score. These 40 products were then summed to form one total score for complexity.

Also of interest were the shifts the child showed in the play, or the number of times a child added or subtracted an object from the set being played with. Shifts were examined in two ways. The first way involved looking at the pattern of scores for the 8 objects and 5 categories within each interval. These patterns were compared in the following manner: If the pattern from one interval to the next were the same, a zero was scored. If the two patterns were different, a one was scored. The total of these scores was called global shifts.

It was felt that this approach to shifts might miss some character of them. For example, the global shifts score would be the same whether one object or more were added to the set. To remove this problem a second shifts score was calculated. The score of each

object was compared from one interval to the next. If the scores were the same, a zero was scored. If the two scores were different, a one was scored. These scores were then summed for each object. These scores in turn were summed to give an object shifts score.

The Relationship Between Measures of Creativity, Playfulness, and Play

To examine Hypothesis 3 that time spent playing with an object would be unrelated to the number and uniqueness of uses given for that object, separate scores were calculated for the four objects used in the Alternate Uses Test. Thus there were number and uniqueness scores for the objects played with (paper clip and matchbox) as well as for those that were not (paper towel and paper cup).

The following variables were then correlated (abbreviations are in parentheses): sex, mental age (MA), number and uniqueness of uses for the paper clip (N1 and U1), number and uniqueness of uses for the paper towel (N2 and U2), number and uniqueness of uses for the matchbox (N3 and U3), number and uniqueness of uses for the paper cup (N4 and U4), the total number and uniqueness scores for the Alternate Uses Test (AUN and AUU), the Revised Art Scale score from the Barron-Welsh Art Scale (BWAS), the fluency, flexibility, originality, and elaboration scores from the Lines part of the

Torrance Figural Test (FLU, FLEX, ORIG, and ELAB), both parts of the Physical Spontaneity, Manifest Joy, Sense of Humor, and Cognitive Spontaneity items as well as Intelligence and Physical Attractiveness items from the Playfulness Scale (PS1, PS2, JOY1, JOY2, SH1, SH2, CS1, CS2, INT, and PA), object use totals for the paper clips, 3 x 5 cards, matchboxes, corks, spools, pipe cleaners, clothes pins, and pliers (PC, CARD, MB, CRK, SP, CL, CP, and PL), category use for integrated, separate, exploratory, functional, and imaginative play (INTEG, SEP, EXP, FUN, and IMAG), complexity (COMPEX), and global and object shifts (GSHIFT and OSHIFT). The correlations are presented in Appendix A.

Examination of Table 11 indicates that Hypothesis 3, that time spent playing with an object should be unrelated to the number and uniqueness of uses given for that object, was supported. Correlations between use of paper clips in play and the number and uniqueness of uses for them are .18 and .14 respectively, both not significant. Similarly, use of the matchboxes correlated .09 and .03 with number and uniqueness of uses for them respectively.

Some other points should be noted from the correlations in Appendix A. Only three variables correlate significantly with sex (positive correlations mean higher scores by boys, negative correlations higher

Table 11

Selected Correlations Between Measures of Creativity, Playfulness, and Play

Correlations Between Time Spent Playing With Objects and Alternate Uses For Them					
	N1	U1		N3	U3
PC	.18	.14	MB	.09	.03

Correlations Between Measures of Play and Creativity					
	INTEG	IMAG	COMPLEX	OSHIFT	GSHIFT
N1	.04	.19	.11	-.03	-.03
U1	-.03	.35	.04	.04	.08
N2	.00	.32	-.01	-.17	-.18
U2	.12	.23	.11	-.08	-.07
N3	-.23	.33	-.24	-.09	-.04
U3	-.20	.15	-.19	-.12	-.10
N4	.12	.32	.16	.14	.15
U4	.12	.37	.16	.13	.14
AUN	.00	.31	.03	-.06	-.05
AUU	.01	.34	.06	.00	.03
BWAS	.36	-.15	.33	-.03	-.09
FLU	.08	.01	-.08	.02	.10
FLEX	-.06	-.02	-.09	.03	.03
ORIG	.06	.03	-.08	-.07	-.06
ELAB	-.01	.37	-.07	-.08	-.04

scores for girls): physical spontaneity--both parts--and the second part of cognitive spontaneity. Three significant correlations out of 42 are not much more than that expected by chance. As a result, there is no further information why the associative fluency effect was found only for girls.

The other intriguing finding is that the highest correlation of mental age with any other variable is .59 with the estimate of intelligence from the Playfulness Scale. This means that the two observers were able to make fairly accurate judgments of the children's mental age from 10 minutes observation of their play.

Examination of Table 11 provides information on the status of Hypothesis 4, that complexity, integration, and imaginativeness of play should be related to creativity. For complexity the hypothesis was not verified. The highest correlation for complexity and a creativity measure is with the Barron-Welsh Art Scale, .33. The measures of shifts, global and object, fare just as badly.

Integration does little better, reaching significance only with the Barron-Welsh Art Scale, .36. Imaginativeness does somewhat better, correlating near significance with most of the Alternate Uses Test items

(correlations range from .15 to .37) and at significance with the elaboration score of the Torrance Figural Test, .37.

Multidimensional Scaling and Clustering of Creativity, Playfulness, and Play

One purpose of the current study was to suggest a model which related certain aspects of play with certain kinds of creativity. To do this the correlation matrix, minus the scores for the individual objects on the Alternate Uses Test, was submitted to multidimensional scaling (Kruskal, 1964). A two dimensional solution with a stress of .254, a reasonable value given the large number of variables, was generated. This solution is presented in Figure 3.

The two dimensions are interpretable. The first dimension is a continuum from separate-imaginative play to a more concrete integrative-functional play. The second dimension appears to be a cognitive style dimension, ranging from creativity through intelligence to shifts (or impulsivity to use Kagan, Rosman, Day, Albert, and Phillips' [1964] term).

It was thought that clustering these variables would be useful in proposing a model of the relationship between play and creativity. The clustering solution, using S. C. Johnson's (1967) special method, is presented in Figure 4. It was then applied to the scaling

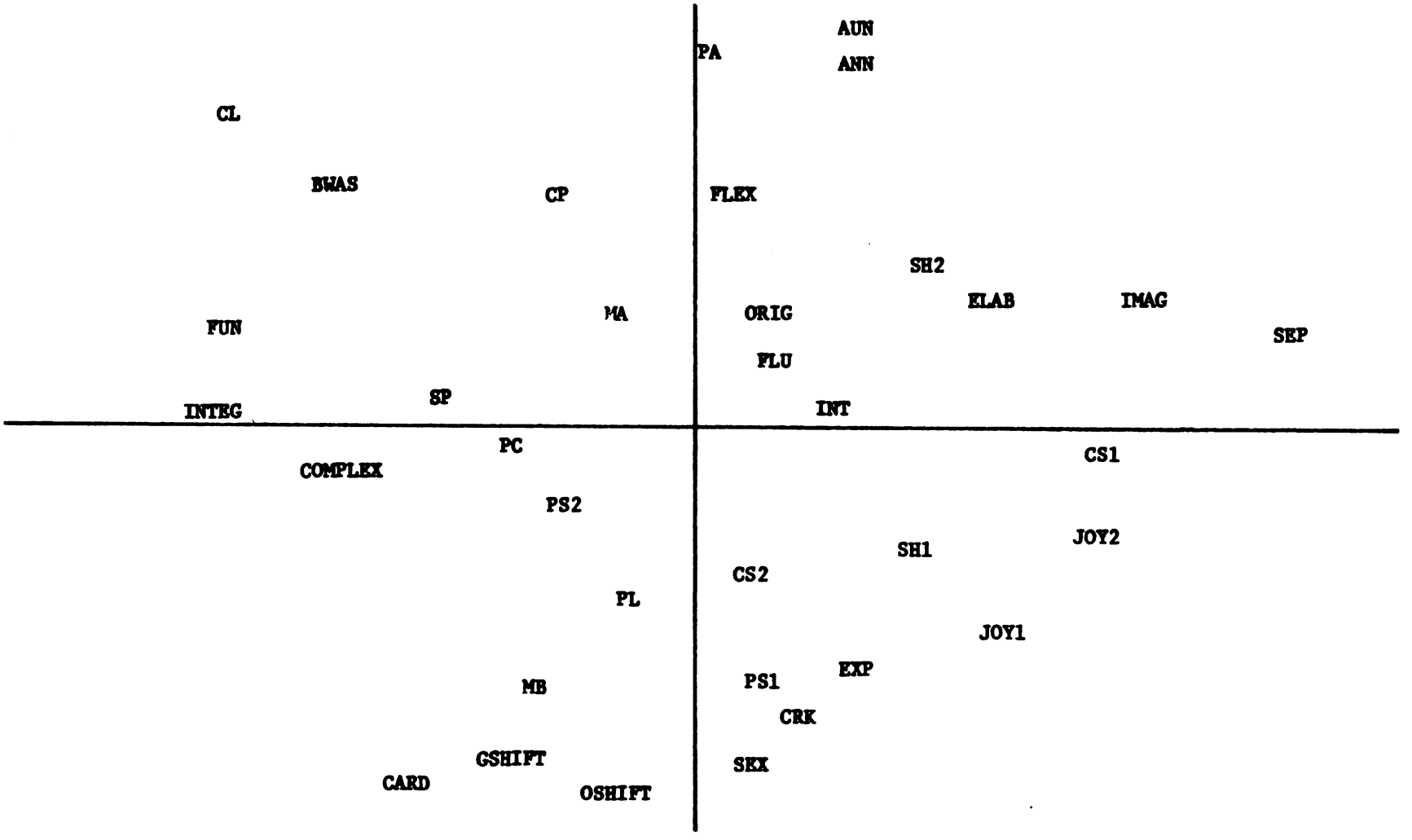

Figure 3

Multidimensional Scaling Solution of Creativity, Playfulness, and Play Data

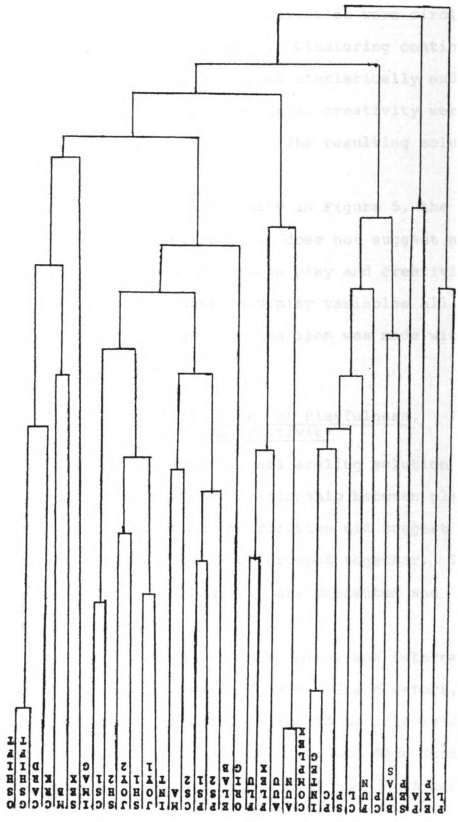

Figure 4
Clustering of Creativity, Playfulness, and Play Data

solution in the following way. Variables were circled as they clustered hierarchically. Clustering continued as long as the clusters made sense statistically and logically, e.g., verbal and nonverbal creativity were not allowed to cluster together. The resulting solution is presented in Figure 5.

As can be seen, especially in Figure 5, the multidimensional scaling solution does not suggest a model for the relationship between play and creativity. The creativity, playfulness, and play variables all cluster separately. Thus no comparison was made with Lieberman's (1964) data.

Path Analytic Model of Playfulness, Play, and Creativity

While the multidimensional scaling solution did not provide a model for the relationship between play and creativity, the clustering solution did suggest that certain variables could be grouped together. The six final clusters from Figure 5 are presented and described in Table 12.

The six clusters were meaningful and internally consistent (alphas greater than .79). The clusters, verbal and nonverbal creativity, should be self-evident from previous discussions of the Alternate Uses Test and the Torrance Figural Test. Use of the 3 x 5 cards,

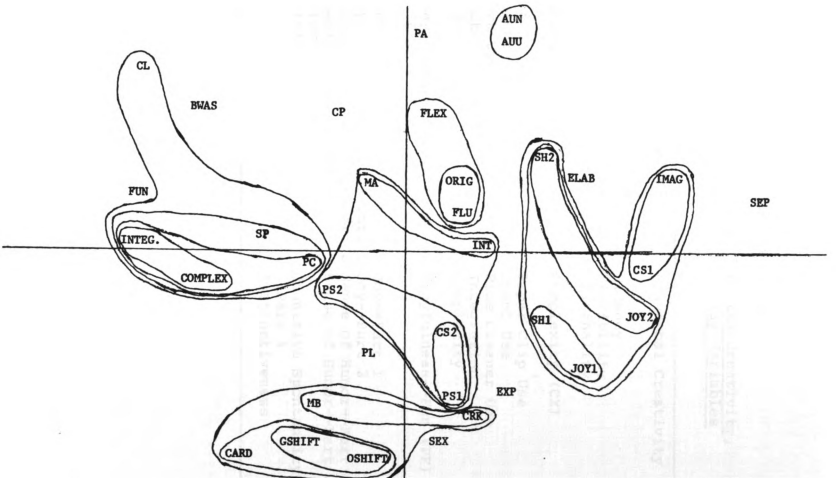

Figure 5

Multidimensional Scaling Solution and Clusters for Creativity, Playfulness, and Play Data

Table 12

Clusters Formed from the Creativity, Playfulness, and Play Variables

Verbal Creativity (VC)	Nonverbal Creativity (NVC)
Alternate Uses--Number	Fluency
Alternate Uses--Uniqueness	Flexibility
	Originality
Shifts (SH)	Complexity (CX)
3 x 5 Card Use	Paper Clip Use
Matchbox Use	Spool Use
Cork Use	Pipe Cleaner Use
Global Shifts	Integration
Object Shifts	Complexity
Playfulness-Intelligence (PI)	Playfulness--Fun (PF)
Mental Age	Joy--Part 1
Physical Spontaneity--Part 1	Joy--Part 2
Physical Spontaneity--Part 2	Sense of Humor--Part 1
Cognitive Spontaneity--Part 2	Sense of Humor--Part 2
Intelligence	Cognitive Spontaneity--Part 1
	Imaginativeness

matchboxes, and corks were included in the shifts cluster, since these objects were easy to add or subtract from the set being played with. Use of paper clips, spools, and pipe cleaners were included in the complexity cluster, since these objects were frequently used in combination with others. The Playfulness Scale with a few other items was divided into two parts: one dealing with intelligence in play, the other with the fun aspect of play. This distinction is consistent with dual aspects of cognition and affect in Lieberman's (1977) notion of playfulness and with Singer's (1967) distinction between reminiscent and playful daydreams.

These clusters were then correlated using Hunter and Cohen's (Note 2) PACKAGE program. The oblique multiple groups analysis routine in this program was performed with the six clusters as the groups. The analysis standardized all the variables that were part of the groups and gave them equal weighting within the groups. The groups were then correlated, correcting for attenuation (see Table 13).

These correlations were submitted to path analysis using the model presented in Figure 6. This model proposes that playfulness, a personality construct, should be evident in play, which in turn should effect creativity. While it can be argued that since

Table 13

Correlations Corrected for Attenuation Between Clusters of Creativity, Playfulness, and Play

	PF	PI	SH	CX	VC
PI	.61				
SH	.08	.57			
CX	-.09	.45	.34		
VC	.13	.16	-.03	-.01	

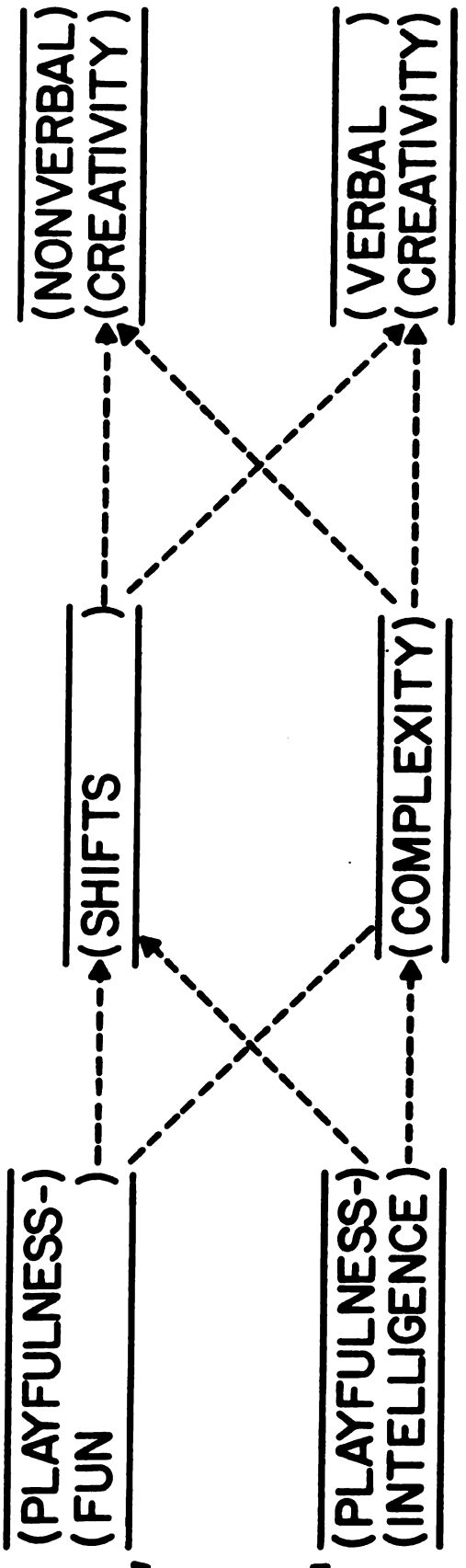

Figure 6

The Path Analytic Model for Playfulness, Play, and Creativity

the ratings of playfulness followed the judges' observations of play, the play clusters should precede the playfulness clusters in the path model, this model was chosen because it more closely matched the relationship among playfulness, play, and creativity proposed by Lieberman (1977).

The fit between the observed and predicted correlations was very good--the sum of the squared deviations was .16 (see Table 14). The path model with the ordinary least squares estimates of the path coefficients is presented in Figure 7. The path coefficients are calculated by doing a regression of each cluster onto its causal antecedents. With two or more antecedents, as in this model, the path coefficients are the beta weights. The value of the double curved arrow between playfulness-fun and playfulness-intelligence is simply the correlation between them.

As can be seen in Figure 7, playfulness-fun and playfulness-intelligence have very different impacts on shifts and complexity. It can be noted by examining Table 13 that the negative path coefficients from playfulness-fun in Figure 7 are not due to a suppressor effect. Children who are high on playfulness-fun (i.e., who outwardly express joy during play) are likely to play with a small set objects and make few changes in which objects belong to the set. Children who are high

Table 14

The Basic Assessment of the Path Analysis of Playfulness, Play, and Creativity

	Observed Correlations					
	PF	PI	SH	CX	VC	NVC
PF	1.00	.61	.08	-.09	.13	.18
PI	.61	1.00	.57	.45	.16	.14
SH	.08	.57	1.00	.34	-.03	.06
CX	-.09	.45	.34	1.00	-.01	.01
VC	.13	.16	-.03	-.01	1.00	.26
NVC	.18	.14	.06	.01	.26	1.00

	Predicted Correlations					
	PF	PI	SH	CX	VC	NVC
PF	1.00	.61	.08	-.09	.00	.01
PI	.61	1.00	.57	.45	-.02	.03
SH	.08	.57	1.00	.41	-.03	.06
CX	-.09	.45	.41	1.00	-.01	.01
VC	.00	-.02	-.03	-.01	1.00	.00
NVC	.01	.03	.06	.01	.00	1.00

	Observed Minus Predicted Correlations					
	PF	PI	SH	CX	VC	NVC
PF	.00	.00	.00	.00	.13	.17
PI	.00	.00	.00	.00	.18	.11
SH	.00	.00	.00	-.07	.00	.00
CX	.00	.00	-.07	.00	.00	.00
VC	.13	.18	.00	.00	.00	.26

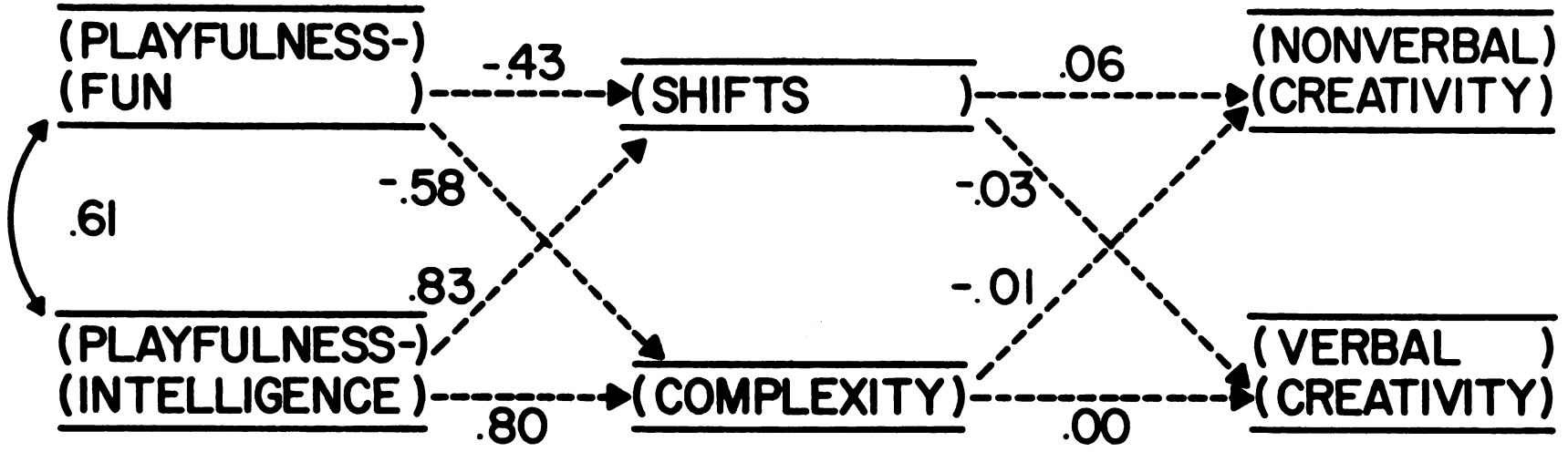

Figure 7

The Path Analytic Model for Playfulness, Play, and Creativity with the Ordinary Least Squares Estimates of Path Coefficients

on playfulness-intelligence (i.e., who view play as an intellectual challenge) are likely to play with a large set of objects and make many changes in which objects belong to that set.

The other point of note in Figure 7 is the near zero path coefficents between shifts and complexity, and verbal and nonverbal creativity. This should indicate that play, at least as defined by these clusters, has a weak effect on creativity.

Redundancy Analysis of Playfulness and Creativity

The final questions to be resolved were Hypotheses 5 and 6, that playfulness is related to creativity, but not when mental age is partialled. To test these hypotheses, playfulness was defined as the Playfulness Scale items, except for the Physical Attractiveness and Intelligence items, which Lieberman (1977) has termed "dummy" items. Creativity was defined as the AUN, AUU, BWAS, FLU, FLEX, ORIG, and ELAB. The correlations among these variables, which can also be found in Appendix A, are presented in Table 15.

To test Hypothesis 5 it was decided to run a redunancy analysis between the two sets of variables (Van den Wollenberg, 1977). Redundancy analysis computes the variance accounted for in one set of variables by another set of variables. It was chosen instead of

Table 15

Correlations Among Measures of Playfulness and Creativity

	Playfulness						Creativity								
	PS1	PS2	JOY1	JOY2	SH1	SH2	CS1	CS2	AUN	AUU	BWAS	FLU	FLEX	ORIG	ELAB
PS1	1.00														
PS2	.65	1.00													
JOY1	.54	.17	1.00												
JOY2	.38	.18	.69	1.00											
SH1	.37	.17	.77	.63	1.00										
SH2	.24	.15	.37	.68	.56	1.00									
CS1	.34	.12	.62	.59	.54	.44	1.00								
CS2	.72	.58	.44	.28	.32	.29	.59	1.00							
AUN	-.01	.00	.00	.05	-.08	.29	.19	.12	1.00						
AUU	.08	.03	.02	.05	-.12	.27	.20	.18	.96	1.00					
BWAS	-.10	.20	-.33	-.32	-.24	-.06	-.16	.00	.02	-.02	1.00				
FLU	.23	.40	.21	.19	.05	.05	-.03	.04	.20	.23	-.09	1.00			
FLEX	.00	.28	-.01	.23	-.16	.23	-.06	.00	.15	.19	-.03	.61	1.00		
ORIG	.20	.26	.12	.21	.07	.26	-.02	.00	.20	.22	.05	.71	.49	1.00	
ELAB	.24	.17	.10	.17	.25	.36	.36	.27	.14	.14	-.15	-.06	.00	.07	1.00

canonical correlation, because canonical correlation can, in maximizing the correlation between two sets of variables, weight heavily two minor components, one from each set, which are highly correlated, but explain little of the shared variance between the sets.

Thissen and Wollenberg (Note 3) provided me with the program for redunancy analysis, REDANAL, which I adapted for current use on the computer. The results of the first analysis are presented in Tables 16 and 17.

Table 16 presents the factor loadings of the playfulness and creativity variables on the redundancy variates. From these loadings it can be determined that the redundancy variates of playfulness explain 31.8% of the variance of creativity, while the redundancy variates of creativity explain 22.2% of the variance of playfulness. (Redundancy analysis is not symmetric.) It can be said that playfulness and creativity have a good deal in common.

This can also be seen in Table 17. The unrotated correlations show high correlations between a number of the variates. (This also illustrates the lack of bi-orthogonality in redundancy analysis.) The correlations among the rotated redundancy variates, which are roughly equivalent to those that would be

Table 16

Factor Loadings of Playfulness and Creativity on Redundancy Variates

	Playfulness Variates							Creativity Variates						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
PS1	-.21	.00	.68	-.04	.24	.18	.56	-.41	.23	.10	-.07	-.09	-.12	-.01
PS2	-.48	.24	.32	-.55	-.05	.36	.30	-.27	.40	-.13	.23	.09	.05	.01
JOY1	-.08	.14	.66	.45	.26	.35	-.23	-.29	-.06	.27	.05	-.09	.04	.06
JOY2	-.28	.14	.65	.51	-.42	.19	-.09	-.28	-.23	.01	.20	-.12	.04	-.05
SH1	.13	-.03	.78	.08	-.11	.14	-.44	-.29	-.16	.25	.01	.21	-.04	-.02
SH2	-.50	-.36	.46	.23	-.42	-.19	-.23	-.30	-.26	-.37	.05	.02	-.07	.03
CS1	-.11	-.46	.49	.29	-.08	.65	-.15	-.33	-.11	-.07	-.21	.05	.08	.01
CS2	-.16	-.32	.28	-.01	.01	.59	.40	-.27	.15	-.11	-.20	-.03	.04	-.03
AUN	-.38	-.33	-.09	.11	.04	.00	-.06	-.23	-.20	-.49	-.21	-.13	.24	.75
AUU	-.41	-.34	-.07	.14	.09	.01	.05	-.29	-.07	-.48	-.29	-.34	.18	.67
BWAS	-.20	-.12	-.23	-.39	.02	-.01	.00	.41	.56	-.50	-.01	.42	-.27	.14
FLU	-.40	.37	.15	-.08	.12	.09	-.01	-.46	.37	.08	.67	-.19	.11	.39
FLEX	-.59	.24	-.13	.07	-.17	.02	.01	-.19	.08	-.50	.71	-.38	.23	-.10
ORIG	-.41	.13	.20	-.03	.02	-.14	.00	-.45	.04	-.17	.60	-.13	-.52	.34
ELAB	-.13	-.40	.33	-.13	-.09	.05	.00	-.78	-.13	-.29	-.25	.37	.04	-.29

Table 17

Correlation Matrices of Playfulness and Creativity Redundancy Variates

Playfulness	Unrotated Creativity 1	2	3	4	5	6	7
1	.216	-.142	.552	-.291	.155	-.061	-.158
2	.155	.150	.363	.508	-.114	.109	-.031
3	-.440	-.027	.248	-.016	.116	-.150	-.030
4	.038	-.355	-.056	-.031	-.390	.050	.005
5	-.065	.244	.200	-.153	-.098	-.059	.185
6	-.061	.176	.056	-.033	.034	.260	-.020
7	-.064	.196	-.015	-.151	-.244	-.106	-.108

Playfulness	Rotated Creativity 1	2	3	4	5	6	7
1	.755	.000	.000	.000	.000	.000	.000
2	.000	.680	.000	.000	.000	.000	.000
3	.000	.000	.604	.000	.000	.000	.000
4	.000	.000	.000	.493	.000	.000	.000
5	.000	.000	.000	.000	.460	.000	.000
6	.000	.000	.000	.000	.000	-.276	.000
7	.000	.000	.000	.000	.000	.000	.232

obtained by canonical correlation, make the case for a relationship between playfulness and creativity much stronger. The correlations between the first rotated redundancy variates of playfulness and creativity is .756.

To test Hypothesis 6, that the relationship between playfulness and creativity would disappear when mental age was partialled, the correlations between playfulness and creativity were recalculated, partialling mental age. The results which are presented in Table 18 show little difference with those previously obtained (compare with Table 15).

Redundancy analysis was performed as before and the results are presented in Tables 19 and 20. From Table 19 it can be calculated that the redundancy variates of playfulness account for 32.3% of the variance of creativity, while the redundancy variates of creativity account for 25.5% of the variance of playfulness. The correlation between the first redundancy variates of playfulness and creativity is .757. As all these results demonstrate there was little change in the relationship between playfulness and creativity, when mental age was partialled, disconfirming Hypothesis 6.

Table 18

Correlations Among Measures of Playfulness and Creativity Mental Age Partialled

	Playfulness						Creativity								
	PS1	PS2	JOY1	JOY2	SH1	SH2	CS1	CS2	AUN	AUU	BWAS	FLU	FLEX	ORIG	ELAB
PS1	1.00														
PS2	.62	1.00													
JOY1	.52	.11	1.00												
JOY2	.35	.11	.67	1.00											
SH1	.36	.15	.77	.63	1.00										
SH2	.20	.08	.34	.66	.56	1.00									
CS1	.30	.04	.60	.57	.54	.41	1.00								
CS2	.71	.51	.39	.20	.32	.22	.56	1.00							
AUN	-.04	-.05	-.03	.03	-.10	.28	.17	.08	1.00						
AUU	.05	-.02	-.01	.02	-.14	.25	.17	.13	.96	1.00					
BWAS	-.13	.18	-.37	-.36	-.26	-.09	-.20	-.05	.01	-.04	1.00				
FLU	.24	.42	.22	.20	.05	.05	-.04	.05	.20	.23	-.10	1.00			
FLEX	-.06	.22	-.07	.19	-.19	.19	-.13	-.13	.13	.16	-.06	.63	1.00		
ORIG	.22	.29	.13	.23	.07	.28	-.02	.01	.21	.23	.05	.71	.51	1.00	
ELAB	.23	.16	.09	.16	.25	.36	.36	.27	.13	.13	-.17	-.07	-.01	.07	1.00

Table 19

Factor Loadings of Playfulness and Creativity with Mental Age Partialled on Redundancy Variates

	Playfulness Variates							Creativity						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
PS1	-.17	.02	.72	.11	.37	.07	.45	.47	.24	.01	.05	-.13	-.09	-.01
PS2	-.45	.25	.32	.64	.15	-.25	.23	.26	.40	.24	-.21	.10	.05	.01
JOY1	-.05	.16	.76	-.39	.35	-.17	-.30	.42	-.03	-.24	-.08	-.07	.04	.05
JOY2	-.27	.16	.73	-.42	-.39	-.19	-.06	.29	-.26	-.02	-.23	-.08	.05	-.05
SH1	.15	.00	.82	.00	-.07	-.10	-.51	.42	-.12	-.18	-.01	.20	-.07	-.01
SH2	-.46	-.38	.49	-.16	-.43	.12	-.31	.20	-.35	.37	-.02	-.01	-.05	.03
CS1	-.03	-.45	.58	-.26	.04	-.61	-.07	.32	-.15	.07	.23	.04	.08	-.01
CS2	-.05	-.30	.42	.04	.32	-.42	.30	.30	.14	.08	.22	-.02	.03	-.01
AUN	-.35	-.36	-.09	-.13	.02	-.02	-.05	.06	-.29	.45	.27	-.22	.38	.67
AUU	-.38	-.36	-.07	-.15	.10	.01	.04	.11	-.17	.46	.32	-.44	.35	.57
BWAS	-.15	-.14	-.29	.38	.03	.01	.00	-.50	.49	.45	.08	.38	-.30	.23
FLU	-.43	.36	.14	.08	.14	-.07	-.01	.42	.33	.19	-.67	-.19	.28	.33
FLEX	-.58	.22	-.14	-.06	-.17	-.04	.01	-.07	-.04	.51	-.71	-.30	.33	-.16
ORIG	-.46	.10	.18	.06	-.01	.13	-.01	.40	.00	.43	-.60	-.23	-.36	.36
ELAB	-.11	-.42	.32	.18	-.08	-.05	.01	.64	-.21	.50	.31	.27	.06	-.36

Table 20

Correlation Matrices of Playfulness and Creativity Redundancy Variates with Mental Age Partialled

Unrotated

Playfulness	Creativity						
	1	2	3	4	5	6	7
1	-.014	-.027	-.570	.284	.207	-.137	-.123
2	-.042	.208	-.387	-.533	-.026	.096	-.027
3	.536	-.020	-.102	.007	.040	-.114	-.045
4	.083	.352	.195	.008	.346	-.093	-.023
5	.158	.371	-.124	.152	-.137	.037	.137
6	-.018	-.069	.015	.012	-.149	-.260	.028
7	.021	.168	.040	.101	-.227	-.048	-.117

Rotated

Playfulness	Creativity						
	1	2	3	4	5	6	7
1	.757	.000	.000	.000	.000	.000	.000
2	.000	.684	.000	.000	.000	.000	.000
3	.000	.000	-.626	.000	.000	.000	.000
4	.000	.000	.000	-.502	.000	.000	.000
5	.000	.000	.000	.000	.473	.000	.000
6	.000	.000	.000	.000	.000	.288	.000
7	.000	.000	.000	.000	.000	.000	-.185

CHAPTER IV

DISCUSSION

The purpose of the current study was to examine Dansky and Silverman's (1975) associative fluency hypothesis in a systematic manner. The associative fluency hypothesis, as formulated by Dansky and Silverman (1975), states that play creates a mental set which enables the player to associate fluently and thus do well on creativity tests since they measure associative fluency. Since creativity has been defined in their studies as verbal creativity, the current study was undertaken to examine the effects of play on other aspects of creativity. This required the use of a variety of creativity tests and thus treatment of their order as an independent variables.

It was therefore quite surprising, given the strict experimental design, that there was a lack of significant findings in the experimental analysis. One problem was the lack of power. It had been expected that order of creativity test presentation would not affect the scores on these tests. When it was found that it did, the number of subjects per cell was reduced from 15 to 5.

A second problem was the variance. Attempts were made to keep the directions comparable. Children who gave a large number of irrelevant responses when taking the Alternate Uses Test were excluded from the analysis. Still there was a lack of homogeneity of variance in many cases, indicating a good deal of individual variation within the treatment condition.

While the lack of a significant treatment effect on the Alternate Uses Test was contrary to expectations, the sex by treatment interaction offered hope of partial confirmation. Examination of the means revealed that girls showed the associative fluency effect, while boys did not. But examination of the correlations within the play condition between sex and the other variables revealed no sex difference.

This suggests that the boys and the girls responded differently to the control condition. But why did the boys in the control condition perform better on the Alternate Uses Test than the girls in that condition? A number of hypotheses were generated, but none were satisfactory. For every reasonable explanation why the boys performed better, there was a reasonable counter-explanation which would predict better performance by the girls. It then seems reasonable to think that this apparent sex difference occurred by chance.

What then is the state of the associative fluency hypothesis? It is probable that the effect exists, given its finding in three studies (Dansky & Silverman, 1973, 1975; Sutton-Smith, 1967) and partial confirmation in the current study. The question remains why have other studies supported this hypothesis, while the current study is equivocal on it.

Perhaps the lack of significant findings in the current study is due to differences between it and those of Dansky and Silverman. Geographical location is an unlikely explanation since both studies were done in Midwestern cities, Lansing and Toledo. Likewise, it is difficult to imagine a historical change between 1975 and 1978 that would explain the difference.

The age difference in the samples between the current study and Dansky and Silverman's studies at first appears to be the explanation. Dansky and Silverman's samples were pre-school children who on average were a year younger than those in the current study. Torrance (1965) has found that there is a developmental decline in creativity about the time children begin kindergarten. This information coupled with the fact that children in Dansky and Silverman's (1973, 1975) studies averaged over 10 alternate uses per object, while those in the current study averaged less than 4 uses, suggests that this decline suppressed the

associative fluency effect. But Sutton-Smith (1967) tested kindergarten-aged children and found the effect, which negates that suggestion.

It could be argued that the complexity of the current study wiped out the effect. Two points can be brought in rebuttal to this argument. First, an examination of those children who were given the Alternate Uses Test first failed to reveal the hypothesized effect. Second, if one takes this argument at its word, it implies that the associative fluency effect is a weak one.

The weakness of the associative fluency effect seems to be the most reasonable explanation for the failure to replicate. The only other remaining explanation is that there was a change in procedure. But for the most part the procedure in the current study duplicated Dansky and Silverman's, even including the instructions given the children in the treatment conditions. If there was a difference in procedure, it must have been slight. This again would attest to the weakness of the effect.

There were other interesting findings in the current study. The treatment by order interaction was not hypothesized, but there is a reasonable post-hoc interpretation. In the current study the creativity tests were presented to the children not as tests, but

as games, following Wallach and Kogan's (1965) suggestion. Perhaps these tests so presented were in effect periods of play before the Alternate Uses Test was presented. If the Barron-Welsh Art Scale is treated as 5 minutes of play and the Torrance Figure Test as 10 minutes of play, we see the patterns displayed in Figures 8 and 9.

As can be seen in Figures 8 and 9 there was an increase in the number and uniqueness of uses as the time spent playing increased up to 20 minutes. There was a sharp decline in the number and uniqueness for those who played for 25 minutes. These children could have become fatigued or bored with the tasks in the experiment. These findings are consistent with Dansky and Silverman's (1975) associative fluency hypothesis, but they also suggest that too much play can be detrimental to performance on creativity tests.

There still remains a major difficulty in Dansky and Silverman's associative fluency hypothesis. Why were the near significant effects seen only for the Alternate Uses Test? It is reasonable that a short period of play would not affect a personality trait, such as liking for complexity. But why did play, essentially a nonverbal activity, at least in the current study, affect weakly verbal fluency but not affect at all nonverbal fluency? It would be advisable to perform

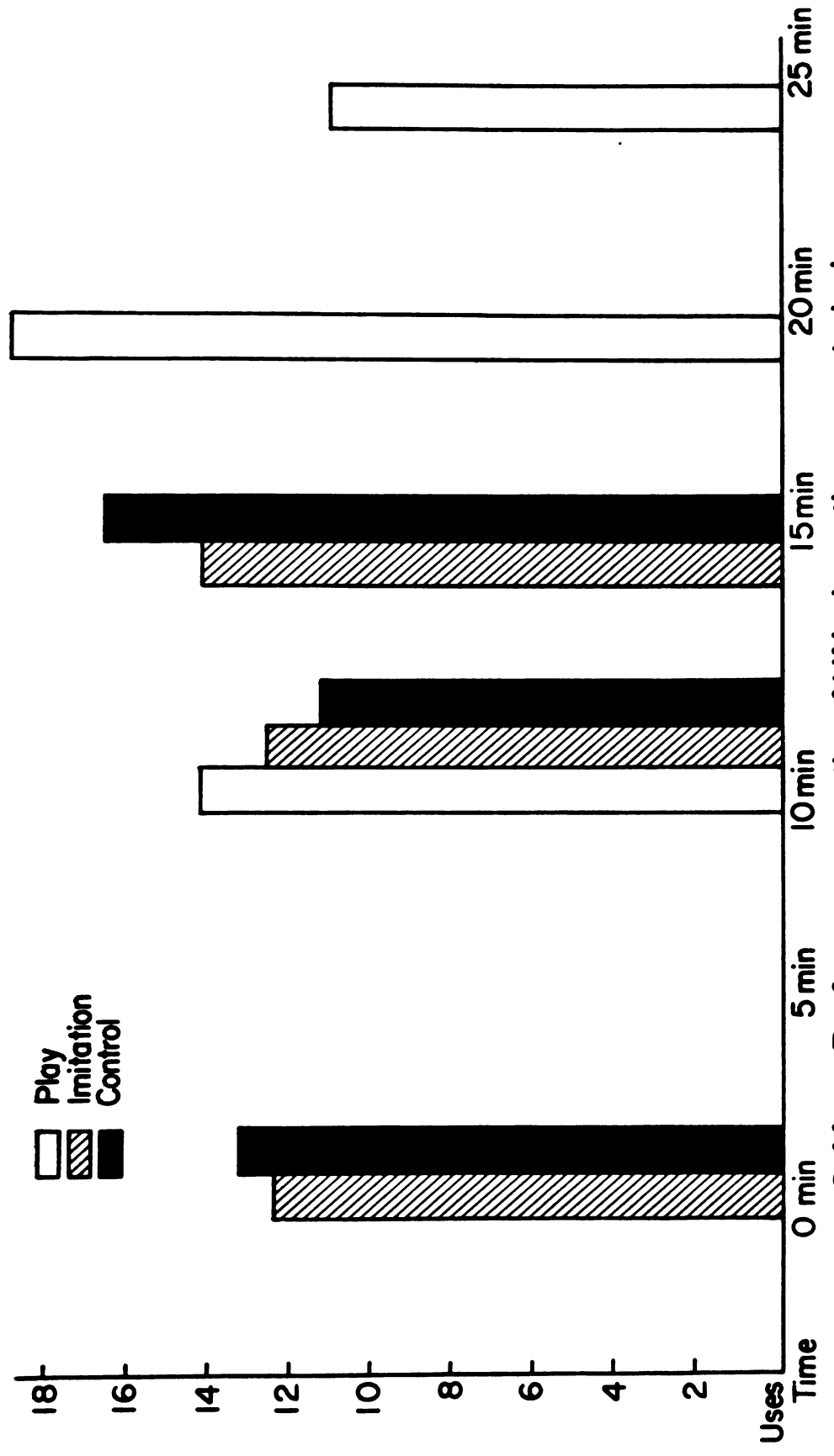

Figure 8 Mean Performance on the AUN given time spent playing

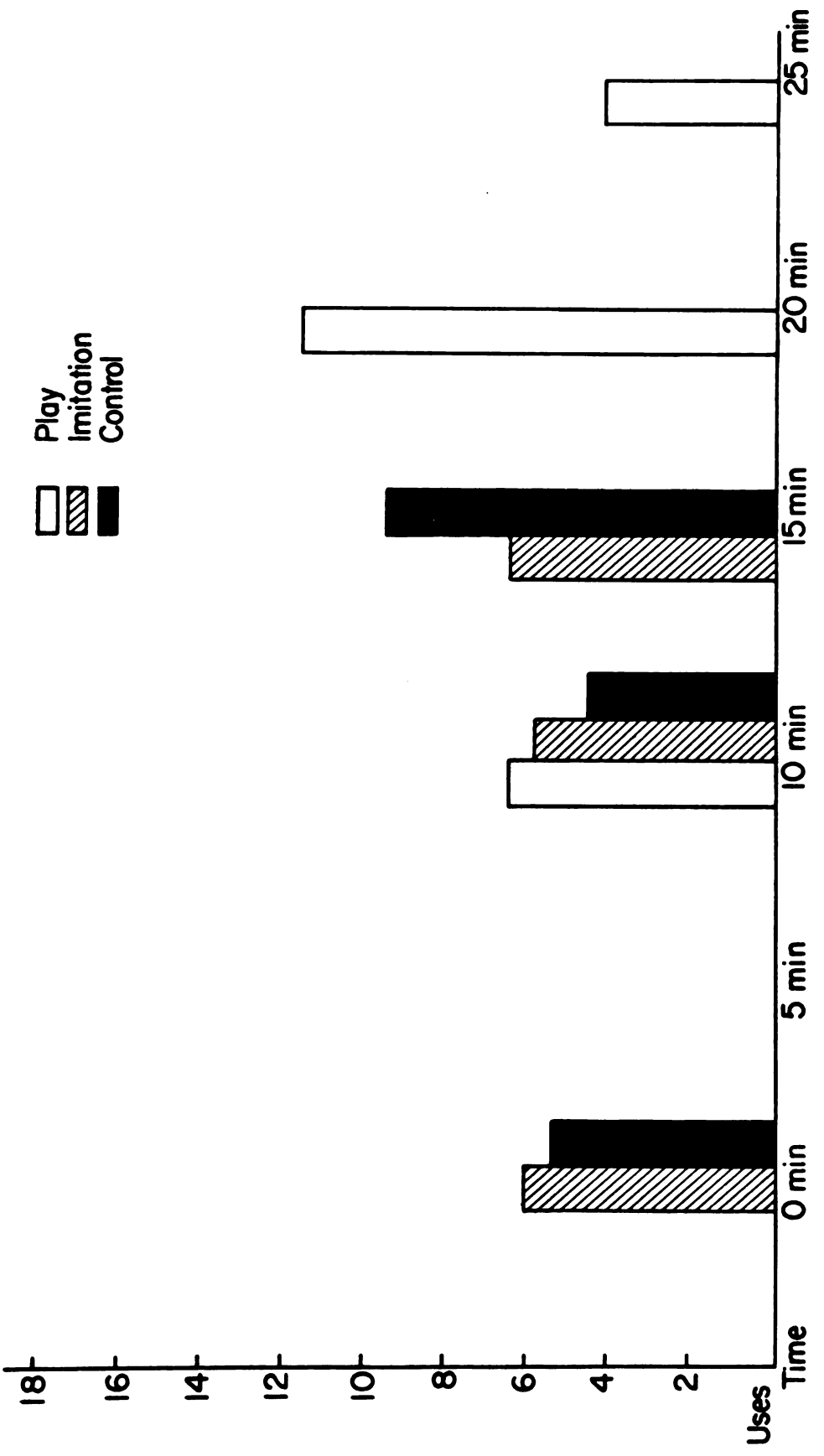

Figure9 Mean Performance on the AUU given time spent playing

a study to examine more closely what effect, if any, play has on nonverbal cognitive skills.

One other finding from the experimental analysis is of interest. The significant treatment effect on the flexibility score from the Torrance Figural Test was not predicted, but there is a post-hoc interpretation for this. The superior performance of children in the imitation condition on flexibility suggests that it was flexibility that was modeled in this condition. The imitation treatment consisted of taking 8 objects and putting them together in four different ways. This was certainly more flexibility than most of the children in the play condition demonstrated in their play.

In summary, the experimental analysis suggests that the associative fluency effect exists, but it is a weak effect, disrupted when changes in procedure or in the complexity of experimentation are made. It would be worthwhile to examine in a further study the limits on the associative fluency effect.

There also remains the question why play affects verbal fluency and not nonverbal fluency. Since nonverbal fluency has been found to be independent of verbal fluency, it would follow statistically that play would not affect nonverbal fluency. But the logic of the argument is not convincing, since play was primarily nonverbal. No easy answer comes to mind. Perhaps

future studies should encourage verbal response in order to understand the parameters of play that affect verbal fluency. From there it would be possible to suggest conditions under which play would aid nonverbal fluency.

The second part of the current study was exploratory in nature. If Dansky and Silverman's (1975) associative fluency hypothesis is accepted, there still remains the question what characteristics of play contribute to the mental set which enables the player to associate fluently. The findings from the correlation analysis of children in the play condition suggested that the imaginativeness and, to some extent, integration, may be those characteristics.

These two characteristics seem appropriate because they parallel what occurs during creativity, when it is defined as an associative process (Mednick, 1962). Creativity, by this definition, involves the combination of previously distinct elements (i.e., integration) in a way to produce a novel result (i.e., imaginativeness).

The problem is that the results from the correlational analysis barely reached significance. A weak relationship is to be expected, because activities during play are not directly translatable into cognition.

(If they were then play would become strictly utilitarian, and thus cease to be play.) It would be advisable to determine if the relationship is weak but significant by testing a larger sample of children in the play condition.

As part of the exploratory aspect of the current study, an attempt was made to build a model for the relationship between play and creativity. It had been hoped that a multidimensional scaling solution would reveal that certain aspects of play are associated with certain types of creativity. Instead aspects of play clustered together, as did the types of creativity. Upon afterthought, this was reasonable when one considers that all aspects of play share a common purposelessness. Any relation to any type of creativity would be bound to be tenuous (Sutton-Smith, 1967).

It was still possible to propose a model of the relationship between play and creativity. Lieberman (1977) has suggested that playfulness, a personality trait, is manifested in the way each child plays. This play can be integrated for use in creativity. Based on these ideas a path analytic model was proposed, which fit the data reasonably well.

It can be argued that, since the judges' ratings of playfulness occurred after their observations of each child's play, the play caused the playfulness. Whether

one model or the other is true cannot be determined within confines of the current study. I prefer the model proposed in the path analysis, since it more closely matches Lieberman's (1977) thoughts about the relationship between playfulness, play, and creativity. In any event, this model is proposed for experimental testing.

There were a number of interesting findings in the path analysis in Figure 7. There were two aspects of playfulness: playfulness-fun and playfulness-intelligence. While others (Singer, 1966; Sutton-Smith, 1967) have noted that play has two aspects--a cognitive or applied aspect, and an affective or fun aspect--Lieberman (1977) has only alluded to it. This was probably due to her finding that all playfulness items loaded strongly on one factor. But one advantage of cluster analysis is that it does not require clusters to be independent of each other, as factor analysis does. When one notes that playfulness-fun and playfulness-intelligence correlated .61 with each other, one can understand why cluster analysis found two factors, while factor analysis found only one factor.

The second finding of interest is the correspondence between the playfulness and play clusters. One of the criticisms made earlier about the Playfulness Scale is its questionable validity. While the current study does not establish the validity of the Playfulness

Scale, it does demonstrate that the Playfulness Scale fairly accurately reflects important individual differences in play, complexity and shifts.

The third finding of interest was that playfulness-fun and playfulness-intelligence had different impacts on the complexity and shifts during play. This finding lends further support to the distinction between the two aspects of playfulness. In addition this finding points to two very different approaches to children's play. Some children appeared primarily to view play as an intellectual activity in which they made frequent changes and strove toward increasing complexity. Other children apparently viewed play primarily as an activity to be enjoyed. They became easily satisfied playing with a small set of objects, with which they make very few changes. This is not an all-or-none dichotomy; children showed some degree of each as the high correlation between the two aspects of playfulness demonstrates.

The redundancy analysis demonstrated a degree of commonality between playfulness and creativity, consistent with other studies (Durrett & Huffman, 1968; Lieberman, 1965). This does not contradict the results from the path analysis. As can be seen in Table 14, the path model is weakest in predicting the relationship between playfulness and creativity.

Contrary to Singer and Rummo (1973), this commonality remained constant when mental age was partialled. Perhaps this difference is due to some difference in procedure between the current study and Lieberman's (1965). The most obvious difference is the familiarity of the judges with the children being rated. In the current study the judges saw the children for only 10 minutes before making their judgments; in Lieberman's (1965) study the judges were the children's teachers and knew them quite well. It seems possible that the results found by Singer and Rummo (1973) were due to a halo effect. Children who are known by their teachers to be creative and intelligence would also be assumed to be playful. The observers in the current study did not know the children well enough to be affected in such a way.

In summary, the current study makes two major points about playfulness. First, playfulness appears to have some validity in describing play activities. Second, there are two distinct aspects of playfulness--a cognitive or applied aspect, and an affective or fun aspect.

With regard to play, the path analysis demonstrates two related but distinct aspects of play--complexity and shifts. Both aspects have been noted before by others. Bishop and Chace (1971) in examining

the creativity in play paid close attention to complexity of the designs children made in playing with geometric shapes. Kaggan et al's (1964) notion of impulsivity is virtually synonymous with the current study's use of shifts.

What is intriguing here is that certain objects lent themselves more closely to one style or the other. Matchboxes and 3 x 5 cards were associated with shifts, while paper clips and spools were associated with complexity. Researchers on style of play must be aware that their choice of toys may influence the style of play children show.

Besides pointing out the different styles of play, the current study reemphasized a point made by Sutton-Smith (1967) that the relationship between play and cognitive development is tenuous, because of the purposeless nature of play. Any study of play and cognition will have to be content with low correlations. This means that a large sample of children will be required to determine if the low correlations are significantly different from zero.

Researchers of play should not be discouraged by the weak relationship between play and cognition. Rather they should examine aspects of play, such as complexity and shifts, that may be related to cognition. Care must be exercised that in trying to strengthen the

relationship between play and cognition, such as by making the play situation similar to the skill being learned, the playful character of play is not lost.

In short, play is weakly related to cognition. This weak relationship should not dishearten researchers. But rather reserachers should use their ingenuity to look at specific aspects of play that may be related to cognition.

With respect to creativity, there are two choices of definition. One choice is to accept the definition of creativity as verbal associative fluency, as Dansky and Silverman (1975) have, and thus have a one-to-one relationship between play and creativity. The other is to define creativity, as it is defined in the current study, as an associative process which includes verbal and nonverbal cognitive skills, as well as personality qualities, and thus is weakly related to play.

The second choice is preferred for a number of reasons. First, it appears more realistic in terms of the relationship between play and cognitive development, as discussed by Sutton-Smith (1967). Second, our naive notions of creative persons include both painters and writers. Creativity is a multi-faceted ability (Anastasi & Schaefer, 1971). Finally, the cluster analysis demonstrated that verbal and nonverbal creativity

are more similar to each other than they are to play or playfulness.

The definition used in the current study also attempts to reconcile two views of creativity within psychology. To personality theorists creativity is a trait which distinguishes one person from another. To cognitive theorists creativity is a skill that all persons have. The point of the definition in the current study is that the two views are interrelated. While the current study views the personality dimension as resulting from the cognitive dimension, others could view it the other way around. No matter which viewpoint is believed, personality and cognitive theorists should include the other viewpoint within their theory. Experimental study could help answer which results from which.

In conclusion then, creativity, defined as an associative process that involves verbal and nonverbal skills that includes personality traits, is preferred for two important reasons. First, it more adequately reflects the hypothesized tenuous relationship between play and cognitive development than does the restricted definition used by Dansky and Silverman (1975). Second, it attempts to reconcile viewpoints within psychology that conceive of creativity as either a personality trait or a cognitive skill.

Finally, what are the next steps in studying the relationship between play and creativity? A number of variations of the current study have been or can be suggested, including closer examination of children in the play condition by having them verbalize, varying the content of the pictures used for coloring in the control condition to determine why boys in that condition were more creative than those in the play and imitation condition, and careful study of children at play for long periods of time to determine why there was such a sudden drop in creativity after 25 minutes of play.

More generally it appears appropriate that future studies of play and creativity return to a more naturalistic approach such as that used by Bishop and Chace (1971) and J. E. Johnson (1976). Such an approach could involve careful observation of the child during play at home or in school and administration of creativity tests that more adequately reflect that environment, e.g., alternate uses for objects in that environment, simple or complex drawings that children of that age might produce. With this type of approach using a large sample of children, the playful character of play and creativity might be preserved, while further exploring the relationship between the two.

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APPENDIX A

CORRELATIONS AMONG MEASURES OF CREATIVITY, PLAYFULNESS, AND PLAY

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Correlations Among Measures of Creativity, Playfulness, and Play

	SEX	MA	M1	U1	M2	U2	M3	U3	M4	U4	AUM	AUU	BMAS	FLU	FLEX	ORIG	ELAB	PS1	PS2	JOY1	JOY2	SH1	SH2
MA	.11																						
M1	-.26	.05																					
U1	-.27	.09	.96																				
M2	-.15	.10	.82	.79																			
U2	-.13	.09	.75	.76	.89																		
M3	.04	-.01	.43	.40	.50	.36																	
U3	.02	.00	.29	.29	.39	.28	.88																
M4	-.06	.23	.74	.76	.68	.68	.60	.50															
U4	-.04	.29	.72	.77	.68	.66	.55	.47	.93														
AUM	-.17	.10	.93	.90	.91	.80	.66	.52	.86	.83													
AUU	-.17	.14	.89	.93	.87	.86	.60	.53	.85	.89	.96												
BMAS	-.08	.08	.09	-.01	.10	.11	-.11	-.15	-.13	-.16	.02	-.04											
FLU	.17	.00	.18	.19	.13	.13	.15	.16	.26	.31	.20	.23	-.11										
FLEX	-.25	.23	.10	.15	.12	.07	.14	.16	.21	.30	.15	.19	-.05	.61									
ORIG	.24	-.05	.11	.12	.15	.11	.28	.27	.25	.31	.20	.22	.05	.71	.49								
ELAB	.16	.06	-.10	-.08	.24	.21	.28	.28	.24	.24	.14	.14	-.17	-.08	-.01	.07							
PS1	.42	.23	-.10	.01	-.15	.02	.10	.08	.22	.22	-.03	.08	-.12	.23	-.01	.20	.24						
PS2	.44	.33	-.06	-.03	-.02	.03	-.06	.01	.12	.15	-.02	.03	.20	.40	.28	.26	.17	.65					
JOY1	.05	.22	.01	.09	-.18	-.17	.09	.05	.13	.08	-.02	.02	-.35	.21	-.03	.12	.10	.54	.17				
JOY2	-.07	.23	-.04	.07	-.05	-.18	.20	.15	.25	.17	.05	.05	-.34	.19	.23	.21	.17	.38	.18	.69			
SH1	.04	.08	-.08	-.04	-.16	-.21	-.10	-.15	.02	-.09	-.10	-.14	-.26	.05	-.18	.07	.25	.37	.17	.77	.63		
SH2	-.13	.22	.22	.26	.23	.15	.24	.14	.37	.30	.29	.27	-.08	.05	.23	.26	.36	.24	.15	.37	.68	.56	
CS1	-.03	.24	.07	.21	.18	.10	.30	.13	.23	.21	.19	.20	-.18	-.05	-.08	-.04	.36	.34	.12	.62	.59	.54	.44
CS2	.36	.46	.02	.11	.09	.18	.22	.06	.23	.26	.12	.18	-.02	-.04	-.02	-.02	.27	.72	.58	.44	.28	.32	.29
INT	.18	.59	.00	.07	.15	.12	.32	.34	.26	.23	.16	.19	.00	-.10	-.06	-.09	.39	.46	.45	.53	.44	.46	.35
PA	-.18	.31	.13	.13	.08	.09	.10	.25	.17	.15	.14	.18	-.18	.01	.06	-.03	-.08	-.20	-.16	.09	-.02	.05	-.08
PC	-.14	.27	.18	.14	-.05	.01	-.22	-.26	.15	.05	.05	.03	.16	-.20	-.18	-.36	-.08	.29	.29	.34	.11	.39	.18
CARD	.18	.22	-.07	-.08	-.15	-.09	-.13	-.10	.05	.14	-.10	-.05	.16	-.09	-.18	-.01	-.07	.41	.20	-.01	-.16	-.19	-.20
MB	.21	.07	.24	.21	.22	.38	.09	.03	.41	.44	.27	.32	.07	.07	-.14	.08	.17	.56	.31	.07	.01	-.02	.07
CRK	.12	.09	-.12	-.10	-.03	.03	.01	.10	.04	.03	-.05	-.01	-.34	-.04	-.08	-.03	-.03	.32	.05	.21	.01	.07	-.19
SP	.26	.45	.00	.03	-.20	-.11	-.08	.03	.08	.13	-.06	.02	.03	.12	.23	.11	-.21	.35	.55	.15	.05	.09	.10
CL	-.06	.19	.14	.02	.00	.03	-.34	-.32	-.11	-.06	-.03	-.06	.37	.04	.17	-.02	-.22	-.36	.15	-.38	-.45	-.14	-.16
CP	-.11	-.09	-.02	-.03	.12	.06	.00	-.02	-.05	-.08	.02	-.02	.36	-.27	-.20	-.22	.22	-.32	-.04	-.12	.02	.05	.08
PL	-.19	-.38	-.05	-.01	-.07	-.11	.06	.07	.13	.07	-.01	-.01	-.17	-.04	-.06	.01	-.10	.11	-.04	-.13	.22	-.06	.12
INTEG	.12	.10	.04	-.03	.00	.12	-.23	-.20	.12	.12	.08	.01	.36	.08	-.06	.06	-.01	.17	.43	-.11	-.12	.10	.03
SEP	-.14	-.03	-.03	.04	.03	-.09	.25	.21	-.09	-.07	.03	.02	-.38	-.07	.09	-.09	.03	-.15	-.40	.11	.14	-.09	-.01
EXP	.13	-.51	-.20	-.16	-.33	-.31	-.17	-.15	-.29	-.34	-.29	-.28	-.20	.13	-.16	.01	-.21	-.02	-.22	.03	-.14	-.05	-.31
FUN	-.15	.10	-.06	-.21	-.09	-.02	-.19	-.06	-.11	-.12	-.11	-.14	.20	-.08	.11	-.07	-.20	-.15	.05	-.28	-.16	-.15	.00
IMAG	.07	.21	.19	.35	.32	.23	.33	.15	.32	.37	.11	.14	-.15	.01	-.02	.03	.37	.19	.09	.29	.28	.22	.19
COMPLEX	.09	.23	.11	.04	-.01	.11	-.24	-.19	.16	.16	.03	.06	.33	-.08	-.09	-.08	-.07	.25	.47	-.04	-.13	.09	.01
OSHIFT	.17	.16	-.03	.04	-.17	-.08	-.09	-.12	.14	.13	-.06	.00	-.03	.02	.03	-.07	-.08	.59	.34	.30	.11	.11	.00
GSHIFT	.13	.14	-.03	.08	-.18	-.07	-.04	-.10	.15	.14	-.05	.03	-.09	.10	.03	-.06	-.04	.63	.27	.41	.16	.16	.00

	CS1	CS2	INT	PA	PC	CARD	MB	CRK	SP	CL	CP	PL	INTEG	SEP	EXP	FUN	IMAG	COM-PLEX	OSHIFT
CS2	.59																		
INT	.67	.69																	
PA	-.03	.01	.20																
PC	.12	.43	.35	.30															
CARD	-.07	.22	.05	-.28	.12														
MB	.06	.39	.08	-.23	.26	.48													
CRK	.07	.17	.15	.07	.05	.21	.45												
SP	-.13	.43	.35	.30	.47	.22	.00	-.05											
CL	-.48	-.20	-.16	.22	.25	-.02	-.24	-.42	.47										
CP	.16	-.05	.27	-.04	.15	-.22	-.30	-.57	-.04	.15									
PL	-.08	-.17	-.22	-.41	-.10	.20	.06	-.08	-.12	-.31	.12								
INTEG	-.23	.11	.16	-.13	.43	.25	.34	-.08	.44	.50	.35	.18							
SEP	.25	-.04	-.11	.15	-.41	-.23	-.33	.10	-.42	-.47	-.37	-.20	-.99						
EXP	-.17	-.29	-.44	-.15	-.17	-.16	-.19	-.08	-.20	-.28	-.02	.29	-.22	.10					
FUN	-.56	-.24	-.13	-.05	.12	.18	.17	.18	.20	.38	-.13	.01	.38	-.31	-.52				
IMAG	.78	.50	.45	.14	-.02	-.12	-.07	-.17	-.10	-.25	.17	-.16	-.29	.30	-.07	-.81			
COMPLEX	.19	.27	.26	.04	.67	.38	.41	.02	.63	.50	.28	.09	.91	-.89	-.28	.38	-.26		
OSHIFT	.07	.44	.18	-.27	.40	.57	.39	.21	.45	.00	-.20	.22	.38	-.36	-.01	.02	-.01	.48	
GSHIFT	.21	.46	.20	-.27	.32	.50	.31	.16	.31	-.13	-.21	.21	.22	-.21	.13	-.20	.16	.29	.95

Correlations whose absolute value is greater than or equal to .36 are significant to the .05 level.