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Sculpture: Representational Development in a Three-Dimensional Medium

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INTRODUCTION

Representational development in the visual arts is a uniquely human endeavor that emerges relatively early and quite spontaneously in ontogenetic development. It is a symbolic activity that sets humans apart from their closest non-human relatives, the great apes; and to date, there is no convincing evidence that symbol (language) trained apes create representational drawings and sculptures (Boysen, Berntson, & Prentice, 1987; Miles, 1990; Miles, Mitchell, & Harper, 1996; Smith, 1973). Great apes can recognize photographs and drawings of people and objects; however, findings regarding their ability to produce representational drawings are ambiguous at best.

Reports on apes’ modeling with clay have not yet been published, but some research has been undertaken with capuchin monkeys who are noted for their skillful tool use. When provided with clay, stones, sticks, paints, and leaves, the monkeys modified the array of items and with their hands and stones reshaped the clay (Westergaard & Suomi, 1997). Their actions included squeezing, tearing, and rolling the mass, striking it against the cage, and incorporating leaves into the clay mass. When provided with sticks, stones, and a slab of clay fastened to the floor, the capuchins used their hands as well as the sticks and stones as marking tools and produced at least one set of lines across the surface of each form, a nonfigurative pattern which, according to the authors, is indicative of the monkeys’ nonrepresentational behavior that lacks any symbolic significance (see Figures 15.1A and 15.1B).

The prolonged exposure of some symbol trained apes to drawing and painting implements, and the generally negative findings regarding their capacity for symbolic representation in this medium, highlights the amazing achievements of young children who, without training or great effort, evolve their first basic representational shapes, name them, and expect others to recognize them.

A chapter devoted to representational development needs to define what is meant by this term, and what the boundaries of this concept are. The concept of representation in its broad meaning refers to thought that is based on a system of differentiated symbols and their referents,
FIG. 15.1. A & B Clay productions of Capucin monkeys. Reproduced with the permission of Gregory Charles Westergaard.
that is, signifiers and their meaning (signified) that can be evoked in thought and in the absence of the real object (Piaget, 1951). In the more restricted sense of the visual arts, representation refers to the invention of pictorial or plastic forms that can stand for the intended object without confusing the symbol with its referent (Golomb, 2002, 2003). In the development of child art we need to differentiate between mere sensorimotor actions on a medium such as pounding the clay and intentional actions designed to create a specific object that can stand for an aspect of the world. The concept of representation implies an understanding that a mental action such as a thought can lead to the intention to create specific shapes that bear some likeness to the object and thus can stand for it. Above all, representation involves a mental activity that goes beyond the perception of objects and events and transforms them with the means available in the chosen medium.

The systematic study of the development of modeling or sculpting in clay, 1 plasticene, or playdough has so far received only scant attention in marked contrast to the intensive scrutiny of drawing development that dates its beginnings to the end of the 19th century. Since this time, children’s drawings have continued to engage investigators for over 100 years, and their interest in this subject has led to large collections of child art, to numerous exhibitions, often in conjunction with the work of adult artists, and to an extensive list of publications. The paucity of published studies on three-dimensional art most likely reflects the technical difficulties of working with clay which is a messy medium, difficult to handle, and requires special care transporting, preserving, and storing the fragile sculptures. In contrast, drawings are relatively easy to elicit, collect, evaluate, and preserve.

Despite those difficulties, the first decades of the 20th century saw a series of publications on the clay sculptures of children and, in some cases, of the models created by blind children (Bergemann-Könitzer, 1928, 1930; Löwenfeld, 1939; Märtin, 1932; Matz, 1912, 1915; Münz & Lowenfeld, 1934; Potpeschnigg, 1912; Wulff, 1927). These pioneering studies reflect the interest of artists, psychologists, and art educators in the role the plastic medium plays in the mental life of normal and handicapped children. Löwenfeld’s interest in different modeling styles, which he derived from his early studies with the blind, led to his formulation of a contrasting typology of “haptic” and “visual” types, which he somewhat later extended to all artistic expression in drawing as well as in modeling (Löwenfeld, 1939, 1947). These early studies broadened the scope of inquiry beyond drawing development as a measure of conceptual development, but the absence of adequate experimental controls and statistical analyses limits the conclusions that can be drawn from these reports. Surprisingly, to this day, basic research in this domain has been very sparse; the published reports are few in number and their focus is primarily pedagogical, that is, to facilitate the use of the medium in creative and expressive ways and to provide art teachers with instructions on how to teach children to work with clay (Burton, 1981; Edwards, Gandini, & Forman, 1993; Grossman, 1980; Haas, 1998; Haas & Gavitch, 2000; Hagen, Lewis, & Smilansky, 1988; Ley, 1980; Löwenfeld, 1939; Sherman, Landau, & Pechter, 1977; Topal, 1986), with some authors listing the number and type of body parts that are modeled at different ages (Brown, 1975, 1984). A different focus can be found in writings that explore the therapeutic and/or diagnostic benefits of clay, drawing, puppets, and stories in the treatment of emotionally disturbed children (Case & Dalley, 1990; Kramer, 2000; Rubin, 1984). With few exceptions (Golomb, 1972, 1973, 1974, 2002; Golomb & McCormick, 1995) studies devoted to modeling have not been concerned with the three-dimensional conceptions that underlie children’s work with clay, conceptions which are at the core of children’s approach to sculpture.

1 In the past, some authors have drawn a distinction between the methods employed by sculptors, the artists who work in stone, and modelers, artists who work with clay, wax, or plaster. This distinction has not been sustained over time, and I shall not distinguish between these terms and use both to describe children’s work in clay or playdough.
Sculpture is an ancient art that dates back to prehistoric times, to 32,000 bce (before the common era), and the earliest figures document Homo sapiens’ ability to create images in the tangible form of ivory, clay, and stone (Bahn & Vertut, 1997; Leroi-Gourhan, 1982; Sanders, 1985). Although we do not know with any degree of certainty what role these early sculptures may have played in the life of our distant ancestors, the care with which they were sculpted and the diverse locations in which they were found indicate that they fulfilled a significant function in the communal life of Cro Magnon man, a hunter’s society establishing itself in Europe during the Ice Age of the Upper Paleolithic period. The first known sculptures of humans and animals are statuettes modeled in the round in ivory and stone, indicating a fully formed three-dimensional representational conception of the figure, with a carbon dating of 32,000 bce. Even during the Upper Paleolithic, the early period of modern man in Europe, anthropologists and archeologists have documented diverse stylistic models in the representation of the human figure (Delporte, 1993). Diversity of models is also the case in the sculptures from the Neolithic period in the Balkans (4500–3000 bce), witness the coexistence of diverse styles which ranged from expressive and naturalistic portraits to highly stylized versions (Sanders, 1985). Throughout this period and throughout the Balkans, Sanders notes the continued significance of clay modeling and firing of pots and figures in kilns, a technically accomplished art form which extended over 1,500 years. Although Sanders records stylistic changes over time in the direction of greater simplification of the human figure, she does not support the notion of a general developmental progression either from abstract forms to naturalistic ones or, in a reverse direction, from realism to abstract representation. Reviewing different historical periods, Sanders points to discontinuities in artistic forms that indicate changing sociocultural conceptions and lifestyle. Throughout art history she identifies a recurrent tension between an inclination toward naturalism and one toward schematization or simplification.

Given this brief historical perspective on the earliest known forms of art making in a three-dimensional medium, and the finding that sculpture played a significant role in the cultural life of Cro Magnon man in Europe, we want to know how such an interest in modeling might find expression in childhood. Do we find evidence for a rule-governed developmental course; and, if so, are its defining characteristics best conceived in analogy to drawing development, or are they subject to the unique constraints and possibilities of the three-dimensional medium? In drawing, the artist is faced with a flat, two-dimensional surface, and the representation of depth requires special techniques to create the illusion of the third dimension. This condition does not apply to clay, plaster, or plasticene, and questions regarding the evolution of representational concepts in these media are of considerable interest for an understanding of artistic development and related competencies.

To the extent that drawing development has served as a model for the analysis of representation in a three-dimensional medium, its progression is said to begin with an undifferentiated global circle, then to proceed from one-dimensional lines to two-dimensional geometric shapes or regions, and to culminate with three-dimensional lines that represent the sides of objects receding into depth, strategies that yield a more differentiated portrayal of an object or scene. In the absence of developmental data, on the basis of his analysis of prehistoric sculpture and in a partial analogy to drawing development, Arnheim (1974) hypothesized that the development of sculpture might begin with an undifferentiated blob or sphere of clay. From this simple beginning, development will proceed to the use of one-dimensional sticks and slabs arranged within one plane and culminate in patterns that represent the cubic object in the third dimension, thus enabling the sculptor to model figures in the round. If one were to transpose this view of the historical antecedents of sculpture to the developmental domain, one might conceive of the sticks and/or snakelike shapes children roll with playdough or clay as equivalents for one-dimensional lines, the pounding or flattening of the clay which yields a thin flat layer as...
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an equivalent for a two-dimensional region on a page, whereas modeling all sides of the cubic object would indicate a three-dimensional approach to sculpture.

Underlying this analysis of historical and ontogenetic development is the assumption that similar principles of differentiation apply to both media, a position that seemed to find some support in the limited data on children’s modeling with clay, especially, in the finding of the frontally modeled and horizontally placed human figures (Brown, 1975, 1984). This view appeared to be quite compatible with the widely accepted notion that children’s persistent use of two-dimensional strategies in drawing and their considerable difficulty with representing a scene in perspective was a mark of their conceptual immaturity to be overcome with the acquisition of concrete operational and formal operational reasoning (Case, 1992; Dennis, 1992; Piaget & Inhelder, 1956; Milbrath, 1998; Porath, 1997).

However, the concept of differentiation in artistic development may find different forms of expression in different media, and a literal and premature application of what we may have learned from drawing development, a medium that lacks the third dimension, may be misleading. Perhaps, children have a basic understanding of the three-dimensional nature of the clay medium and what it can afford them and develop, early on, simple but three-dimensional representational concepts of the modeling task. The reasons children model the canonical frontal view of a human and place this figure in a horizontal orientation need to be explored, and it is premature to interpret such findings in terms of children’s limited three-dimensional concepts. Of course, it would be futile to expect children’s sculpture to meet the stringent requirement of modeling in the round, to conceive of the emerging figure from all its sides, which is a highly sophisticated approach developed in Greece in their large-scale sculptures around 400 bce. Modeling in the round requires the sculptor to consider all potential views as he or she works on a particular aspect or side. We might, however, consider more elementary aspects of three-dimensional representation, for example, the upright standing posture of a figure, and the child’s intention to model more than a single frontal side. Such a conception of three-dimensional representation in sculpture provides a new perspective on its development in children.

I now turn to a review of two studies that were designed to explore children’s representational concepts in the three-dimensional medium of playdough and clay, and to findings that provide some insight into the role of significant variables that affect the modeling of diverse objects. These studies were conducted at two different times, and both address the development of three-dimensional conceptions in children’s sculpture (Golomb, 1972, 1973, 1974, 2002; Golomb & McCormick, 1995).

The first study focused on the emergence of representational conceptions and the transition from a nonrepresentational attitude to the evolution of effective “models” of the human figure. The participants in this study were 300 American and Israeli children enrolled in preschool, kindergarten, and first grade (Golomb, 1972, 1974). Their ages ranged from 2 to 7 years. Children were seen individually and given a standard portion of playdough with the request to make a doll, a mommy, and a daddy. Following the modeling tasks, each child was also asked to make a drawing of a mommy and a daddy. These data and the extensive protocols that record each child’s behavior during the session provide us with a fairly clear picture of the early representational concepts that find expression in this medium.

The second study provides a more comprehensive account of children’s models of inanimate and animate objects and records the developmental changes that occur in the conceptions and executive skills of children throughout the childhood years. The participants were 109 children ranging in age from 4 to 13 years (Golomb, 2002; Golomb & McCormick, 1995). They were enrolled in preschool centers, kindergarten, and elementary-junior high schools through seventh grade. We also included an adult sample of 18 liberal arts students who were enrolled at an urban university. Approximately one half majored in the visual arts or took art
courses; the others were students of psychology. Each participant was seen individually over one to two sessions, and for each task was provided with a ball of clay 4 in. in diameter. A detailed record was made on all facets of the construction process with careful attention to the modeler’s actions and comments which were also tape recorded. The sculptures were preserved for examination, analysis, and scoring. This study aimed for a more detailed examination of the variables that affect the three-dimensional treatment of inanimate and animate objects, namely, complexity, symmetry, balance, and familiarity. Of these variables, complexity refers to the number and arrangement of differentiated elements that comprise an object and vary from a few simple to many diverse elements. Symmetry refers to the number of sides of the volumetric object that have the same or similar characteristics; these can vary from complete symmetry of the six sides of a cube to the partial symmetry of a four-footed animal whose two long sides are near symmetrical, to the bilateral symmetry of the human figure whose front and back sides are distinctly different. Balance a variable that is quite specific to the clay medium, refers to the construction of a freestanding sculpture, which requires some understanding of its mechanical properties and the technical difficulty of balancing an upright figure. Familiarity refers to knowledge of the object and the availability of practiced representational models. Thus, for example, familiarity with drawing might predispose a child who has not yet worked with clay to rely on a well-practiced graphic model (or schema) and transpose it to the clay medium.

We selected these variables to study their impact on modeling of diverse objects and to distinguish among the effects of the medium, instruction, and the child’s concept of the object. We were especially interested in delineating the developmental progression, whether it follows the dimensional pattern established for drawing, from one- to two- to three-dimensional use of lines most commonly assumed (Lark-Horowitz, Lewis, & Luca, 1967) or whether dimensionality plays a different role in this medium.

In order to provide an integrated review of the findings, the results from the two studies are combined into a single and unified report.

FROM PREREPRESENTATIONAL ACTIONS TO THE FIRST MODEL OF A HUMAN

When presented with clay or playdough, the youngest children in our sample (2.0–2.8) tend to hold the material passively in their hands, turn it aimlessly, or use it in conjunction with other toys, for example, sticking it on blocks or vehicles. Somewhat later (2.8–3.2) they tend to handle the matter more actively, squeezing, folding, poking, pinching, and flattening the playdough. Children seem to enjoy handling the soft and pliable material, but in the beginning their actions do not show a representational intention. Eventually, children discover the rolling motion, rolling the dough back and forth on the table top which yields the first visually coherent and pleasing unit in playdough (plasticene or clay). Without apparent planning, the child has created his first articulate shape in this medium, a stick or snakelike shape, and somewhat later he or she discovers how to make the more difficult rounded shape of a ball or irregularly shaped sphere. With the creation of these basic elements we note, in short succession, a sequence of prerepresentational interpretations that are characteristic of a transition from mere action on the medium to a first inkling of representational possibilities: Romancing, Imitative Actions, Reading Off, and Verbal Designation.

Romancing, the first of these representational devices, is the child’s attempt to respond to the request of an adult or an older child to explain what he or she has made. Lacking any real concept of what “making or modeling” might involve, Romancing is a kind of forced interpretation of an accidentally produced formation, and the ensuing fantasy narrative develops quite independently of form quality and is not yet tied to a perceptual likeness.
A somewhat more advanced form of prerepresentational interpretation can be seen in *Imitative Actions*, in which a piece of rounded playdough or clay is bounced in imitation of a ball, a blob is moved across a table in imitation of a car or an animal walking, and a flattened lump of clay is equated with making meat patties. Although these actions imply the object by imitating one of its functions, they do not aim to create a perceptual likeness. Romancing and imitative actions serve as short-lived substitutes for representation proper; they mark a transitional phase of development when functional representational concepts and models are as yet lacking.

*Reading Off* and *Verbal Designation* are somewhat more advanced forms of prerepresentational devices. Reading off is based on an incidental discovery of perceptual similarity between the blob of clay and a real object. It relates to the “looks” of the product and thus is less arbitrary and fanciful than Romancing. Verbal Designation is the most advanced of the prerepresentational devices invented by the child and serves as a useful aid to representation in that the parts, though not yet modeled, are verbally identified. In this case, the verbal identification of parts no longer depends on the matter’s chance appearance, and the figure, though still crude and minimally differentiated, is made to conform to the child’s original intention. Parts are now interpreted according to some principle such as location on a vertical axis: Top is head, center is tummy, and bottom is legs. Designation requires the notion of correspondence, and the discovery that the top of the bulky structure can stand for the upper part of a person is a significant step and further representational development depends on it.

**EARLY MODELS OF THE HUMAN FIGURE**

Following the earlier exploration of the medium and discovering what can be done with it, children develop three basic models of a human, and we can follow their evolution from a minimally differentiated figure to a more detailed model that bears some resemblance to the object it is meant to represent. These models include the *upright standing column*, a lengthened blob of dough, crudely shaped, held up in the air, or placed erect on the table; a *ball with facial features* poked out or separately formed; and the *layout model* which consists of an arrangement of separately formed parts that represent the facial features but can also include arms and legs (Figures 15.2A–15.2C). In relatively short time, depending on practice with the medium, these early models undergo differentiation: The upright standing one-unit column figure undergoes internal subdivision of its parts; the ball with facial features develops into a tadpole figure, consisting of a sphere and legs; and the layout model becomes a *graphic model* (Figures 15.3A–15.3D). The latter is a linear model which derives its concepts and procedures from drawing, in that it outlines the major body parts with thin strips of dough (clay), or creates the stick figure which is a variant of the graphic model.

From these early sculpting models we can infer the representational concepts that gave rise to them. As in drawing, they are characterized by generality, such that a global form can stand for another global entity, in this case a person. Verticality, uprightness, and facial features serve as defining attributes of the human figure. Considering the technical difficulty of working with playdough or clay, the determination to create a specific object and the ability to sustain this intention while shaping the mass is a significant achievement. It reveals the capacity to subordinate the modeling action and the child’s verbal designation of parts to a central, dominant representational intention. Indeed a profound distance exists between the prerepresentational child who merely acts on the medium and the child who makes a crude column with designated parts.

Progress in modeling can be seen in the differentiation of the parts of the human figure that are now distinctly modeled. We see continued developments in the three early models with
the upright standing figure composed of several solid parts, the horizontal figure constructed of solid rounded or flattened parts, and the more detailed graphic outline figures (Figures 15.4A–15.4C).

The primitive one-unit figure splits apart and now includes, at the very least, a separately formed head, body, and legs, though it is often armless and faceless. The horizontal figure represents a compromise formation between the three-dimensional upright standing figure and the flat two-dimensional model of graphic origin. Once it develops a differentiated trunk and legs, its appearance varies from the crude and slightly lumpy construction of younger children.
FIG. 15.3. Beginning differentiation in the early models of the human figure. A. Upright standing columns composed of two parts: head and body. Boy, age 4.0, girl, age 3.8. B. Tadpole figure composed of head and limbs. Girl, age 4.4. C. Graphic model. The major parts are outlined with thin strips of playdough or clay. Girl, age 5.9. D. Stick figure, a variant of the graphic model. Figure comprises a head with prominent facial features, body, arms, and fingers. Girl, age 4.9.
FIG. 15.3. Continued
FIG. 15.4. Differentiated models of the human figure. A. Upright standing Man, Woman, and Figure Bending. Boy, age 7.6. B. Horizontally placed figure composed of head, eyes, body, arms, and fingers, legs, and feet. Boy, age 5.9. C. Graphic models of the human figure composed of a solid head, outlined body, arms, legs, and fingers. Girl, age 5.9.
to the skillfully and symmetrical production of the more experienced children. The graphic model in playdough, the descendant of the earlier layout model and of the graphic tadpole figure, persists and is perfected. The figure, outlined with strips of dough, closely follows the characteristics of the drawn line. These figures demonstrate careful planning and measuring the length of sides. Overall, the tendency is toward greater differentiation of the parts, modeling arms and hands, legs and feet, and distinguishing between the upper and the lower torso.

In each of the three sculpting models the figure passed through a process of orderly differentiation determined by the properties of the medium and the specific model employed. The main emphasis is on the differentiation of forms and the creation of balanced and symmetrical structures. Once this has been achieved, the overall proportions of the figure improve gradually and attention extends beyond the frontal view. Here it is important to note that frontality carries special weight in the representation of the human figure. In the case of the human body, the frontal aspects are the most important and informative ones; they define the character of the person, gender, affect and intentionality, direction of movement, and social communication. In sculpture, as in real life, humans relate most directly through their senses, which favor the representation of the canonical frontal view, and this view receives the most attention from our young sculptors. In modeling, unlike drawing, the human figure is often faceless and armless, whereas the trunk is more often included, even in the models of young children. Overall, in sculpture we find less attention to detail and little ornamentation.

Models are temporary solutions, and the adoption of a model does not imply its continued use. On the contrary, the child who spends a great deal of time with this medium tends to discard the less suitable model and invents other means of representation. This is especially evident in the graphic model which is unstable, cannot be lifted without serious dislocation of its parts, and requires patience and fine motor coordination. For these reasons the graphic model tends to
be exchanged for more solidly modeled forms that are more suited to the task at hand. We also note significant individual differences, with some 3-year-olds creating advanced sculptures, whereas some 4- and 5-year-olds produce undifferentiated tadpoles. Above all, models should be considered as tentative solutions, temporary and flexible formulae for representation and not printouts of an underlying conceptual schema, a finding which is well documented in the next study that examines children’s models on diverse tasks.

CHILDREN’S REPRESENTATION OF INANIMATE, HUMAN, AND ANIMAL FIGURES IN CLAY

So far we have focused on modeling the human figure in young children. We now turn our attention to the modeling conceptions and skills of older children engaged in a range of different tasks. The aim of this expanded study is twofold: (a) to determine the order in which representational concepts emerge in the medium of clay and (b) to clarify the impact of selected task variables on the child’s ability to represent objects in a three-dimensional manner.2

The order of stages or phases in the development of three-dimensional representation is primarily addressed in terms of the posture of the figure (upright standing or placed horizontally on the table), the child’s attention to multiple sides of the modeled object, and the manner in which the medium is used, for example, by hollowing out and creating protrusions, thus suggesting the inside as well as the outside of the figure. We wished to examine the hypothesis that three-dimensional development in sculpture follows the same progression conventionally established for drawing or, alternatively, that children exhibit from the beginning a basic three-dimensional representational conception of the object that undergoes differentiation with development.

In the study of task variables, we payed special attention to the difficulty associated with modeling specific objects, notably the human figure. Previous studies had noted similarities in the drawing and modeling of a person, which seemed to suggest the dominance of children’s two-dimensional strategies of representation in both media. This interpretation ignored the uniquely difficult problem of representing the human figure in an upright fashion without recourse to an armature (a kind of wire scaffold). A contrasting hypothesis that considered the horizontal posture of the modeled human figure a function of this particular task and its medium was not considered, and this issue is raised in our second study where we consider the previously mentioned variables of complexity, symmetry, balance, and familiarity.

We chose eight tasks that varied along these selected dimensions. The tasks were modeling a Cup, Table, Man, Woman, Person Bending to Pick Up a Ball, Dog, Cow, and Turtle. According to our analysis of potential task effects, objects that are familiar to the child, simple in construction, easily balanced, and have symmetry of sides, are the most likely candidates for successful three-dimensional modeling. These conditions apply most fully to the Cup and the Table. Animals are more complex in structure and comprise a larger number of differentiated parts that require skillful planning. They are, however, relatively stable (balanced) in structure with bodies resting on four legs placed perpendicular to the horizontal axis of the body, which facilitates an upright posture. Animals are also quite symmetrical, with two major sides, the long sides, near-duplicates of each other. Instead of a dominant canonical view that favors a single side, which is the case for the human, in four-footed animals there is competition between frontal and side views (Golomb & Farmer, 1983; Ives & Rovet, 1979) which calls

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2It is important to keep in mind the distinction between working with mass and a three-dimensional conception of a figure that is to be modeled on all sides and placed standing upright. The fact of working in a three-dimensional medium does not by itself guarantee a three-dimensional conception and/or production.
attention to more than a single side or view. In terms of familiarity, most children are familiar with the animals we selected, either from direct experience or from picture books, with dogs and turtles somewhat more familiar to urban children than cows that are mostly known from picture books.

Finally, the human figure, though the most familiar object, is also the most complex one in this series of tasks. Its structure is organized along the vertical axis, and its relatively disproportionate parts which include head, neck, body, arms and hands, legs and feet make it difficult to balance. In contrast to animals, the dominant sides of the human figure are quite distinct with marked differences between its front and its back sides. The human body calls for the vertical alignment of a large torso with two spindly legs which creates problems of balance for a standing figure, thus favoring the horizontal position. However, specification of a theme that makes posture more salient as in the Person Bending task may facilitate uprightness and attention to multiple sides.

The results of our findings highlight the importance of the variables we had identified and reveal that even young preschoolers, the 4-year-olds, entertain an implicitly three-dimensional conception of the objects they modeled.

UPRIGHTNESS

On the first two tasks, that were symmetrical in structure, familiar, balanced, and relatively simple in the construction of its parts, all the 4-year-olds, almost without exception, modeled the cup and the table in a three-dimensional upright standing fashion. Although the younger children modeled their objects more crudely than the older children, the three-dimensional attributes of uprightness and a hollowed-out center for the cup was clearly in evidence (Figure 15.5).

The great majority of animal figures were also modeled standing upright and exceeded the number of erect standing human figures. Among the human figures, the Person Bending to

FIG. 15.5. Cup modeled in clay by 4, 5, 7 and 10-year-old children.
Pick up the Ball was modeled more frequently in an upright posture than the Man or Woman, revealing sensitivity to the nature of the topic or theme. Findings for the total sample of children indicate that 57% attempted to model the Man and Woman figures standing which is comparable to the 50% of upright humans modeled by the adult sample. For the children this figure increased to 76% for the Person Bending (adults 100%), and peaked at 83% for the animal tasks (adults 100%).

An interesting age-related factor emerged on further analysis of the human figure task. Upright intention decreased with age and with the complexity of the figure, with preschoolers having the highest upright intention (71%), followed by the kindergarteners (68%), with all others trailing far behind. We found a significant relationship between the posture of the human figures and the degree of their differentiation (complexity). As the figure increases in detail, children find it harder to make it standing, thus resorting to a horizontal posture. These findings suggest that at an early stage in the modeling of young children, 4- and 5-year-olds employ a primitive three-dimensional strategy which yields crudely modeled upright standing humans.

Once the figure becomes more differentiated in the number and proportions of its parts, the spindly legs cannot support the head, neck, and torso, at which point horizontality provides a reasonable solution to the task the child has set herself. The adults in our sample face the same technical problem and they adopt a similar solution in regard to posture.

In contrast to the human figures, animal figures, their horizontally placed body resting on four legs that provide a stable base, were mostly modeled in an upright fashion.

MODELING OF SIDES AND DIMENSIONALITY SCORES

In addition to upright posture, modeling of sides comprised another aspect of our dimensionality assessment. The findings from the human and animal tasks indicate that even our youngest children in this study, the 4-year-olds, were inclined to model more than a single side of an object, especially in the case of the animals. Overall, the tendency was to create an upright standing animal, its head and body orientation clearly differentiated such that the head was modeled frontally and the body in side view. Attention was also payed to the underside of the body and the shaping of the legs. Children worked attentively on up to six sides of an animal, and in the process of modeling they turned the figure upside down and to the side to create the different parts.

Dimensionality is a composite measure that includes number of sides modeled, uprightness, and procedures such as hollowing out, creating protrusions, indicating parts located inside the body (open mouth, tongue, teeth, earlobes) or underneath clothing. In general, dimensionality scores increased with age, with Animal figures gaining higher scores than the humans and the Person Bending gaining higher scores than the Man and Woman figures. This age-related increase in children’s scores tends to level off at ages 8 or 9, but scores again increase for the adult sample. It is worth noting that despite the leveling off in dimensionality scores, and the somewhat crude appearance of the majority of the sculptures, the attitude of the older children differed from that of the younger ones. This was noticeable in their persistence with the task, in the repeated attempts to revise their model often three or four times, and in their efforts to smoothen the appearance of the clay figure.

FIGURAL DIFFERENTIATION AND REPRESENTATIONAL MODELS

As with the findings from our earlier reported study on the evolution of the modeled human figure, figural differentiation was mostly age related. The majority of our participants created three-dimensional models that were held upright, free standing, or standing with some support.
Variability in style and degree of differentiation was common in each age group and characterizes children’s performance across all tasks. Thus, for example, children who employed a graphic model on the human sculpture switched to solidly shaped upright standing animals. Different strategies might be employed on the three animal tasks which suggests the exploratory and experimental nature of children’s approach to modeling rather than the print-out of an underlying conceptual model (Figures 15.6A and 15.6B; Figures 15.7A and 15.7B).

Differentiation is the hallmark of development and with experience children create more detailed figures, introduce measurement, guide their own progress, make corrections, and gain greater satisfaction from the end product. In the case of the human figure we note a more differentiated torso; shoulders; the inclusion of a neck; and clothing such as shirts with sleeves, flaring skirt or pants, an occasional tie, hat, belt, earrings, mustache, beard, zipper, shoelaces, and heels (Figures 15.8A and 15.8B).

As the human figures gains in detail it is mostly placed horizontally. Although the sculptures continue to be modeled quite crudely, older children attempt to introduce motion and gesture, attend to proportions, and convey more information. The technique of the older children is often not better than that of younger ones; but their attitude toward the task, the serious reflection, and the concentrated time devoted to their efforts distinguish between them. One of the main differences in the work of our children and adults concerns the sexual differentiation of the human figure. In the case of children, it was rare to find sexually distinctly modeled humans; but in the adult sample those differences became very marked by the inclusion of breasts, penis, buttocks, broader shoulders for the male, thinner waists and broader hips for the female (Figures 15.10 and 15.11B).

Differentiation of the animal models can be seen in collars on the dog, bells, horns, and udders on the cow, and spots on the turtle. There is also more attention to size differences, with the dog smaller than the cow, and attempts to introduce actions (Figures 15.9A–15.9C). Along with planning, reflection and increased skill comes a more critical awareness and a negative evaluation of the final product.

Construction style, that is, the manner in which children compose their figures, involves two strategies: internal subdivision of the lump of clay by pinching, pulling, and subtracting clay from a single unit or addition of separately modeled parts. In our sample, the additive method was more frequently employed than internal subdivision, and it was unrelated to age and differentiation of the figure and also independent of the sequence of construction. Regarding the sequence of ordering the parts during construction, the majority of humans were composed in a top-to-bottom sequence. Next came the inverse order of bottom to top that in many cases facilitated the figure’s upright stance, followed by a sequence that modeled the body first. In the case of animal figures, the body was always the first part modeled, indicating that ordering of the body parts was generally flexible and adapted to the nature of the task. Overall, figures in clay were constructed with utmost simplicity, devoid of detail and adornment, often faceless, but most commonly including the trunk.

Modeling a figure in clay seems to make its own demands, and although facial features are rarely omitted in the drawn human figure where they seem to constitute the figure’s defining characteristic, the prevalence of faceless figures in clay was high, with approximately one third of the humans lacking facial features. In animal figures these omissions reached 40%.

SUMMING UP

Our major questions concerned the development of three-dimensional concepts in modeling with clay and the order in which dimensional strategies evolve. Our findings indicate that when children become representational in this medium, approximately during their fourth or fifth year, they exhibit some basic three-dimensional understanding as indicated by their attention
FIG. 15.6. Distinctive modeling of humans and animals. Girl, age 9.7. A. Humans are modeled as stick figures: the Woman with a prominent hairdo, the man with short hair, and the Person Bending with a bent back and shoulders. B. Animals are modeled on all sides and standing.
FIG. 15.7. Exploration of different animal models. A. The Dog, standing upright, is modeled from all sides, with differentiated front and side views; the Cow, placed horizontally, is constructed quite solidly, equipped with two legs, its head, horns, and facial features aligned with the side view; the two-legged Turtle is flattened, its head turned frontally and aligned with its body. Girl, age 5.7. B. Dog and Cow, differentiated by their size, are modeled upright and are quite similar in their construction of head, body, and legs. The Turtle is modeled with a top-view in mind that emphasizes head, body-shell with prominent markings, and a tail; legs are invisible. Girl, age 6.8.
FIG. 15.8A & B. Human figures with differentiated torso and clothing that suggest the underlying body. Girls, ages 10.9 and 10.10.

(Continued)
FIG. 15.9. Continued

FIG. 15.10. The human figure of the adult artists shows greater sexual differentiation.
FIG. 15.11. Diverse models of the human figure created by young adults. A. Man and Woman modeled frontally and placed horizontally on the table. Female, age 19. B. Man, Woman, and Person Bending in a sitting position that circumvents the difficulty of modeling a standing figure. Male, age 25.
to multiple sides, to the volume of a figure and its upright stance. The flattened and horizontally placed human figures appear to be a somewhat later development, a function of familiarity with this difficult medium and the ambition to create a more complex and differentiated figure. Even then the tendency to work horizontally on the figure’s frontal side is counteracted on the Person Bending and Animal tasks and override it. It is most striking to observe the differential treatment which the same child applies to our different tasks (Figures 15.6A and 15.6B; Figure 15.7A). Thus, the previously held notion that the singular attention to frontal aspects represents the child’s conceptual limitations regarding dimensionality no longer seems tenable. From the very beginning of their work with clay children develop representational concepts that are incipiently three-dimensional in nature, and then refine them with continued practice. When their ambition to create a better likeness to the object, which requires the inclusion of a larger number of body parts, militates against the use of an upright posture, they resort to what appear to be two-dimensional strategies: flattening some of the forms in order to better attach them and placing the figure horizontally on the table.

It is perhaps surprising that the process of differentiation tends to level off during the middle childhood years. Even the sculptures of our educated adult sample shows this leveling off effect, with 50% of the humans placed horizontally and attention focused on the frontal region of the sculpture (Figures 15.10 and 15.11A). This leveling off effect is similar to what we find in drawing, and only in cases of continued practice and the motivation to acquire new representational skills do the drawings of adolescents and adults progress beyond the typical childhood drawings. Similar factors may underlie the arrest of modeling skills.

We found very little support for the view that considers the early and primitive representations merely as expressions of cognitive immaturity, and much evidence that the young artist struggles with problems older children must also confront: how to create a satisfying representation in a medium that puts a premium on balance, uprightness, and the modeling of multiple sides, all of which require great skill and practice. Given children’s limited experience with modeling in clay and their lack of knowledge of the cultural traditions and practices that prevail in this medium, their early somewhat primitive constructions are to be expected. Early beginnings tend toward simplicity and economy of forms that result in global representations.

In addition to mapping representational development in clay, our findings document some of the limitations that are inherent in the transposition of interpretive models derived from the domain of drawing and applied to sculpture. This statement receives additional support from cross-cultural studies that explore the drawings and sculptures of preliterate youngsters.

**CROSS-CULTURAL STUDIES**

In order to establish the generality of findings from research conducted in Western industrialized societies, investigators look for additional data that will support their interpretation or call for a modification of their theory. Thus, the search is for cross-cultural research with “naive” subjects drawn from a preliterate society, not known for its artistic traditions. The search for untrained, spontaneous beginnings of art making has led many investigators to collect drawings from children and adults who live in non-Western, unschooled communities. Studies that include modeling are extremely rare and, with but few exceptions, incidental to the quest for drawing. One often quoted study, conducted during the years 1934 to 1937 in Northern Ghana by the anthropologist Meyer Fortes who, in collaboration with his wife, collected drawings from unschooled Tallensi children and adults (Fortes, 1940, 1981). Modeling was not the focus of this research, but Fortes commented on the three-dimensional nature of clay figures which played a significant role in the life of the children. He noted that children’s favorite pastime
was modeling small clay figures of people, horses, cattle, and other animals, 3 to 6 in. in height. Boys and girls played extensively with their clay figures which varied in quality, but the best among them were realistic representations, endowed with facial features but lacking ears. The human figures clearly indicated sex differences, modeling the females with breasts, an occasionally enlarged belly signifying pregnancy, and a slit between the legs to indicate the vulva which was decorated with a tuft of hair snipped from the artist’s head. The figures of men were not given genitals; however, an enlarged scrotum was occasionally represented. Figures of chiefs mounted on horses were always dressed in bits of cloth and equipped with a hat modeled from clay. Cattle were modeled with horns; and bulls and stallions with scrota (Fortes, 1981).

In a recent study designed to collect drawings as well as sculptures from a preliterate community, Sven and Ingrid Andersson (1997) requested drawings and sculptures from children and adolescents living in a remote area of Northern Namibia, near Ruacana and the Epupa Falls at the Kunene River. The youngsters, members of the Himba tribe, did not attend school and had no previous access to paper and pencils. In a video made by the Anderssons, we meet the participants of their study and observe their approach to drawing and modeling. We note that the adolescent girls and young women wear their hair in an elaborate and highly ornamental style, adorn their neck and bare-breasted chests with decorative pendants and necklaces, and their wrists with bracelets, evidence of a developed aesthetic sense. The adolescent boys shave their hair on both sides of the skull and wear their hair plaited and hanging down the back. They also wear some necklaces and straps around the ankles and wrists, but compared to the girls, the males use fewer ornamental devices.

Provided with paper and holding the pencil gingerly, the youngsters take turns drawing small circles, lines, and figures in an inverted orientation to the drawer. The figures resemble stick figures, tadpoles, open trunk figures, and two-dimensional people with or without arms; the drawings also include circular enclosures that are identified as house and animal shed. With the help of an assistant who serves as translator, all the drawn objects are identified. Most participants draw with intense concentration, taking their time as they create the simple variants of the basic human and animal figures.

The second set of data were collected from members of the Himba tribe living at the Epupa Falls. In this study, the Anderssons first supply their subjects with clay and ask them to model a person or an animal. All the participants hold the clay in their hands as they model and shape their sculpture in the round, turning, pulling, pushing, and pinching the material to create an upright standing, quite naturalistic looking three-dimensional figure. Some create an animal quickly and very competently, modeling head, body, four legs, ears, and a curled up tail. The object is modeled by internal subdivision of its parts, and the animal is standing. The girls in this group tend to model their humans with a long neck and breasts, emphasizing hairdo and buttocks, and upright posture. The ease and confidence with which they model their figures suggest that the artist has some familiarity with clay modeling. Talent and individual differences also play a role that can be seen when we compare the work of highly adept modelers with that of others who are less skillful and create more crudely shaped figures. Following modeling with clay, the participants are provided with paper and pencils and asked to draw. The forms, figures, and configurations that emerge are very similar to the ones drawn by the first group of subjects. By comparison with their ease of modeling clay figures, the youngsters appear to be deeply immersed in the drawing efforts, seem less relaxed, and experience more difficulty. The differences between the drawn and the sculpted models of humans and animals highlight the significance of the medium of representation, which yields the abstract linear quality of the pencil drawing and the three-dimensional more naturalistic representation of clay figures, radically different constructions on the same theme. The different strategies are ingenious problem-solving approaches to the problem of representation.
NOTES ON DRAWN AND SCULPTED FIGURES

In this chapter I focused on the development of sculpture and my references to drawing and its developmental trajectories have been brief. In order to apprehend the impact of the medium on the form representations may take, one also needs to take account of some of the dominant theoretical conceptions regarding the nature of children’s drawings.

Dating back to Piaget’s account of drawing development (1928, 1929; Piaget & Inhelder, 1956, 1971) and under the influence of Luquet’s taxonomy of child art (Luquet, 1913, 1927), Piaget viewed drawing developmental in close parallel to logicospatial reasoning. Thus, drawings provided an index of the child’s conceptual development captured in the often-heard phrase “a child draws what he knows not sees.” According to Piaget, prior to the emergence of concrete operational thought this knowledge is incomplete, deficient, and centered on some of the most prominent characteristics of the object. Unable to consider all essential aspects of the object, and failing to organize the elements into a coherent representation, the preoperational child omits and misplaces body parts and creates distorted and ill-proportionate figures. With the acquisition of Euclidean and projective concepts of measurement and the ability to consider the viewpoint of the observer, the concrete and formal operational child overcomes the earlier conceptual limitations and handicaps, and consequently the drawings are supposed to exhibit greater fidelity to the true appearance of objects and scenes.

Although Piaget was not interested in children’s artistic development and viewed the data on drawing within the context of cognitive development and as support for his genetic epistemological theory, his writings have had a significant influence on researchers studying child art. Of course, his position has not gone unchallenged, and new data and their interpretation have contested his proposition that conceptual deficits account for the typical childhood drawings (Cox, 1992; Freeman, 1980; Freeman & Cox, 1985; Golomb, 1973, 2002, 2003; Pariser, 1995; Willats, 1997; Winner, 1996). There is now considerable evidence that the nature of the task, the medium, theme, and instruction have a considerable effect on the child’s representation; and the notion of a central, unified mental image that underpins drawing is seriously questioned. Thus, for example, omission of the trunk in drawing but its inclusion in modeling cannot indicate conceptual confusion on one hand and competence on the other. Furthermore, studies that document drawing development during the late childhood and adolescent years clearly indicate that the hypothesized progression from intellectual realism to visual realism, from a knowledge-based drawing that is subjective and somewhat distorted to one that approaches optical realism, has not been supported. Without explicit training, neither children nor adults reach this level of proficiency in the projective rendering of space, suggesting that art is a domain where visual thinking and problem solving follows its own rule system which does not simply mirror the domain of logical reasoning. However, the elegance of a more unified conception of intellectual and artistic development continues to inspire students of child art, and Piaget’s overarching conception of drawing development as a progression toward realism in art continues to find adherents (Case, 1992; Case & Okamoto, 1996; Dennis, 1992; Milbrath, 1998; Morra, 1995; Morra, Moizo, & Scopesi, 1988; Porath, 1997).

The data on drawing and modeling point to the existence of significant differences in the models that evolve in both media, in the construction of inanimate and animate objects, and further indicate that realism in art is not a spontaneously achieved competence but subject to cultural norms, training, talent, and motivation. Differentiation of form is a fundamental principle that underlies development in the arts, but the specific forms its expression takes is influenced by the nature of the medium and its specific tools and affordances.

In both two- and three-dimensional media, development begins with global undifferentiated forms that represent their object in a minimal and highly economical fashion, a model consisting
of a basic unit which represents the whole person. As the figure undergoes further differentiation of its parts, frontality dominates in drawing with its emphasis on linear elements that provide clear contours and significant detail useful for indicating a subject’s age, gender, activity, and relationships. In modeling, other aspects become dominant such as uprightness, the order of construction, dimensional treatment, and an earlier attention to multiple sides. In contrast to drawing, clay is a revisable medium such that the figure can be taken apart, matter can be added or subtracted, and the construction process can be reversed. In modeling we note an emphasis on the overall structure of the figure and its major components at the expense of facial features, detail, and ornamentation, a style that is reminiscent of certain historical antecedents, the prehistoric Venus statuettes, the differently modeled beautiful Cycladic figures of 2700–2000 BCE, and more recently the modern sculptures of Arp, Brancusi, Moore, and others.

Finally, our study of children’s modeling militates against a notion of a single underlying mental image or schema and provides evidence for considerable flexibility in the child’s creation of two- and three-dimensional figures. Two-dimensional drawings, mixed models that combine the side view of an animal with its frontally depicted head, omission of features and body parts, emphasis on frontality and many other so-called faults in children’s drawings need not indicate conceptual confusion or memory constraints on one hand and competence on the other. The answer is to be found in the evolution of artistic thinking, sensitivity to the possibilities and constraints of each medium, and a spontaneous awareness that a representation is not a literal imitation of an object.

CONCLUDING COMMENTS

The studies reported in this chapter provide us with a first systematic account of developmental trends in modeling and the evolution of children’s three-dimensional conceptions in playdough and clay. We paid special attention to the nature of the medium, its affordances and constraints, and the effects of such task variables as complexity, symmetry, balance, and familiarity in the construction of a sculpture.

Contrary to the widespread assumption that the development in sculpture would mirror the progression in drawing from one- to two-dimensional representation and, eventually, culminates with a three-dimensional portrayal, our data indicate that basic three-dimensional conceptions emerge early on as seen in the child’s intention to model an upright standing figure and his or her inclination to work, in addition to the frontal part, on multiple sides. With increasing practice in modeling, the differentiated human figure comprised of separately modeled parts tends toward horizontal placement in contrast to the upright standing animal figures. These different procedures highlight the effects of the nature of the tasks and the facilitating role of symmetry and balance in the construction of an object. The vertically aligned human figure composed of such major parts as head, neck, body, and limbs poses the problem of how to stabilize a top-heavy upper part on slender legs, whereas the symmetry of the horizontally aligned animal body and its four legs facilitates the modeling of a balanced and upright standing structure.

The significant differences between the competence of our youngsters modeling multiple sides and the skills of the prehistoric artists who sculpted their ivory statuettes in the round should not mask the similarity in their three-dimensional representational conceptions which emerges early in our young participants, suggestive of a basic competence in this domain. The findings from the cross-cultural studies we reviewed and our comparison of the diverse styles children evolve in drawing and modeling suggest that we are dealing with representational models that are characteristic of the different affordances of the two- and three-dimensional media and do not, by themselves and taken in isolation, reflect the conceptual limitations of the
artist. Altogether, children’s use of different models on diverse tasks indicates a considerable flexibility of representational schemas in both drawing and modeling, a finding that also calls for a reevaluation of stage conceptions in drawing as a progression toward a single endpoint, namely, optical realism in art.

Of course, the early and primitive efforts of young children’s modeling are only the beginnings of a long route toward the accomplishments of the skilled artist, and our study documents only limited phases of this potential development. Our current findings call for a more extensive sets of studies on modeling that consider major aspects not addressed so far: the role of talent, motivation, practice, training, and individual differences. The usual short-term interventions that comprise most of our research are inadequate for a genuine understanding of children’s representational conceptions, skill level, motivation, and ability to learn from their experience and from instructions. The work of children and adolescents ought to be studied in a more studio-like environment where professional assistance is made available, where work is sustained over several sessions and the young artist’s conceptions can evolve over time. Of course, art educators are familiar with such an approach, and under facilitating conditions it ought to be possible to conduct research that meets the requirements of systematic observations and the necessary experimental and statistical controls of scientific inquiry.

REFERENCES


