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Drawing with and without models: An examination of drawing behavior in children and adults

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Drawing With and Without Models: An Examination of Drawing Behavior in Children and Adults

by

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This thesis is dedicated to my parents,
John and Tula, and to my grandparents,
Peter and Stephana, for their belief
in all my academic and creative ventures,

to my niece and nephew, Natalie and Michael,
for sharing with me the wonders of childhood,

and to Drew, for his sacrifices, and dedication to this work.

Abstract

Research in drawing development has indicated that individuals' drawing behavior changes with age. Preschoolers, six, nine, twelve year-olds, and adults participated in the present study since these ages corresponded to the most prominent stages noted in the literature. Part one of this study examined drawing behavior in three drawing conditions: a model-absent condition (C1) in which drawing took place following a brief verbal description, a model briefly-present condition (C2) in which the model on which the verbal description was based was examined and drawn when removed from sight, and a model continuously present-condition (C3) in which drawings were made while the model remained present. All participants created such drawings with two familiar drawing topics: a flower and a dog.

Further empirical support for the literature was derived from results which indicated that the two youngest age groups drew the most elaborate, colourful and unrealistic drawings, and that technical skill and realism first became apparent in nine year-olds' work. Further evidence of gender differences was also revealed. Evidence for the suggestion that drawing from a model may enhance drawing performance (Gardner, 1980) was also obtained. In part two, subjective judgements of drawings revealed further evidence that a model may enhance drawing ability since drawings made in a model continuously-present vs. a model-absent condition were correctly discriminated by all age groups, four year-olds through adults, at a consistent level.

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Finally, my love is extended to all my family, and especially to my beloved sisters, Christine and Stefanie, and brother Peter. Their support and faith meant more to me than they'll ever know.

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" Once I drew like Raphael, but it has taken me a whole lifetime to learn to draw like children."

Picasso, 1974

To date, a vast but diverse amount of literature exists on the topic of drawing behavior development. The purpose of this introduction is to provide the reader with an overview of the format through which this literature will be reviewed. Its second goal is to introduce the reader to some of the ideas of the most prominent researchers in the field. These authors include Howard Gardner, Jacqueline Goodnow, Rhonda Kellogg, Claire Golomb and Viktor Lowenfeld.

The majority of the above authors' observations of drawing development have been the result of reviewing and categorizing countless samples of differently-aged children's drawings which were made from their mental images of objects. As a result, such research has delineated many drawing skills and/or events which are linked with age differences in children's work in a descriptive manner. While this work may be criticized on this point, it nonetheless is the cornerstone of research in the area of drawing development. A second purpose of this literature review is to present empirical investigations of children's drawings of their mental images of objects which have examined the most prominent features in drawings discussed by the above authors.

The final purpose of this literature review is to introduce the reader to a second primary condition in which drawing behavior has been investigated: drawing from a model. The primary emphasis of such studies was to delineate accuracy in

children's copies of various 3-d models and 2-d replications of them. Collectively, the following review on drawing behavior will form the basis for the present study's examination of drawing behavior in individuals of different ages.

Howard Gardner (1980)

Gardner, one of today's leading authorities on the development of children's drawings, has documented and clearly organized the life cycle of children's art work. From the ages of four until early adolescence, drawing behaviour is described as progressing across three broad stages.

Representational Designs (4 to 9 years)

In the fourth year the child enters the representational design stage and remains in this stage until, approximately, his/her ninth year. It is in this stage that the child's first efforts at drawing representations of objects in his/her world begin. However, while drawings at this stage are recognizable, they are quite unrealistic. Objects in drawings made by younger children also tend to free-float across the page, and thus are produced in an unorganized fashion. Colour use is extremely vibrant, expressive, yet unrealistic as well. A very important event also occurs in this stage of drawing development, that being the production of "tadpole" drawings. The tadpole is the child's first depiction of the human being. So named because of its striking resemblance to the respective metamorphic stage of the frog, the tadpole human figure in its simplest form is

constructed of a single circle, which represents the head with lines connected to it representing the legs. Occasionally, "arms" are drawn from the sides of the circle, and facial features, if any, usually include eyes (see Appendix A).

Children also draw other objects in the representational stage. Thus, while the inventory of the child's depicted objects increases, it is also important to note that at this stage the child's depictions of objects in her world are still at the general level. People, cats, dogs and houses are drawn in a general context. Since children do not distinguish between the identities of (say) dogs in their drawings, they draw their version of a prototypical dog instead. In short, this prototypical dog is a depiction of "their" dog, is considered to be "right" in their mind's eye, and is replicated repeatedly in future drawings of the object.

At approximately six years of age, drawings of familiar objects become more detailed and sophisticated, and are regarded as even more lively and flamboyant than those of four year olds. Children at this age also begin to draw elaborate scenic pictures. Drawings made by children at this age are also described as becoming more harmonious, balanced and graceful. They are also described as forceful, vibrant, and expressive and especially appealing to the eye.

This stage is regarded as the "central enigma" of the child's artistic development because the child's failure to draw his/her object realistically is what makes these pictures so

delightful. At this point a true peak is believed to have occurred in the child's work in which he/she is "artistically fluent". This "golden age" of the child's artistic development, however, is destined to dissipate as the child moves into the next stage of artistic development: realism.

The Incorporation of Realism in Children's Drawings (9 to 12 years)

The emergence of realism in drawing occurs by approximately the ninth year of age, and at this stage the child begins to draw less frequently. Not only are drawings produced less often, but those which are produced are also more precise, detailed and less flamboyant and vibrant than drawings made a few years earlier. While technical competence is quite developed, the "peak" previously witnessed in the representational stage has steadily declined. Much of what is (or is not) present in drawings is attributed to the child's preoccupation with accurate representation and realism. Gardner proposes that since a child of nine or ten years has, in most cases, been successfully socialized, such socialization also extends to his/her artistic expression. Gardner, furthermore, explains that a preoccupation with "correctness" through mores, peer and social pressures, entices the child's expression in his/her artwork away from spontaneity and leads it towards conventionalism.

The adolescent and adult artist

Gardner and one of his colleagues, Ellen Winner (Gardner & Winner, 1982; Winner, 1982), also noted that most children completely cease drawing by the time they enter adolescence. These authors believed that one factor which causes the adolescent to cease drawing is the self-consciousness he/she feels towards his/her artwork. It is also proposed that the adolescent may completely stop drawing because other methods of self-expression, such as social interaction with others, are available to him/her.

In post-adolescence, drawing behaviour, however, may resurface. Gardner also proposed that since the post-adolescent has a more expanded social and emotional life, the need for self-expression may also prompt him/her to begin to draw once more. These authors proposed that this event occurs since the adult, having graduated from the realism stage, is now less constrained by the dictates of conventionalism, and thereby can implement originality again in his/her art work. Therefore, drawings in adults, once again, can appear to be unconventional, unconstrained, unrealistic, vibrant and expressive once more.

In summary, these authors proposed that individuals' drawings can, therefore, follow a U-shaped pattern of development. As noted, drawings made by the child in the "representational design" stage are indicative of a peak in graphic development because of their vibrancy and liveliness. This "peak", however, dissipates during the child's "realism"

stage, when his/her preoccupation with accuracy and realism is strong. The "realism stage", therefore, corresponds to the trough of the U-shaped pattern of graphic development. Finally, the individual's graphic work may once again peak when drawing begins again. In such cases, drawings are considered to be akin to drawings made by young children which do not incorporate realism into their work. From this interpretation, Gardner and his colleagues regarded such graphic works as returning upwards to meet the level of unconventional, vibrant and unconstrained artistry apparent in earlier ages.

Jacqueline Goodnow (1977)

Goodnow (1977) states that it is important to analyze drawings since they are a visual mode of communication. For our purposes, Goodnow's investigation of sequence and spatial patterning behavior in children's drawing will be examined.

Sequencing in children's drawings

Left-to-right sequencing

Goodnow's investigation of children's drawing behaviour indicated that sequencing was advanced and consistent as early as the age of three. School-aged children were observed to draw paired features, such as arms or legs, in a left-then-right sequence. Preschoolers, on the other hand, showed a preference

for a right-then-left sequencing pattern. The school-aged children's predominant left-to-right sequencing pattern was proposed to be the result of their learning to write in school.

Top-to-bottom sequencing

Goodnow also observed a predominant top-to-bottom sequencing pattern, especially in children's drawings of the human being. Observations indicated that children typically drew the human figure beginning first with a circle, adding facial features next, and finally, legs.

Patterning of units in children's drawings

Goodnow indicated that one integral aspect of spatial patterning in children's drawings is the organization of units through space and boundaries. This investigation indicated that young children predominantly segregate the units in their drawings through the use of open space and boundaries, fit units of a drawing into available space, and refrain from overlapping features and objects.

In short, Goodnow noted that features in children's drawings are related to one another according to space and boundary, and to sequencing principles. Unlike Gardner (1980), Goodnow's work did not examine drawing behavior in the middle childhood years. Moreover, age differences in drawings were not stressed and the development of realism in drawings was not addressed.

Rhonda Kellogg (1969)

Rhonda Kellogg spent a lifetime of work dedicated to the understanding of development in children's art. By studying literally hundreds of thousands of drawings from children all around the world, Kellogg documented a sequence of drawing events that a child progresses through between the ages of two to seven years. Like Goodnow's work, Kellogg also did not stress age differences strongly in her work.

The child's first step in drawing is marked by the appearance of the scribble, which Kellogg regarded as the basic "building block" of art. Twenty basic scribbles were documented to occur in children's drawings by their second year (see Appendix B).

Following basic scribbling behavior, Kellogg also observed that children then typically began to make their scribbles within a perimeter or frame of the page. This was labelled the child's "placement patterns", which then progressed to the "emergent diagram shape" phase, in which this behavior occurred independently of the edge of the page. To Kellogg the emergent diagram shapes were indicative of the commencement of drawing the six basic diagrams typically found in young children's work (the rectangle (and square), the oval (and circle), the triangle, the Greek cross (i.e., "+"), the diagonal cross (i.e., "X"), and the odd shape diagram).

Observations also showed that the child then begins to draw "combines" and "aggregates", which are those formations made when

two or three or more diagrams are drawn together, respectively. Kellogg's investigation also indicated that children typically drew combines which were separated, overlapping or contained in each other. Kellogg also considered the "mandala" combine (formed by a circle or square which is divided into compartments by a Greek or diagonal cross) to be a key form in children's drawings since a developmental sequence proceeding from mandalas to suns to the human figure was evident. Moreover, she also considered the mandala to be a particularly important link between children's and adults' art work, since the frequency of its appearance in both cases was observed to be quite high.

Beginning in the fourth year, the child enters the stage of early pictorialism. In this stage the child's first drawings of objects in his/her world, such as animals and flowers, are made. Animals were observed to be created by drawing ears on the head of the human figure. When drawn vertically, animals are usually drawn from the frontal view. When drawn horizontally the side view was usually adopted. Flowers and trees are also drawn by children at this stage. The child's first depictions of trees were noted to be quite similar to an arm-less human figure, with the "head" containing many extra markings depicting fruits and/or blossoms. Finally, flowers were also assumed to be formed from sun and mandala forms.

Viktor Lowenfeld (1957)

Lowenfeld (1957), like Gardner, also recorded a series of stages in children's drawing development. Between the ages of 4 to 13 years, children's drawing behaviour was documented to progress across five stages.

The Pre-Schematic Stage (4 to 7 years)

In the pre-schematic state. ttempts at representation in drawings first become evident and possible, since the child develops the forms with which he/she will depict objects in this stage. What the child draws in his/her pictures, in Lowenfeld's opinion, also indicates what is important to him/her. What is included in the child's pictures, moreover, is defined as his/her "active knowledge". "Passive knowledge", on the other hand, is described as the knowledge the child has about a particular object but does not use in his/her drawings. In the pre-schematic stage, however, no realistic relationship exists between colours and objects. Instead, Lowenfeld proposed that colour use is subjective in nature in this stage.

The Schematic Stage (7 to 9 years)

Colour use is not realistic in the schematic stage. Selection of colour for objects, however, is considered to be important. When the child establishes colour choices for certain objects, he/she is observed to repeat such choices, thereby establishing a colour schema. The use of specific colours for

objects, however, was noted to vary between children, and depend on the child's first experiences with the object and its colour.

In this stage the child also begins to create spatial relationships between objects. Although the concept of space is apparent to the child in this stage, the third dimension is not yet recognized. Deviations in drawings of the human schema in particular are also apparent in this stage and usually include exaggeration of parts which are regarded as important to the child. Qualitative differences in humans are also depicted through variations in size.

The Gang Age (9 to 11 years)

In the gang stage, realism is incorporated into drawings. Realism, according to Lowenfeld, occurs whenever an attempt is made to represent reality as a visual concept. Between these ages, children also recognize the inefficacy of their previous artistic skills. Thus, drawings begin to be made much more realistically. Lowenfeld also proposed that this realistic approach to drawing is coupled with a preoccupation with detail, and collectively these factors serve to create depictions of human figures, in particular, which are described as "stiff" and "rigid" in form.

The representation of space also becomes more realistic in the gang stage and the concept of depth also becomes apparent in drawings. In this stage, overlapping and realistic colour use also occur in drawings. Colour relationships with objects, however, can still remain highly subjective.

Exaggeration of size as a means of self-expression in drawings of human figures, which was apparent in the schematic stage, also ceases. Instead the child increases the amount of detailing in features of the human figures which are emotionally significant to him/her. By the tenth year the tendency to express qualitative differences between human figures through size also begins to dissipate.

The Stage of Reasoning (11 to 13 years)

In this stage children are believed to approach their works in one of either two ways: visually or non-visually. Visually-minded children are concerned with the visual and perceptual characteristics in their works. Works created by non-visually minded children, on the other hand, are exhibits of their subjective and emotional interpretation of the external world. Lowenfeld also noted that only visually-minded children depicted realistic concepts in their works.

Space concepts are also different between these types of artists, with only the visually-minded child being aware of the concept of depth. With respect to colouring, visually-minded children are also more realistic in their drawings and even depict the effects of natural conditions such as lighting and shading on colours. Non-visually minded children, however, continue to use colours according to their emotional appeal. Therefore, colour use remains subjective and often unrealistic in the non-visually minded artist.

The stage of reasoning was regarded as a preparatory stage for adolescence. During early adolescence, Lowenfeld contends that the onset of puberty causes the youth to become critically aware of his/her imagination. This critical awareness is believed to create a loss in the young adolescent's creative ability because the adolescent, now emerging into adulthood, deems his/her works as 'childish' and 'inefficient'.

The Crisis in Adolescence

Lowenfeld observed that most children ceased drawing when they entered adolescence. It was proposed that a lack of confidence in the adolescent's "conscious approach" to drawing was partly responsible for his/her cessation of drawing behavior. Such a loss in confidence was also believed to cause the adolescent's confidence in his/her imagination to dissipate. Furthermore, the young adolescent is also believed to lose his/her subjective attitude towards drawing. Overall, Lowenfeld deemed a lack of confidence and the absence of an established and secure approach to drawing as responsible for the cessation of drawing behavior.

Claire Golomb (1974)

Golomb's (1974) work on two to seven year olds' drawings mainly concentrated on drawings of humans. According to Golomb, at three years of age, initial attempts towards representation in drawing occur. This behavior results from the child's awareness of the forms contained in his/her earlier scribbles and of the

usefulness of lines for representation. The circle is the most popular form in children's drawings at this age, and is used frequently in depiction of humans, animals and flowers.

The initial and most frequent representation of the human figure at this stage is the circle-oblong human which, is formed from a large circle which usually encompasses the majority of the page. Children at this point view the global human as depicting the complete human being, and the third dimension is not yet acknowledged.

Children were also observed to work hard at attaining visual likeness in their works, and to express frustration and also criticise their work. Occasionally they will also rename their work so that it corresponds better with their final product. Although children are aware of and describe many aspects of their works, they nevertheless are quite economical with the number of parts included in this stage. In a short while, moreover, the size of the circle in human drawings diminishes and represents the head and face alone. By the age of six, size differences are also apparent between drawings of humans.

Children also work on the frontal plane primarily, ignore the third dimension, and pay most of their attention to the addition of facial features, stomach navels and hair. Children are still economical with the depictions they include in their work at this stage, and sometimes indicate their deliberate omission of them. Overall, this indicated to Golomb that the child is quite aware of his/her work at this point.

Golomb also noted that when children are satisfied with the degree of differentiation and completeness of their drawings,they then begin to differentiate between the sexes more specifically. For example, short hair is typically drawn for boys, and longer hair for girls. Children also count the number of finger and toes in their drawings in this stage. Thus, their work becomes quite complex because of the number of separately drawn body parts. By the first grade children were also observed to add more detailing features such as nostrils, pupils and irises in their drawings. Thus, the child's economy of parts is observed to decrease in this stage as he/she is observed to 'elaborate' and 'beautify' his/her drawings. Between the ages of six and seven years the child also uses the side view more frequently and further increases his/her efforts to depict figures as realistically as possible.

The above review of drawing development provides various sources of information which indicate that drawing behavior changes with age. While Gardner's and Lowenfeld's research mainly concentrated on the course of realism from the preschooler to young adolescent and adult, Goodnow's, Golomb's and Kellogg's work mainly discussed the rudimentary principles in drawing of preschool to early grade school children. The fundamental features in which changes with age were the most apparent included the use of colour, the presence of overlapping, area of space utilized, sequencing patterns, and the inclusion of background and detailing features in children's drawings.

EMPIRICAL INVESTIGATIONS OF CHILDREN'S DRAWINGS

Thus far in our study of the literature, we have reviewed the stages and/or events characterizing drawing development according to the most prominent researchers in the field. In all cases, such examinations have been based on children's drawings of their mental images or representations of objects. The majority of the above description of children's drawing behavior also did not appear to incorporate specific empirical analyses as a method of delineating behavior across age. Instead, they are the result of many objective categorizations of differently aged children's work. The following reports on children's drawings of mental representations have empirically analyzed many of the features discussed in the above review of drawing development.

Drawing Made From Mental Representations of Objects

Richards & Ross (1967)

In 1967, Richards and Ross conducted one of the first empirical investigations on the development of children's drawings. Twelve hundred children, ranging in age from four to fourteen years, were asked to "draw a picture of a cat and kittens". Results indicated that up to the age of eleven, girls used more colours in their drawings than boys. Moreover, it was also observed that for both sexes the number of colours used peaked by the age of seven or eight and once again at the age of eleven years. After the age of eleven, however, the number of

colours used was also observed to decline. The use of unrealistic colour in drawings was also found to be significantly higher for boys in age groups of eight to eleven years and twelve to fourteen years. While unrealistic colour use declined with age in both sexes, it also increased again in girls after the age of twelve and boys after the age of thirteen. Results also indicated that girls up to the age of ten years tended to use more of the area of the page for their drawings than did boys. Moreover, the use of area in both sexes peaked by the age of 7 or 8 years and again by the age of 11 or 12 years and declined thereafter. Overall, twelve year olds used more space than four through nine year old children. Drawings made by boys also included fewer background objects than drawings made by girls, and overall this observation was significant for children between the ages of five to seven and in the nine year old group as well. The number of background features was also noted to increase until the age of nine, then steadily decrease from the age of twelve years on.

Finally, Richards and Ross also noted that the tendency of females to perform differently on certain measures, such as the number of colours, may have been due to the earlier onset of puberty in girls. It was proposed that this factor may have played a role in the more mature drawings created by females.

Golomb & Farmer (1983)

Golomb and Farmer (1983) conducted an empirical study on the compositional strategies of three to seven year old children. This study was designed in order to investigate graphic planning strategies in these young children when a theme was specified, to examine the sequencing of single and multiple objects, to determine the extent to which top-to-bottom serial orders in drawings of figures were task-dependent; and finally, to more closely examine the roles of compositional variables such as colour used and placement granted, by children of this age range. In this study children were asked to draw four themes: "a family", "Children Playing", "a Birthday Party", and "a Garden with Trees, Flowers and a Pond".

Results indicated that across age groups, human figures were mainly drawn in a top-to-bottom order beginning with the depiction of the head. Conversely, flowers and trees were primarily drawn in a bottom-to-top sequencing pattern which was also consistent across ages. Results also indicated that three and four year olds showed no directional preference in their placement of figures or in their drawing of limbs. A left-to-right sequence, however, was predominant in 6 year olds, who proceeded in a left-to-right sequence eighty per cent of the time.

Results also indicated that forty-five percent of drawings made by the three and four year olds had figures randomly extending over the entire page, while undifferentiated use of the

whole page was apparent in only five percent of six year-olds' drawings. Finally, observations also demonstrated that although four year olds' colour use in their drawings was largely unrealistic, some representative colour use was evident. Overall, however, six and seven year olds were noted to be the most realistic in their choice of colors for figures and objects in all tasks.

Richards and Ross' (1967) and Golomb's (1983, 1984) studies of drawings of mental representations serve to provide empirical support to the previously discussed literature which emphasized that drawing behavior in individuals changes with age. Moreover, for the first time in our review of the drawing literature, we have also witnessed evidence which documents that on certain measures drawing behavior differs between the sexes (Richards & Ross, 1967).

Copying

As noted, the above reviews on drawing development were primarily concerned with drawings made from children's mental representations or images of objects. In the following review, however, we will also examine some studies which investigated children's drawing development in tasks in which drawing various models was required.

Opinions on the benefits of copying, as a method of teaching drawing, vary. Some authors such as Kellogg (1969) and Lowenfeld (1957) state that copying should never be encouraged in the

child. Robertson (1985), however, noted that while some types of copying may inhibit a child's artistic behaviour, other types may foster its growth. Robertson also acknowledged that copying from popular sources, such as comics, has been viewed as both positive and negative by researchers.

Goodnow (1977) also noted that studying copying behavior has practical implications which include the investigation of the development of consistency and flexibility in behaviour, as well as the investigation of origins of error. Gardner (1980) and Wilson and Wilson (1972) also noted that copying can teach children artistic skills and may also serve to provide children with confidence in their artistic ability. Gardner (1980) also noted that children are capable of producing more sophisticated and advanced art work when drawing from a model than when drawing independently. This appears to be the case because the child merely needs to replicate the depiction of the object rather than relying on his/her own drawing skills associated with its mental representation or schema.

According to Piaget (1951) imitative behavior is not unnatural, since it occurs spontaneously in children and plays an important role in learning. Moreover, according to Korzenik (1979), older children want to copy images in their culture because they are socialized to adopt such behavior. Smith (1985) contends, however, that it is important to recognize that some types of copying employ artistic behaviors while others may not. She proposed that research should be conducted in order to

identify types of copying behavior which are not harmful to a child's artistic thought as well as to identify those which do not enhance, promote, or involve inventive and expressive behavior. Smith also proposed that in any investigation on the issue of copying, three factors need to be addressed in order to determine if the particular copy includes or does not include artistic behavior: need, model and process.

Need indicates what model the child seeks to copy. It also reveals the style of copying required. Collectively this reveals some of the child's artistic intentions. She also emphasizes that the models, specifically, deserve special attention in order to determine if they are useful in promoting artistic development. Finally, the child's process of copying deserves special attention since when compared with the model one may observe which aspects of the model were important, and therefore copied by the child. Moreover, whether the child replicates the model or merely modifies it also deserves attention. From this, according to Smith (1985), methods to encourage artistic behavior in the child can be delineated.

Drawings Made in Model Tasks

The following studies all investigated drawings made by children in modelling tasks. The methods incorporated in these examinations specifically investigated children's drawings of 3-d geometrical objects and/or 2-d replications of them in order to delineate age and/or model effects. In each case all drawings

were made in conditions in which the model remained continuously in the subjects' views.

Children's drawings of 2-d line drawings of 3-d geometric objects

In 1978, Phillips, Hobbs and Pratt conducted a study in which two objectives were undertaken. The first was to determine whether the accuracy with which copies of line drawings of three dimensional stimuli were made was affected by whether or not the drawings were of non-objects or objects, and whether intellectual realism (the tendency to draw what one knows about an object versus what one actually sees) will occur at all in such a copying task. Two age groups of children (mean ages of 7.6 and 9.4 years) were investigated in this study.

Four experimental conditions were designed in which children were required to replicate two dimensional line drawings of objects (blocks) or non-objects (patterns) using two techniques, either continuously looking at the model while being unable to observe their drawing, or drawing with a normal technique (i.e., being able to look at the model and their drawing). Finally, children were also required to draw a cube from memory.

Results indicated that, overall, drawings of objects were less accurate than were drawings of non-objects. Results also showed that older children drew significantly more correct three-dimensional drawings of the objects (cubes) than did younger children. Differences between these age groups for non-objects (patterns), however, were not significant.

Furthermore, cubes which were drawn from memory were done so less accurately than cubes drawn in the model tasks. Finally, it was also apparent that continuous looking at the drawing being replicated reduced the amount of intellectual realism in the drawings. Therefore, it was concluded that intellectual realism resulted from one's conceptual knowledge of an object, which was dominant over the perceptual experience of the object.

Children's drawings of 2-d photoslides of a 3-d geometric scene

Bradley (1986) also conducted a study using two-dimensional replications of three-dimensional figures as stimuli. In this study children in grades seven through nine (twelve, thirteen and fourteen year olds, respectively) were required to draw two photoslides (Drawing 1 and Drawing 2) of three dimensional objects which were comparable in geometric form. The purpose of this study was to determine differences in drawing abilities of these age groups, and to investigate where difficulties in drawing a three-dimensional figure onto a two-dimensional medium may arise. Bradley's study also investigated whether these adolescents would use a familiar conceptual schema to draw the figures or whether they would draw the actual perceptual representation of the object. Finally, the possibility of sex differences and the influence of art experience were also examined. Perceptual scores were obtained for depictions in drawings which were exactly alike those in the photoslides. Conceptual scores were also obtained for depictions which were

not identical to the photoslides. Domains used in the scale included shape, texture, transparency, depth, craftsmanship, gradation, detail, figure, ground and size.

Results indicated that fourteen year olds tended to score higher overall on the drawings than the twelve and thirteen year olds. Drawings made by fourteen year olds were also the most realistic. Overall, ninth graders were superior to seventh graders on the depth, detail, shape and size domains in both drawings. Ninth graders were only superior to eight graders on the depth and detail domains in Drawing 1 and Drawing 2, respectively.

Results also revealed that students with underdeveloped observational skills also demonstrated a lack of accuracy in their representation of perceptual objects. Moreover other students were also found to rely on their repertory of prior concepts in that they tended to depict detailed drawings of objects which were actually quite simple. These students also tended to detail objects which were not of central importance in the drawings. Others were also observed to include words for the object they attempted to draw. To Bradley such observations were indicative of the students' dependence on their perceptual knowledge of the objects in the photoslides.

Observations also indicated that most students represented background objects with a perceptual stereotype rather than with what was actually present in the photoslide stimuli. Bradley also concluded that contrary to other researchers' investigations

(e.g., Lowenfeld and Brittain, 1982, cited in Bradley, 1986) the twelve year olds in this study had difficulty depicting size and depth relationships in their drawings. Thus it was concluded that the twelve year olds in this study did not possess fundamental drawing skills and perceptual awareness skills by the time they entered the seventh grade.

Finally, no significant correlation was found between scores and elementary school art experience. A significant correlation between art experience at the junior high school level and drawing skill was evident in that older grades scored higher, overall, than younger grades. A significant correlation was also revealed between amount of free time spent drawing and scores on the drawing domains. However, the number of participants demonstrating this behavior was not revealed. Negligible sex differences were revealed across drawing domains for age groups.

Drawing tasks involving Real-life 3-d objects

While some studies have investigated children's drawing abilities using stimuli which were depicted in two dimensions, other studies have investigated this problem using real-life three dimensional geometric objects.

Drawings of a 3-d Pictorial Scene

Willats (1977) conducted a study in which children were required to draw a real 3-d scene from a fixed viewpoint. Children ranging in age from five to seventeen were examined. A

pictorial scene composed of a table with three objects, which partially occluded each other and parts of the back edge of the table, was used as the model to be copied. According to Willats, because subjects were restricted to using line drawings in this modelling task, the depiction of occlusion through the use of overlapping could be investigated.

Results indicated that a high correlation existed between age and overlap score. Overall, results indicated that children younger than nine years of age used little or no overlap in their drawings, and that rapid learning occurred between the ages of nine to eleven years. From these results Willats concluded that overlapping was a continuously learned process which was complete after the age of eleven to twelve years. Finally, results also revealed that more time was spent completing the drawings as the age of the participant increased.

Children's drawings of iterative and non-iterative 3-d cubes

In 1985, Lewis compared five through ten year-olds' drawings of a plain cube (iterative) with drawings of a cube which had a different design on four of its sides (non-iterative). This study was undertaken in order to examine the effects a non-iterative cube might possibly have on young children's tendencies to represent a whole geometric form by only one of its sides, hence in a two-dimensional manner (i.e., a cube by a quadrilateral or square, or a pyramid by a triangle).

Overall, results indicated that the tendency to represent cubes with more than one drawn side increased consistently with age, except in fifth graders' plain cube drawings, which were comparable to fourth graders' scores.

Observations also indicated that across all ages the plain cube was represented by one of its iterative sides (a quadrilateral, specifically) more frequently than was the designed cube. Results also indicated that kindergartner's and first graders' drawings were higher in accuracy in the designed cube condition than in the plain cube condition. Results between the two cubes, however, did not differ through the second, third and fifth graders' scores, and higher accuracy was revealed in the fourth graders' plain cube scores.

Unsuccessful attempts at depicting depth (or perspective) were first observed in grade one children's drawings which were also observed to be highest for girls' drawings of the designed cube. Scores for unsuccessful perspective were also higher in fourth graders' drawings relative to younger grades, and boys' scores were higher than girls'. Moreover, successful drawing of both cubes in perspective first occurred in fourth graders, in which females out-scored males in drawings of the designed cube, and males out-scored females in drawings of the plain cube.

To Lewis, it was apparent that drawing a three-dimensional designed cube elicited attempts at depth depiction in kindergartners through first-graders more than did drawing a plain cube, and that a plain cube is represented by one side more

frequently than a designed cube. Finally, the apparent complexity of a designed cube appeared to hinder children's successful attempts at representation in perspective, since successful perspective drawings of both cubes became evident first in fourth graders' drawings.

Children's drawings of a 3-d unfamiliar object

Colbert and Taunton (1988) also conducted a study using a three- dimensional model to determine the strategies that preschoolers and third graders used to depict depth when drawing a 3-d model onto a two dimensional medium. The model used in this study was constructed of a solid cube with a solid triangle located on its top, had variously sized rectangles attached onto its faces and edges, and was painted with various details such as dots, lines, checks, diamonds and stripes. Such an array of detail and projections was included to prompt the notion of occlusion and knowledge of hidden features in the children.

Results indicated that nine drawing strategies were used by these students. These strategies ranged from the simplest drawings of segregated details of the cube to drawings of a single plane, to two attached planes with or without occlusion and obliqueness , and finally to the most sophisticated, of three attached planes with occlusion and obliqueness.

Results also revealed that while 35 and 30 percent of preschoolers depicted the object with segregated features (details of planes) or single planes, respectively, 30 percent

also depicted the object by drawing two or more planes without obliqueness and/or occlusion, or by two or more planes with obliqueness and/or occlusion. According to Colbert and Taunton, such depictions were indicative of the preschooler's beginning ability to draw in a three-dimensional manner. These authors also noted that this result contradicted previous research (e.g., Cox, 1978; Freeman, Eiser & Sayers, 1971; Lewis, 1982) which reported that such drawing systems are not expected until the eighth or ninth year. Furthermore, these authors also observed that the third graders also depicted the model in these manners 36 percent of the time. Finally, results also revealed that the most common system used by both age groups was to depict the model in a single plane with a triangular top.

According to Colbert and Taunton three atypical findings were therefore observed in their study. First, an impressive range of strategies were used by preschoolers. Second, an impressive amount of similarity existed between the two age groups' use of strategies. Third, and finally, these authors were extremely impressed with the preschool children's cooperation and willingness to perform in such a complex copying task.

Children's copies of a 3-d object and its 2-d replications

In 1984 Chen, Therkelsen and Griffiths conducted a longitudinal study in order to examine the possible differences between six and eight year-olds' drawings of 3-d objects with

their drawings of a two-dimensional replica of the model. Under the premise that two-dimensional representations of a three-dimensional object may enhance drawing by rendering available previously less attainable drawing devices, this study compared drawings of real life cylinders and cubes with two-dimensional line drawings and photographs of the identical objects. All children were tested three times at twelve month intervals over a period of two years.

Results indicated that overall, drawings of cylinders were more accurate than were drawings of cubes. No sex differences were apparent as well in this study. Results also indicated that eight year olds produced more visually accurate drawings of cylinders than did six year olds. Moreover, while accuracy in the six year olds' drawings of the cylinder increased over the two years of testing, eight year olds' drawings of the cylinder did not change. Results also indicated that eight year olds' drawings of cylinders were not significantly different under the three drawing conditions. On the other hand, six year olds' copies of the line drawing were more realistic than were their copies of the photograph. Overall, in these age groups these drawings were also more realistic than were drawings of the 3-d model.

Eight year-olds' drawings of the cubes, overall, were more accurate than were six year-olds' drawings. Accuracy in all the children's work was also observed to increase over the two years of testing. Furthermore, while copies of the two-dimensional

models of the cube were more accurate than drawings of the real-life model, no significant differences were observed between the two two-dimensional representations. Overall this study indicated that children's ability to draw cubes was acquired later than was the ability to draw a cylinder. Furthermore, it was concluded that the ability to draw such models was age- and shape-dependent. It was also concluded that representations of three-dimensional objects on a two dimensional medium aided children's ability to depict depth cues accurately.

Preschoolers' and Adults' Drawings of a Mental Representation and From Drawing a 3-D Model: A Comparison Study

Kleisath (1987) conducted a study in order to investigate any similarities and differences in drawings made by preschool children and adults in two drawing conditions. In this study all subjects were required to draw a model of a house and family (Model-Present Condition) and to draw their mental representation of their house and family (Model-Absent Condition).

Results indicated that while differences according to age and model condition were evident, on certain dependent measures drawings made by adults and preschoolers in these drawing conditions did not significantly differ. For example, in the model-absent condition both adults and preschoolers did not significantly differ from each other on the addition of background features in their drawings. More children than adults, however, included background features in the

model-present condition. Observations also revealed that adults used more numbers of colours in their drawings than children. Furthermore, while adults used more colours in the model-present condition relative to the model-absent condition, preschoolers showed the opposite tendency. Adults and children also did not utilize significantly different areas of the page in the model condition, and overall more area was used in the model-absent condition than in the model-present condition. In the model-absent condition, however, adults used more area of the page than preschoolers. Interestingly, adults and preschoolers scored lower on the Goodenough-Harris (1963) Draw-A-Person test in the model-present condition than in the model absent condition. In both cases, however, adults' scores were higher than preschoolers'.

Finally, results also showed that, overall, adults spent more time completing their drawings than preschoolers. Furthermore, across the two drawing conditions, adults spent more time in the model-present condition than in the model-absent condition, and preschoolers did the opposite. Kleisath's (1987) investigation was the first known study which directly compared drawings by preschoolers and adults under conditions which required subjects to copy a model or draw from a personal mental image.

The purpose of this review of drawing development was to illustrate that research on drawing development has also incorporated various model conditions to investigate drawing skills across age. As with research on drawing from mental representations, results in this area of the literature have also indicated that drawing skills change with age. Moreover, evidence in this literature also suggests that differences in drawing skills also exist between the sexes across particular ages, on measures of depth depiction and accuracy (Lewis, 1985).

Experimental Overview

The present review documented that the majority of the above studies investigated drawing development under only one of two main conditions: drawings made either from mental representations, or from drawing various models. Research in the area of graphic development can, however, be extended through experimental procedures designed to simultaneously investigate drawings made by an individual under both types of drawing conditions. Such a procedure would serve to extend our understanding of how differently-aged children and adults draw, since a comparison of drawing behavior across conditions would be permitted.

As will be explained in more detail below, the present study will examine and compare drawings made by individuals under three drawing conditions. It is worthwhile to note at this point that the issue of possible practice effects in this study was considered, since all subjects will be required to draw one drawing topic for three consecutive times. In fact, however, previous research revealed no significant improvements in drawings for five year olds who participated in identical drawing tasks once or twice consecutively (Lansing, 1981; 1984). Unlike these studies, subjects in the present study will participate in three different drawing tasks.

The issue of fatigue in individuals, and especially in the preschool participants, has also been considered. In his investigation of children's drawing behavior, Gardner (1980)

emphasized the observation that young children often produce several works in a single sitting with an abundance of energy. In the Golomb and Farmer (1983) study, four to seven year-old children participated in a drawing task which entailed the drawing of four rather complex, drawing themes (e.g., "Draw children playing"). This age group, in these authors' opinion, displayed no difficulty with the task requirements. Finally, one of Colbert and Taunton's (1984) key observations commented on the willingness and enthusiasm that preschoolers exhibited when drawing a complex three-dimensional model. In short, such observations have been akin to other researchers' observations (Gardner, 1980; Kellogg, 1969; Lowenfeld, 1957; Winner, 1982) that children thoroughly enjoy drawing and voluntarily spend extended amounts of time participating in such behavior.

The primary purpose of the present study is to compare drawings made by variously-aged children with those of adults under conditions in which drawings are created from a verbal description of an object and from drawing a 3-d model version of it. Three drawing conditions in total will be implemented in the present study. A drawing task in which the individual is asked to draw an object after receiving a brief verbal description of it (Model-Absent (C1)) will be examined. This condition will be included in order to examine individuals' drawings from a verbal request. A drawing task in which the individual is provided with a 3-d version of the object and asked to draw it while the object remains continuously in view (Model Continuously-Present (C2))

will also be examined in order to examine how drawings are affected when an individual draws from a model, while able to continuously refer to it. Finally, a drawing task in which the individual is presented with a model for observation and is asked to draw the object when it is removed from sight (Model Briefly-Present (C3)) will also be investigated. The main purpose of this latter drawing condition is to examine how drawing is affected by a drawing task intermediate to the above, more traditional, methods of examining drawing behaviour. The MBP (C2) condition is considered to be intermediate to C1 and C3, since it partly involves observation of the model and drawing from a mental representation of it.

This study will also specifically examine and compare similarities and differences in drawings as they pertain to the various stages and observations of graphic development noted by the above authors. In order that this may be accomplished, the present examination will be conducted with children aged four, six, nine and twelve years, and with adults. The ages of the children were specifically chosen so as to correspond with the stages of graphic development highlighted by our review. Adults were also chosen so that a comparison of artistic skills in individuals who have passed through the artistic stages in development can be examined and compared with individuals currently at various stages of development. Collectively, this study will permit an examination of drawing behaviour from the preschool years through adulthood. Both males and females will

also participate in this study in order to examine and delineate any sex differences which may be apparent.

Two familiar objects, a flower and a dog, will be used as the objects to be drawn in this study. These familiar objects were chosen because prototypical objects such as animals and flowers are quite prevalent in youngsters' drawings (Gardner, 1980; Goodnow, 1977; Kellogg, 1969). Second, a familiar object was chosen because of the inherent difficulties involved in a verbal request for an unfamiliar or abstract object.

Finally, all drawings in all three conditions will then be compared and scored on the following measures: top to bottom and left to right sequencing patterns, the number of colours used, unrealistic colour use, the inclusion of background features, the area of space utilized, the presence of overlapping, and the presence of a correct frontal perspective, since from our review these are the most predominantly examined features of drawing behavior. Time spent drawing and the inclusion of all of a drawing topic's parts will also be examined.

Experiment One (Part Two)

Part two will serve as a supplementary study to experiment one. In this study we will investigate individuals' subjective judgements of drawings. Such methods have become standards in research examining aesthetic judgments and perceptions of art (for review, see Berlyne, 1974).

Research has investigated children's and adults' preference in adults' artwork (e.g., Machotka, 1966; Rump and Southgate,

1967; Bell and Bell, 1979), children's sensitivity to adults' stylistic use of colour (e.g., O'Hare & Cook, 1983) and aesthetic features such as expressiveness and repleteness (Carothers & Gardner, 1979) and finally, whether children can be trained to become sensitive to adults' artistic styles (e.g., Gardner, 1972). However, only a few studies have investigated children's judgements of other children's work (e.g., Hart and Goldin-Meadow 1983; Moore, 1986).

The purpose of the present study is to determine if children and adults will be able to accurately distinguish between drawings made in the C1 and C3 conditions. Experiment one specifically compares various dependent measures according to age and drawing condition in a serial-like fashion. However, since experiment two involves overall judgement of drawings, the dependent variables examined in experiment one will be examined in a composite-like fashion in experiment two, since all relevant variables will be presented simultaneously for inspection in the completed drawings.

Method (Part One)

Subjects

Preschoolers, children in grades one, four, seven (aged approximately four, six, nine and twelve years, respectively), and adults, for a total of 148 subjects, participated in the present study. Each age group was comprised of 30 individuals (15 females and 15 males) with the exception of the preschool and seventh grade groups which had a 15:14 female/male ratio. Preschool children were recruited from day-care centres in the Kitchener-Waterloo area. School-aged children were recruited from a number of private schools also located in the K-W area, and from Girl Guide groups. Finally, adult participants were contacted through the "volunteer participant pool" established in the Department of Psychology at Wilfrid Laurier University.

Materials and Apparatus

A package of eight Crayola crayons, consisting of the colours red, green, yellow, blue, black, brown, purple and orange was used. All drawings were made on 12" x 18" sheets of brown manilla paper. This type of paper was chosen on the basis that some teachers have noted that children tend to be apprehensive when drawing on white paper but not when drawing on manilla paper. A synthetic flower and a stuffed toy dog were used as the three-dimensional models to be drawn. A standard stop watch was also used to time the duration of each individual drawing task. All drawing sessions took place in a quiet, adequately lit room located in the day-care centre or school.

Design

A split-plot analysis of variance (ANOVA) design was used to analyze all data. Between-subject variables consisted age (preschoolers, students in grades one, four, seven and adults) and sex (males or females). The within-subjects variables consisted of Drawing Condition, Model-Absent (C1) vs. Model Briefly-Presented (C2) vs. Model Continuously-Present (C3) conditions, and Drawing Topic (flower versus dog). All dependent variables were analyzed according to age (preschoolers versus grade ones, fours, sevens and adults), sex (males versus females), Drawing Condition (C1 vs C2 vs C3), and Drawing Topic (dog vs flower).

Procedure

Prior to any testing sessions all children returned parental/legal guardian consent forms granting permission for them to participate in the study (see Appendix C).

Before testing, the experimenter introduced herself to the child and informed him/her that she was interested in investigating how people draw pictures. The child was then asked if he/she would like to draw some pictures for the experimenter. He/she was then seated at a desk which had placed on top of it a sheet of manila paper and eight crayons evenly distributed one inch above it. The colour order of the crayons was determined in a random fashion and this sequence remained constant for each individual drawing session. From left to right the colour order of the crayons was as follows: orange, red, blue, brown, yellow,

purple, black, and green.

In the Model-Absent condition (C1) the experimenter informed the child that (s)he would be asked to draw a dog, for example, after receiving a brief verbal description of it. The experimenter then provided the child with a description of the object. This very brief verbal description of the drawing subject was included in order to restrict the possible variance of the orientation in the children's subjective drawings, and to provide a basis for comparison with the model condition (for verbal descriptions, see Appendix D). After the verbal description of the drawing had been delivered, the child was asked if he/she had any questions. Once any questions were answered, the child was then instructed to commence drawing, and was instructed to take his/her time in doing so. When the child completed the drawing, (s)he was congratulated and thanked and asked if he/she would like to draw another picture.

It should be noted that every effort was made by the experimenter to ensure that all participants clearly understood this verbal description. More specifically, each child was asked if (s)he understood the experimenter's instructions, had them repeated whenever asked, and also had the two youngest groups count to six (since this was the highest number for a feature in the topics) in order to see if the child understood this number.

This second session entailed the Model Briefly-Present condition (C2), which occurred following a one minute break period. In this condition, subjects had the model placed on top

of the desk, a few inches in front of the paper. Each child was then instructed to carefully observe the model, and was informed to do so since he/she would be required to make a drawing of the model after it had been removed from sight. The experimenter then asked the child if he/she had any questions. The child was allowed to observe the model for a maximum of two minutes. When the child informed the experimenter that he/she had finished observing the model, the model was then removed from sight. The child was then asked to commence drawing, and was informed once again to take his/her time to do so. When the child completed his/her drawing, he/she was congratulated and thanked again; and was then asked to make one final drawing. This final drawing task consisted of the Model Continuously-Present (C3) condition, which also took place following a one minute break. In this condition, testing was identical to the model briefly present condition, only in this case the model remained in the child's view.

When the child completed this drawing task, he/she was asked to repeat all drawing tasks again with the second drawing topic. The sequence of drawing topics in these conditions was randomly selected for each child using a random numbers table. Testing procedures with the second drawing subject were identical to the above procedure.

All drawing conditions were timed in seconds with a stopwatch. The experimenter also manually recorded sequencing patterns in all drawing conditions. Testing of twelve year olds

and adults also took place in a similar manner.

All drawings were identified with the age and sex of the individual and by the model condition and drawing topic as well. All drawings were scored according to the following dependent variables in the following manner.

Dependent Variables

Based on our review of the drawing literature, nine primary dependent variables were selected for testing purposes in the present study. These dependent variables were chosen since they corresponded to the most prominent features discussed in the literature. The number of included features either described or presented in the models was also analyzed to evaluate correct completion, as was the time taken to complete each drawing.

(a) Number of colours used in each drawing, from a total of eight possible colours, was counted (Golomb and Farmer, 1983; Kleisath, 1987; Richards and Ross, 1987).

(b) The presence of unrealistic colour use was also recorded. Unrealistic colour use was noted when stereotypical colouring was not depicted in drawings (Gardner, 1980; Golomb and Farmer, 1983; Lowenfeld, 1957; Richards and Ross, 1967). For drawings of the dog, the following colours were counted as realistic: black, brown, and orange anywhere on the body; black, brown, green and blue on the eyes and red on the mouth and ears (Richards & Ross, 1967). If any other colours were used, they were counted as unrealistic.

For drawings of the flower, the following colours were considered as realistic for the petals: red, yellow, orange, blue and purple. Only the colours green and browne were considered realistic for the stem and leaves. Any other colours were deemed unrealistic.

(c) the total area of the page utilized to make the drawing was also calculated. This was accomplished by placing a gridded plexiglass plate with a total of fifty-four squares on top of each drawing and counting each square which contained markings. All areas which had markings in them were granted scores of 1. Therefore area of page utilized was calculated from a possible score of fifty-four (Richards and Ross, 1967).

(d) all drawings were also categorized according to whether or not background features were included in them. Drawings without background features were granted a score of 0, while drawings with background features had the total number recorded (Richards and Ross, 1967).

(e) A completion score was also calculated for all drawings. In the flower drawings one point was granted, respectively, for the presence of 6 petals, two leaves, a stem, and a centre. In the dog drawings, one point was also granted, respectively, for the presence of four legs, two ears, two eyes, and a nose. Therefore, completion scores were calculated from a maximum score of four.

(f) the number of overlapped features in the models was calculated. In the model conditions six and five occluded features, respectively, were present in the flower and dog topics. From this, overlap scores in the model conditions were calculated from the total possible points of occlusion in each model (Willats, 1977). The total number of overlapped features in the model-absent condition was also counted.

(g) The frequency of drawing the topics from a frontal/ vertical perspective was also recorded. Drawings which used this perspective were granted a score of one, while drawings which did not were granted a score of zero.

(h) left-to-right and top-to-bottom sequencing was also recorded. One point was granted for the presence of each occurrence.

(i) The total time taken to complete drawings in each drawing condition was also recorded in seconds.

Method (Part two)

Subjects

Preschoolers, children in grades one, four, seven, (aged approximately, four, six, nine, and twelve years) and adults, for a total of 93 subjects, participated in this study. Fifteen

preschoolers (8 males, 7 females), 20 first-graders (8 males, 12 females), 18 fourth-graders (13 males, 5 females), 20 seventh-graders (5 males, 15 females) and 20 adults (10 males, 10 females) comprised the age groups. Preschoolers were recruited from day-care centres in the surrounding Kitchener-Waterloo area. School-aged children were recruited from St. Agnes School, of the Waterloo County Separate School Board. Three adult volunteers were graduate students in the Department of Psychology at Wilfrid Laurier University, and the other adult participants were contacted through the department's "participant pool".

Design and Procedure

Each subject was presented, in a randomized fashion, ten pairs of drawings, two from each age group which were completed in the model-absent (C1) and model continuously-present (C3) condition, and were asked to choose which drawing of each pair appeared as though it were made in the presence of a model. Following each choice, all participants were asked to explain why such a choice was made, and to indicate which drawing they preferred. All sample drawings were selected on the basis of each age groups' mean score on the dependent variables in part one, and deviated from the mean by one to two standard deviations. All reports were recorded and analyzed with an analysis of variance (ANOVA) which examined judges' scores according to their age, as well as scores given by the age of the artist.

Hypotheses (Part one)

The proposed study compared drawings made by individuals ranging from the preschool years to adulthood. Moreover, this study also compared drawings made by drawing a model which is only briefly presented for observation, with drawings made while the model remains continuously in view, and with drawings made from mental representations, according to the above dependent measures. This is the first known study which examined this age range of individuals' drawings under the above described drawing conditions. From our review of the literature, it is hypothesized that an effect of age on drawing behavior will be observed. The issue of gender effects, however, remains less certain. In light of this uncertainty, we will adopt the null hypothesis and predict that no significant differences between the sexes will be observed. In light of the above literature review, the following observations could also be expected. For purposes of simplicity, only detailed hypotheses based on Gardner's perspective, and on the literature on drawings of a model will be made.

According to Gardner's analysis of drawing development the following hypotheses would be proposed. It is anticipated that the number of colours and instances of unrealistic colour use will be higher in four and six year-olds than any other age groups examined. Gardner also notes that, when copying, children are able to produce drawings which are more sophisticated than those they can create independently. From this observation, it

is also anticipated that fewer numbers of colours will be present in both model conditions than in the C1 condition in this age group, and that less unrealistic colour use will be evident in C3 than in C2, since all individuals will be able to refer to the model throughout this task. Finally, it is also hypothesized that adults will use comparable numbers of colours and levels of unrealistic colours as four and six year-old children, across all drawing conditions.

On measures of overlapping, it is also anticipated that nine to twelve year-olds will overlap more features in their C1 drawings than younger children since their drawing skills are more technically advanced, and that adults will be comparable to the four to six year-olds on this measure. It is also anticipated that overlapping will be more accurate in C3 than in C2 since all subjects will be able to refer to the model continuously throughout the drawing.

With respect to area of space used, it is also anticipated that children before the age of nine will utilize more area of the page than older subjects, and that adults' scores will be comparable to four or six year-olds' scores.

The number of background features is also expected to be highest in six year-olds' C1 drawings, since they are noted to frequently draw elaborate scenic drawings. We also anticipated that the number of background features in adults' drawings will be comparable to the four to six year-old age bracket. The effects of the model conditions on the inclusion of background

features remains uncertain. However, we expected that fewer background features would be present in the model conditions since these may prompt drawing of the model only. Finally, no gender effects are specified based on Gardner's work since this possibility was not addressed by him.

Finally, on measurements of sequencing behavior, it is also hypothesized that six year-olds will demonstrate a greater left-to-right sequencing tendency than preschoolers, that top-to-bottom sequencing will be demonstrated in this age group (Golomb & Farmer, 1983; Goodnow, 1977), and that top-to-bottom sequencing may be less frequent in drawing of flowers (Golomb & Farmer, 1983). Finally, it is also proposed that a vertical perspective will be more prevalent in flower drawings than in dog drawings (Kellogg, 1969).

Model Studies

In these studies, accuracy in children's ability to draw three-dimensional geometric models and/or their two-dimensional replications was measured. Based on Willats' (1977) study, on scores for overlapping we expect that only the nine year-olds and older participants will accurately represent depth by overlapping in the model continuously-present (C3) condition. Time spent drawing is also expected to increase with age.

From the other studies reviewed, we also predicted that the ability to represent depth by overlapping would vary with age. We anticipated that preschoolers (Colbert and Taunton, 1984) and

six year-olds (Lewis, 1985) would also demonstrate some tendency to depict depth by overlapping, that six year-olds' scores would be lower than nine year-olds' (e.g., Chen et al., 1988; Lewis, 1985), and that nine year-olds would display this behavior well (Phillips et al., 1977). Finally, while other research demonstrated that overlapping ability is firmly established by the twelfth year of age (e.g., Willats, 1977), Bradley's (1986) work demonstrated that the ability to depict depth was underdeveloped in twelve year-olds. Therefore, the ability of twelve year olds to depict depth by overlapping remains uncertain. Finally, it is also anticipated that gender differences may occur in six and nine year-olds' scores on this measure (e.g., Lewis, 1985).

Hypotheses (Part two)

In light of Gardner's (1980) suggestion that individuals are able to create more advanced drawing when using a model than when drawing independently, we expect that subjects would be able to accurately discriminate between conditions. Furthermore, it is also anticipated that the age of the artist will affect scores granted to their drawings. More specifically, since realism increases with age (Gardner, 1980; Lowenfeld, 1957) it is likely that the nine and twelve age groups' drawings will be discriminated correctly more frequently than the younger age groups' work. Finally, it is also proposed that scores granted to adults' drawings will be comparable to those granted to four and six year-olds, since their drawings have been proposed to be

similar to those of that age range (Gardner, 1980; Gardner and Winner, 1982).

Results

An analysis of variance (ANOVA) was conducted on each of the following dependent variables: level of completion, total number of colours, unrealistic colour use, area of space used, presence of background features, presence of overlapped features, left-to-right sequencing, top-to-bottom sequencing, a correct vertical/frontal orientation, and total time spent drawing. The between-subject variable, AGE, was examined using orthogonal polynomials (i.e., linear, quadratic, cubic and quartic polynomials). The between-subject variable, SEX, was examined using a preplanned contrast which compared females' and males' scores. The within-subject variable, drawing condition (COND), which consisted of the three drawing conditions of Model-Absent (C1), Model Briefly-Present (C2), and Model Continuously-Present (C3), was compared by using two preplanned contrasts. The first preplanned contrast compared results in the Model Briefly-Present condition (C2) with those in the Model Continuously-Present condition (C3). In other words, differences in scores according to whether the model remained in sight throughout the drawing, versus a brief observation of it prior to commencement of drawing, were examined. The second contrast compared results in the Model-Absent condition (C1) with the averaged scores of the Model Briefly-Present and Model Continuously-Present conditions (C2 plus C3). This contrast examined whether or not scores

differed between drawings which were made in the absence of a model versus those which were made with at least some exposure. The within-subject variable, TOPIC, was also examined using a preplanned contrast which compared scores between the two topics. Finally, since the majority of dependent variables were correlated with each other (see Table 1), a 0.01 level of significance was adopted.

Level of Completion (COMP)

Level of completion (COMP) for each drawing topic was graded out of a total possible score of four points. In the flower drawings, one point was granted for the presence of each of the following contents: (a) 6 petals, (b) two leaves, (c) a centre, and (d) a stem. In the dog drawings, one point was also granted for the presence of (a) two ears, (b) two eyes, (c) a nose, and (d) four legs.

The ANOVA for COMP revealed a significant AGE (linear) x COND (C1 vs. C2+C3) interaction, $F(1,138)=9.56$, MSE=2.24, $p< .002$ (see Figure 1), in which COMP scores increased with age, and in which scores in the model present condition (C2+C3) were higher than scores in the C1 condition. Overall, a significant main effect of AGE, which was quadratic in its trend, was also revealed, $F(1,138)=61.75$, MSE=64.38, $p< .0001$ (see Figure 2), in which COMP scores increased with age until the ninth year and plateaued thereafter (mean scores and standard deviations:

Figure Caption

Figure 1. Age (linear) x Condition (C1 vs. C2 + C3) interaction for mean level of completion score.

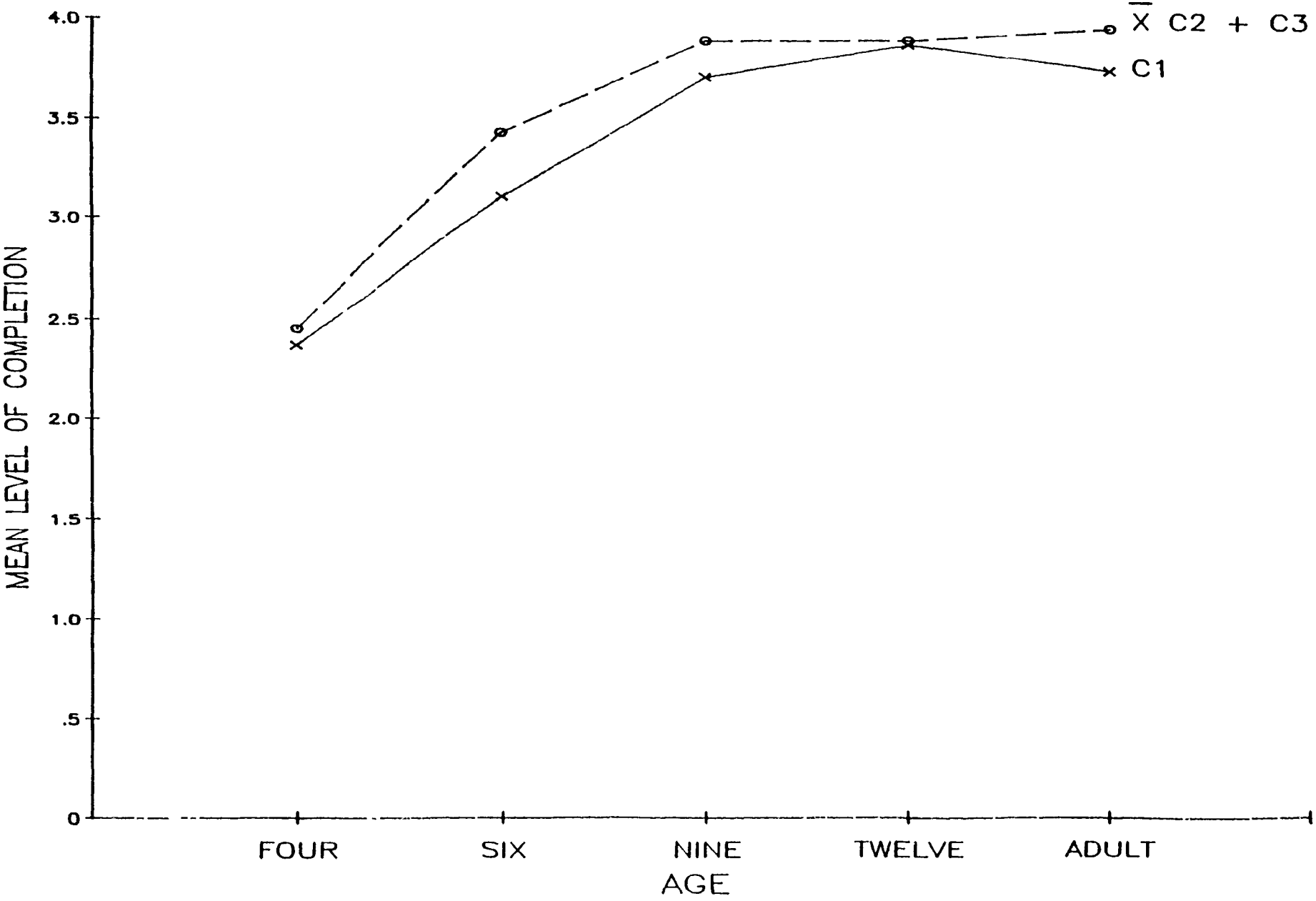
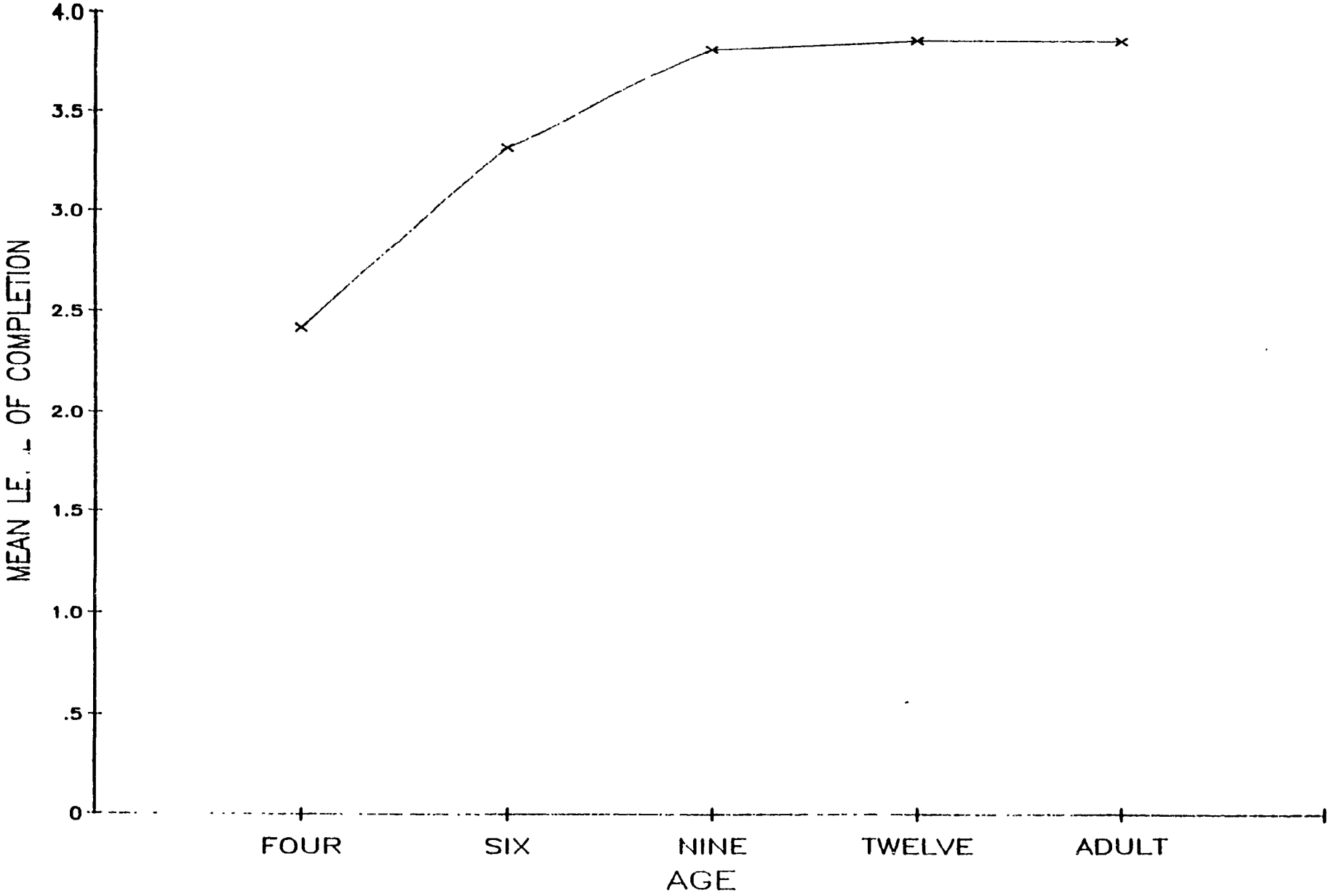

4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
MEAN LEVEL OF COMPLETION
X̄ C2 + C3
C1
FOUR
SIX
NINE
TWELVE
ADULT
AGE

Figure Caption

Figure 2. Age (quadratic) main effect for mean level of completion score.


4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
MEAN LE. . OF COMPLETION
FOUR
SIX
NINE
TWELVE
ADULT
AGE

four year-olds=2.42 (.91), six year-olds=3.32 (.61), nine year-olds=3.82 (.33), twelve year-olds=3.88 (.23), adults=3.88 (.22). A significant main effect for TOPIC was also revealed, $F(1,138)=13.17$, MSE=5.16, $p<.0001$, in which COMP scores in the flower drawings ($M=3.473$) were higher than COMP scores in the dog drawings ($M=3.462$). No significant main effect for SEX was revealed ($p=.906$); and overall scores between C2 vs. C3 were not statistically different ($p=.128$). A main effect of COND was also not significant ($p=.06$). Finally, post hoc comparisons, using Fischer's LSD, between nine year-olds' through adults' C1 scores revealed no significant difference in scores ($p > .05$).

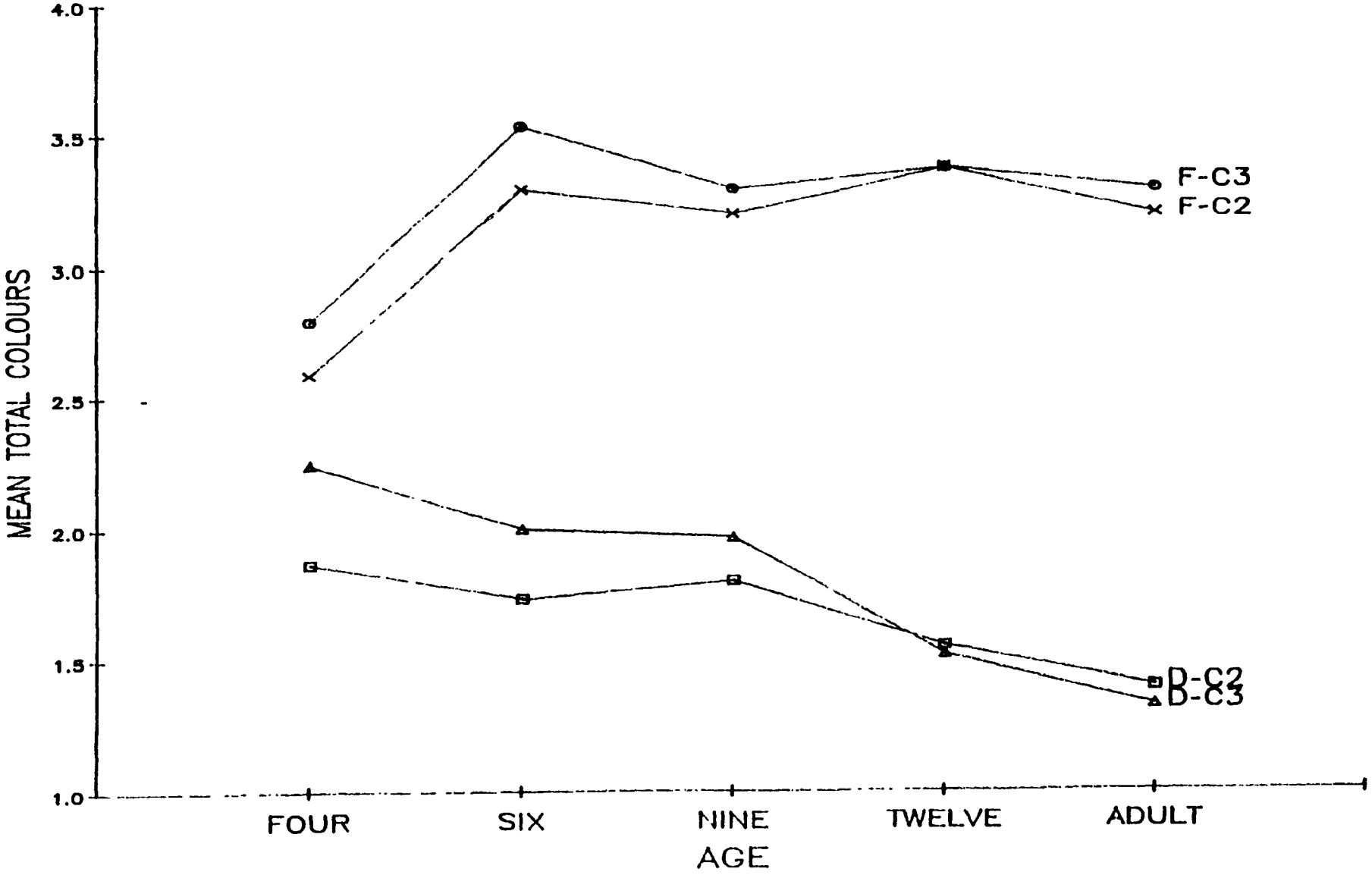
The level of completion in drawings, therefore, was enhanced by the age of the artist, and equally by the presence of a model which was either viewed briefly prior to, or was continuously present during, a drawing.

Total Colours

An ANOVA which investigated the total number of colours used in the drawings revealed a significant AGE(linear) x COND (C2 vs. C3) x TOPIC interaction, $F(1,138)=21.70$, MSE=25.65, $p< .0001$ (see Figure 3), in which the number of colours used in four through nine year-olds drawings' were higher in C3 than in C2. Figure 3 also shows that the number of colours used increased between four and six year-old groups, in the flower drawing topic, and decreased overall with age in the dog drawing topic.

Figure Caption

Figure 3. Age (linear) x Condition (C2 vs. C3) x Topic interaction for mean total number of colours.


4.0
3.5
3.0
2.5
2.0
1.5
1.0
MEAN TOTAL COLOURS
F-C3
F-C2
B-C2
B-C3
FOUR
SIX
NINE
TWELVE
ADULT
AGE

Results also revealed a significant difference between scores in the model-absent condition (C1) versus scores in the averaged model-present conditions (C2 + C3), $F(1,138)=6.79$, MSE=3.01, $p< .01$], in that more colours, overall, were used in C1 than in C2 + C3 (mean scores: C1=2.68, C2 + C3=2.45).

Furthermore, an AGE (cubic) x COND (C1 vs. C2+C3) x TOPIC interaction ($p=.027$), which missed our level of significance (.01), showed that the number of colours was greater in C1 than in C2+C3 across ages for dog drawings, and in four and six year-olds' flower drawings. Moreover, this result also showed that the highest number of colours was used in six year-olds' model-absent (C1) drawings of a flower, and in four year-olds' dog (C1) drawings.

Results also revealed a significant AGE (linear) x SEX x TOPIC interaction, $F(1,138)=7.00$, MSE=5.15, $p<.009$ (see Figure 4), in which four and six year-old females used more colours than males of the same ages. Twelve year-old and adult females also used more colours than males in the flower drawings, and nine year-old females used more colours than males in the dog topic. Overall, scores in the flower drawings remained relatively stable from nine year-olds to adults, while (with the exception of four and six year-old males) the number of colours used in the dog drawings decreased with age in both sexes.

Results also revealed a significant SEX x COND (C2 vs. C3) x TOPIC interaction, $F(1,138)=7.67$, MSE=9.07, $p<.006$ (see Figure 5), in which males' scores remained consistent between the model

Figure Caption

Figure 4. Age (linear) x Sex x Topic interaction for mean total number of colours.

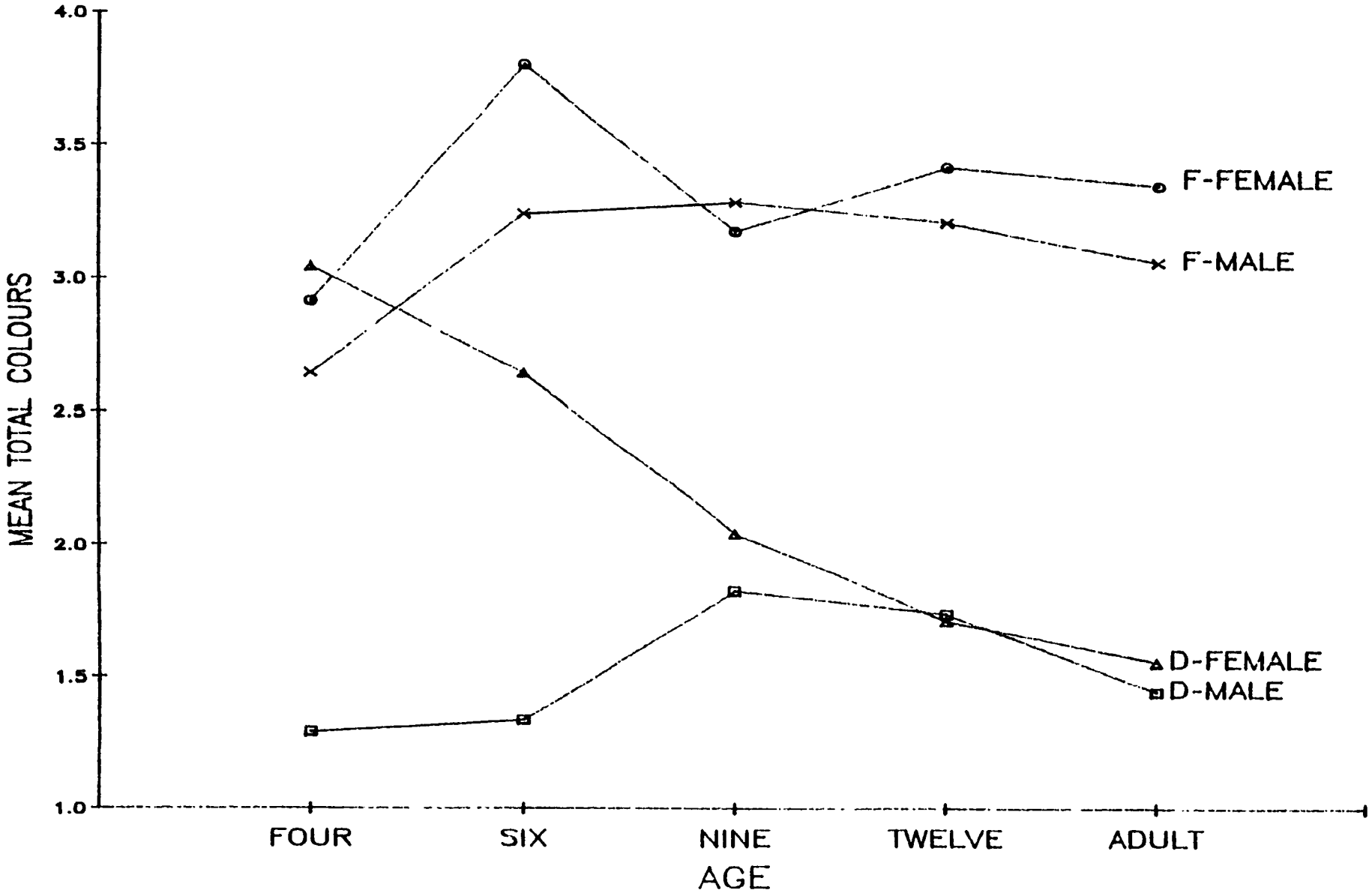
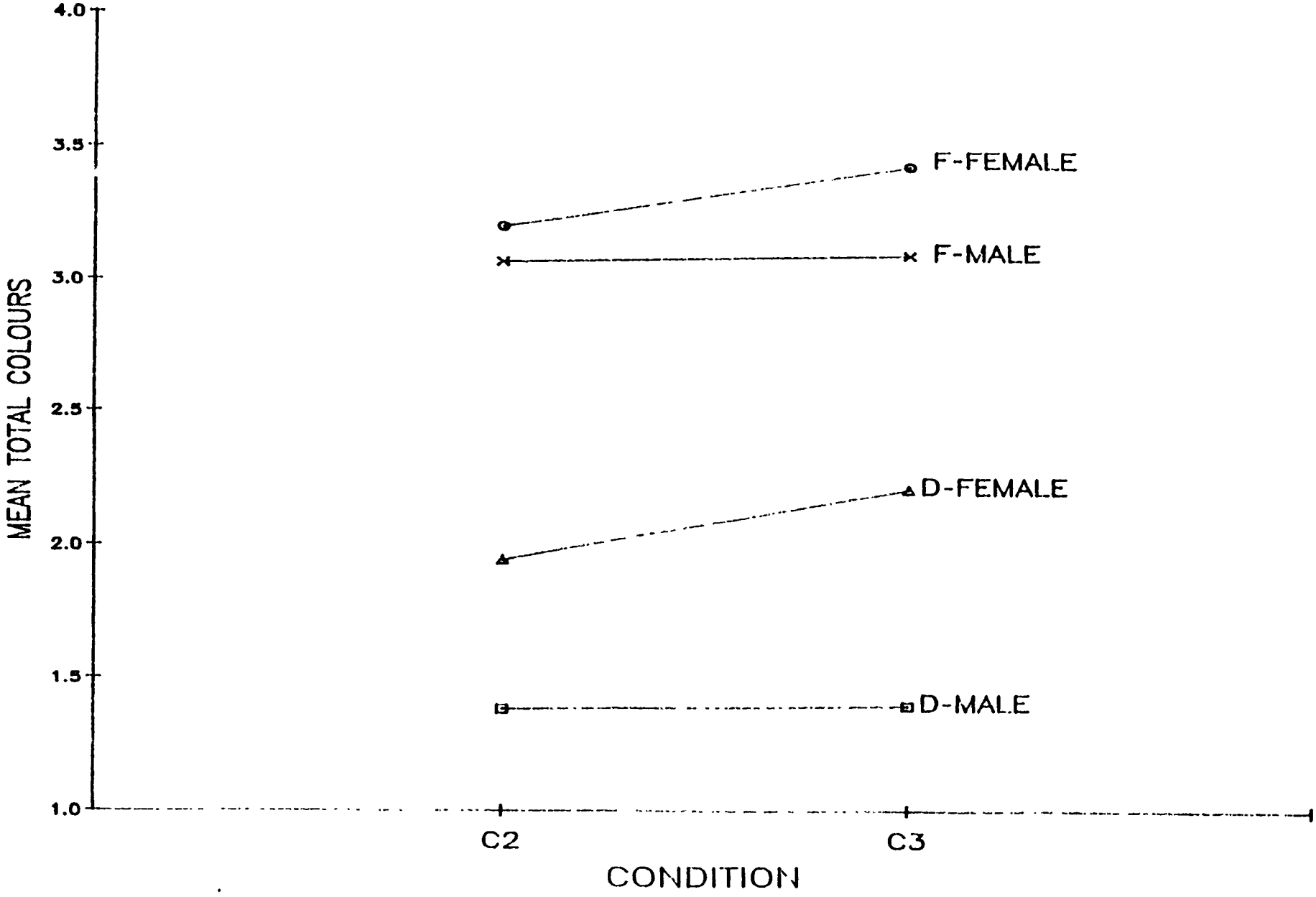

4.0
3.5
3.0
2.5
2.0
1.5
1.0
MEAN TOTAL COLOURS
F-FEMALE
F-MALE
D-FEMALE
D-MALE
FOUR
SIX
NINE
TWELVE
ADULT
AGE

Figure Caption

Figure 5. Sex x Condition (C2 vs. C3) x Topic interaction for mean total number of colours.


4.0
3.5
3.0
2.5
2.0
1.5
1.0
MEAN TOTAL COLOURS
F-FEMALE
F-MALE
D-FEMALE
D-MALE
C2
C3
CONDITION

conditions, while females' numbers of colours increased from C2 to C3. Overall, females used more colours than males across these conditions in each drawing topic. Finally, results also indicated a significant main effect of COND, $F(2,276)=8.19$, MSE=5.12, $p<.0001$ (mean scores: C1=2.68, C2=2.4, C3=2.5), but no significant main effect of AGE ($p=.374$).

Thus, results showed that COND affected this dependent variable in that more colours were used in a model-absent condition than when a model was present. Moreover, across the two model conditions, consistent age effects were also found for four through nine year-olds, since more colours were used when the model remained continuously present (C3) than when it was briefly presented (C2). Finally, in C3, an increase in total colours relative to C2 was only evident in females' drawings.

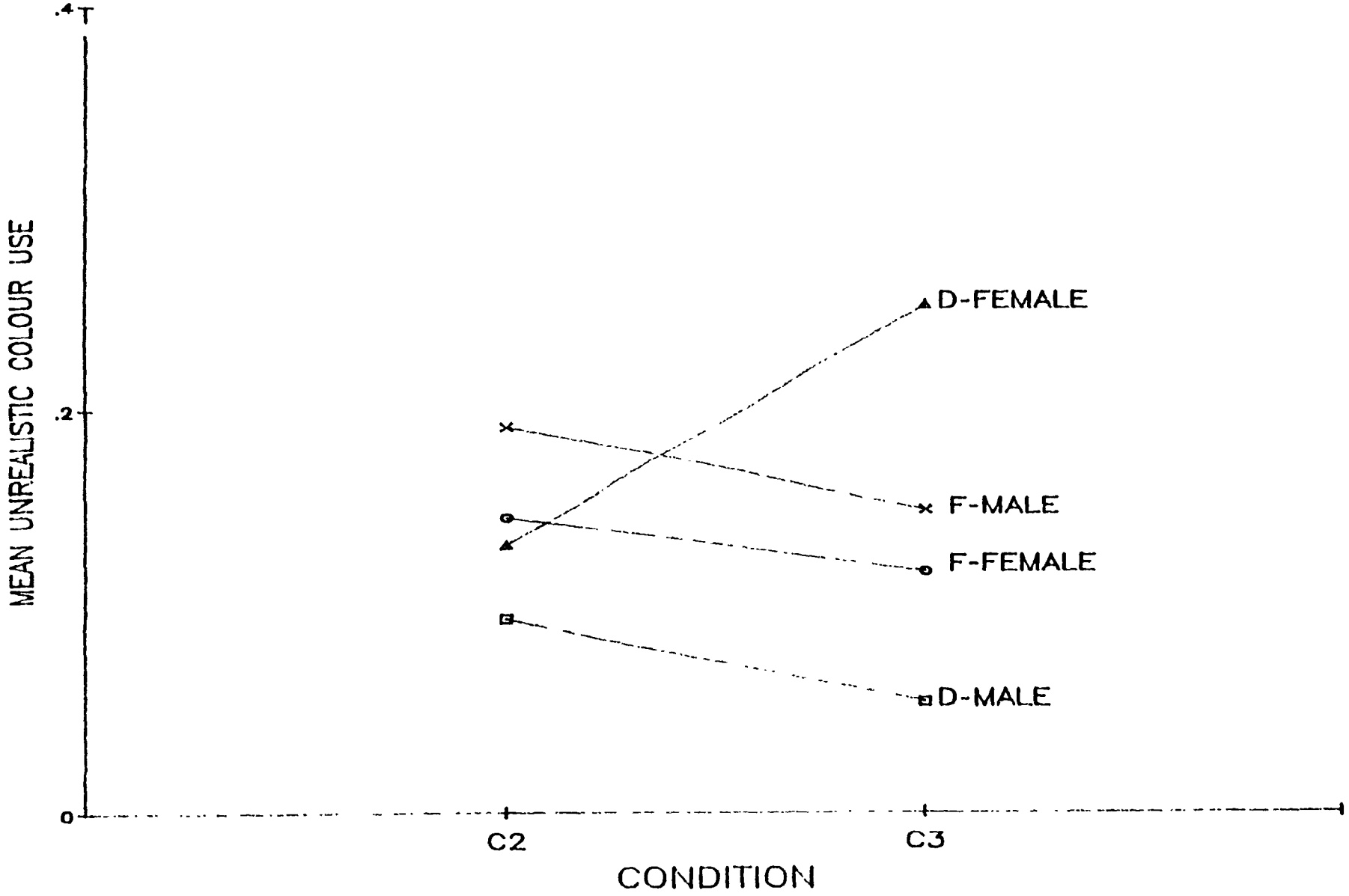
Unrealistic Colour Use

An ANOVA conducted on the instances of unrealistic colour use revealed a significant SEX x COND (C2 vs. C3) x TOPIC interaction, $F(1,138)=7.42$, MSE=1.69, $p<.007$ (see Figure 6), which indicated that the number of unrealistic colours decreased from C2 to C3, with the exception of females' dog drawings, which peaked in C3.

Results also revealed a significant main effect for AGE (quadratic) in which the number of unrealistic colours was highest in the four year-old group, followed by the six year-old

Figure Caption

Figure 6. Sex x Condition (C2 vs. C3) x Topic interaction for mean total number of unrealistic colours.


.4
.2
0
MEAN UNREALISTIC COLOUR USE
D-FEMALE
F-MALE
F-FEMALE
D-MALE
C2
C3
CONDITION

group, and negligible in the nine year-olds through adult age groups (mean scores and standard deviations: four year-olds=.59 (.63), six year-olds=.41 (.22), nine year-olds=.02 (.05), twelve year-olds=.04 (.07), adults=.02 (.04), $F(1.138)=35.82$, MSE=12.28, $p < .0001$. Finally, no significant difference in unrealistic colour use was evident between the C1 vs. C2+C3 condition ($p=.777$), and overall, no significant main effect of COND was revealed ($p=.925$).

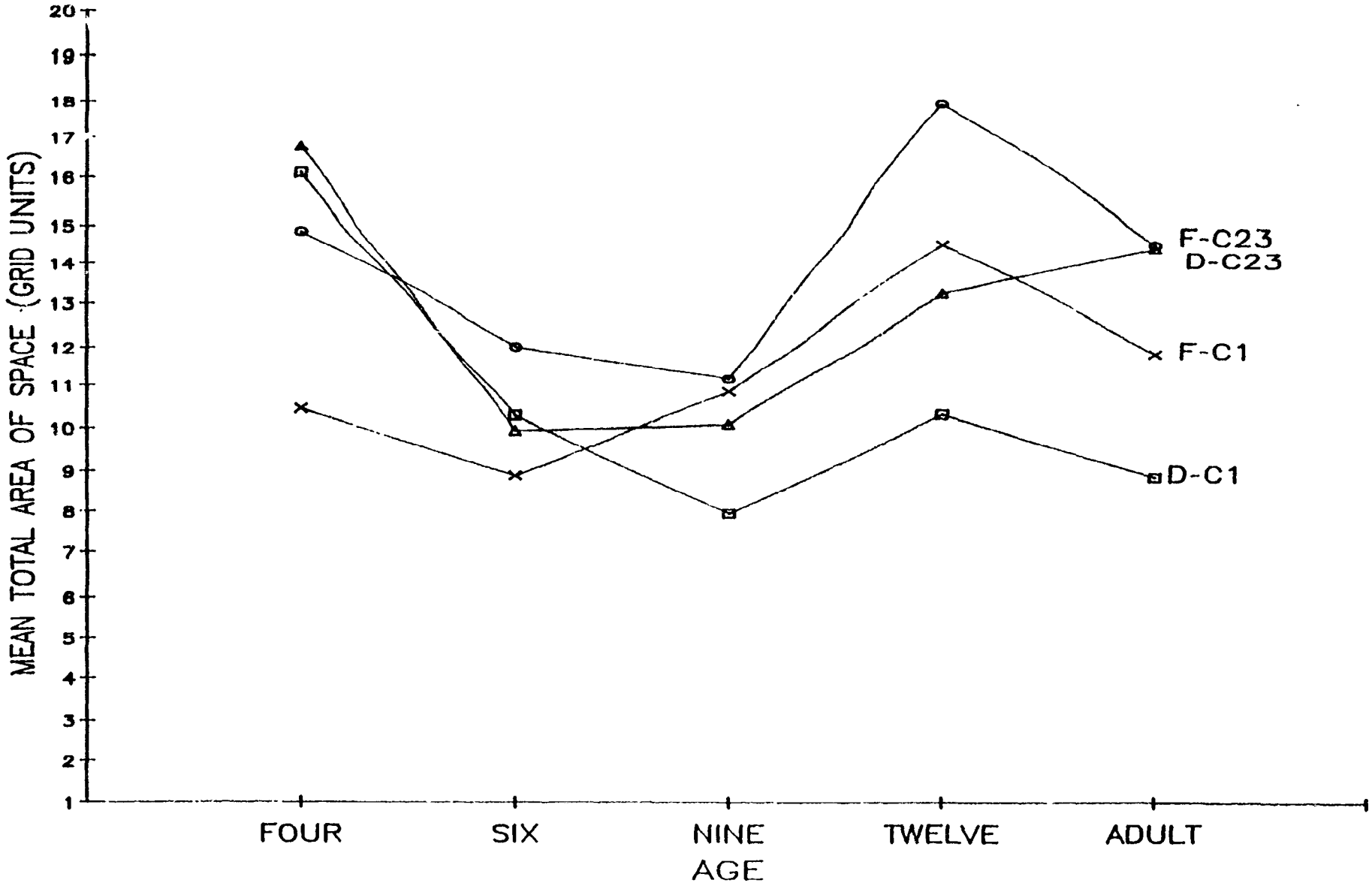
From these results it is evident that unrealistic colour was predominantly affected by age, since it was notable only in the two youngest age groups. Furthermore, it also appeared that a model continuously in sight served to reduce the frequency of unrealistic colour use in all cases except females' dog drawings.

Area of Space Used

The ANOVA conducted on the area of space utilized in the drawings revealed a significant AGE (quadratic) x COND (C1 vs. C2+C3) x TOPIC interaction, $F(1,138)=7.46$, MSE=202.86, $p < .007$ (see Figure 7). Area of space decreased from four to six year-olds' drawings. In nine year-olds' drawings, further decreases were also evident in the flower model-present and dog model-absent conditions. Moreover, nine year-olds' scores in the dog model-present condition remained consistent with six year-olds' scores, while scores in the flower model-absent condition increased relative to the four and six year-olds' scores. Area of space used increased in the twelve year-old age

Figure Caption

Figure 7. Age (quadratic) x Condition (C1 vs. C2 + C3) x Topic interaction for mean total area of space (grid units).


MEAN TOTAL AREA OF SPACE (GRID UNITS)
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
FOUR
SIX
NINE
TWELVE
ADULT
AGE
F-C23
D-C23
F-C1
D-C1

group, and tended to decrease again in the adult group. In each age group (except six year-olds' dog drawings), area of space was also higher in the model-present conditions (C2+C3) than in the model-absent (C1) condition. Post hoc comparisons between four year olds' and adults' scores also revealed no significant differences in the C2 + C3 condition for both topics, and no significant difference in the flower model-absent (C1) condition ($p > .05$).

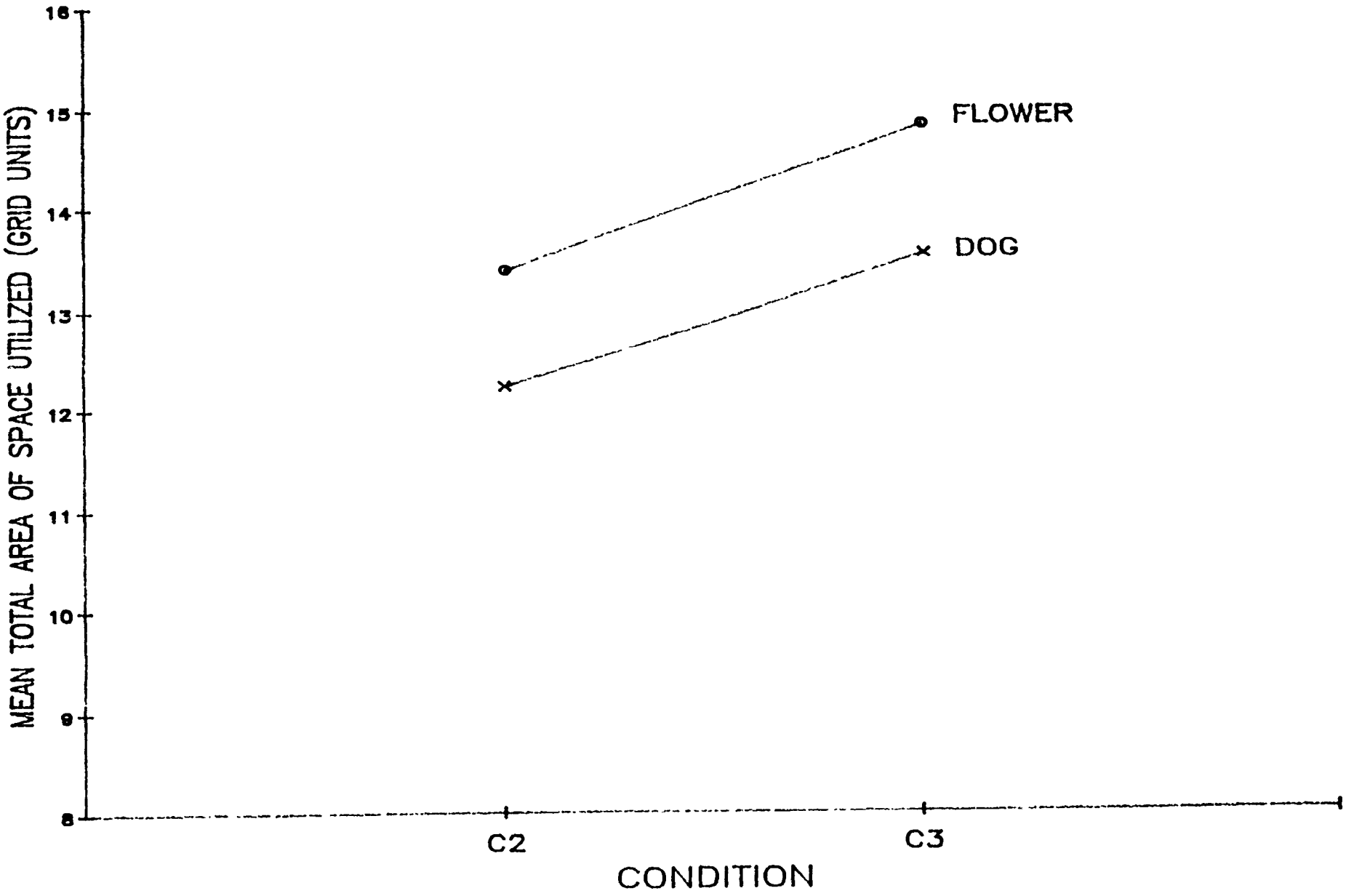
Results also revealed a significant COND (C2 vs. C3) x TOPIC interaction, $F(1,138)=15.05$, MSE=594.37, $p<.0001$ (see Figure 8), which indicated that while area of space was greater in flower drawings, and area utilized increased from C2 to C3, this increase was greater in flower drawings.

Overall, a significant main effect of AGE [$F(1,138)=8.18$, MSE=1731.28, $p<.005$], which was cubic in its trend, was also revealed (mean scores and standard deviations: four year-olds=14.97 (6.1), six year-olds=10.53 (5.0), nine year-olds=10.24 (4.1), twelve year-olds=14.59 (5.1), adults=13.17 (4.1)), as was a significant main effect of COND, $F(2,276)=8.51$, MSE=222.27, $p<.0001$ (mean scores: C1=11.0, C2=13.1, C3=15.2). Finally, no main effect for SEX was evident ($p=.643$).

In summary, area of space utilized in drawings was affected by age, and peaked in four and twelve year-olds' drawings. Area of space was also affected by COND, and was enhanced the most when a model remained continuously-present (C3).

Figure Caption

Figure 8. Condition (C2 vs. C3) x Topic interaction for mean total area of space (grid units).


MEAN TOTAL AREA OF SPACE UTILIZED (GRID UNITS)
16
15
14
13
12
11
10
9
8
FLOWER
DOG
C2
C3
CONDITION

Background Features

The presence of background features in the drawings was also analyzed, and results revealed a significant main effect for AGE which was linear in its trend, $F(1,138)=13.89$, MSE=58.49, $p < .0001$ (mean scores and standard deviations: four year-olds=.55 (.54), six year-olds=.87 (.75), nine year-olds=.24 (.28), twelve year-olds=.09 (.17), adults=.02 (.04)). Thus, with the exception of six year-olds' drawings, the number of background features included in drawings decreased to negligible amounts as age increased. Planned comparisons between C1 vs. C2+C3 and C2 vs. C3 revealed no significant differences between the conditions ($p=.953$; $p=.726$, respectively), and no main effect of COND was apparent ($p=.920$). Finally, no significant difference between the sexes was evident ($p=.07$).

In short, it is evident that drawing condition did not affect the inclusion of background features in a drawing. Age of participant, however, clearly affected this measure. The youngest participants were essentially the only groups to include background features in their drawings, with six year-olds scoring the highest.

Number of Overlaps

The ANOVA conducted on the number of overlaps included in the drawings revealed a significant AGE (quadratic) x COND (C2 vs.C3) x TOPIC interaction, $F(1,138)=7.85$, MSE=17.53, $p<.006$ (see

Figure Caption

Figure 9. Age (quadratic) x Condition (C2 vs. C3) x Topic interaction for mean total number of overlaps.

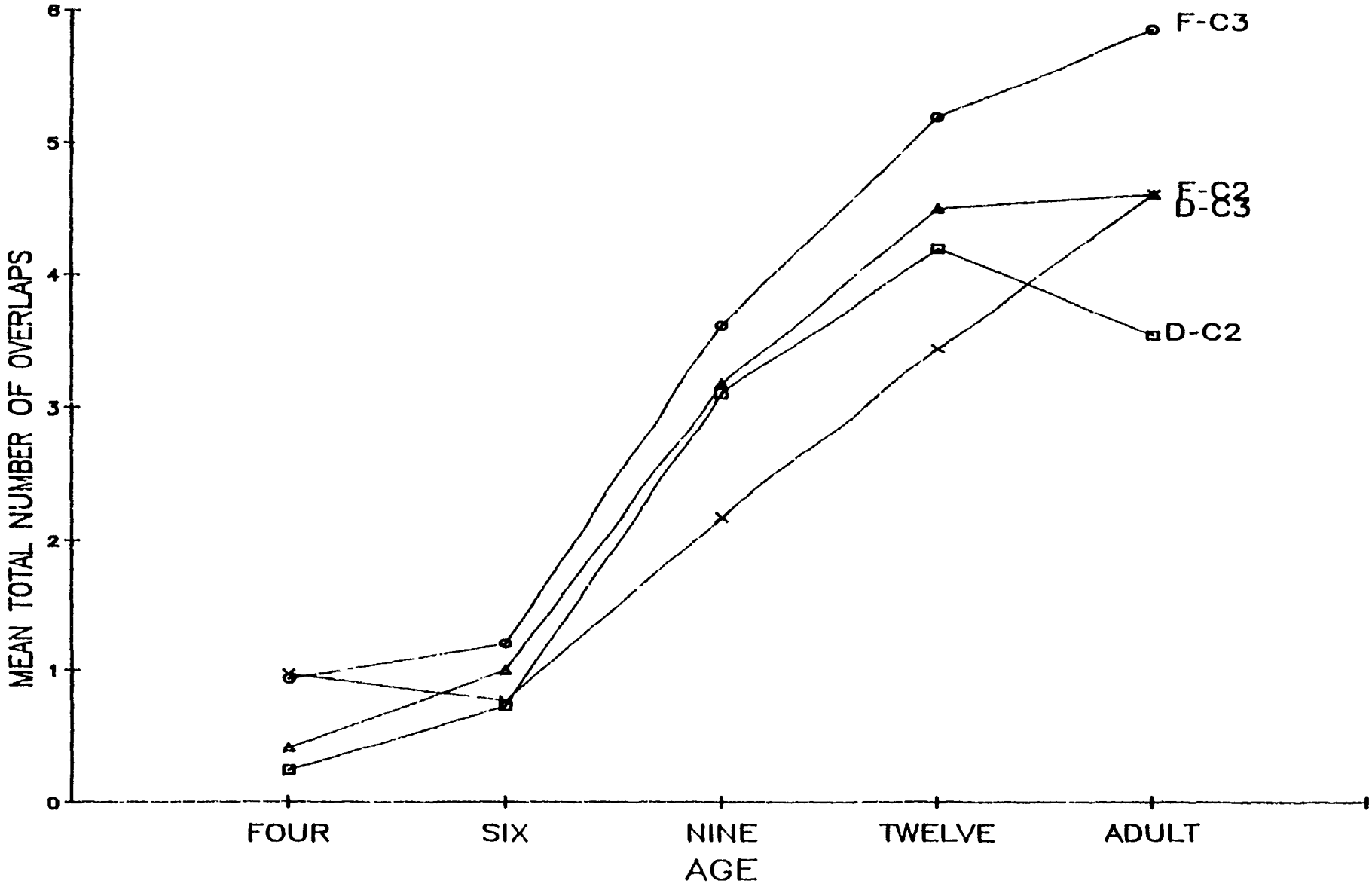

MEAN TOTAL NUMBER OF OVERLAPS
0
1
2
3
4
5
6
FOUR
SIX
NINE
TWELVE
ADULT
AGE
F-C3
F-C2
D-C3
D-C2

Figure 9). Examination of this interaction showed that across ages, in the flower drawings, the number of overlaps in C3 was greater than in C2. For the dog topic, this was also the case only in four year-olds' and adults' drawings. Scores in C2 were higher than scores in C3 in nine and twelve year-olds' drawings, and virtually equal in six year-olds' drawings. Overall, the number of overlaps included in the drawings increased slightly between four and six year-olds, sharply between nine and twelve year-olds and remained relatively consistent to adults' drawings.

Results also revealed a significant AGE (linear) x COND (C1 vs. C2+C3) interaction, $F(1,138)=35.15$, MSE=70.82, $p< .001$ (see Figure 10). The results showed that while four and six year-olds' scores were low, the number of overlaps in C2+C3 outnumbered those in C1 in all age groups. Overall, the number of overlaps included in the drawings increased with age, with the exception of adults' C1 drawings. This increase was generally more marked in the model-present conditions, however.

A significant SEX x COND (C2 vs. C3) interaction was also observed for this dependent variable, $F(1,138)=10.38$, MSE=11.85, $p < .002$ (see Figure 11). Females included more overlaps in their drawings in C2, and while both sexes increased their scores in C3, males' overlap scores were higher in this condition than were the females' scores.

An AGE (quartic) x SEX interaction was also revealed, $F=(1,138)=6.95$, MSE=23.67, $p<.009$ (see Figure 12). Again, while few numbers of overlaps were present in four and six year-olds'

Figure Caption

Figure 10. Age (linear) x Condition (C1 vs. C2 + C3) interaction for mean total number of overlaps.

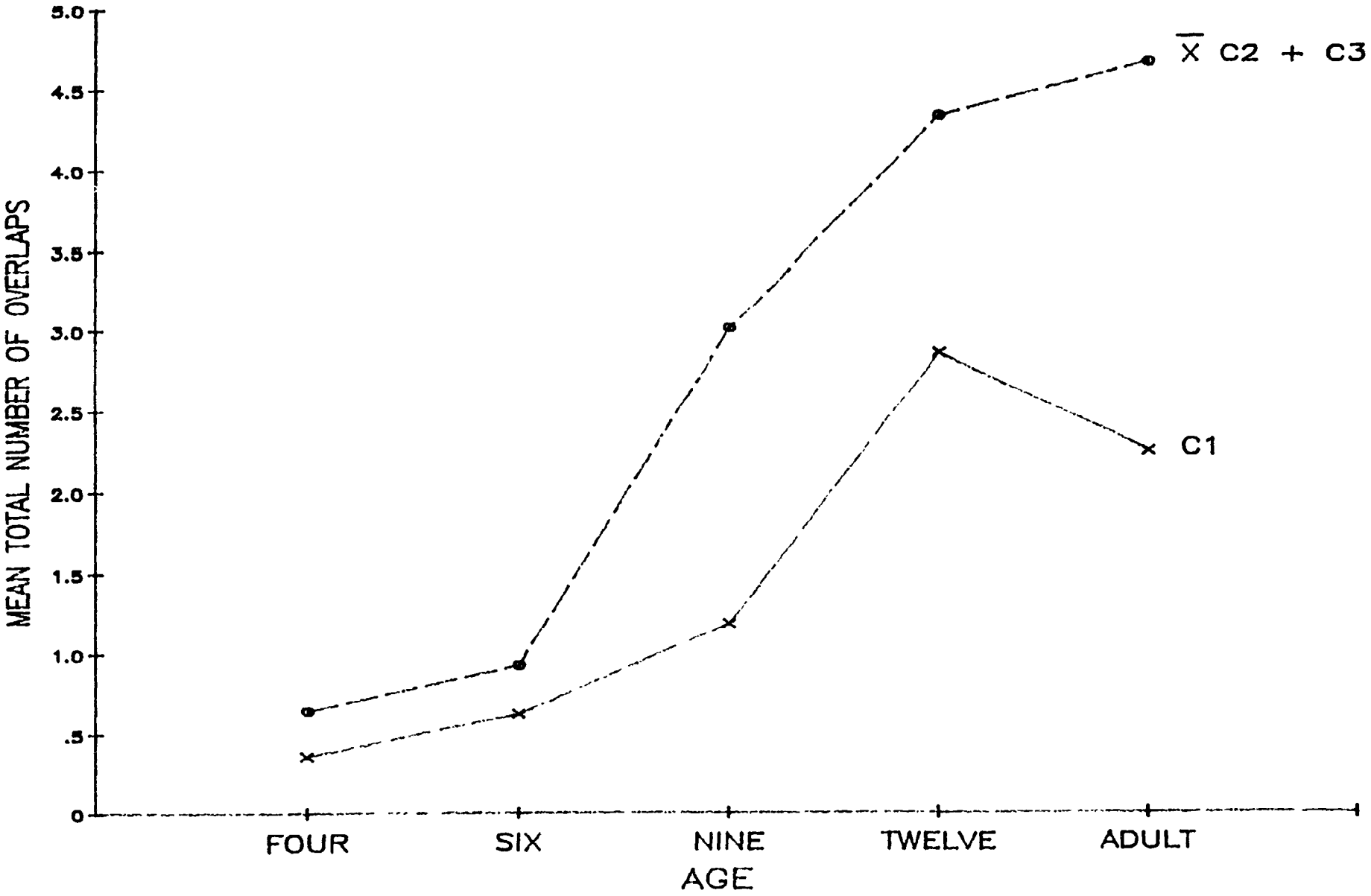

MEAN TOTAL NUMBER OF OVERLAPS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
$\overline{X}$ C2 + C3
C1
FOUR
SIX
NINE
TWELVE
ADULT
AGE

Figure Caption

Figure 11. Sex x Condition (C2 vs. C3) interaction for mean total number of overlaps.

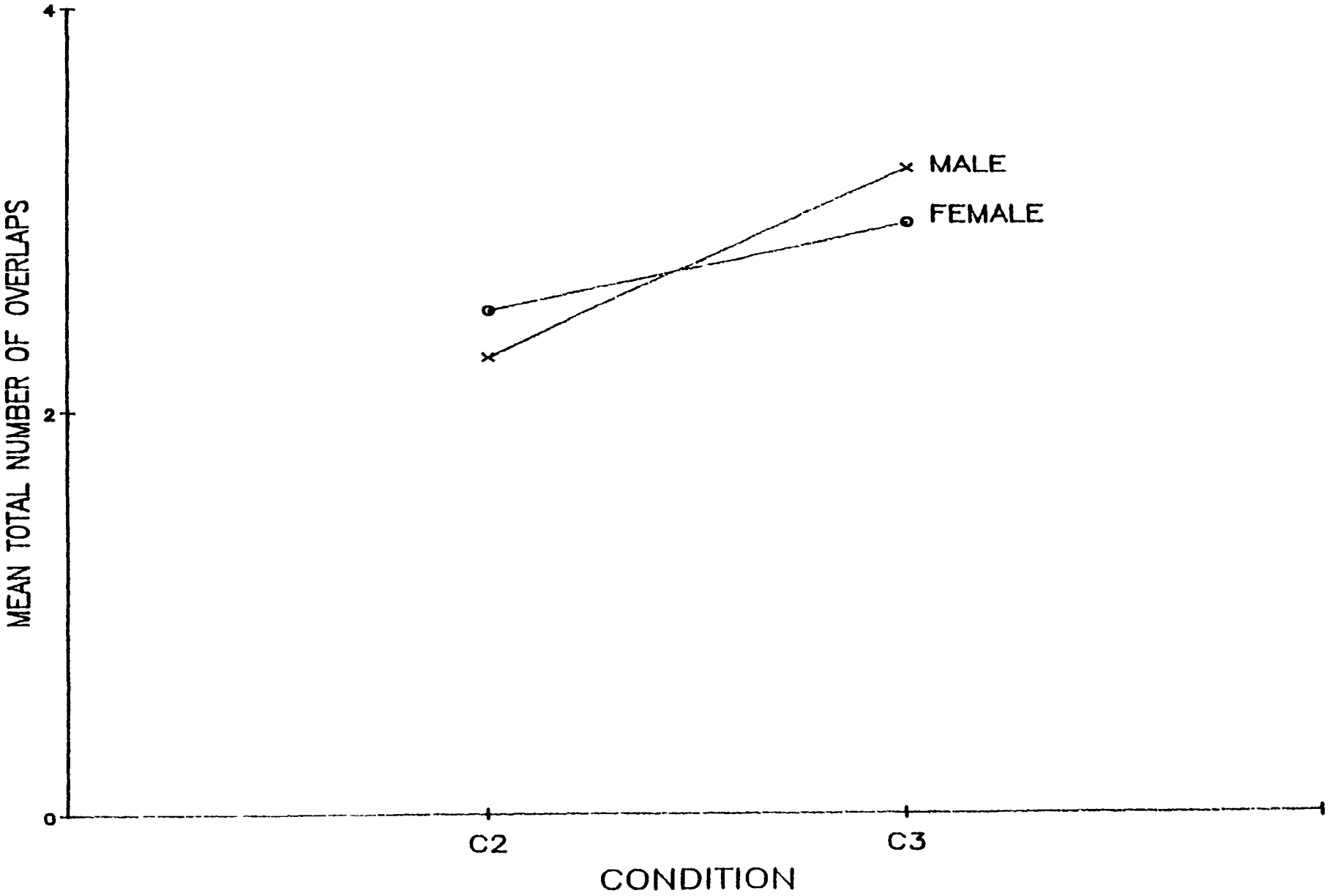
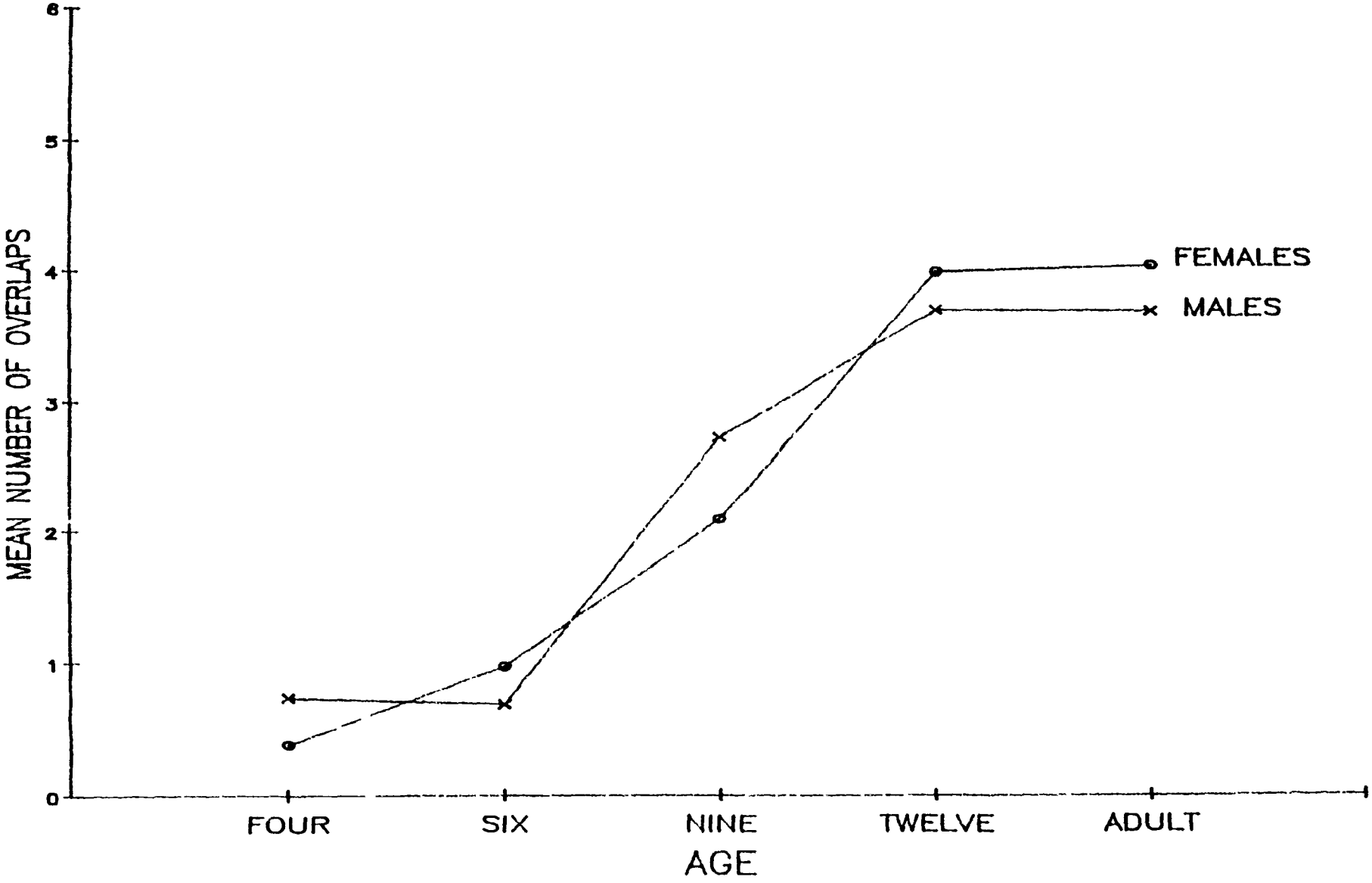

4
2
0
MEAN TOTAL NUMBER OF OVERLAPS
MALE
FEMALE
C2
C3
CONDITION

Figure Caption

Figure 12. Age (quadratic) x Sex interaction for mean total number of overlaps.


MEAN NUMBER OF OVERLAPS
0
1
2
3
4
5
6
FEMALES
MALES
FOUR
SIX
NINE
TWELVE
ADULT
AGE

drawings, scores increased continuously between nine and twelve year-olds and plateaued in adults. Four and nine year-old males included more overlaps in their drawings than females, while females out-scored males in the other age groups.

Finally, a significant main effect of AGE, which was cubic in its trend, $F(1,138)=38.75$, MSE=132.01, $p<.0001$, was also revealed (mean scores and standard deviations: four year-olds=.55 (.70), six year-olds=.82 (.79), nine year-olds=2.41 (1.8), twelve year-olds=3.85 (2.0), adults=3.87 (1.9), as was a significant main effect of COND, $F(2,276)=46.86$, MSE=74.01, $p<.0001$ (mean scores: C1=1.45, C2=2.38, C3=3.06).

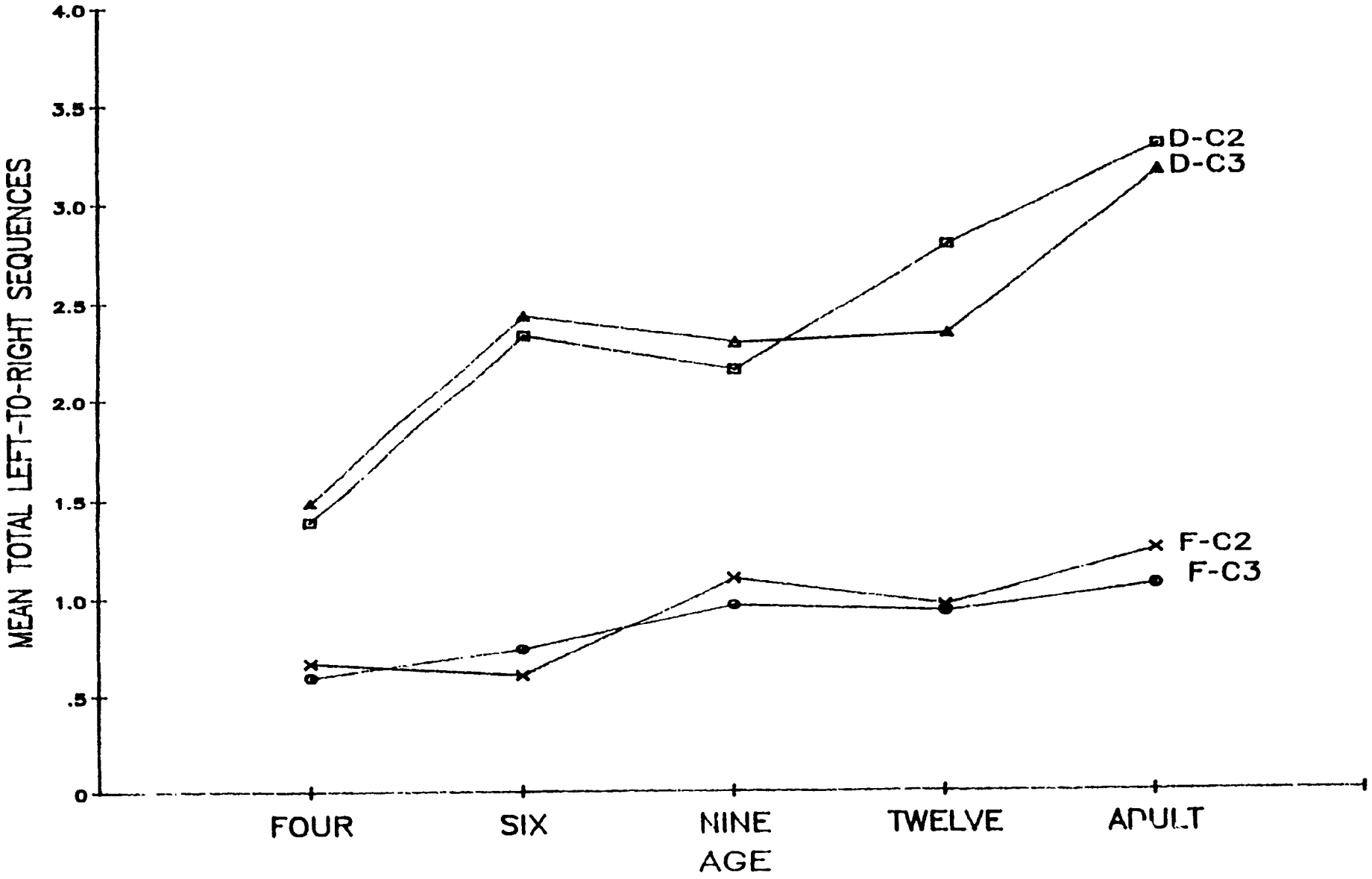
Therefore, it is evident that the presence of overlapping in drawings increased with age, and first became readily apparent in nine year-olds' drawings. Moreover, drawing condition also affected this measure since overlapping was enhanced in the model conditions.

Left-to-Right Sequencing

The number of left-to-right sequences while drawing was also analyzed. The ANOVA for this dependent variable revealed a significant AGE (linear) x COND (C2 vs.C3) x TOPIC interaction, $F(1,138)=10.69$, MSE=14.03, $p<.001$ (see Figure 13), which showed that left-to-right sequencing increased with age, especially in drawings of dogs. Figure 13 also shows that this sequencing pattern was more prevalent in drawings of dogs than in drawings of flowers. Left-to-right sequencing was also higher in C2 in

Figure Caption

Figure 13. Age (linear) x Condition (C2 vs. C3) x Topic interaction for mean total number of left-to-right sequences.


MEAN TOTAL LEFT-TO-RIGHT SEQUENCES
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
D-C2
D-C3
F-C2
F-C3
FOUR
SIX
NINE
TWELVE
ADULT
AGE

twelve year-olds' dog drawings, in nine year-olds' flower drawings, and in both topics in adults' drawings.

A significant AGE (linear) x COND (C1 vs. C2+C3) x TOPIC interaction, $F(1,138)=16.90$, MSE=13.97, $p<.0001$, also revealed more dramatic increases with age in dog drawings than in flower drawings, and that this sequencing was more prevalent in the dog topic (see Figure 14). More sequencing of this type was also apparent in C1 drawings for twelve year-olds in both topics, and in six year-olds' flower drawings (see Figure 14).

A significant AGE (quartic) x SEX x TOPIC interaction was also revealed, $F(1,138)=8.17$, MSE=5.92, $p<.005$ (see Figure 15). In the flower drawings, while this sequencing behavior increased slightly with age, the changes in this type of sequencing were quite minimal for both sexes and hovered at the one instance level. In the dog drawings, females' sequencing increased steadily across age, while males' levels increased in six year-olds, troughed in the nine year-olds, and steadily increased thereafter. Post hoc comparisons in males' scores showed non-significant differences between the nine and four year-olds, twelve and six year-old, and twelve and adult age groups ($p>.05$).

Finally, an overall linear main effect of AGE was also revealed, $F(1,138)=42.68$, MSE=109.72, $p<.0001$ (mean scores and standard deviations: four year-olds=1.06 (.90), six year-olds=1.54 (1.2), nine year-olds=1.59 (1.1), twelve year-olds=1.87 (1.2), adults=2.14, (1.4)), and no main effect of

Figure Caption

Figure 14. Age (linear) x Condition (C1 vs. C2 + C3) x Topic interaction for mean total number of left-to-right sequences.

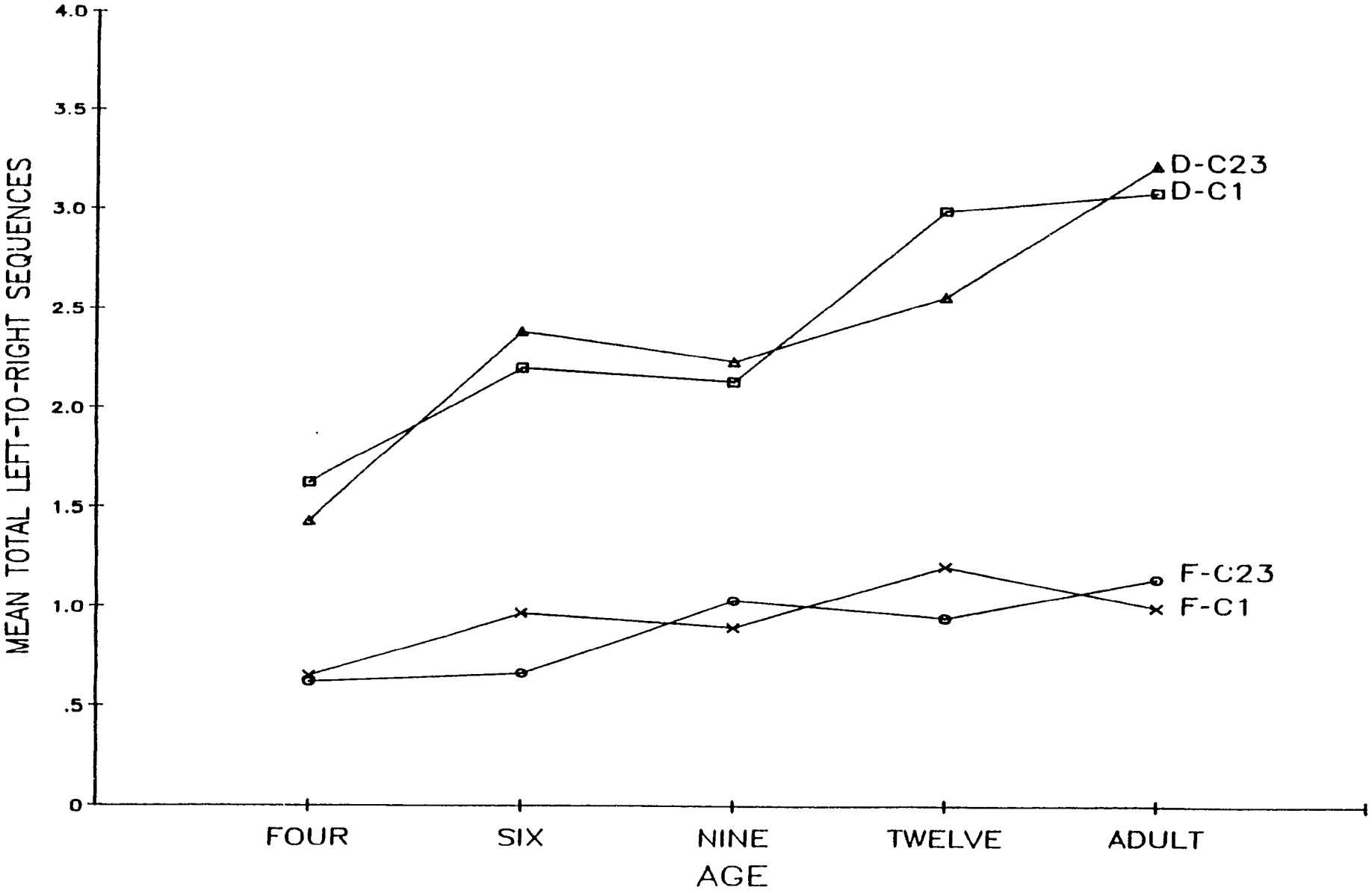
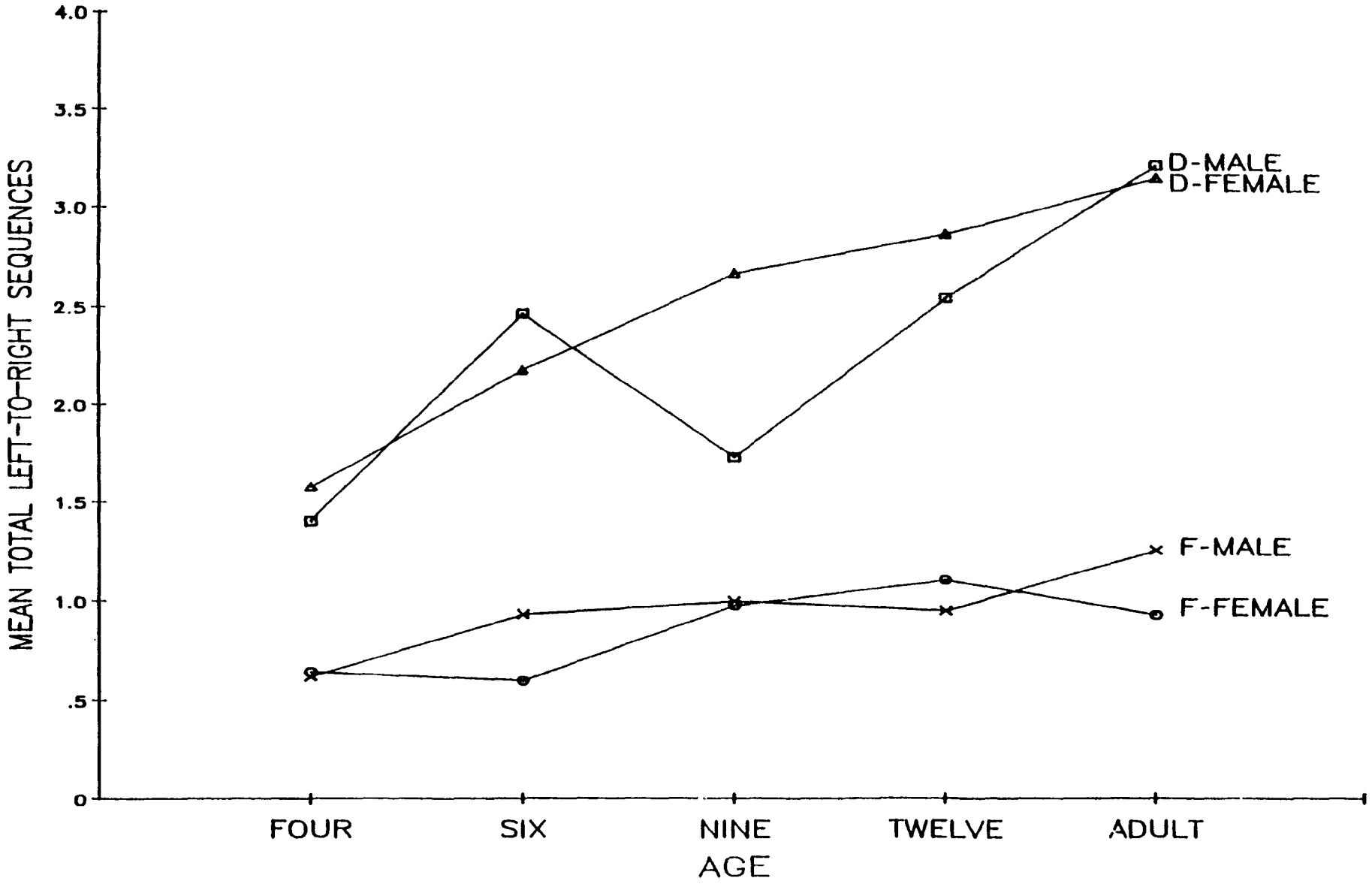

MEAN TOTAL LEFT-TO-RIGHT SEQUENCES
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
D-C23
D-C1
F-C23
F-C1
FOUR
SIX
NINE
TWELVE
ADULT
AGE

Figure Caption

Figure 15. Age (quartic) x Sex x Topic interaction for mean total number of left-to-right sequences.


MEAN TOTAL LEFT-TO-RIGHT SEQUENCES
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
D-MALE
D-FEMALE
F-MALE
F-FEMALE
FOUR
SIX
NINE
TWELVE
ADULT
AGE

COND was evident (p=.75).

In brief, the number of left-to-right sequences in drawings increased with age. Furthermore, it is also apparent that drawing condition did not affect groups' scores consistently, except in twelve year-olds who used more sequences of this type in a model-absent condition (C1).

Top-to-Bottom Sequencing

An ANOVA was also conducted on the instances of a top-to-bottom sequencing pattern. Results for this dependent variable revealed a significant AGE (quadratic) x COND (C1 vs. C2+C3) interaction, $F(1,138)=11.78$, MSE=1.57, $p<.001$ (see Figure 16). Examination of this interaction revealed than while the number of top-to-bottom sequences decreased in six year-olds' drawings, this decrease was greater in the model-present conditions (C2+C3) than in C1. Scores, however, steadily increased from six year-olds' through twelve year-olds' drawings, in which C2+C3 scores were greater than C1 scores, and decreased once again in the adult group. Post hoc tests showed that scores were not significantly different by age groups in C2+C3, except between six and twelve year-olds ($p < .05$).

A significant COND (C1 vs. C2+C3) x TOPIC interaction was also evident, $F(1,138)=12.83$, MSE=2.41, $p<.0001$ (see Figure 17), which indicated that more top-to-bottom sequences were used in dog drawings than in flower drawings. Figure 17 also shows that this sequencing behavior decreased in the model conditions for

Figure Caption

Figure 16. Age (quadratic) x Condition (C1 vs. C2 + C3) interaction for mean total number of top-to-bottom sequences.

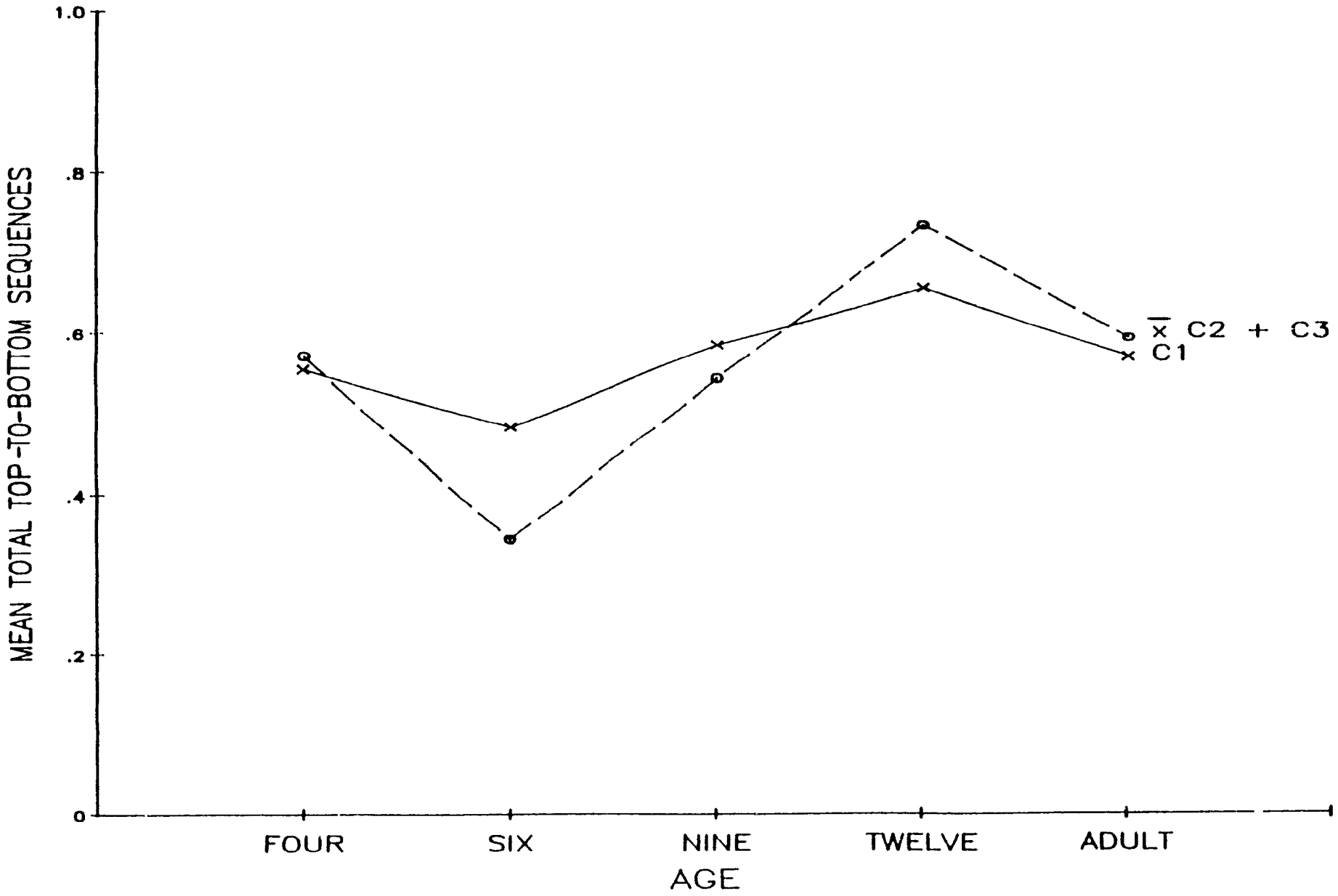
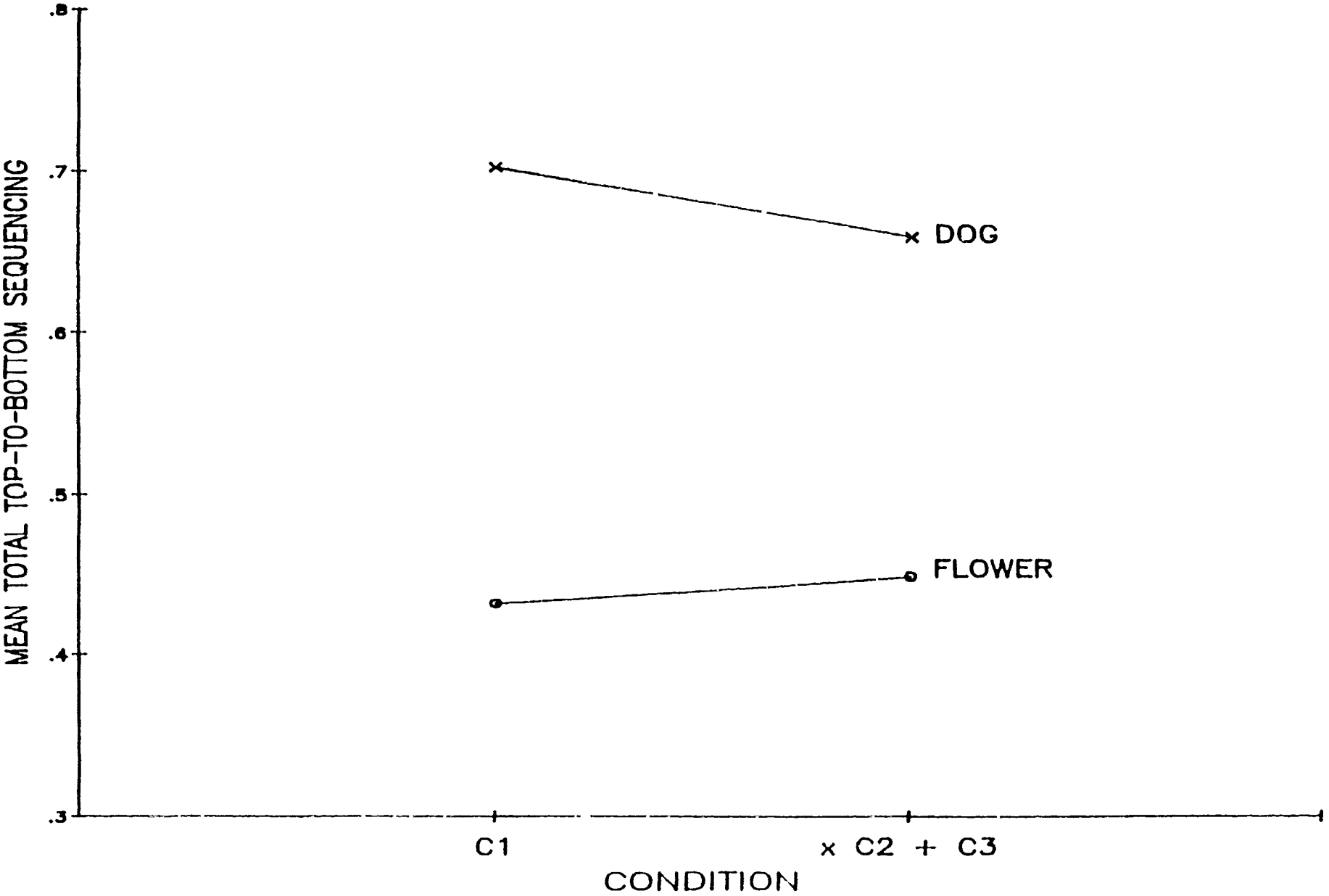

MEAN TOTAL TOP-TO-BOTTOM SEQUENCES
1.0
.8
.6
.4
.2
0
FOUR
SIX
NINE
TWELVE
ADULT
AGE
x̄ C2 + C3
C1

Figure Caption

Figure 17. Condition (C1 vs. C2 + C3) x Topic interaction for mean total number of top-to-bottom sequences.


MEAN TOTAL TOP-TO-BOTTOM SEQUENCING
.8
.7
.6
.5
.4
.3
DOG
FLOWER
C1
x C2 + C3
CONDITION

dog drawings, and increased in this condition for flower drawings.

A significant COND (C2 vs. C3) x TOPIC interaction also indicated that while top-to-bottom sequences in dog drawings remained stable across C2 and C3, more top-to-bottom sequences were found for flowers in C3 than in C2, $F(1,138)=22.21$, MSE=7.77, $p<.0001$ (see Figure 18). Finally, a significant main effect of AGE, which was cubic in its trend, was also revealed, $F(1,138)=11.88$, MSE=6.6, $p<.001$ (mean scores and standard deviations: four year-olds=.56 (.46), six year-olds=.39 (.41), nine year-olds=.56 (.38) twelve year-olds=.71 (.34), adults=.58 (.38)), but no main effect for SEX ($p=.635$), or COND ($p=.194$) was evident.

In summary, the number of top-to-bottom sequences varied by age, and troughed and peaked respectively, in six and twelve year-olds' model conditions. Relative to a no-model condition, even a model briefly-present enhanced sequencing of this type in drawings of flowers, but reduced it in drawings of dogs.

Correct Orientation

The presence of a vertical/frontal perspective in drawings was also analyzed. Results for this dependent variable revealed a significant AGE(linear) x COND (C2 vs. C3) x TOPIC interaction, which indicated that while flowers' overall scores and nine year-olds' through adults' dog scores, ranged between 95 and 100% correct, four and six year-olds' dog drawings only ranged between

Figure Caption

Figure 18. Condition (C2 vs. C3) x Topic interaction for mean total number of top-to-bottom sequences.

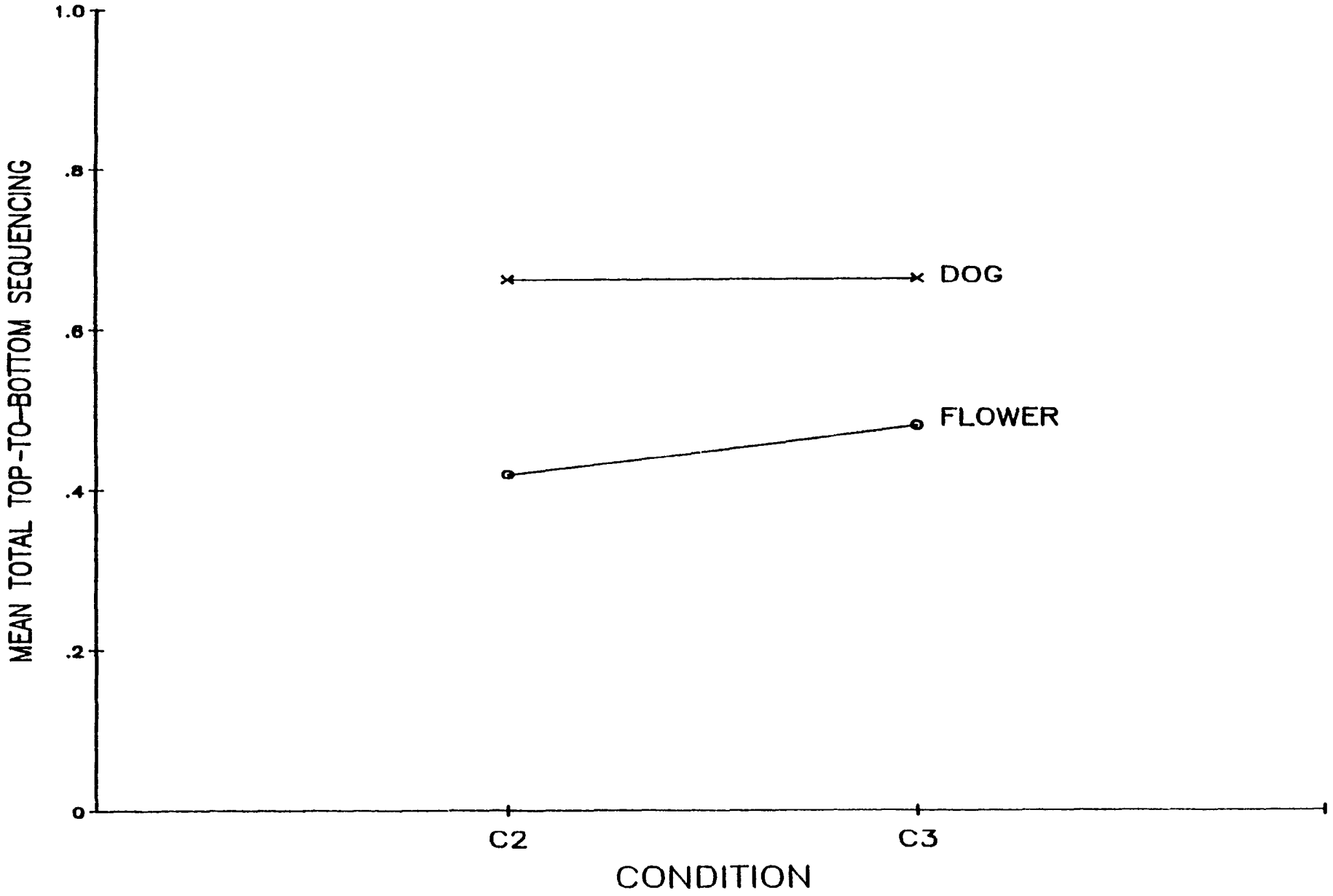
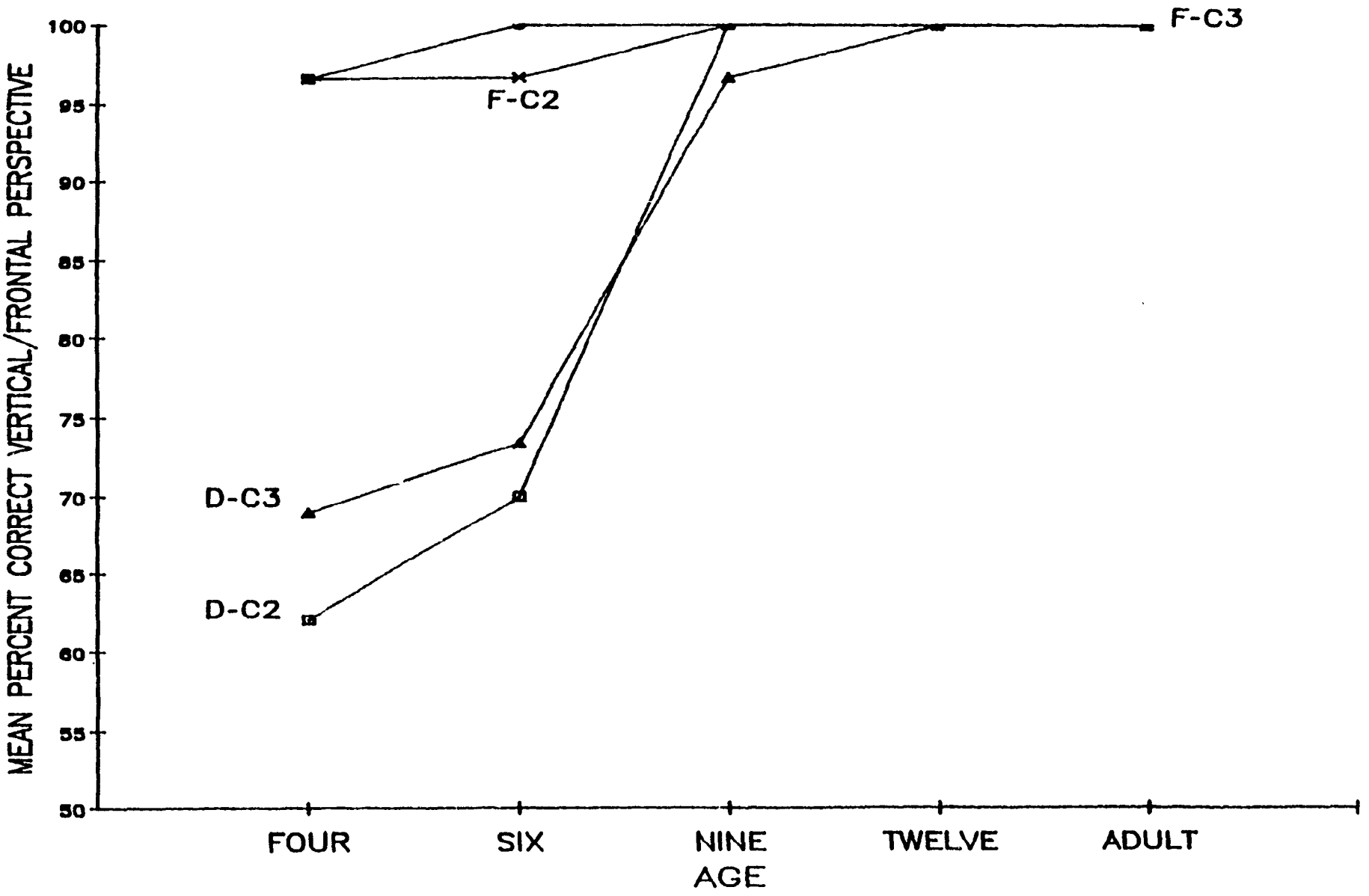

1.0
.8
.6
.4
.2
0
MEAN TOTAL TOP-TO-BOTTOM SEQUENCING
DOG
FLOWER
C2
C3
CONDITION

Figure Caption

Figure 19. Age (linear) x Condition (C2 vs. C3) x Topic interaction for mean total percent correct use of a vertical/frontal perspective.


MEAN PERCENT CORRECT VERTICAL/FRONTAL PERSPECTIVE
100
95
90
85
80
75
70
65
60
55
50
F-C3
F-C2
D-C3
D-C2
FOUR
SIX
NINE
TWELVE
ADULT
AGE

62-75% correct, $F(1,138)=22.70$, MSE=2.23, $p<.0001$ (see Figure 19). In this latter case, however, more correct orientations were observed in C3 than in C2. This was also the case for six year-olds' flower drawings.

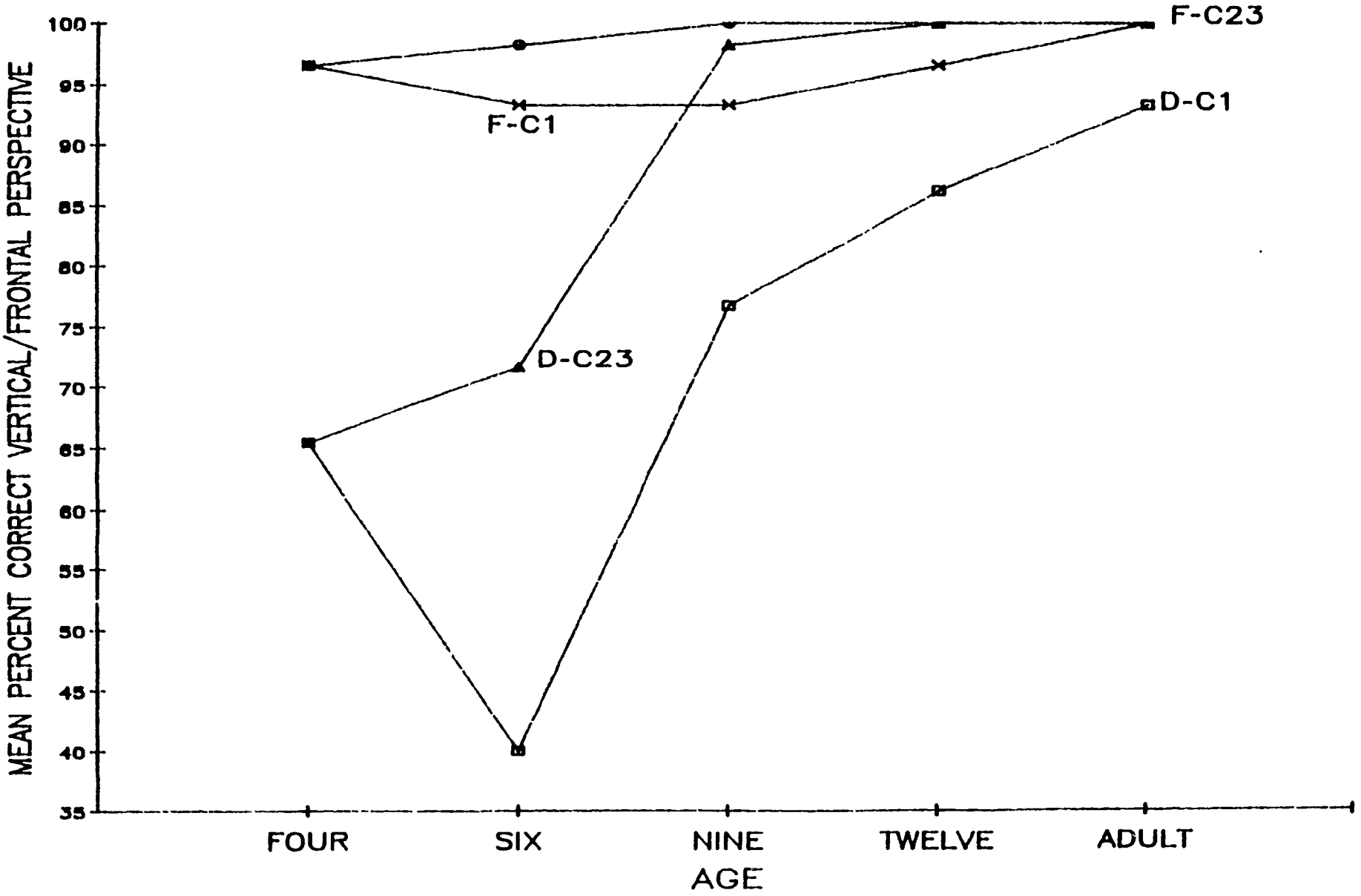
A significant AGE (linear) x COND (C1 vs. C2+C3) x TOPIC interaction was also revealed for this measure, $F(1,138)=16.49$, MSE=1.08, $p<.0001$ (see Figure 20). In the flower drawings, while the mean scores for all ages ranged between 93 and 100% correct, scores in C2+C3 were higher than scores in C1 in six, nine and twelve year-olds' drawings. Scores in the dog drawings, however, increased more dramatically with age, except for six year-olds' C1 drawings which were very low. Furthermore, in all age groups (except four year-olds), dog scores in the model-present condition (C2 + C3) were higher than in the model-absent (C1) condition.

Finally, a significant main effect of AGE, which was linear in its trend, was also evident, $F(1,138)=44.84$, MSE=5.14, $p<.0001$ (mean scores and standard deviations: four year-olds=81% (27%), six year-olds=79% (23%), nine year-olds=94% (11%), twelve year-olds=97% (7%', adults=99% (3%)), as was a significant main effect for COND, $F(2,276)=10.82$, MSE=.44, $p<.0001$ (mean scores: C1=84%, C2=92.5%, 93.5%). No significant SEX effect was observed ($p=.956$).

Therefore, it was evident that representation of correct orientation in drawings was affected by the age of the participant. Furthermore, it was also apparent that the model

Figure Caption

Figure 20. Age (linear) x Condition (C1 vs. C2 + C3) x Topic interaction for mean total percent correct use of a vertical/frontal perspective.


MEAN PERCENT CORRECT VERTICAL/FRONTAL PERSPECTIVE
100
95
90
85
80
75
70
65
60
55
50
45
40
35
F-C23
F-C1
D-C1
D-C23
FOUR
SIX
NINE
TWELVE
ADULT
AGE

conditions served to enhance correct representation of orientation in drawings.

Time Spent Drawing

A final ANOVA was also conducted on the total time spent drawing (in seconds). Results revealed a significant AGE (linear) x COND (C2 vs C3) x TOPIC interaction, $F(1,138)=7.42$, MSE=60796.71, $p < .007$ (see Figure 21), which indicated that drawing time increased with age, was higher in nine, twelve year-olds', and adults' C3 drawings, especially for flower drawings.

A significant difference between COND (C1 vs. C2+C3) also showed that less time was spent drawings in a model-absent condition than in the model-present conditions (C2 + C3), $F(1,138)=71.1$, MSE=232978.5, $p<.0001$, (mean scores: C1=138.9, C2+C3=151.1).

A significant AGE (linear) x SEX interaction, $F(1,138)=8.32$, MSE=382437.32, $p<.005$ (see Figure 22), also indicated that while time spent drawing tended to increase with age (with the exception of nine year-old females), four and six year-old females spent more time drawing than their male counterparts, while males did so in the three other age groups.

Finally, results also showed that a significant linear main effect of AGE existed for this measure, $F(1,138)=20.5$, MSE=942302.16, $p<.0001$, (mean scores and standard deviations: four year-olds= 109.1 (61), six year-olds=125.0 sec (52), nine

Figure Caption

Figure 21. Age (linear) x Condition (C2 vs. C3) x Topic interaction for mean total drawing time (seconds).

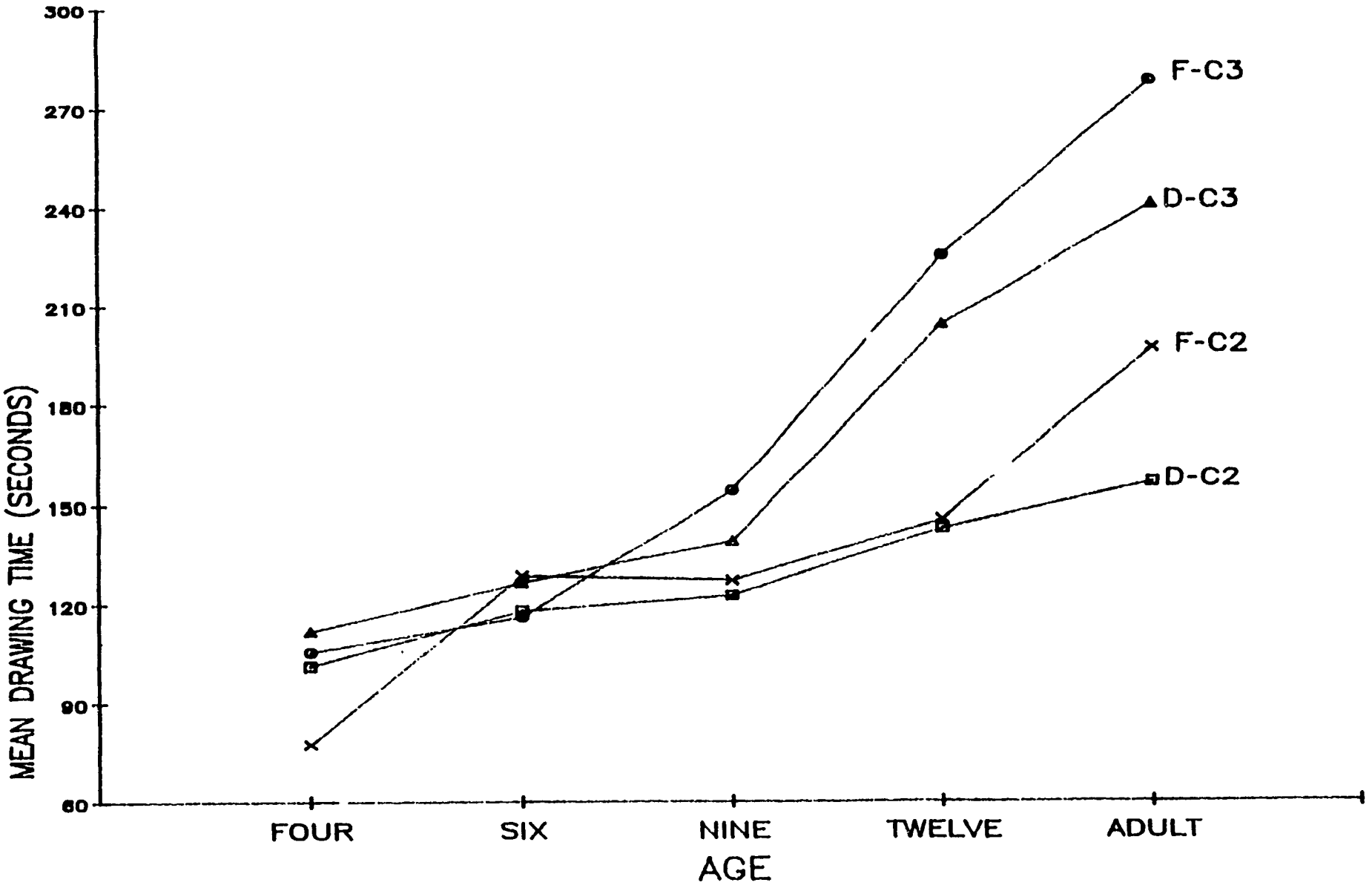
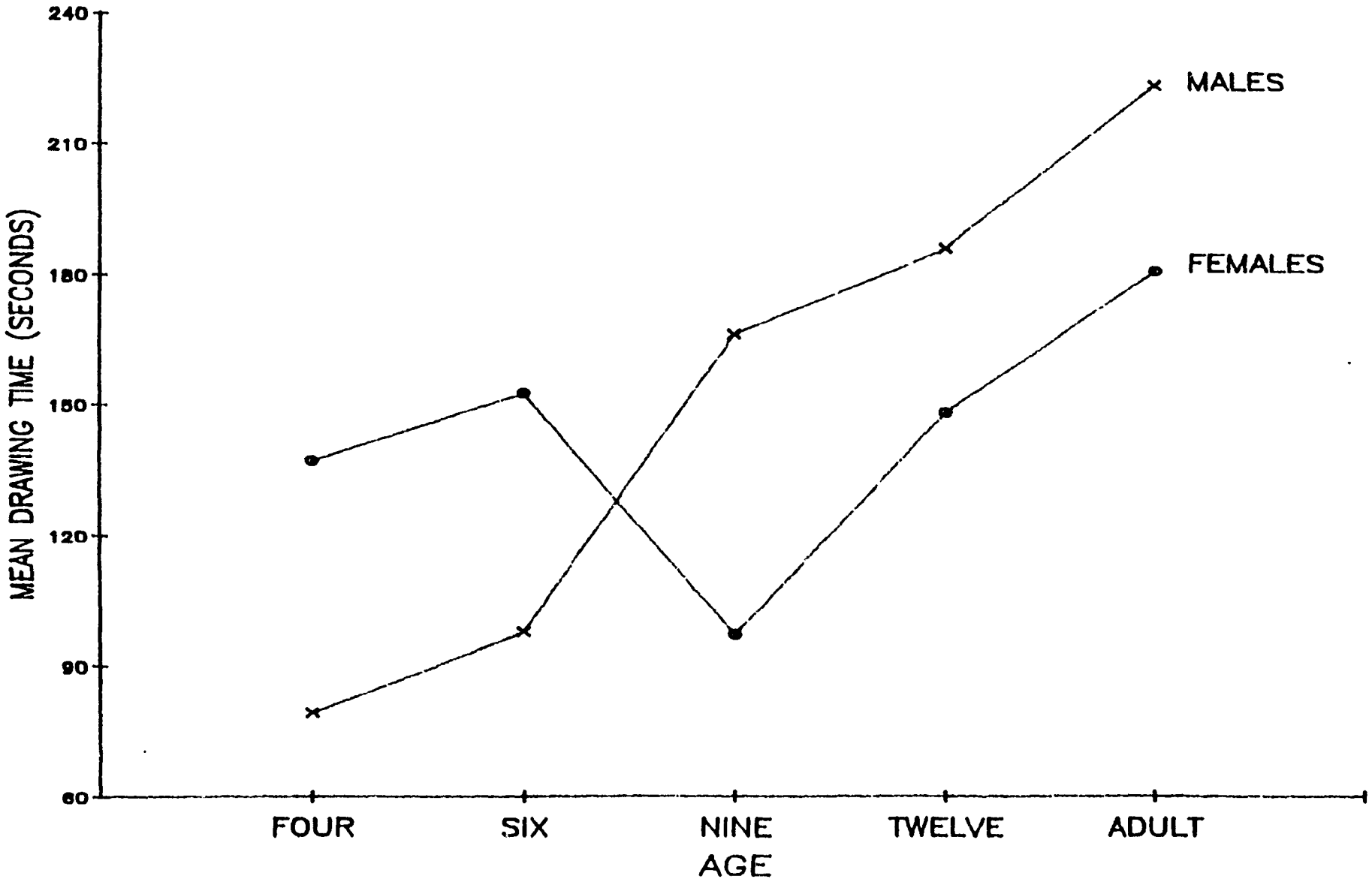

300
270
240
210
180
150
120
90
60
MEAN DRAWING TIME (SECONDS)
F-C3
D-C3
F-C2
D-C2
FOUR
SIX
NINE
TWELVE
ADULT
AGE

Figure Caption

Figure 22. Age (linear) x Sex interaction for mean total drawing time (seconds).


240
210
180
150
120
90
60
MEAN DRAWING TIME (SECONDS)
MALES
FEMALES
FOUR
SIX
NINE
TWELVE
ADULT
AGE

year-olds=131.5 sec (44.6), twelve year-olds=166.4 sec (63.2), adults=202.4 sec (73.4)), as did a significant main effect for COND, $F(2,276)=23.83$, MSE=138197.34, $p<.0001$ (mean scores: C1= 138.91 sec, C2=131.95 sec, C3=170.35 sec).

In short, time spent drawing increased with age. Overall, drawing time was also greatest in a model continuously-present (C3) condition.

Summary of Age and Condition main effects and Age x Condition interactions

For purposes of simplicity, a summary of the Age and Condition main effect, and Age x Condition interactions, for the above dependent measures, is presented in Table one.

Table 1

Summary of Age, Condition main effects, and Age x Condition interactions for the dependent variables in experiment one (part one)

	AGE	COND	AGE x COND (C1 vs. C2+C3)	AGE x COND (C2 vs. C3)
COMP	***	--	*	---
COLOR	---	***	---	***
URC	***	---	---	---
AREA	*	***	*	---
BACK	***	---	---	---
OVER	***	***	**	*
L-R	***	---	***	**
T-B	**	---	**	---
V/F	***	***	***	***
TIME	***	***	---	*

*** p<.0001
** p<.001
* p<.01

KEY
COMP: level of completion
COLOR: total number of colours
URC: unrealistic colour use
AREA: area of space utilized
BACK: presence of background features
OVER: number of overlapped features
L-R: left-to-right sequencing
T-B: top-to-bottom sequencing
V/F: vertical/ frontal perspective
TIME: time spent drawing

Correlations of the Dependent Variables

Table 2 indicates that the above dependent variables were, in the majority of cases, correlated with each other at a significance level of .01. Level of completion was positively correlated with the number of overlaps in drawings, instances of left-to-right patterning, the correct use of a vertical/frontal perspective, time spent drawing, and was also negatively correlated with unrealistic colour use, area of space, and the inclusion of background features. The number of colours in drawings was also positively correlated with the instance of unrealistic colour use, area of space, background features, and drawing time, and was negatively correlated with the number of overlaps. Unrealistic colour use was also positively correlated with area of space, the number of background features, and negatively correlated with the number of overlaps, left-to-right sequencing, and drawing from a vertical/frontal perspective.

Table 2 also shows that area of space in drawings was positively correlated with the number of background features, top-to-bottom sequencing and time spent drawing. Background features were also negatively correlated with the instance of overlapping, left-to-right sequencing, depiction of a vertical/frontal perspective, and positively correlated with drawing time. Moreover, overlapping in drawings was also positively correlated with left-to-right and top-to-bottom sequencing, drawing from a vertical/frontal perspective, and drawing time.

Table 2

Pearson-product moment correlations of dependent variables in experiment one (part one)

	COMP	COLOR	URC	AREA	BACK	OVER	L-R	T-B	V/F	TIME
COMP	---									
COLOR	.022	---								
URC	-.6 ***	.23 **	---							
AREA	-.15 *	.33 ***	.23 **	---						
BACK	-.26 *	.66 ***	.23 ***	.42 ***	---					
OVER	.66 ***	-.15 **	-.46 ***	.06	-.39 ***	---				
L-R	.40 ***	-.06	-.24 **	.06	-.19 **	.35 ***	---			
T-B	.08	-.1	-.08	.15 *	-.11	.32 ***	.07	--		
V/F	.54 ***	-.03	-.21 **	-.002	-.29 ***	.55 ***	.35 ***	.30 ***	---	
TIME	.23 **	.32 ***	-.06	.32 ***	.15 *	.35 ***	.09	.10	.21 **	---

*** p <.001
** p <.01
* p <.05

Finally, both types of sequencing patterns were also positively correlated with the ability to draw from a vertical/frontal perspective, which finally, was positively correlated with drawing time

Results (Part two)

Next we turn to the results of the second part of our study, which examined individuals' disciminations between drawings made in the absence of a model with drawings made with a model continuously-present.

An analysis of variance (ANOVA) was conducted on the mean percent correct identification of drawings that had been made in the Model Continuously-Present condition (C3) versus those made in the Model-Absent Condition (C1). The effect of the judges' age was also investigated using orthogonal polynomials (e.g., linear, quadratic, cubic and quartic).

Results revealed that no significant differences existed between any age groups' judgments ($p > .3$). The mean percent correct answers for each age group were as follows: four year-olds= 63%, six year-olds= 58%, 9 year-olds=65%, 12 year-olds=62%, adults= 67%. Therefore, it was apparent that regardless of age, all judges' answers were at a consistent level and were more accurate than chance probability (50%), as determined by a binomial test of proportions ($z=1.645$, $p < .05$).

An ANOVA was also conducted on the mean correct percent identification of drawing according to the age of the artist. Results revealed a significant effect, $F(4,352)= 6.78$, MSE=.66, $p<.0001$. Scores for each age group were as follows: four year-olds' drawings= 54.3%, six year-olds' drawings= 60.2%, nine year-olds' drawings= 59.7%, twelve year-olds' drawings= 76.9%, adults drawings'= 62.9%.

Post hoc comparisons using Fisher's LSD indicated that twelve year-olds' drawings were correctly discriminated more frequently than all other age groups' drawings. Moreover, results also indicated that only the six and nine year-old age groups did not significantly differ from each other. In summary, this examination indicated that judges of all ages discriminated between drawings better than chance, and that scores granted to the artists' drawings increased significantly with age, overall, until twelve year-olds' drawings, and decreased significantly for adults' drawings.

Finally, a step-wise discriminant analysis was conducted between drawings made in the model-absent condition (C1) with those in the model continuously-present condition (C3). This analysis was conducted in order to determine which of the following measures, if any, discriminated between the C1 and C3 examples chosen: level of completion, total colours, unrealistic colours, area of space used, background features, overlapping, and correct vertical/frontal orientation.

Results revealed that a significant difference between C1 versus C3 existed, $F(3,16)=.61$, $p=.041$. Moreover, results also indicated that the number of overlaps ($B=.18$; $t(16)=.015$), number of background features ($B=-.30$; $t(16)=.082$), and age of artist ($B=-.26$; $t(16)=.025$) measures accounted for 74% of the variance. The regression equation for the model was: $Y=Bo-.26(X1)-.30(X2)+.18(X3)$, where $Y=1$ represents C3 and $Y=0$ represents C1. Therefore, the higher the score on overlapping,

the more the equation approached Y=1, hence the C3 condition. Conversely, scores on background were closer to Y equals 0, hence the C1 condition. Thus, examination of this equation showed that a greater incidence of overlapped features occurred in the model continuously-present (C3) drawings (C3=3.1, C1=1.6), while model-absent (C1) drawings tended to have more background features (C1=.5, C3=.1). Interestingly, these results also revealed that the drawing samples were not discriminable from each other on measures of completion, number of colours, unrealistic colour, area of drawing space used, and depiction of vertical/frontal orientation. Finally, the discriminant analysis revealed an 80 % correct classification rate, using the derived discriminant equation with these data (see Table 3).

Table 3

Classification Rate for discriminant analysis (part two)

GROUP	NO. OF CASES	PREDICTED GROUP MEMBERSHIP	
		C1	C3
MODEL-ABSENT (C1)	10	8	2
MODEL-PRESENT(C3)	10	2	8

* total percent of group cases correctly classified equals 80%

Discussion

The present studies had three major objectives. One purpose was to provide further empirical evidence on differences in drawing behavior that occur with age. A second purpose of this research was to compare drawing behavior when participants drew with and without a model. This investigation was implemented in order to provide empirical evidence for the suggestion that drawing behavior can be enhanced when it occurs with the aid of a model. A final goal of this research was to examine both children's and adults' abilities to discriminate between drawings which were made with and without a model (part two).

Beginning with part one, we now proceed with the discussion of the results obtained in the present studies. Limitations in these studies and recommendations for future research will also be addressed.

The completion scores calculated across age groups clearly indicated that age played a significant role on this measure, since near perfect scores were first evident in nine year-olds' drawings. These results support both Gardner's (1980) and Lowenfeld's (1957) propositions that children between the ages of nine through twelve are preoccupied with accuracy of depiction in their drawings, and also indicate that this tendency is present in adults as well.

The experimenter also noted that the older participants were extremely serious and expended considerable effort in their attempt to depict all specified and described features

accurately. Frequently, when drawing without a model, these individuals would repeat aloud the experimenter's instructions and use these as a guide while drawing. In the model briefly-present condition, these age groups would also describe aloud the parts of the model just observed. Finally, when the model remained present, participants were also observed to point to its parts and compare them with their own drawing. Overall, this was not frequently observed in the two youngest groups.

Gardner's (1980) and Gardner and Winner's (1982) proposal that adults' drawings may be similar to youngsters' drawings was not supported, since adults' scores were higher than four and six year-olds' scores, and comparable to those of nine and twelve year-olds.

It was also evident that the model conditions enhanced completion scores in all age groups except twelve year-olds, and were especially pronounced in six and nine year-olds' and adults' scores. This result also supports Gardner's (1980) suggestion that drawing from a model can enhance one's drawing performance, since more of a topic's features were included even when the model was only briefly presented.

Observations of drawing behavior by the experimenter also indicated that the youngest age groups frequently made mistakes on this measure in the flower drawings when they did not leave enough room for six petals, or conversely, added extra petals because of too much leftover space. Goodnow (1977) noted that the spacing of units in drawings in these age groups is critical

and that children will fit units into available space in their drawings. In the dog drawings, the experimenter noted that these age groups frequently did not include the correct number of legs because of the sitting position which was required.

The observation that twelve year olds' scores did not differ across the drawing conditions could be attributed to observations which found that children of this age are at a high level in their desire for accuracy (Gardner, 1980; Lowenfeld, 1957). Therefore, an expectation of enhanced completion scores in the model condition could be unwarranted. Finally, although four year-olds' drawings were improved in the model conditions, the improvement was slight. It is possible that because children of this age are not concerned with accuracy in their drawings (Gardner, 1980; Lowenfeld, 1957), their focus of attention while drawing was not on the accurate inclusion of all viewed or even specified parts.

Turning to total colour use, the overall difference between total colour use in the two drawing topics was due to the fact that in this study three colours were contained in the flowers (red, green and yellow), while only one (brown) was contained in the dog topic. Age affected this measure in that, overall, the number of colours decreased with age in the dog drawings, increased between four and six for flower drawings, and remained relatively stable thereafter.

Observations which showed that the highest number of colours were used in four year-olds' dog and six year-olds' flower

drawings, plus the tendency of these groups to use the most colours in a model-absent condtion, lend support to Gardner's (1980) research which documented that children of these ages are more vibrant in their colour use than nine and twelve year-olds. In fact, six year-olds' tendency to use more colours (in their flower drawings) is supportive of research which documents that at this age drawings peak in their flamboyance, creativity, imagination and vibrancy (Gardner, 1980; Gardner and Winner, 1982).

Drawing from a model, overall, decreased the number of colours relative to a no-model condition. Inspection of the two model conditions showed that a briefly-present condition decreased this more than a continuously-present model in four through nine year-olds' dog drawings, and in fours', sixes', nines', and adults' flower drawings. An intriguing observation was that these decreases (with the exception of four year-olds' flower drawings) were in the direction of the true number of colours in the model. Interestingly, the model conditions did not affect twelve year-olds' drawings, and colour number in the continuously-present condition was truer to the number of colours in the topic for four year-olds' flower and adults' dog drawings. Thus, while these observations, overall, lend support to Gardner's (1980) hypothesis of enhanced drawing performance in a model situation, they also suggest that a briefly-presented model may affect colour usage more accurately than a model always in view. Thus it appears that a model continuously in view prompted

the three youngest groups to detail their drawings with colour more than a briefly-present condition. Perhaps more accurate colour use was evident in this latter condition since efforts were concentrated on remembering the colours in the models. In other words, the tendency to elaborate a model may have been dissipated when the colours of the model had to be remembered, rather than being present in sight.

Gardner's (1980) and Gardner and Winner's (1982) proposal that adults' drawings may be similar to that of youngsters' drawings did not receive support from our results. Moreover, previous observations (Kleisath, 1987), that adults used more colours than four year-olds in a model-absent condition, were not confirmed. However, Kleisath's observations that adults used more colours than four year-olds in a continuously-present condition were confirmed, but only by our flower drawing results.

Observations in this study also confirmed and extended previous research, which found that colour use while drawing differs between the sexes. More specifically, like Richards and Ross' (1967) observation, four to nine year-old females in this study used more colours in their dog drawings than did males. This observation was also evident in four and six year-olds' flower drawings. The present study also found sex differences in the two oldest groups' flower drawings, in which females also used more colours than their male counterparts. Therefore, our study revealed that the tendency of young females to use more colours than males can continue through to adulthood for some

topics at least.

The present study also discovered that sex differences were present in the two model conditions, since females used more colours than males in each topic and were the only ones to increase their colour use in a model continuously-present condition. Thus, while the number of colours remained stable across the model conditions for males, a model continuously-present prompted females to increase the number of colours in a drawing.

We turn next to a discussion of unrealistic colour use in drawings. Unrealistic colour use was also strongly related to age. More specifically, four year-olds demonstrated the highest frequency of unrealistic colour use, followed by six year-olds, while nine year-olds through adults included virtually none. Our results supported previous research (e.g., Golomb & Farmer, 1983) which observed that four year-olds used more unrealistic colours in drawings than six year-olds, and research which observed that four and six year-olds as a group use more unrealistic colours that nine and twelve year-olds (Gardner, 1980; Lowenfeld, 1957; Richards and Ross, 1967).

The present research, therefore, further documented that four and six year-olds are not concerned with realistic depiction of colour for objects, and that their colour choice may be subjective in nature. Furthermore, our results are also consistent with other research (e.g., Gardner, 1980; Lowenfeld, 1957) which found that beginning in the ninth year, children

begin to cease using unrealistic colours. Moreover, our observation which showed that nine year-olds used low levels of unrealistic colours, comparable to twelve year-olds' and adults' usage, indicated that the preoccupation with realistic colour use is firmly established by the ninth year. However, Gardner's (1980; 1982) research, which contended that adults can demonstrate drawing behavior typical of young children, was not supported in this case, since adults actually showed negligible amounts of unrealistic colour use. As noted, his proposal appears to made on the basis of observations of children's and adults' spontaneous work. Thus, this result may be due to the fact that adults were conscious of following the task instructions correctly instead of deviating from them.

Our hypothesis (based on Gardner's, 1980, suggestion), that drawing from a model continuously present would reduce the level of unrealistic colour use relative to a model briefly present condition, was supported across the sexes (with the exception of females' dog drawings), since fewer unrealistic colours occurred in the continuously-present condition than in the briefly-present condition. Thus, in this case it appeared that a model continuously-present was an effective method to decrease unrealistic colour use across the sexes. Why females demonstrated more of this behavior in their dog drawings in the continuously-present condition seems unclear, however.

Finally other research which found sex differences in age groups (e.g., Richards and Ross, 1967) on this measure was not

supported by our findings. This may have been due to the large number of participants (1200) in Richards and Ross' study, and the consequently greater level of power in their analyses. However, our study did demonstrate that the sexes differed between the two topics in the two model conditions, since males outscored females in the flower drawings, while females outscored males in the dog drawings.

Moving on to a discussion of area of space used in drawings, age also played a significant role with respect to this measure, since area of space, overall, declined after the age of four, and increased again in twelve year-olds' drawings. These results support previous research which documented that four year-olds use more space in their drawings than six year-olds (Golomb, 1974; Golomb and Farmer, 1983), as well as research which proposed that four and six year-olds as a group use more space in their drawings than nine year-olds (Gardner, 1980; Lowenfeld, 1957). These researchers proposed that both four and six year-olds draw in a grandiose fashion and have little concern for differentiated use of the page. Moreover, our research also showed that this tendency begins to dissipate in the sixth year This observation may be due to the fact that at this age, children begin to demonstrate conscious control over the size of their drawings and cease drawing in a large globular form (Golomb, 1977).

The area utilized in adults' model-condition drawings, and in their flower model-absent drawings, was comparable to four

year-olds' scores. This observation lent some support to Gardner's (1980) and Gardner and Winner's (1982) suggestion that adults' drawing behavior may be similar to that of young children. However, their proposition was not supported by scores in the dog model-absent drawings. It is possible that adults and four-year olds scored similarly in this case since both of these age groups tend not to be very experienced drawers. More specifically, four year-olds are just beginning to draw, whereas adults tend to stop drawing at the beginning of adolescence (Gardner, 1980; Lowenfeld, 1957). Previous research (Kleisath, 1987), which found more space used in adults' model-absent drawings relative to four year-olds', was not supported by our results. They actually revealed the opposite in drawings of dogs.

Research which previously found decreases in area used for twelve year-olds' drawings relative to younger ages (e.g., Lowenfeld, 1957) received some support from observations which showed that twelve year-olds used less space than four year-olds in the dog model-absent, and overall dog model-present, conditions. Overall, however, results that twelve year-olds used more space than four through nine year-olds confirmed Richards and Ross' (1967) findings. The Richard and Ross findings of sex differences on this measure, however, were not supported, which may have been due to the relatively smaller number of participants in our study.

The present study also revealed that the model conditions

encouraged the artist to use more space while drawing with a model than without, across all ages, with the exception of six year-olds' dog drawings. Thus it is apparent that the models induced the participants to draw a topic which was larger than they would when they did not have a model for size reference. This result also supports Gardner's (1980) suggestion that drawing from a model may enhance accurate drawings, since it is apparent that, overall, individuals increased the area of space in their drawings when drawing from a model, presumably in order to depict its size. Moreover, it was also apparent that drawing from a model after brief viewing caused the drawer to use less space than when the model remained in sight. This observation may indicate that in such a condition a model was remembered as being smaller, relative to a model continuously in sight. Finally, the discrepancy in area of space used between the two topics was in all likelihood due to the fact that the flower model was taller than the dog which in turn was wider than the flower.

Turning next to the issue of adding background features to a drawing, it was apparent that the inclusion of background features in a drawing was affected by the age of the drawer, in that six year-olds included more background features than any other age group, and were followed by four and nine year-olds, respectively, while virtually no background features were included in twelve year-olds' and adults' drawings.

These results confirm Gardner's (1980) and Gardner and

Winner's (1982) observations which documented that six year-olds create the most flamboyant drawings, and that by this age the child also begins to draw scenic drawings. Nine and twelve year-olds' scores also provided further support for Gardner's (1980) and Lowenfeld's (1957) observation of a preoccupation with realism and accuracy in these age groups. More clearly, because no background features were included, or mentioned, in any of the drawing conditions, it appeared that these age groups drew only what was described or viewed, and thereby, performed more accurately than the youngest age groups. Gardner's hypothesis that adults' drawing behavior may regress to that of four and six year-old children was also not supported by our findings. Richards and Ross' (1967) observations, which found that twelve year-olds included fewer background features than both six and nine year-olds, were confirmed by our results. However, the present study did not confirm their observations which found sex differences in six year-olds' drawings.

Our hypothesis that fewer background features would be evident in the model conditions than in the model-absent condition was not supported, since no significant differences were revealed across the three drawing conditions. Furthermore, our results also did not lend support to previous research (Kleisath, 1987), which found more background features, overall, in a model-absent condition versus a model continuously-present condition, and found that adults and preschoolers included comparable numbers in the model-absent condition. However, her

results which showed that adults included fewer background features than four year-olds in a model continuously-present condition were confirmed in our study.

Thus, the present study showed that only the two youngest age groups added extra features in their drawings. Moreover, our observations that six year-olds added more features than all other age groups confirms Gardner's (1980) and Gardner and Winner's (1982) position that children of this age draw the most elaborate and imaginative drawings. Furthermore, our study demonstrated that this behavior remained consistent across all three drawing conditions.

Finally, informal observations noted that background features in both topics depicted an outdoor theme (e.g., sun, rain, clouds, grass). Thus, it appears that children associated these objects with an outdoor schema. These results may be interpreted to lend further support for the existence of "intellectual realism" in drawing, the tendency to draw what one knows about an object rather than what one sees (e.g., Phillips et al., 1978), and that one's conceptual knowledge of a feature may prevail in drawings (e.g., Bradley, 1983), since it was quite evident that the youngest children included conceptual knowledge of associated features with the two topics in their drawings.

We now move to a discussion of the presence of overlapping in drawings. Age of the participant also played a significant role in the representation of occluded parts by overlapping in

drawings. Moreover, our observations, which indicated that consistent overlapping first occurred in nine year-olds' drawings, confirm previous investigations which proposed that overlapping is virtually non-existent before the age of nine years (Lowenfeld, 1957; Willats, 1977), and that it increases with age (Willats, 1977). While few instances of overlapping existed in the drawings of four and six year-olds, our results also lent support to research which found that overlapping is, however, detectable in preschoolers (Colbert and Taunton, 1984; Kellogg, 1969), and that six year-olds do attempt to depict depth in their graphic work (Chen et al., 1984; Lewis, 1985). Therefore, our observations indicated that overlapping is detectable at an early age, increases with age, and thereby support previous research which demonstrated that the ability to depict the third-dimension in drawings is an age-dependent skill (Colbert and Taunton, 1988; Chen et al., 1984; Lewis, 1985; Phillips et al., 1978). Finally these observations also lent support to Gardner's (1980) suggestion that nine and twelve year-olds are more preoccupied with realism than younger children because overlapping scores in these age groups were higher than in the two youngest age groups.

Gardner's (1980) and Gardner and Winner's (1982) proposal of a similarity in adults' and children's drawings was not supported by these results since adults scored higher on this measure than did the younger age groups.

Our results also showed that drawing from a 3-d model

enhanced the inclusion of overlaps. Although this was evident in all age groups, it was the most apparent in nine year-old and older participants. Furthermore, our observation that twelve year-olds performed particularly well on this measure does not support Bradley's (1986) conclusion that twelve year-olds do not possess adequate skills to represent depth. The present study also revealed that drawing from a model only briefly present for inspection also enhanced the inclusion of overlapping in drawings. Overall, however, overlaps were higher in all age groups (except four year olds' flower drawings and sixes' dog drawings) when a model remained continuously in sight. Therefore, it appeared that while a 3-d model enhances overlapping, one continuously-present does so even more, presumably because the artist has the opportunity to attend to this feature throughout the course of a drawing.

It should also be noted that although no age group scored perfectly on this measure, some discrepancy between the topics could have been attributable to the fact that in the model conditions, five points of occlusion were present in the dog model while six were present in the flower model.

Although no sex differences were anticipated on this measure, our investigation showed that overlapping differed between the sexes across the two model conditions. More females than males included overlaps in their model-briefly present condition, while males outscored females in the continuously-present condition. Thus, these results indicated

that females had a better ability to represent depth by overlapping in their drawings after a brief inspection of a model, while males did so more often when a model remained in sight. Moreover, the sexes also differed on this variable with age, in that females outscored males in the six, twelve and adult age groups, while males outscored females in the four and nine year-old groups. In another model paradigm, Lewis (1985) also discovered gender differences in six and nine year-olds' ability to depict depth. While results in this latter case can also be explained by Richards and Ross' (1967) acknowledgement that the earlier onset of puberty in females may cause them to draw in a more advanced manner than males, this does not clarify why prepubescent nine year-old males scored higher than nine year-old females. Collectively, these observations provide further information on the issue of overlapping and its relation to gender which is worthy of future research.

Overall, the present results on this measure support previous research, which found that the ability to depict a 3-d model in drawing is age-related, and also provide new evidence that a model aid can enhance the depiction of depth. Moreover, this study also showed simliar findings to that of research which found this age-related behavior in a 2-d model paradigm (e.g., Phillips et al., 1978), and in a paradigm which involved both a 3-d model and 2-d replications of it (e.g., Chen et al., 1988). However, in this latter study it was revealed that children, overall, depicted depth more accurately with a 2-d version of the

model than with the real model itself. While our study showed that the ability to depict depth by overlapping is enhanceable for all age groups with a 3-d model, it is also possible that differences in our results could have been delineated through the incorporation of 2-d replications of our models as well. Future research should, therefore, integrate such a condition.

From our study, as in other research (e.g., Chen et al., 1988; Lewis, 1985; Phillips et al., 1978) it is also concluded that the model itself is of great importance in the examination of depth depiction in drawing. More specifically, from the present results, it was clear that a familiar topic, a flower, in a continuously-present condition generated the greatest improvement on this measure overall. Although previous research has avoided the use of familiar objects (e.g., Chen et al., 1988), has found that non-familiar objects are drawn more accurately than familiar objects (e.g., Phillips et al., 1978), and that a complex model may inhibit depth depiction (Lewis, 1985), our study showed that a familiar object did not appear to inhibit any age group's attempt at depth depiction. Thus, while such a discrepancy may be apparent in studies which examined geometrical models, it was not the case with a familiar, non-geometric model. Therefore, the potential use of other familiar models in enhancing depth by overlapping should also be investigated more thoroughly, since from our study they appear to be effective in enhancing depth depiction in drawing.

We turn next to a discussion of left-to-right sequencing

while drawing. Age also influenced left-to-right sequencing behavior in that an increase with age, overall, was evident. Moreover, this behavior in four and six year-olds' dog drawings, and their flower model-absent and model continuously present drawings, confirmed previous findings which observed that six year-olds used a left-to-right sequence while drawing more frequently than four year-olds (Golomb, 1972; Golomb and Farmer, 1983; Goodnow, 1974). According to Goodnow (1977), left-to-right sequencing in drawing is the result of learning to write in a left-to-right fashion in school. Therefore the fact that this type of sequencing increased with age could be indicative of having more left-to-right writing experience with age.

The greatest discrepancy across drawing condition also occurred in twelve year-olds' drawings, as well as in six year-olds' flower drawings only, which both demonstrated more left-to-right sequencing in the model-absent condition. In these cases it appeared that drawing with a model reduced the frequency of drawing in a left-to-right pattern. Moreover, in twelve year-olds' dog drawings, a continuously- present model showed this disruption more than did a briefly-viewed model. Therefore, it is possible in this case that viewing a model when drawing caused a more systematic drawing procedure, which may have led to fewer left-to-right sequences.

New information on left-to-right sequencing was also revealed in the present study, since it was evident that the sexes differed on this variable with age. In the flower

drawings, six year-old and adult males used more sequencing of this type than did females. In the dog drawings, males only used this sequencing pattern more frequently than females in the six year-old group, and were surpassed by females in the nine and twelve year-old groups. Therefore, while our observations confirmed observations that found left-to-right sequencing is higher in six year-olds than in four year-olds, they also revealed new observations that males exhibit more of this behavior in the six year-old age group, an observation that also reoccurred in adults' flower drawings. Results on this measure did not confirm Gardner's (1980) and Gardner and Winner's (1982) contention that adults may draw like children, since adults demonstrated more of this pattern than did younger children.

In this study it was also quite evident that more left-to-right sequences occurred in drawings of dogs than those of flowers. Goodnow (1977) also noted that a left-to-right sequencing pattern tended to be predominant for paired features such as limbs. From her observations it is, thereby, proposed that more sequencing of this type occurred in the dog drawings because more paired features were present than in the flower drawings. Specifically, for the dog topic, one pair of eyes, and of ears and two pairs of legs were present, while the only paired feature in the flower topic consisted of its two leaves. Finally, it is also possible that larger differences were found with age in this topic because of the presence of more paired features along with higher experience of left-to-right writing

behavior with age.

Moving on to a discussion of top-to-bottom sequencing, it was apparent that age also affected the frequency of this type of sequencing in drawings since this behavior decreased from four to six year-olds, increased in twelve year-olds, and declined again in adults' scores. Scores for four and six year-olds did not support previous research which revealed that sequencing of this type is well established in these age groups, since six year-olds displayed less of this behavior than four year-olds. (Golomb, 1972; Goodnow, 1977). In fact, the present study revealed that this sequencing behavior was highest in twelve year-olds. No support was also evident for Gardner's (1980) and Gardner and Winner's (1982) "regression" hypothesis since adults behaved comparably with all age groups on this measure.

Drawing condition strongly affected this sequencing behavior in six and twelve year-olds. While encouraging this behavior in twelve year-olds, drawing with a model actually reduced this behavior in six year-olds.

Moreover, our observations also showed that this drawing behavior differed between the two topics across drawing condition. In the dog drawings the tendency to draw in a top-to-bottom fashion, which was quite evident in the model-absent condition, was lowered relatively equally by the two different model conditions. On the other hand, the lower tendency to draw the flowers in this fashion increased in the model conditions

which a model continuously-present had the strongest effect. Thus, our study indicated that drawing from a model can disrupt the natural top-to-bottom tendency associated with a drawing topic.

As noted above, it was evident that more top-to-bottom sequencing occurred in the dog drawings than in the flower drawings. Kellogg (1969) noted that drawings of animals evolve from drawings of humans. Other research has also observed that children's drawings of humans predominantly occurs in a top-to-bottom fashion (Gardner, 1980; Golomb, 1974; Goodnow, 1977). Thus, it is possible that more top-to-bottom sequencing occurred in the dog drawings because of their evolution from drawings of the human being. Our observations that less sequencing of this type occurred in flower drawings can also be explained by Golomb and Farmer's (1983) research, which observed that flowers tend to be drawn in a bottom-to-top fashion, presumably because of their attachment to the ground.

Turning next to the issue of drawing from a vertical/frontal perspective, drawing a topic from such a perspective was clearly more problematic in drawings of dogs than of flowers. The experimenter also noted a common difficulty experienced by all age groups in the model-absent condition. Most participants, when asked to draw the dog 'sitting down and facing you', expressed that this would be difficult to do since depicting the legs involved occlusion of body parts, and hence overlapping. Moreover, these participants also remarked that drawing a dog

from a horizontal side view was a more familiar drawing schema to them. Our results substantiate this observation since scores were lowest in this drawing topic. Drawing a flower from this perspective, however, did not pose nearly as much of a problem for participants, presumably since this was a more familiar drawing schema.

Overall, results also indicated that this ability increased with age. Moreover, observations which revealed that nine and twelve year-olds scored higher than the younger groups also provide support for research which observed that children of these ages are able to draw realisticallym better than younger age groups, since they adopted this perspective more frequently than did fours and sixes (Gardner, 1980; Lowenfeld, 1957). Collectively, the model conditions in the dog drawings enhanced scores relative to the model-absent condition. Moreover, in the three oldest age groups, this increase in performance approached or attained the level of a perfect score. Thus, it was evident that even brief viewing of a model in this position enhanced participants' ability to draw the dog from this perspective. Drawing from a model also enhanced performance in six through nine year-olds' flower drawings and was just as effective when briefly viewing it, as when it remained in sight in nine and twelve year-olds' drawings. These observations support Gardner's (1980) proposal that drawing from a model can enhance drawing ability. Interestingly, this study also showed that drawing condition did not affect four year-olds' and adults' flower

scores on this measure, since each groups' scores were comparable across the three drawings conditions. Overall, these results, however, do not support Gardner's (1980) and Gardner and Winner's (1982) hypotheses of an adult "regression", since adults performed much better than youngsters in dog drawings, while in flower drawings all ages performed comparably. In brief, from the present study, it was evident that drawing from a vertical/ frontal perspective was an ability which increased with age, and which was enhanceable with the aid of a model example.

We turn now to a discussion of our final dependent measure, time spent drawing. The amount of time spent drawing was also found to increase with age. These results confirm previous research which also found this effect in a model-only condition (Willats, 1977), and in a model versus no-model condition (Kleisath, 1987). Drawing condition also displayed its most consistent effects on drawing time in the nine year-old and older age groups, where it was greater in a model continuously-present condition.

These observations can be explain by other research (e.g., Gardner, 1980; Lowenfeld, 1957) which documented that nine and twelve year-olds are preoccupied with accuracy. From this research, it seems reasonable to propose that because of this tendency, time spent drawing was greater relative to younger groups which are not as preoccupied with accuracy. In short, efforts to capture accuracy in a drawing may have taken up more time. Further, it is also possible that having a model present

enhanced this behavior even more, and consequently prompted more drawing time. From our observations it was also evident that this seemed to be the case for adult drawers. New information on gender differences was also revealed in this study, since it was quite apparent that females spent more time drawing in the two youngest age groups, while the opposite was found in the three oldest.

Correlational analysis conducted between the dependent variables (see Table 1) also served to substantiate our findings. More specifically, observations showed that scores on the size of the drawings, the number of colours, instances of unrealistic colour use, and inclusion of background features were all positively correlated with each other. Furthermore, these measures were also observed to be negatively correlated with scores on the depiction of depth by overlapping, and the accurate frontal/vertical perspective measures. Thus, these findings indicated that drawings which were higher on the above measures tended also to be less technically correct. Moreover, this conclusion was also formed on the basis of results which showed that composition scores were negatively correlated with unrealistic colour use and background features, but were positively correlated with overlapping scores, left-to-right sequencing patterns, and vertical/frontal perspective scores. Finally, correlations between time spent drawing and level of completion, the number of colours used, area of space utilized, the inclusion of background features, overlapping and the correct

depiction of a vertical/frontal perspective served to indicate that time spent drawing was increased by greater drawing efforts on these measures.

One possible explanation for condition differences in this study may include the issue of fatigue. The potential existence of fatigue, especially in preschoolers, however, was not substantiated in the present experiment. All participants in this study created the six required drawings with an abundance of enthusiasm. Moreover, this observation is supported by the high number of individuals who participated in these tasks and from the extremely low drop-out rate. In total only three children dropped out of this study, one from illness, one from an unexpected school fire drill, and one because the child was picked up from school earlier than expected. In our opinion, the youngest children in this examination behaved consistently with other researchers' experience (e.g., Colbert & Taunton, 1988; Gardner, 1980; Golomb & Farmer, 1983; Winner, 1982). These researchers observed that children can comply well with demanding drawing tasks and are capable of creating several drawings in a single sitting. The issue of fatigue in any task with children, however, is certainly of great importance and is worthy of specific research.

The possibility of a practice effect in our study was also carefully monitored. While this possibility was certainly more difficult to document than the more visible signs of fatigue, the results in our study do not support its existence. If practice

effects were apparent then we would have expected consistently more background features in children's drawings across the three drawing tasks. Clearly, this was not the case since this behavior was consistent throughout the tasks. Similarly, consistently higher completion scores would have also been expected across the three drawing conditions. This too was not the case, since in the two model conditions, scores were not significantly different. Moreover, on the unrealistic colour measurement, scores did not consistently decrease with age across the three tasks. Similarly, the youngest age groups, while showing some improvement on their overlap scores over the tasks, also did not improve greatly. On orientation scores, only a slight improvement was noted in four year-olds' dog drawings across conditions, while their flower drawing scores were consistent. Moreover, in nine year-olds, dog drawing scores were actually higher in the second drawing condition than in the third. In short, while it is still possible that practice effects did exist, unequivocal evidence of this possibility was not apparent. In our opinion, participants in this study began each drawing with consistent and refreshed interest. However, the issue of practice effects, like fatigue effects in tasks with children, is worthwhile for future research.

Summary (part one)

In summary, the present study provided further empirical support for research which documented that drawing behavior changes with age. From our examination, it was quite evident that four and six year-old children created the most imaginative and unrealistic drawings. More specifically, our study showed that these age groups created more colourful drawings, which were scenic in their themes, more unrealistic in colour, and incorrect in their completion compared with those of older artists. Furthermore, it was also evident that the ability to depict the third dimension by overlapping, and the ability to draw from a sometimes novel frontal perspective, were underdeveloped in these age groups relative to older participants.

The present examination also supported previous studies which observed that in the ninth year of age the child begins to draw in a more realistic manner. This was clear from the higher composition scores, lower instances of unrealistic colour use and the infrequent inclusion of background features. It was also evident that beginning in the ninth year children are able to depict depth by overlapping in their drawings, and that depicting an object from an unfamiliar perspective is less troublesome graphically.

Although some similarities were found between adults' and young children's drawings on measure of area of space used, overall, adults scored differently than young children on our measures. A number of explanations for this observation exist.

First, it is possible that in a testing situation, adults, like nine and twelve year-olds, conformed to the task rules. More specifically, it is likely that adults followed the experimenter's instructions and did not deviate from them while drawing. Second, most adults also admitted little recent drawing experience. Thus, it is possible that these inexperienced individuals relied on the drawing skills they had in their early adolescent years. Perhaps a more seasoned artist would have incorporated more 'flair' and flamboyance in his/her drawings, since more drawing experience may have prompted a deviation from a preoccupation with accuracy and realism.

Moreover, it is also possible that the "flamboyance" and creativity which Gardner (1980) and Gardner and Winner (1982) described as existing in adults' and children's drawings was not assessed by our variables. Therefore, before the hypothesis of parallels between adults' and children's work is dismissed as incorrect, more sophisticated measurements than ours should be devised and implemented. One possible solution is to devise a creativity/imagination scale in the future, which could be formulated from judgments of children's, adults' and even the great masters' works, and which could be used for comparison purposes.

New findings which showed that the sexes differed across the various conditions on measurements of number of colours, unrealistic colour use, left-to-right sequencing behavior, time spent drawing, and finally the ability to depict depth by

overlapping were also revealed in the present examination. Future investigations which may delineate more thoroughly the differences between the sexes in graphic behavior are warranted by these results.

Finally, it was also quite evident that drawing from a model frequently enhanced, or changed, drawing behavior across ages. In brief, it was clear that drawing from a model increased composition scores, the time spent drawing, and the size of drawings, while decreasing the instances of unrealistic colour use. Moreover, this paradigm also enhanced even the youngest age group's ability to depict depth by overlapping, as well as the ability to draw from a frontal/vertical perspective. Furthermore, it was also apparent that drawing from a model encouraged participants to reverse their frequency of drawing in a top-to-bottom manner, and in some cases even their left-to-right sequencing tendency.

Limitations/Recommendations (part one)

Recommendations for improvements in future drawing investigations can be made. First, a larger number of participants than those examined in the present study should be implemented in future examinations in order that sex differences be examined more thoroughly. Second, the present study only examined five primary age groups. Thus, an examination of all ages between the preschooler and the twelve year-old might serve to provide further information on drawing behavior in model and no-model conditions. Similarly, future designs should also include a thorough investigation of the adolescent, since drawing behavior frequently ceases at the beginning of this stage. Individuals at various stages of adulthood should also be included in future paradigms so that drawing behavior in the advanced years can be examined and compared.

The present study was also limited in that only two drawing topics were examined; hence results pertained to these topics only. In short, however, our study demonstrated that drawing behavior, especially on measurements of sequencing and overlapping, varied with topic. Thus, while greater information was obtained through the examination of more than just one topic, future research should investigate drawing behavior with a larger number of topics so that the present results can be tested with other topics, and so that more models which may have benefits for drawing behavior can be discovered.

Along these lines, future research should also include more

dependent variables than those in the present study so that more information on the presence of age-related patterns in drawing behavior may be gathered. Moreover, while the present study did examine colour number, unrealistic colour presence, and inclusion of background features in an attempt to measure the tendency of young children to draw unrealistic and elaborate drawings, it is evident that, as stated above, imagination and creativity were not thoroughly measured by these variables. More detailed and sophisticated measurements would, therefore, serve to not only document children's drawing behavior more thoroughly, but would also provide a more sophisiticated method of testing Gardner's (1980) and Gardner and Winner's (1982) hypotheses of a similarity in young children's and adults' drawing behaviors. Finally, future research should also integrate a 2-d model condition in order that differences in drawing behavior in a no-model, versus a 2-d model, versus a 3-d model, condition may be delineated.

Part two

The final objective of this research was to examine children's and adults' ability to discriminate between a sample of drawings which were made in the model-absent and model continuously-present conditions. Our observations, while indicating that all age groups were able to do this better than chance, also indicated that scores were at a consistent level across these age groups. This was a very intriguing observation, since four year-olds performed as well as adults. This

observation supports Gardner's (1980) proposal that a drawing can be affected by the use of a model, since all choices were greater than chance. Moreover, it appeared that these drawings were different enough to prompt comparable choices across age groups. Informal observation of participants' responses to questions which asked why such choices were made, indicated that they regarded these drawings as "better" or "more real" in certain parts or in their totality. This observation also gains support from our results, which showed that these drawings also contained more overlapped features. More specifically, because overlapping depicts depth, it is likely that its higher occurrence made this group of drawings readily discriminable from a no-model drawing, on the basis of realism, and the depiction of the third dimension. In a no-model condition, however, drawings were discriminable on the basis of added background features. Clearly, however, other factors, such as stylistic differences between conditions, could have also influenced discriminations. Thus, while part one of this study examined various measures individually, subjective judgements of a sample of our drawings suggested that drawing from a model affected drawings in a way that they were judged as being more realistic (or "better") than drawings which were made without a model.

It was also apparent that the number of correct choices overall increased significantly with age from four through twelve year-old artists' drawings and decreased in adults' drawings. This result also revealed provocative information, since it was

clear that correct choices, overall, increased with the age of the artist up until adulthood. This observation corresponds to the realism trend described in Gardner's research which was reported to increase until the twelfth year of age. Moreover the fact that adults' drawings were correctly discriminated less frequently than twelve year-olds' may support Gardner's (1980) and Gardner and Winner's (1982) observations that adults can show a tendency to deviate from realism in their art work.

Limitations/Recommendations (part two)

While this examination served to extend the research on children's and adults' judgements of other children's and adults' drawings, certain limitations also existed. First, only a small sample of drawings was examined. The analysis which found differences between the two sample conditions was also limited since it was also conducted on this small sample size. Thus, this examination could have been improved by conducting analyses on each of the 296 drawings in the two drawing conditions, which might have revealed other variables which discriminated between the sample types. Moreover, a formal account of explanations for the choices could have been informative. Finally, only two drawing topics were presented. Thus, future paradigms could be improved by the examination of a wider variety of drawings and by a greater number of exhibits. From our examination, a strong argument for the importance of future examinations of this type can be made since it is clear that the preschooler is not only

capable of drawing differently in a model condition, but is also a competent judge of art, specifically in this discrimination sense.

Practical Implications

Earlier in our review, we noted that encouraging children to copy from a model has been met with both approval and disapproval from researchers and educators in the field. The main argument made by opponents is that in such cases the child's own artistry may become subordinated by a replication task. Imitative behavior, however, is not unnatural to the child (Piaget, 1951) and others (e.g., Gardner, 1980; Wilson & Wilson, 1982) have proposed that copying can instill a sense of confidence in the child's drawing skills. Smith (1985) also proposed that the child's copying behavior is indicative of his/her desire for knowledge which is part and parcel of natural development. Thus, Smith proposed that educators recognize, support, and guide copying behavior in a positive manner. To meet this goal she also stressed that the model be carefully analyzed in order to delineate its potential in promoting artistry in the child. In our opinion, the present study conformed to this requirement and also provided further support for the contention that drawing from a model does possess potential benefits for the child's drawing development.

The present examination also served to provide information on the benefits of drawing from models in the classroom setting. For example, the concept of depth might be promoted in the classroom if children were encouraged to draw a model which demonstrated this notion in a variety of ways. Moreover, from our results it also seems feasible to teach the notion of

different perspectives (e.g., aerial views) by providing children with different models to draw from. Finally, the concept of size differences (e.g., big versus small) may also be effectively taught by drawing various models. In short, incorporating drawing from models in the classroom may be an effective aid to promote cognitive development in the child. Future research on these possibilities as effective teaching aids is worthwhile to determine which models may be of the best use.

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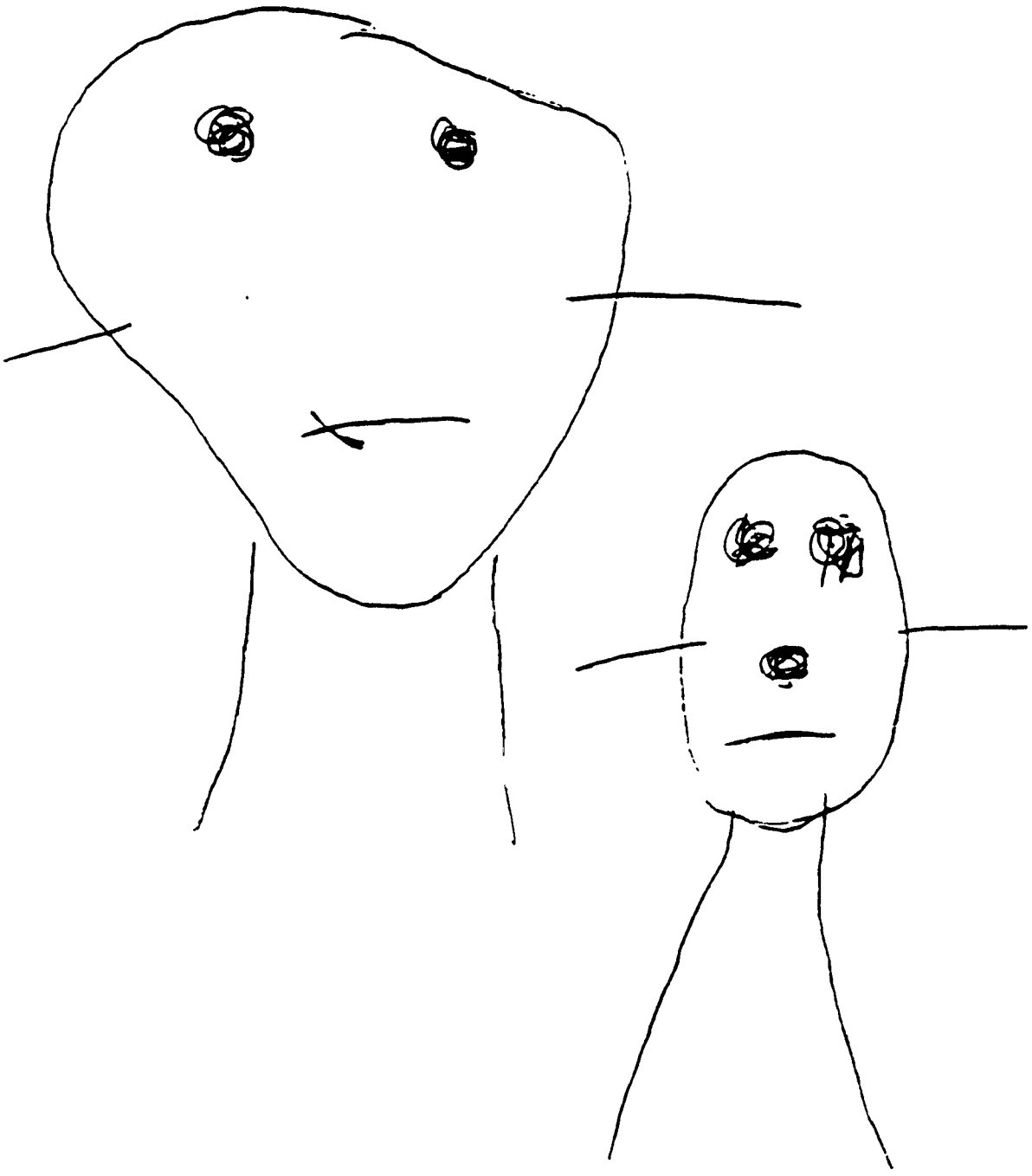
APPENDIX A

The tadpole human figure



APPENDIX B

The 20 basic scribbles

Scribble 1		Dot
Scribble 2		Single vertical line
Scribble 3		Single horizintal line
Scribble 4		Single diagonal line
Scribble 5		Single curved line
Scribble 6		Multiple vertical line
Scribble 7		Multiple horizontal line
Scribble 8		Multiple diagonal line
Scribble 9		Multiple curved line
Scribble 10		Roving open line
Scribble 11		Roving enclosing line
Scribble 12		Zigzag or waving line
Scribble 13		Single loop line
Scribble 14		Multiple loop line
Scribble 15		Spiral line
Scribble 16		Multiple-line overlaid circle
Scribble 17		Multiple-line circumference circle
Scribble 18		Circular line spread out
Scribble 19		Single crossed circle
Scribble 20		Imperfect circle

Appendix C

Dear Parent/Legal Guardian,

Hello, my name is Jenet Bogles. I am a Masters student enrolled in the Department of Psychology at Wilfrid Laurier University. Currently, under the supervision of Dr. R.J. Gebotys, I am conducting research in the area of drawing development in children and adults.

Research in the area of drawing development indicates that as we grow older the way we draw changes. This seems to be the case when we spontaneously draw an image of an object (for example, a dog) or when we draw a model of it. There is also some evidence to suggest that when adults draw, their drawings tend to be similar to drawings made by young children.

The main purpose of my research is to examine and compare drawings made by children with adults when drawing with and without a model. I am also interested in children's and adults' judgements of drawings. Specifically, their explanations for deciding which drawings look as if they were drawn with a model and which look as if drawn without one.

In order to complete this research, I will need to gather a sample of children's drawings so that I may compare drawings across age groups. The purpose of this letter is to ask you and your child permission to have your child make and comment on some of these drawings for me.

Your child's participation in this study is completely voluntary and anonymous. At no time will his/her name be identified with any of his/her drawings or any of his/her opinions. Only his/her age and sex is required for comparison purposes. If you agree, or disagree, please fill out the following page and return it to school with your child as soon as possible.

Thank you very much for your co-operation!!

Sincerely yours,

Jenet Bogles B.A (hons)

Robert J. Gebotys (Ph.D)
Assistant Professor

Appendix D

Verbal Description for "Dog" Drawing Topic

"Can you draw me a picture of a brown, short-haired dog that is sitting down facing you, has two short brown legs, two short brown ears, two eyes, and a brown nose?"

Verbal Description for "Flower" Drawing Topic

"Can you draw me a picture of a flower that has six large red petals, two long green leaves, a long green stem, a yellow centre, and is facing you?"