FIELD INDEPENDENCE, CREATIVITY AND GENDER IN PRESCHOOL CHILDREN

by

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Abstract

Exploring the relationships between cognition and creativity is one way to understand individual differences and ability in art-related tasks. Research in the area of cognitive style suggests that there is a relationship between the cognitive style dimension of field independence and creativity in adults (Bloomberg, 1967; Noppe, 1985; Noppe & Gallagher, 1977; Spotts & Mackler, 1967). This relationship, however, has not been established in children. The purpose of this study was to determine the relationship between field independence (FI) and a creativity characteristic, ideational fluency, at the preschool level. The Preschool Embedded Figures Test (PEFT) (Coates, 1972) and the Multidimensional Stimulus Fluency Measure (MSFM) (Moran et al., 1983) were administered to 62 preschool children ranging in age from 3 years 10 months to 5 years 11 months. Multiple simultaneous regression analysis revealed that there is a significant correlation between PEFT and original MSFM scores for females but not for males. The results of this study are consistent with those done with adults in which high levels of creativity are related to FI.

Table of Contents

List of Tables

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This study was motivated by my curiosity about individual differences and ability in art-related tasks: How do the visually artistic and talented perceive, and think, when involved in art tasks? This problem was approached from the context that cognitive and creative abilities differentiate the talented from the average.

The area of cognitive style, which is the study of differences in the ways that people perceive, remember, and think was chosen as a starting point for the study of cognition. The notion of creativity is approached from the point-of-view that it is a measurable phenomenon which exists to varying degrees in all people. Through the investigation of cognitive style and creativity, gender differences in perceptual abilities became apparent.

This study was intended to investigate the relationship between creativity, cognitive style, and gender. Gender needs no explanation, however, the concepts of creativity and cognitive style need to be described in terms of their context within this study.

Creativity

Society tends to associate creativity with talent, giftedness, and achievement. Creative people are rewarded and honoured at all levels of society; the creative child is praised by teachers and parents, and

the creative worker is sought after and rewarded with money, power, and respect. The importance of creativity to education and business has led to enormous amounts of research on the subject, however, there is still no definitional consensus on what creativity is. In order to explain how creativity is defined within the context of this study, it is necessary to describe some common approaches to the study of creativity.

It is generally agreed that creativity is a multidimensional concept which is open to varying points-of-view. In the past, creativity was viewed as the genius quality that was possessed by very few and inherent only in the aristocracy (Ripple, 1989). The belief that only noble people were creative eventually faded from popularity, however, the notion that creativity is very rare and possessed by very few remained a common belief (Ripple, 1989).

By the 1950s, social scientists had begun to experiment with ways of testing creativity (Ripple, 1989). This research led to a series of creativity tests attempting to measure aspects of divergent thinking. Divergent thinking is the process of generating ideas when there is no predetermined solution; it is the opposite of convergent thinking where answers are predetermined (Ripple, 1989). The generation of ideas

(ideational fluency) has been identified as a key aspect of creative thinking (Moran, Milgram, Sawyers, & Fu, 1983). The most researched divergent thinking skills are fluency, flexibility, originality, and elaboration (Torrance, 1988).

Creativity research, based on the notion of divergent thinking, was significant in that it began to measure creativity on a continuum and acknowledged that creativity can exist to varying degrees in all people. Today, the divergent thinking approach to the definition of creativity is still evident, but it is not exclusive. Other definitions focus on the "product of novel solutions to significant social problems" (Ripple, 1989); others believe that creativity is evident in meaningful outcomes and not those which are random and odd (Richards, Kinney, Benet, & Merzel, 1988); some believe that creativity only occurs when the right combination of individual, problem, and environment come together (Tardif & Sternberg, 1988).

The notion of creativity in children is as multifaceted and varied in terms of definitions and research as with adults. Dudek (1974) summarized the popular beliefs surrounding child creativity:

> In addition to the notion that creativity in young children is (1) universal and spontaneous and (2)

> innate, there are some additional popularly held beliefs to be noted in the same texts. It is assumed (3) that children's creativity begins to dry out very early, around age 5; (4) that this is a result of society's strenuous pressures for conformity; (5) that a serious drop in creativity occurs in grade 4, at age 9, and another in grade 7, at age 12; (6) that creativity and mental health are closely interrelated; (7) that by contrast with children, all adults are uncreative. (Conclusion for adults: To see reality with a child's eye again is good and much to be desired).
>
> (Dudek, 1974, p. 283)

Dudek (1974) very rightly points out that none of these "stridently stated and presumably factual founded beliefs are supported by evidence" (p. 283). The criteria used to approach a definition of creativity in children and adults should be the same. Therefore, this study posits that child and adult creativity is a measurable phenomenon which is capable of being broken down into the observable phenomena of originality, fluency, flexibility, and elaboration (Ripple, 1989). Creativity is considered to be a characteristic evident in all people to varying degrees and can be evidenced in thoughts, actions, and products.

Cognitive Style

Cognitive style can be defined as the differences in the way that people perceive, remember, and think in a variety of behavioural situations (Lovano-Kerr, 1983). Cognitive style is generally studied as a series of dimensions. The dimension of interest in this study is field independence (FI) and field dependence (FD).

Field Independence/Field Dependence (FI/FD)

The origins of FI/FD are found in the research of Witkin (1977a). Witkin's research is based on the notion that people differ significantly in terms of the degree to which they rely on external or internal frames-of-reference for spatial orientation and figure-ground discrimination. This differentiation was referred to as an analytic perceptual attitude versus a global perceptual attitude. The analytic attitude was identified by a tendency to perceive items as discrete from their backgrounds which reflected the ability to overcome the influence of an embedded context. The global perceptual attitude reflected lesser degrees of disembedding ability. People differ in terms of analytic perception. The terms "field independence" and "field dependence" were used by Witkin (1977a) as descriptions of this perceptual variation. The term FI is defined as the ability to differentiate objects as discrete from

their background and FD is defined as the inability to separate a figure from its surrounding visual field. Differences in spatial orientation (FI/FD) are believed to be associated with social functioning and personality. FI people have high spatial restructuring ability, relatively autonomous personal behaviour, and a sense of individualism in terms of needs and values. FD people are socially oriented and tend to focus their interests on people more than abstractions (Witkin, Moore, Goodenough, & Cox, 1977).

The Relationships Between FI, Creativity, and Gender

The areas of creativity, FI, and gender form the basis of this study, and will be examined in terms of their relationship with one another. The following paragraphs will examine the relationship between (a) FI and gender; (b) FI and creativity; and (c) FI, gender, and creativity.

FI and Gender

Research on FI with school-aged children and adults suggests that males tend to be more FI than females (Bieri, 1958; Lovano-Kerr, 1983; Spotts & Mackler, 1967; Witkin et al., 1977a). The amount of available research on FI and gender differences in preschool children is not abundant. However, Coates (1974) cites six studies which

indicate that girls between the ages of 3 and 5 years tend to have higher levels of FI than boys. Coates (1974) suggests that levels of FI in children between the preschool and primary grade years are not consistent; girls, past the age of 5 or 6, become less FI, and boys between the ages of 5 or 6 become more FI.

FI and Creativity

In 1967, Bloomberg wrote a review of the literature on the relationship between FI and creativity in which he concluded that "FI is a necessary, but not sufficient, condition for creativity," and that while "all creative persons are FI, only some FI persons are creative" (Bloomberg, 1967, p. 133). Since Bloomberg's (1967) article, there have been several studies which attempt to establish a relationship between FI and creativity. Spotts and Mackler (1967) reported a significant relationship between high levels of FI and creativity as measured by tests created by Guilford (1967, 1980), and Torrance (1981, 1988).

In a more recent study involving male and female college students, Noppe and Gallagher (1977) reported that FI students were significantly more creative than FD students, and Noppe (1985) reported that "the constructs of field-dependence-independence and formal thought alone are reasonably effective predictors of creative ability"

(p. 94).

Research on the relationship between FI and creativity in children is very sparse. Grossman (1969) examined the relationship between cognitive style, drawing skills, and creativity in Kindergarten children using the Torrance Tests of Creative Thinking. He reported a significant correlation between FI and the elaboration component of the Torrance test. The conclusions from this study can be questioned, however, since recent research suggests that the Torrance creativity tests are not a reliable measure of creativity in Kindergarten-aged children (Moran et al., 1983). An extensive literature search revealed that the Grossman (1969) study is the only one reported on the relationship between creativity and FI in young children. There is no available research on FI and creativity in preschool children. Steele (1989) explores the relationship between FI and intelligence at the preschool level, but this is the only comparable study. There is an obvious gap in FI and creativity research with young children.

FI, Gender, and Creativity

If a relationship exists between FI and creativity in adults, then it could be hypothesized that a similar relationship may exist with preschool-aged children. If Coates's (1974) hypothesis is correct, and preschool

girls at age five are more FI than boys, then this group should not only score high on the creativity measure but should also have the strongest correlation with creativity scores. This would confirm the hypothesis that regardless of gender, high levels of creativity and FI are correlated. Confirming the notion that preschool girls are more FI than preschool boys is important because it points out that FI is not primarily a male trait. It also suggests that there is a gender shift in FI between the preschool years and early primary years.

Identification of the Problem

The problem of this study is to determine if there is a relationship between FI and creativity at the preschool level and to consider gender as a potential moderator of this relationship.

Hypothesis

The hypotheses for this study are that females will have significantly higher means on the PEFT than males and there will be a stronger correlation between PEFT and MSFM scores for females than for males.

Literature Review

Creativity

Tests used to measure creativity in adults and school-aged children have traditionally included

components of divergent thinking (Ripple, 1989). However, Starkweather (1971) suggests that the traits of fluency, flexibility, originality, and elaboration which are used to test for creativity in older children, are not necessarily differentiated in early childhood, and the focus of original problem-solving should be with the generation of ideas. Sawyers, Moran, and Tegano (1990) suggest that "given the level of evaluation abilities in young children, the focus of creativity or original problem-solving research at this young age should focus on the generation of ideas--the process that precedes evaluation" (p. 70). Because young children have limited capabilities in terms of evaluation and hypothesis testing, they must be distinguished from older children and adults in terms of the way creative behaviour is assessed. The Minnesota Tests of Creative Thinking (MCTM) created by Torrance (1981) have been the primary assessment tools for creativity in school-aged children (Arasteh & Arasteh, 1976). There is, to date, no preschool creativity test which has been tested and used as extensively as the MCTM.

Moran et al. (1983) devised a preschool creativity test, the Multidimensional Stimulus Fluency Measure (MSFM) which attempts to measure ideational fluency in

children from 3 years 10 months to 6 years. The MSFM is based on the research of Guilford (1967), Mednick (1962), Wallach and Kogan (1965), Ward (1968), and Starkweather (1971). The test requires the subject to respond verbally to three tests which include verbal and manipulable stimuli. The tests are labelled Instances, Uses, and Patterns. The Instances test involves naming a particular feature of an object such as its colour or shape. The Uses test asks that the children list possible uses for familiar objects. The Patterns test requires that the child list as many interpretations as possible for a given object. The child is able to hold and manipulate the test objects. The reliability and validity of the MSFM has been tested by Tegano, Moran, and Godwin (1986) and Godwin and Moran (1990). The results have suggested that the MSFM is a reasonably good measure of creative potential in preschool children and a reliable and valid instrument for measuring ideational fluency in preschool-aged children.

Moran et al. (1983) suggest that many of the preschool tests for creativity were not designed with the young child in mind and because of this, are less successful than the MSFM in measuring creative thinking at the preschool level. Because the MSFM uses 3-dimensional objects as opposed to 2-dimensional, and the

children are able to handle the objects, their test elicits more responses in areas which had produced few responses on other tests. Also, because the MSFM is able to elicit more responses from the children, researchers are able to obtain enough information to differentiate between high and low creativity scores (Moran et al., 1983).

The scoring procedure for the MSFM involves categorizing the responses as either popular or original. Popular responses are those which are given more than 5% of the time, and original responses are those which are given 5% of the time or less. This is an important component of the MSFM because it allows for differentiation between the quality and the quantity of the responses. It has been suggested (Milgram, Milgram, Rosenbloom, & Rabkin, 1978; Moran et al., 1983) that the production of popular responses is a prerequisite for producing original responses. The chances of a subject producing original responses are greater when more responses are given. It has also been shown that popular responses tend to come at the beginning of the response hierarchy and original responses are usually found near the end (Moran et al., 1983). Research suggests (Moran et al., 1983) that popular responses are related to intelligence but original responses are not. The

distinction between creativity and intelligence may be unclear if only popular scores are measured, therefore, this study will focus on original scores as the basis of analysis.

Although the MSFM is perhaps the most reliable and valid measure of ideational fluency in preschool children to date, it is not the conclusive measure of creativity in young children. Moran et al. (1983) suggest that perhaps the best measure of creative potential in preschool children is a combination of the MSFM and the Thinking Creatively in Action and Movement (TCAM) created by Torrance (1981). Like the MSFM, the TACM is considered to be a reliable and valid measure of ideational fluency in preschool-aged children (Tegano et al., 1986). The TCAM requires that the children act out their responses through movement, but verbal responses are also accepted. The TACM is divided into four subtests in which the children are given opportunities to act out their responses and ideas. The notion behind this approach to measuring ideational fluency is that young children, regardless of race, culture, or economic status, practice this type of behaviour (Tegano et al., 1986).

Although Moran et al. (1983) suggest that the best measure of creative potential in preschool-aged children

is a combination of the MSFM and the TCAM, it must be pointed out that the use of both tests involves a very substantial time-commitment on the part of the researcher. The present study's restrictions did not allow for limitless time. Therefore, the MSFM was chosen as the single indicator of ideational fluency for this study.

Through the use of testing devices such as the TCAM and MSFM, researchers have been able to substantiate a number of concepts regarding creativity in young children: (a) creativity should be assessed in a nonevaluative atmosphere, (b) creativity and intelligence are distinct, (c) ideational fluency serves as the best single measure of divergent responding, (d) the quality of ideational input is related to its quality, and (e) popular responses are usually given early in the response sequence whereas original responses occur later in the response hierarchy (Moran et al., 1983).

The amount of available research on creativity and gender in preschool children is not abundant. The bulk of quantitative research in this area has been conducted by Moran et al. (1983, 1988) at the Preschool Creativity Project at the University of Tennessee, 1981-1992. Present research suggests that it is inconclusive as to whether boys or girls have higher levels of ideational

fluency at the preschool level (Moran et al., 1983). There have been no consistent gender differences found in the MSFM (Freeland, 1987). Studies which report gender differences for original thinking are inconsistent in terms of assessment techniques and research designs which makes it difficult to interpret the findings. However, a study by Tegano and Moran (1989), involving 188 children ranging in age from preschool to third grade, reported that gender differences in ideational fluency, as measured by the MSFM, do begin to appear in early elementary grades, and by third grade, there is a strong tendency for boys to produce more original responses than girls (Tegano & Moran, 1989).

The percentage of original responses declines from preschool into the primary grades, and the decline appears to be more rapid for girls. Tegano and Moran (1989) reported that girls showed no increase in original responses from first to third grade. By grade three, girls produced 27% original responses and boys produced 38%, as compared to 60% for both boys and girls in preschool (Tegano & Moran, 1989). Tegano and Moran (1989) suggested that a "U-shaped developmental pattern exists with respect to proportion of original responses" (Tegano & Moran, 1989, p. 108). Prechool children and college students have been shown to have the highest

proportion of original responses in relation to the total number of responses given (Tegano & Moran, 1989).

The MSFM may favour students who are intrinsically motivated more so than those who are extrinsically motivated because it is designed to eliminate any form of evaluation; there are no time restrictions and there is no feedback (Tegano & Moran, 1989). Kogan (1974) suggests that the divergent thinking skills in boys may be motivated more by intrinsic tasks than those of girls. Research supports the notion that girls tend to conform more easily than boys at this age (Cooper, 1974; Maccoby & Jacklin, 1974). Therefore, the lack of external motivators such as evaluation on the MSFM may lead girls to be less-motivated by the tasks than boys.

The effects of socialization at preschool and elementary school may also help explain the appearance of gender differences in original thinking in young girls (Tegano & Moran, 1989). Preschools generally tend to be less-structured and include less-formal evaluation than primary grade classrooms. Preschools focus on socialization, play-based and child-centered activities. Primary classrooms include group work, formal evaluation, and a tendency to focus on academic achievement. Therefore, if girls tend to be more motivated by tasks which enable them to conform, they may be less-willing to

take risks. For example, girls may suppress their initial responses in order to respond in a way that they predict will please the teacher/examiner (Tegano & Moran, 1989). Personality traits, socialization, and school may all contribute to the gender differences associated with original thinking in the primary years. There is, however, no research on whether there is evidence that these gender differences exist at the preschool level.

Field-Independence/Field Dependence

Over the years, many definitions have been given to the term cognitive style. In order to clarify the meaning of cognitive style, it is important to note some of these definitions. Mahlios (1989) states that cognitive style "concerns individual differences in the process of cognition, which generally includes all processes by which knowledge is acquired: perception, thought, memory, imagery, and problem solving" (Mahlios, 1989, p. 90). Cognitive style has been explained as "consistencies in individual modes of functioning in a variety of behavioral situations" (Goldstein, 1978, p. 3). Kogan (1974), however, defined cognitive style as "individual differences in a person's way of perceiving, remembering, and thinking" (Kogan, 1978, p. 244). Although these definitions vary in some ways, there is a common element: Cognitive style is generally considered

to be a manner or form of thought; it does not refer to a person's level of ability or skill; it is not related to performance.

Cognitive style has been studied and researched not as a whole but as a series of dimensions or categories: (a) field independence vs. field dependence, (b) scanning, (c) breadth of categorizing, (d) cognitive complexity vs. simplicity, (e) reflectiveness vs. impulsivity, (f) leveling vs. sharpening, (g) constrictive vs. flexible, (h) tolerance for incongruous or unrealistic experiences, (i) conceptualizing style, and (j) visual vs. haptic. References for the origins of all 10 cognitive styles can be found in Lovano-Kerr (1983).

Cognitive style theory is founded in the study of perception (Mahlios, 1989). One example of this is seen in the work of Witkin (1977) whose perception research in the 1950s led to the development of the cognitive style theory of FI/FD. FI/FD has been the most studied of all the cognitive style dimensions. It refers to the degree to which individuals perceive objects as discrete from a field. FD people have been shown to rely more heavily on external referents than FI people (Witkin et al., 1977a), and because of this, they have greater difficulty with disembedding exercises. FI/FD are bipolar concepts,

however, most people fall on a continuum within these extremes. The tendency to be nearer either end does not have a predesignated value in comparison with, for example, intelligence, wherein it is more desirable to be near the higher end. In order to assess an individual's propensity towards either FD or FI, Witkin et al. (1977a) used three main assessment procedures: The Body Adjustment Test (BAT), the Rod and Frame Test (RFT), and the Embedded Figures Test (EFT). The BAT requires that the participant sit in a tilting chair which is situated in a tilting room. While the chair and the room are tilting, the subject is asked to adjust the chair to an upright position. The degree to which the subject is able to do this is the degree to which the person is considered to be FI or FD. The RFT requires that the subject orient a lighted rod to the vertical position within a lighted frame while sitting in a completely darkened room; the rod and frame are being tilted while the person is trying to adjust the rod to an upright position, and as with the BAT, the subject's score is in relation to the degree of uprightness achieved. The EFT requires that the subject locate a figure hidden in a series of lines. The time taken to locate the hidden figure is translated into a level of FI or FD.

Until 1972, the only FI/FD assessment tool available

for young children was the Children's Embedded Figures Test (CEFT). In design, it is much like the EFT used with adults. The CEFT uses colour elements, and requires the child to identify multiple figures of varying sizes which are hidden within a field. Coates (1972) designed the Preschool Embedded Figures Test (PEFT) which has become the most commonly-used tool for assessing FI/FD in very young children. Because of the colour element, and the requirement to identify multiple shapes of varying sizes, Coates (1972) has eliminated all colour. Unlike the CEFT and the EFT, the hidden figure in the PEFT does not vary from picture to picture; the subject is looking for the same-sized equilateral triangle in a series of line drawings. The PEFT is designed for children approximately 3 to 5 years. The reliability of the PEFT has been reported by Derman and Meissner (1972), and Kogan (1976). The PEFT is the assessment tool used in this study.

Witkin et al. (1977a) suggest that the perceptual differences evident in FI and FD persons are related to behavioural and personality differences. For example, FI persons differ from FD persons in that they are less-likely to rely on external referents, they are considered to be analytical, and are often less-influenced by authority. FI people have highly-developed spatial

restructuring skills and can isolate objects from the surrounding field more effectively than FD persons. FI persons depend on their own values and expectations and can be impersonal and socially withdrawn. FI people are usually employed in situations where they can work independently. They generally work in abstract fields, rather than in situations requiring a great deal of personal interaction (Lovano-Kerr, 1983).

FD people are less analytic and more global than FI people, and they are more likely to rely on external referents than FI people (Lovano-Kerr, 1983). FD people are more influenced by authority figures, and have considerable interest in people. They are usually employed in situations that involve people, and they are interested in social and emotional needs and concerns, more than abstractions (Lovano-Kerr, 1983).

In addition to behavioural and personality differences, FD and FI people differ in the manner in which they learn. For example, FI people learn through intrinsic motivation and personal goals. FI people tend to impose order and structure on unstructured situations, whereas FD people are likely to accept the situation as it is, without reorganizing or imposing a new structure. FD people are believed to have more difficulty learning unorganized content (Lovano-Kerr, 1983). They tend to

use the available information to solve problems and they learn quickly from abstractions. FD people learn quickly from overt clues and tend to overlook possible clues or information when solving problems.

Although there are differences between FI and FD persons in terms of behaviour, personality, and learning style, there is no difference between FD and FI people in terms of cognitive development. Globerson (1985) states that "field-dependent children do not lag behind their field-independent age peers in their cognitive development" (p. 268). Because of the structure of the testing devices, in which FD is determined by the failure to perform a certain task, FD has often been perceived as the less-desired of the two styles (Ausburn & Ausburn, 1978; Bloomberg, 1967; Guilford, 1980; Kogan, 1971; Mahlios, 1989; Morell, 1976; Saracho, 1988; Spotts & Mackler, 1967). In addition to this, attempts to train people to be more FI implies that FD is the less-preferred style. Lovano-Kerr (1983) states that there is no difference between FI and FD persons in terms of learning ability, or memory and learning-organized material. There is no difference in learning when there are material or social rewards given, no difference in the number of attempts required to learn a concept, and there is no difference at the college level in terms of

academic achievement (Lovano-Kerr, 1983).

Some efforts have been made by researchers to change individual cognitive styles, and, in particular, to change FD styles into FI styles. In terms of modifying FI/FD styles, the motivation has been to train FI people to be more social and FD people to be more analytic (Barnes, 1981; Morell, 1976; Witkin, 1967). However, of the 10 cognitive styles mentioned, there is, according to Kogan (1971), no evidence that modification of style is possible. Kogan (1971) suggests that some dimensions are more resistant to modification than others. For example, the dimension of FI/FD is more resistant to modification than dimensions such as conceptual style. Kogan (1971) attributes this difference to a concept of capacity and strategy. The dimensions that possess a property of capacity, such as Witkin's FI, are more resistant to modification than dimensions of strategy such as conceptual style (Kogan, 1971). In the latter, the subject is consciously choosing an approach strategy, whereas in the former, the subject is unconsciously adapting to the stimulus.

In more recent research, Ramirez and Castaneda (1974, cited in Saracho, 1983), and Saracho (1983) found that in certain "classroom activities or specific social atmosphere, children are able to exhibit bicognitive

development" (Saracho, 1983, p. 49). It must be noted that this research was conducted in a fabricated setting, and children would not necessarily behave similarly in a natural setting. Szeto and Salome (1977) suggest that training in scanning techniques can improve skills required for pattern detection and figure discrimination. If it is possible to improve visual skills necessary for successful completion of the Hidden Figures Test (HFT), then it would be reasonable to suggest that it is possible to raise levels of FI. This, however, does not suggest that performing better on the HFT through training will have any effect on the personality and behavioural traits associated with FI/FD.

Cognitive style is considered to be relatively stable over time (Ausburn & Ausburn, 1978; Witkin, Goodenough, & Karp, 1967). As children grow older, their dominant cognitive style grows more apparent. For example, a child may be considered more FI at 12 years than at 8 years, but if the same child was considered to be FD at 8 years, then at 12 years, that child would still be considered FD when compared to a 12-year-old who was FI. It has been suggested (Witkin, 1967) that stability in FI/FD is a component of personality traits resulting from environment, childhood training, and general cultural influences (Ausburn &

Ausburn, 1978, p. 339). Cultures that value "conformity, strong traditional dominance, parental authority, group identity, strong family unity, and severe discipline tend to inhibit the development of field-dependence" (Ausburn & Ausburn, 1978, p. 339). In general, cultural groups who are socially orientated are more FD than cultural groups who do not have a strong social orientation (Ausburn & Ausburn, 1978).

Stability of cognitive style is also believed to be the result of psychological factors. Research has shown (Dimond & Beaumont, 1974; Milner, 1975) that FI persons demonstrate greater use of specific parts of the left side of the brain for speech and motor controls and more specialization of the right side of the brain for patterning tasks (Lovano-Kerr, 1983). Although research suggests various theories to account for the stability of Cognitive style, it is generally agreed that cognitive dimensions are internally consistent and relatively stable over a person's lifetime (Ausburn & Ausburn, 1978; Mahlios, 1989; Witkin, Goodenough, & Karp, 1967).

In terms of gender differences, research indicates that males generally tend to score higher on measures of FI than females; the results of countless studies throughout the world in a variety of cultures have lead researchers to the conclusion that males are

predominantly more FI than females (Bieri, 1958; Coates, 1974; Witkin, 1950; Witkin, Moore, Ottman, Goodenough, Friedman, Owen, & Raskin, 1977). However, Coates (1974) noted the following:

> Although sex differences in field independence appear with remarkable consistency in older children and adults, the distribution of scores for the two sexes overlaps considerably, and the magnitude of differences between the sexes rarely amounts to more than half a standard deviation. (p. 260)

Therefore, although there is a significant amount of evidence to suggest that males, as a group, tend to be more FI than females, the magnitude of this difference must not be blown out-of-proportion.

Although the evidence suggests that males, as a group, are more FI than females, there is some question as to whether this is the case in the preschool years. Coates (1974) reviews the literature (published and unpublished) on early sex differences in FI/FD and reports that out of studies, only three failed to report sex differences favouring females. Out of the nine studies, six found differences favouring females, and in three of the studies, no sex differences were observed. Coates (1974) suggests that some of these findings may not have reported significant results favouring females

because the researchers did not use age as a variable; instead, all the data from children of all preschool ages from 3 to 6 was lumped together. Measuring the mean sex differences by age might result in a more accurate analysis. In her own research, Coates (1974) analyzed the data by age and reported that at the age of 4 years, sex differences were minimal; by year 5, females showed significantly higher levels of FI than males. Coates' (1974) research raises potentially important questions about the origin and significance of sex differences.

Explanations for the emergence of gender differences in FI at the preschool level are not conclusive. There are, however, theories based on empirical studies which attempt to explain these differences. Coates (1974) suggests that gender differences at the preschool level in FI may be, in part, affected by the maturity level of the children. Girls may develop in this area more quickly than boys. Another explanation is based on a model by Maccoby (1966) which hypothesizes that maximum intellectual functioning occurs at the mid-point of a passivity-activity continuum. Extreme passivity and aggressiveness are considered to be inhibiting to successful cognitive functioning. Coates (1974) suggests that girls may be closer to this mid-point during the preschool years than boys. Boys are generally perceived

to be more aggressive by the time of preschool years which Coates (1974) suggests may put them nearer an extreme aggressive position on the passivity-activity continuum. As a result, they tend to be less FI than girls, who are nearer the center of the continuum. However, by the age of six years, boys become less-aggressive, and thus closer to the mid-point, whereas girls around the age of six years become more passive and further away from the mid-point. Therefore, since girls generally tend to fall nearer the passive end of the continuum and boys nearer the active end, maximum cognitive functioning will occur for girls when they shift towards the more active end and for the boys when they shift towards the more passive end.

Research to support the Coates' and Maccoby's hypothesis (Maccoby, 1966) reports that girls with high analytic ability tended to be more aggressive than other girls, and boys with high analytic ability tended to be more passive than other boys. Fitzgibbon (1965) reported that preschool girls who tend to be aggressive and show little interest in traditionally feminine activities tend to be more FI than preschool girls who are interested in feminine activities such as playing with dolls and playing house. In turn, boys who are considered to be the toughest and most aggressive in the group tended to

be the most FD, and the boys who were more passive tended to be more FI.

At present, there is no published study which deals with the relationship between FI, ideational fluency, and gender at the preschool level. The results of related studies suggest that males are more FI than females, and there is a significant correlation between creativity and FI in adult males (Noppe, 1985; Noppe & Gallagher, 1977; Spotts & Mackler, 1967). Coates (1974) reported that preschool girls are more FI than preschool boys, but Moran et al. (1983) found no significant gender differences in ideational fluency at the preschool level on the MSFM. Therefore, the relationship between FI and ideational fluency in preschool children is unclear.

Methods

Subjects

The sample for this study consisted of 62 preschool children ranging in age from 3 years 9 months to 5 years 11 months. Forty-five of the children were from the Clearbrook Children's Center located in Clearbrook, B.C., and the remaining 17 Kindergarten students were from Eric Langton Elementary School in Maple Ridge, B.C. The children came from middle to low income families and are representative of a range of cultural backgrounds. Although the sample is taken from only two settings, the

children are representative of all the preschools and elementary schools in the area. Ideally, the sample should have been taken from several different preschools, daycares, and elementary schools, however, due to economic and time constraints, this was not practical.

Apparatus

Test 1: The Preschool Embedded Figures Test (PEFT). Intended for children from the age of 3 to 5 years, it requires that the subject find a simple equilateral triangle within a larger and more complex figure by tracing over the shape with his/her finger. The shape is integrated into the larger pattern so that its outlines become part of other shapes in the whole. The figures are in black and white and relatively simple because of the age-group involved. The subject is allowed a maximum of 30 seconds to find the hidden figure. There are 24 shapes in total, and the test takes approximately 15 minutes to administer. The subject is encouraged to keep looking for the triangle even after several unsuccessful attempts. If the child gave up attempting to find the triangle before the time is up, then the examiner may continue to the next card. The subjects are praised and encouraged throughout the testing sessions, however, no material rewards are given.

Test 2: The Multidimensional Stimulus Fluency Measure (MSFM). This test consists of three components: the Patterns subtest, the Uses subtest, and the Instances subtest. In the Patterns subtest, the subjects are given a 3-dimensional, wooden shape and asked to give as many explanations as possible for what the shape could be. The subjects are allowed to hold and manipulate the shapes in order to help them visualize possible interpretations. There are three shapes: a red half-moon, a yellow hammer, and a blue capital H. The Uses subtest requires that the subject provide possible uses for a box and paper. The Instances subtest requires the subject to name as many things that they can that are red, and things that are round. The children are allowed to take as much time as they like for all of the activities. The test takes approximately 20 to 30 minutes to administer. There is no verbal praise given at anytime during the exercises. The examiner writes the subject's responses verbatim.

Procedure

Both tests, the PEFT and the MSFM, were administered to all subjects. The testing was done over the months of January and February, 1992. The tests were administered to each child in separate sessions; the time lapse between the first and second sessions was approximately

four weeks. The PEFT was administered in the first session and the MSFM in the second session. With the exception of one child whose mother administered the MSFM test, all tests were administered by the examiner in areas which were separated from the main classrooms and relatively free from other stimuli. Participation in the study was voluntary, and children were free to withdraw from the study at any time. The PEFT session required approximately 20 minutes. The MSFM session lasted as long as the child-generated responses; no time restrictions were applied. Older children generally required around 20 to 30 minutes to complete all the tasks. In both settings, the children had prior exposure to the experimenter who spent some time at the preschool and the elementary school prior to the testing sessions.

Scoring

The PEFT was scored by the researcher. One point was given for each item correctly traced within 30 seconds. The total score was calculated as the sum of these points. The MSFM test booklets were sent to The University of Tennessee and were scored by trained graduate students under the direction of Doctors Moran and Tegano. The tests were scored on the basis of statistical frequency of responses. Responses occurring in less than 5% of the norm group are considered

original; while those responses which occur in greater than 5% of the norm group were scored as popular. For example, if the sample size (number of responses) was 139, then any response which occurred less than six times was scored as original.

The scoring procedure included recording each subject's responses which yields a long list of possible responses for the group. The marker then tallied the times the same response was given, and then categorized the response as original or popular. For example, in answer to the prompt, "Tell me all the things that are red?" the response of apple occurred in 25 out of the 75 children in the sample. This was greater than 5% and, consequently, was scored as a popular response. The scored data indicated a popular and original score for each of the test components. The original and popular scores for each of the test components were totaled to get the total original score, the total popular score, and the total fluency score which is a combination of popular and original scores.

Data Analysis

The hypotheses for this study were primarily of association, therefore, correlation was used to test for an association between FI and creativity. Simultaneous multiple regression was used to test for the predictive

ability of the variables, and Analysis of Variance (ANOVA) was used to test for the interaction between age and gender.

Results

Independent samples t-tests were used to compare the PEFT and MSFM mean scores for the 3-, 4-, and 5-year-old age groups (see Table 1). The correlation between PEFT and MSFM scores was analysed and results are given in Table 2. The total Original scores and PEFT scores were positively correlated ($r = .42$, $p < .001$). Although this was a significant correlation, it should not be over-estimated; the correlation of $r = .41$ is modest. An additional correlation, dividing the total group by gender, showed a non-significant correlation for males ($r = .12$) and a significant correlation for females ($r = .56$, $p < .01$). As with the whole group correlation, the female correlation was statistically significant although it was only moderately higher than for the total group.

The data was analyzed using simultaneous multiple regression. The PEFT scores were used as the dependent variable for all of the simultaneous regressing analyses. The rationale for this is based on Bloomberg's (1967) belief that all creative people are FI but not all FI people are creative. If this is true, then original

Table 1: Means, Standard Deviations, and t-Tests for Sex Differences in PEFT and MSFM Original Scores (by age group)

	PEFT					MSFM Original Scores				
	Males		Females			Males		Females		
Age	M	SD	M	SD	t	M	SD	M	SD	t
3	13.13	3.91	14.00	2.65	-.35	9.13	3.48	10.33	8.51	-.35
4	16.08	3.15	17.79	2.58	1.52	17.00	12.89	20.36	13.05	.66
5	12.50	4.95	18.62	3.71	3.52**	14.00	5.74	25.46	15.62	2.39*

* $p < .05$
** $p < .01$

Table 2: Correlation Between PEFT and MSFM Original Scores for Sex Groups and Combined Groups

Group	n	r
Males	32	.117
Females	30	.561*
Combined	62	.421**

* $p < .01$
** $p < .001$

A significant difference ($F_{(1,27)} = 13.29$, $p < .001$) was found between the Pearson Correlation Coefficients for the male and female groups.

scores (creativity scores) should predict high levels of FI, however, FI would not necessarily predict creativity because not all FI persons are creative. This is perhaps an arguable rationale, never-the-less, it is reasonable within the context of this study. The necessity of choosing between PEFT and MSFM scores for a dependent variable is difficult because both could be viewed as being appropriate as either a dependent or independent variable.

Multiple simultaneous regression analysis was used to predict PEFT scores on the basis of age, gender, and original scores. The results indicated that 29% (R^2 = .287, $p < .001$) of the variance in the PEFT can be predicted by these variables. Most of the predictable variance is due to the gender and original score variables (see Table 3). Additional simultaneous regression analyses were conducted dividing the total sample by gender (see Table 4). Results for the female group showed that 35% (R^2 = .35, $p < .01$) of the variance is due to originality scores and age. The Original variable accounted for considerably more of the predictable variance than the age variable. Results for the male group indicated no significant variability. A final simultaneous regression analysis dividing the total group by age revealed significant results for the

Table 3: Regression Analysis of PEFT as a Function of Sex, MSFM Original Scores, and Age: Combined Group

Predictor	Beta	t	p
Sex	.349	2.95	.004
Original	.315	2.63	.011
Age	-.011	-.100	.923

Table 4: Regression, Analysis of PEFT as a Function of MSFM Original Scores and Age: Grouped by Sex

Predictor	Beta		t		p	
	M	F	M	F	M	F
Original	.140	.500	.753	3.07	.457	.005
Age	-.129	.198	-.694	1.21	.493	.236

Sample size: male = 30, female = 32

5-year-olds only, in which 52% (R^2 = .517, $p < .000$) could be predicted by gender and originality scores with original scores accounting for more of the predictable variance than gender (see Table 5).

A 2 X 3 (gender by age) analysis of variance with PEFT scores revealed significant main effects for sex ($F(1,56) = 7.2939$, $p < .01$), but neither age nor the sex X age interaction was significant (see Table 6). A similar analysis of variance of total original scores (MSFM scores) revealed no significant main effects or interaction.

Discussion

The hypotheses for this study were that females would have significantly higher means on the PEFT than males, and that there would be a stronger correlation between PEFT and MSFM scores for females than for males.

Results of this analysis confirmed the hypothesis that preschool-aged females would score significantly higher than males on the PEFT. The analysis suggests that most of the difference is due to the sex differences among 5-year-old subjects. These findings are consistent with those of Coates (1974) wherein females around the age of 5 years score higher on measures of FI than males.

The hypothesis that there would be a stronger correlation between PEFT and originality for females than

Table 5: Regression Analysis of PEFT as a Function of MSFM Original Scores and Sex: Grouped by Age

	Beta		t		p	
Age Predictor	4	5	4	5	4	5
Original	.091	.457	.456	2.76	.653	.012
Sex	.284	.387	1.42	2.34	.170	.029

Sample size for 4-year-olds n = 26, 5-year-olds n=25

The sample size for 3-year-olds was insufficient to obtain reliable results.

Table 6: ANOVA for PEFT Whole Group

Source	Sum of Squares	DF	Mean Square	F-Ratio	P
Age	78.19	2	39.10	2.92	.062
Sex	97.71	1	97.71	7.29	.009
Age & Sex	78.53	2	39.26	2.93	.062
Error	750.23	56	13.40		

for males was confirmed (see Table 2). It would appear that the modest, but significant, correlation between PEFT and MSFM scores for the whole group and the females is due, in part, to a relatively high correlation for 5-year-old females ($r = .731$, $p < .01$, $n = 13$). The interpretation of the results for the correlation between PEFT and MSFM scores for 5-year-old females should be tentative because of the small sample size for this group, however, the results show a significantly higher correlation for this group than for any other group in the study.

The gender differences on the MSFM evident in this study were, in part, inconsistent with previous research. Moran et al. (1983) reported that preschool boys produced more original responses than preschool girls, and Dr. J. Moran (personal correspondence, March 2, 1992) suspected that the present study would not find gender differences on the MSFM at the preschool age. Freeland (1987), however, reported that preschool girls produced more original responses than boys and noted that it is unclear why the results varied from the Moran et al. (1983) study. It is possible that consistent gender differences have not been reported on the MSFM because age has not been considered as a variable. Neither Tegano and Moran (1989) nor Freeland (1987)

consider the preschool age levels as variables in their analysis.

The purpose of this study was to explore the relationship between FI and creativity at the preschool level. A relationship has been established and is most evident with females, and, in particular, with 5-year-old females. More research is needed to determine the consistency of gender differences at this gender group. The relationship between ideational fluency and FI at this age level is consistent with research on adult and adolescent subjects in which FI was related to creativity (Noppe, 1985; Noppe & Gallagher, 1977; Spotts & Mackler, 1967). More research is needed to investigate the apparent gender shifts in FI in young children, as well as the possible connection between the developmental shifts in FI and levels of creativity; the gender differences in creativity may be a function of developmental shifts in FI and FD.

The Significance of the Relationship Between FI and Creativity to the Field of Art Education

The cognitive style dimension of FI/FD has been described, research on the relationship between FI and creativity has been discussed, and a relationship between creativity and FI in preschool children has been established, however, the relevance of the relationship

between these two factors to the field of art education has yet to be examined. Creativity is inherent in art and art education. It could be argued that the primary objective of art education is the development of creativity and appreciation for creativity. Art educators, we have a particular interest in problem-solving skills related to art tasks, however, the ability to solve problems creatively is a requirement in most academic realms. The development of creativity is important not only to the aspiring artist, but to all students, in all curriculum areas. As researchers continue to investigate the intricate relationships between perception, cognitive style, and creativity, educators will gain more information to use as a foundation to develop curriculum which encourages and develops creative growth through specific perceptual tasks and art activities.

The relevance of FI to the field of art education needs some explanation. In the 1970s and early 1980s, a considerable amount of research was devoted to the educational implications of cognitive style (Ausburn & Ausburn, 1978; Copeland, 1984; Guilford, 1980; Kogan, 1971; Lovano-Kerr, 1983; McWhinnie, 1970; Saracho, 1983). Of the 10 cognitive styles previously mentioned, the dimension of FI/FD has been most researched in terms of

identification of the style and educational implications Over the years, researchers have identified particular perceptual abilities associated with levels of FI/FD. The implications of these perceptual abilities for art education have not been thoroughly researched; many perceptual functions may relate to various art behaviours and abilities. Witkin et al. (1977a) reported that the spatial restructuring skills of speed of closure, functional fixity, and perspectivism are related to levels of FI/FD. Lovano-Kerr (1983) supports Witkin's (1977a) findings, indicating that there is a strong relationship between FI and restructuring tasks; "field-independent people seem better able to achieve a different precept when required by situational demands or inner needs through restructuring of their initial experience, at least for spatial configuration materials" (Lovano-Kerr, 1983, p. 200). Consequently, it can be hypothesized that these restructuring tasks are more highly-developed in FI individuals, and because of this, FI people may be more successful in particular art-related tasks than FD people.

Speed-of-closure refers to the mental tendency to organize perceptions so that they are easily understood. People have a tendency to organize their perceptions as simply and logically as possible, which means filling in

gaps in perception if necessary (Witkin & Goodenough, 1977). For example, if we are to look at a simple geometric shape such as a circle or a cube, and the lines of these shapes are not complete, we mentally close the lines in order to give the shape an easily-recognizably form. This principle also applies to trying to remember an event from the past. We might invent details in order to remember the event more clearly (Zimbardo, 1979). Field-independent people are generally better able to organize perceptions mentally so that they make sense. In terms of art tasks, an inability to organize perceptions effectively would perhaps not so much hinder the field-dependent person as it would help the field-independent person. For example, in drawing tasks, students are often required to perceive and concentrate on a myriad of shapes, lines, and forms. A person with good speed-of-closure skills would very quickly be able to recognize and make sense of individual shapes and lines; interpretation and analysis of subject-matter would be more accurate than in the case of a person who has limited speed-of-closure ability. Szeto and Salome (1977) state that "speed of closure . . . seems necessary for better analysis of the stimulus object" (p. 45).

Functional fixity is a term used in the field of psychology to describe a state in which people are

hindered in their ability to solve certain types of problems because they are unable to see new uses for familiar objects or ideas. An example of this type of problem-solving procedure is Duncker's (1945) experiment, in which he gave a group of students three boxes, candles, tacks, and matches. In some cases, the candles, tacks, and matches were in the box, and in other situations, these objects were not in the box. The task required for these objects was to attach a candle to the wall in such a way that it could be lighted. The obvious solution would be to use the box as a stand, tacked to the wall, and to place the candle on the box. However, students who received materials in a box were sometimes set into thinking that the box's only use was to carry objects, and the students were not able to consider the box as being used for another purpose (Zimbardo, 1979).

Lovano-Kerr (1983) suggests that FI people are better able to use familiar objects for a variety of uses, and are, therefore, able to solve certain types of problems more effectively than FD people. In terms of the implications of functional fixity for art production, there are many art tasks, both 2-dimensional and 3-dimensional, that require students to solve problems unconventionally. Collage, sculpture, and architectural concepts in curriculum often require that students

rethink conventional uses for objects.

Perspectivism is the ability to maintain visual orientation of an object as it is moved into different positions. People with high levels of perspectivism can visualize how an object will look from a variety of angles and perspectives. Examples of art tasks requiring perspectivism are representational drawing and perspective drawing as both require that the student imagine objects from various viewpoints. According to Witkin and Goodenough (1977), tasks involving perspectivism are the most researched in terms (1977) state that "the extensive literature now on hand leaves no doubt that spatial-visualization ability is correlated with field independence" (p. 27).

Research suggests that certain restructuring tasks are more developed in FI than in FD people. This study suggests that because of this, FI people may out-perform FD persons on certain art tasks. If Bloomberg's (1967) hypothesis is correct, and all creative people are FI, then the relationship between creativity and FI may explain why some people are innately more skilled at art tasks than others. Also, attempting to identify a relationship between FI and ideational fluency at the preschool level is a first step towards understanding possible developmental shifts in these areas. The

apparent shift in FI with age may be consistent with the shift in gender differences in creativity. That is, gender differences in creativity may be a function of developmental shifts in FI.

With the amount of available research on the relationship between perception, cognitive style, personality, and creativity, it is not good enough for art educators to take the stance that creative growth will occur naturally through exposure to a variety of art activities and media; the perceptual and cognitive implications of the activities must be considered.

References

American Psychological Association. (1983). Publication manual of the American Psychological Association (3rd ed.). Washington, DC: Author.

Arasteh, A. R., & Arasteh, J. D. (1976). Creativity and related processes in the young child. In A. R. Arasteh & J. D. Arasteh (Eds.), Creativity and human development: An interpretive and annotated bibliography (pp. 8-39). New York, NY: Schenkman.

Ausburn, L. J., & Ausburn, F. B. (1978). Cognitive styles: Some information and implications for instructional design. Educational Communication and Technology, Winter, 337.354.

Barnes, G. M. (1981). The effects of training on field dependence/independence and the educational implications for the pre-school. Australian Journal of Education, 25(3), 297-311.

Bieri, J., Bradburn, W. M., & Galinsky, M. D. (1985). Sex differences in perceptual behavior. Journal of Personality, 26, 1-12.

Block, J. H. (1976). Issues, problems, and pitfalls in assessing sex differences: A critical review of "The psychology of sex Differences." Merrill-Palmer Quarterly, 22, 283-308.

Bloomberg, M. (1967). an inquiry into the relationship between field independence and creativity. Journal of Psychology, 67, 127-140.

Coates, S. (1972). The preschool embedded-figures test: PEFT. Palo Alto, CA: Consulting Psychologists.

Coates, S. (1974). Sex differences in field independence among preschool children. In R. C. Friedman, R. M. Richart, & R. L. Vande Wiebe (Eds.). Sex differences in behavior (pp. 259-274). New York, NY: Wiley.

Cooper, H. M. (1979). Statistically combining independent studies: A meta-analysis of sex differences in conformity research. Journal of Personality and Social Psychology, 37, 131-146.

Copeland, B. D. (1984). The relationship of cognitive style to the evaluation of university art instructors. Studies in Art Education: A Journal of Issues and Research, 25(2), 109-114.

Derman, D., & Meissner, J. A. (1972). Preschool embedded figures test. In V. C. Shipman (Ed.), Disadvantaged children and their first experiences. New Jersey: Educational Testing Service.

Dimond, S. J., & Beaumont, J. G. (Eds.). (1974). Hemispheric function in the human brain. New York, NY: Halstead.

Dudek, S. Z. (1974). Creativity in young children: Attitude or ability? Journal of Creative Behavior, 8(4), 282-292.

Dunker, K. (1945). On problem solving. Psychological Monographs, 58(5), (Whole No. 270).

Fitzgibbon, D., Goldberger, L., & Eagle, M. (1965). Field dependence and memory for incidental material. Perceptual and Motor Skills, 21, 743-749.

Freeland, S. H., & Moran, J. D., III. (1987). Gender effects in preschool children's creativity. (ERIC PS 016555)

Fu, V. R., Kelso, G. B., & Moran, J. D., III. (1984). The effects of stimulus dimension and mode of exploration on original thinking in preschool children. Educational and Psychological Measurement, 44, 431-440.

Globerson, T. (1985). Field dependence/independence and mental capacity; A developmental approach. Developmental Review, 5, 261-273.

Goldstein, K. M. (1978). Cognitive-style: Five approaches and relevant research. New York, NY: John Wiley & Sons.

Godwin, L. J., & Moran, J. D., III. (1990). Psychometric characteristics of an instrument for measuring creative potential in preschool children. Psychology in the Schools, 27, 204-210.

Grossman, M. J. (1969). Perceptual creativity, and various drawing abilities. Studies in Art Education, 11, 51-54.

Guilford, J. P. (1967). The nature of human intelligence. New York, NY: McGraw-Hill.

Guilford, J. P. (1980). Cognitive styles: What are they? Educational and Psychological Measurement, 40, 715-735.

Halpern, D. (1986). Sex differences in cognitive abilities. New York, NY: Lawrence Erlbaum Associates.

Kogan, N. (1971). Educational implications of cognitive styles. In G. S. Lesser (Ed.), Psychological and educational practice (pp. 242-292). London: Scott, Foresman.

Kogan, N. (1976). Cognitive styles in infancy and early childhood. Toronto, ONT: John Wiley & Sons.

Lovano-Kerr, J. (1983). Cognitive style revisited: Implications for research in art production and art criticism. Studies in Art Education, 24, 195-205.

Lowenfeld, V., & Brittain, W. L. (1970). Creative and mental growth (5th ed.). New York, NY: Macmillan.

McWhinnie, H. (1970). A review of recent literature in perceptual and cognitive style with implications for theory and research in art education. Studies in Art Education, 11(3), 31-38.

Maccoby, E. E. (1966). The development of sex differences. Stanford, CA: Stanford University.

Maccoby, E. E., & Jacklin, C. N. (1974). The psychology of sex differences. Stanford, CA: Stanford University.

Mahlios, M. (1989). The influence of cognitive style on the teaching practices of elementary teachers. Early Child Development and Care, 51, 89-107.

Mednick, S. A. (1962). The associative basis of the creative process. Psychological Review, 69, 220-222.

Milgram, R. M., Milgram, N. A., Rosenbloom, G., & Rabkin, L. (1978). Quantity and quality of creative thinking in children and adolescents. Child Development, 49, 385-388.

Milner, B. (Ed.). (1975). Hemispheric specialization and interaction. Cambridge, MA: MIT.

Moran, J. D., III, Milgram, R. M., Sawyers, J. K., & Fu, V. R. (1983). Original thinking in preschool children. Child Development, 54, 921-926.

Moran, J. D., III, Sawyers, J. K., Fu, V. R., & Milgram, R. M. (1988). Measuring creativity in preschool children. Journal of Creative Behavior, 22(4), 254-263.

Morell, J. A. (1976). Age, sex, training, and the measurement of field dependence. Journal of Experimental Child Psychology, 22, 100-112.

Noppe, L. D. (1985). The relationship of formal thought and cognitive styles to creativity. Journal of Creative Behavior, 19, 88-96.

Noppe, L. D., & Gallagher, J. M. (1977). A cognitive style approach to creative thought. Journal of Personality Assessment, 41, 85-90.

Oltman, P. K. (1968). A portable rod and frame apparatus. Perceptual and Motor Skills, 26, 503-506.

Richards, R., Kinney, D. K., Benet, M., & Merzel, A. P. C. (1988). Assessing everyday creativity: Characteristics of the lifetime creativity scales and validation with three large samples. Journal of Personality and Social Psychology, 54, 467-485.

Ripple, R. E. (1989). Ordinary creativity. Contemporary Educational Psychology, 14, 189-202.

Saracho, O. N. (1984). Young children's academic achievement as a function of their cognitive styles. Journal of Research and Development in Education, 18, 44-50.

Saracho, O. N. (1988). Cognitive styles in early childhood education. Journal of Research in Childhood Education, 3, 24-34.

Sawyers, J. K., Moran, J. D., III, & Tegano, D. W. (1990). A theoretical model of creative potential in young children. In C. W. Taylor (Ed.), Expanding awareness of creative potential worldwide (pp. 69-73). Salt Lake City, UT: Brian Talent-Powers.

Spotts, J. V., & Mackler, B. (1967). Relationships of field-dependent and field-independent cognitive styles to creative test performance. Perceptual and Motor Skills, 24, 239-268.

Starkweather, E. K. (1964). Problems in the measurement of creativity in preschool children. Journal of Educational Measurement, 1, 543-547.

Starkweather, E. K. (1971). Creativity research instrument designed for use with preschool children. Journal of Creative Behavior, 5, 245-255.

Steele, C. (1989). Cognitive style and the gifted young child. Early Child Development and Care, 15, 157-174.

Szeto, J. W., & Salome, R. A. (1977). The effects of scanning practice and perceptual training upon several visual functions: Implications for drawing. Studies in Art Education, 19, 45-51.

Tardif, T. Z., & Sternberg, R. J. (1988). What do we know about creativity? In R. J. Sternberg (Ed.), The nature of creativity: Contemporary psychological perspectives (pp. 429-440). New York, NY: Cambridge University.

Tegano, D., & Moran, J. D., III. (1989). Sex differences in the original thinking of preschool and elementary school children. Creativity Research Journal, 1(1-2), 102-110.

Tegano, D., Moran, J. D., III, & Godwin, L. J. (1986). Cross-validation of two creativity tests designed for preschool children. Early Childhood Research Quarterly, 1, 387-396.

Torrance, E. P. (1981). Thinking creatively in action and movement. Bensenville, IL: Scholastic Testing Service.

Torrance, E. P. (1988). The nature of creativity as manifest in its testing. In R. J. Sternberg (Ed.), The nature of creativity: Contemporary psychological perspectives (pp. 43-75). New York, NY: Cambridge University.

Wallach, M. A. (1970). Creativity. In P. H. Mussen (Ed.), Carmichael's manual of child psychology: Vol. 1 (3rd ed.) (pp. 1211-1272). New York, NY: Wiley.

Wallach, M. A., & Kogan, N. (1965). Modes of thinking in young children: A study of the creativity-intelligence distinction. New York, NY: Holt, Rinehart, and Winston.

Ward, W. C. (1968). Rate and uniqueness of children's creative responding. Child Development, 40, 869-878.

Witkin, H. A., Dyk, R. B., Faterson, H. F., Goodenough, D. R., & Karp, S. A. (1962). Psychological differentiation. New York, NY: Wiley.

Witkin, H. A., & Goodenough, D. R. (1977). Field independence revisited. (Research Bulletin No. RB 77-16). Princeton, NJ: Educational Testing Services.

Witkin, H. A., Goodenough, D. R., & Karp, S. S. (1967). Stability of cognitive style from childhood to young adulthood. Journal of Personality and Social Psychology, 7(3), 291-300.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependence and field dependence cognitive styles and their educational implications. Review of Educational Research, 47, 1-64.

Witkin, H. A., Moore, C. A., Oltman, P. K., Goodenough, D. R., Friedman, F., Owen, D. R., & Raskin, E. (1977). Role of field independent and field dependent cognitive styles in academic evolution. Journal of Educational Psychology, 69, 197-221.

Zimbardo, P. G. (1979). Psychology and life. Illinois: Scott, Foreman.

Appendix

1. The Preschool Embedded Figures Test by Susan Coates is available through Consulting Psychologists Press, Inc., 557 College Avenue, Palo Alto, California, 94306.

2. Instructions for constructing, administering, and scoring the Multidimensional Stimulus Fluency Measure are available through Dr. D. Tegano and Dr. J. Moran, College of Human Ecology, Department of Child and Family Studies, 1215 West Cumberland Avenue, Room 115, Knoxville, Tennessee, 37996-1900.