THE CHILD'S CONCEPT OF OBESITY

by

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Chapter 1

INTRODUCTION

Obesity is one of the major health problems in America today. The evidence indicates that obesity decreases one's life expectancy, primarily through complications of diabetes, hypertension, and coronary artery disease (Bray, 1978; Mancini, Lewis & Contaldo, 1979). Because a close correspondence exists between adult obesity and childhood obesity (Garn & Clark, 1976; Feig, 1980), many people are becoming convinced that the time to intervene to prevent obesity is when the concept is developing, not after a person has become obese. According to Winick (1975), both professional and lay people must now work together to prevent the problem of obesity in children from becoming more widespread than it is. Material written for parents of obese children should help parents understand the implications of obesity in childhood. At the same time, such materials provide parents with ways of helping their children cope with the controlling of his or her weight (Wolff & Lipe, 1978; Fisch, Bilek & Wistrom, 1975).

The obese young child cannot be expected to outgrow "baby fat." Fisch et al. (1975) found that children who are overweight at age four, are very likely to be overweight at age seven. An earlier study (Asher, 1966) showed a strong relationship between being overweight in infancy and the chance of being overweight at 3 to 5 years, and at 10 to 15 years of age. Feig (1980) reports that it is estimated

that up to 40 percent of school age children in the United States are overweight, and that 50 to 85 percent of these overweight children will become obese adults. Other studies have also indicated that overweight children are very apt to become overweight adults (Ashwell, 1975; Brook, 1974; Hirsch, 1975). We must, then, begin to examine the problem of obesity before adulthood. A better time to begin finding solutions to the problem appears to be in childhood when the children are developing the thoughts and habits connected with eating. One aspect of childhood obesity that can be studied is the development of cognitive concepts of the causes of obesity.

Present Study

The present study was designed to investigate how non-obese children develop a concept of human fatness. Using the cognitive aspects of developmental theory, this investigation was planned to determine whether or not children's thoughts and knowledge about the size of people develop along the same developmental levels as other cognitive concepts. The framework of the study was based upon the Piagetian cognitive developmental theory, specifically the cognitive tasks of identity and causality were used. A major aspect of this study was the expansion of Piagetian theoretical literature to include these areas of inquiry. Equally important, however, are the implications of the results for those people working with young children. Accordingly, the relationships between the concept of obesity and social identity, social causality, physical conservation, and physical causality were examined.

Review of Literature

Although obesity seems to be a popular area of study, most existing studies deal with the etiology or the treatment of the problem. The effects of childhood obesity on peer attitudes have been examined by a few researchers, who found that young children hold strong negative stereotypes concerning obesity. Children as early as kindergarten age begin to express negative attitudes towards obese peers (Learner & Gellert, 1969). Richardson, Goodman, Hastorf and Dornbusch (1961) found that the negative attitudes toward obese children were stronger than toward children with handicaps such as missing limbs or handicaps requiring wheelchairs or braces. When the children were asked to choose pictures of children with various handicaps in the order with which they would like to play, the obese child was chosen last. Several studies using a similar preference format indicate that obese children themselves also hold these negative attitudes toward obesity (Lerner & Korn, 1972; Young & Audzej, 1979; Staffiere, 1967; Richardson et al., 1961; Goodman, Dornbusch, Richardson & Hastorf, 1963). Sallade (1973) found that obese children as young as third grade have poorer self concepts than age mates of normal weight. These findings, along with those of the preference studies, have important implications for the development and adjustment of the obese child.

Past research in the area of obesity has not examined how the child learns about obesity. A search of the literature, in fact, revealed no research which dealt with how the concept of obesity is developed in

the child. The purpose of this study was, therefore, to investigate how young non-obese children came to understand the concept of obesity.

Theoretical Approaches

Concept Development

Concepts are, for the most part, ideas and feelings that the individual acquires through complex combinations of all his experiences from birth (Piaget, 1950, 1965a).

Concept development has been investigated through a number of different theoretical approaches. Some theories that have been used to deal with concept development are behaviorial (especially as prompted by Skinner), component (Baron, 1973), and Piagetian. Learning theorists, who are representative of one type of behaviorism, include a wide range of personalities who advocate a variety of methods for investigating the development of concepts. There is no single learning theory of concept development. A number of psychologists have examined the issue of how humans learn in different ways.

One approach to cognitive development involves information processing (Baylor & Gascon, 1974; Estes, 1978). This approach proposes that each stage of cognitive development reflects a different information processing routine and that each routine can be examined separately. This approach frequently makes no assumptions about the thought processes necessary to promote observed actions (Keats, Collis, & Halford, 1978), as is often true of a cognitive approach.

Some researchers have used either an information processing approach or an experimental learning approach to examine small areas of

learning, especially in the areas of human perception and memory, rather than examining the total thought process involved in learning (Gibson, 1969; Baum, 1954; Welch, 1947; Furby, 1972). Extensive surveys of developmental research associated with perceptual and behavioral theories have been made by Estes (1970), Stevenson (1972), and Reese (1976).

Hull (1943), using the ideas of stimulus-response connection stated that when the environmental response to a particular stimulus is consistently followed by reward or reinforcement, that response will remain and will form the basis for concept learning. This basic form of the S-R reaction has been examined by numerous psychologists, each looking at the specific aspect of learning that was of most interest to him. There are many studies on topics such as short-term memory, attention and concept training techniques which add to the body of psychological knowledge concerning the development of concepts (Ross & Kerst, 1978; Hagen, Jorgeward, & Kail, 1975; Appel, Cooper, McCarrell, Sim-knight, Yussen, & Flavell, 1972; Borke, 1975). According to Elkind (1969), the main difference that separates experimental psychologists and Piagetian theorists in their explanations of concept development is the type of environmental variability each stresses. The Piagetian method of examining how concepts develop entails a greater amount of theoretical background than either of the methods already mentioned. It begins with a biological base and extends into all areas of thinking.

According to Jean Piaget's cognitive theory of intellectual development, thinking is an active process whereby individuals organize their perceptions of the world from their environment. The individuals use their thoughts and choices to influence later actions and beliefs. This process of building foundations is basic to the theory. According to this theory, older children do not simply know more than younger children, but actually think in qualitatively different ways. An important aspect of Piagetian theory is that all children go through the same sequence of developmental stages, although the rate of progress through the stages may vary depending on the particular culture in which the child is living.

Gagne (1968) is a representative of the experimental approach to learning. This approach considers concept attainment to be the mastering of all of the steps leading to the desired concept. These steps can be empirically measured and can, according to researchers who use this plan, be taught to an individual at any age (Brainerd, 1976, 1978; Rosenthal & Zimmerman, 1972).

Closely related to the ideas in Gagne's learning theory of concept development is what Baron (1973) referred to as component theory. According to this theory, a concept is considered to be an acquired habitual plan which can be analyzed into subplans. These subplans can be combined in a variety of ways leading to the attainment of different concepts depending on the individual's experiences. Many of the features of component theory parallel the features of Piaget's theory of concept development. Specifically, component theory is an extension

of Piaget's idea of assimilation of novel situations to old schemes (Baron, 1973) in that component theory assumes that the individual component or subplan may be used independently to answer small questions before all of the necessary components are acquired for larger concepts.

These three theories (experimental, component, and Piagetian) are similar in that they all deal with many of the same issues; however, the emphases they take are varied. Gagne (1968) studied specific concepts that can be demonstrated by behavioral tasks, component theories are interested in teaching and then examining a base of components to promote further learning, and Piagetian theorists deal with the stages and structures that are formed by the interrelationships of all of the information the individual has experienced. All of these theories add important knowledge to our understanding of how children learn to think and the ways that the process of learning can be enhanced.

Flavell's (1970) discussion of concept development examined the topic from many perspectives, and included both criticism and support for a variety of them. It was clear from Flavell's review that there is no single method of studying concept development. The present study uses Piagetian theory to provide an introduction to the understanding of how young children develop a logical concept of obesity. Piagetian theory provides a framework for examining what children think about what causes people to become fat as well as looking at the

stages involved in the process of the development of this understanding about the concept of obesity. No other theory provides this framework.

Social Cognition: Developmental Studies. There have been few studies dealing with how young children develop specific concepts in some areas. These studies extend Piaget's cognitive-developmental theory to explain certain aspects of the child's physical behavior. Until recently, most of the research done with relation to children's responses was done by behaviorists, and the behavior examined was overt behavior. Very few investigators have examined the social aspects of the child's behavior using a developmental format. One explanation for the scarcity of examinations of the developmental scheme to social events and attitudes causing behavior is that the scientific method of inquiry is difficult to use with people. Physical objects behave in a more predictable manner and are not as sensitive to current social contexts as are people (Glick & Clarke-Stewart, 1978). Only recently has increased attention and effort been given to examining the less easily seen and measured relationship between cognitive development and social activity. Some of these studies have dealt with the positive influence of social events on cognitive learning (Kohn & Rosman, 1974; Lambert & Nicoll, 1977; McKinney, Mason, Perkerson, & Clifford, 1975), and more recently, have dealt with the influence of cognitive development on social adaptation (Barret & Yarrow, 1977; Hoffman, 1975; Johnson, 1975; Miller & Brownell, 1975; Emmerich, Cocking & Sigel, 1979).

These studies have all added to information about how to study social aspects of behavior.

Undertaking the task of examining the development of a single concept throughout childhood is difficult and few have attempted it. Bernstein and Cowan (1975) used Piagetian tasks to relate the concept of physical causality (i.e., where night comes from) to that of social causality (i.e., where babies come from) in an attempt to follow the development of the child's concept of the origin of babies from the beginning of the child's awareness of babies to the time when they understood the physical and social facts surrounding conception and birth. This qualitative analysis of the child's concept development was one of the first to look at children's responses concerning social events at several ages to find a stage sequence for this response similar to those developed by Piaget for overall cognitive development.

An earlier study concerning the child's concept of birth used a relatively simple questionnaire to discover how much information children have about sexual matters (Kreitler & Kreitler, 1966). On the basis of the results of their study of 4 and 5½ year old children, Kreitler and Kreitler concluded that there was little support for either Freudian or Piagetian claims as to what children think about human birth. It may simply be that children say those things they have been told. It must be noted that Kreitler and Kreitler's study included only one age group, making it an investigation of an age standard and not one of sequence of concept development.

Another concept that has been examined developmentally is that of death. Nagy (1948) conducted one of the most comprehensive studies of the child's ideas about death in which he listed three stages of development in the age range of 3 to 10 years of age. Nagy explained the specific ideas that the children had about death, but did not attempt to determine why the children thought as they did. There was no exploration as to how the results related to other areas of the child's cognitive development.

Melear (1973) expanded the investigation of death to include how the child thinks about death. He encouraged the children to expand and clarify their responses to specific questions about death and then classified the responses into categories. This study and the study by Nagy (1948) laid the foundation for more recent studies that use a developmental perspective to examine the child's concept of death in a broader sense.

White (1978) was one of the first researchers to relate other cognitive abilities (i.e., conservation) to the understanding of death concepts. By using conservation tasks and concrete stories to get children to give concrete reasons and thoughts about death, it was possible to answer more specific questions concerning how the child's concepts of death develop. For the first time it was possible to relate the child's ability to conserve (and therefore to the concrete stage of thought) to the type of reasoning used in understanding a concept such as death.

Cousinet (1939) in an earlier study related the child's concept of death to his experience with death, and found that children learn to accept death at an earlier age than they learn to understand it. Nagy (1948) found the opposite to be true in her sample; that is, she found that children learn to understand death, but do not learn to accept it until after the age of nine. Another study dealing with the role of experience, also studied the sequential progression of development of the concept of death. Koocher (1973) found that the responses of his subjects (6 to 15 years of age) followed the Piagetian stages, but unlike Nagy, did not find that the children personified the death of others. Using the information gained from all of the earlier studies, Kane (1979) studied the stages of development of the concept of death more closely. Using a Piagetian framework, she found that children's concepts of death did develop as a function of age and, in fact, developed in three stages clearly related to the preoperational, concrete operational, and formal operational stages suggested by Piaget.

Another concept that has been studied from a developmental framework is that of ecology. Owley (1976) used Piaget's stage-related changes as a guide in examining the changes in the child's thinking about ecology. Using Piaget's findings (1950) that children tend to perceive the world in more general abstract terms with increasing age, Owley developed questions to help discover the major parameters of the child's concept of ecology. He found that, in general, the child's developing ideas about ecology did corroborate those stage-related

changes found in other aspects of cognitive thought outlined by Piaget (1965a, 1965b).

The study of how the concept of love develops has been examined by a number of people, but few have used a developmental approach. Although Knox (1970) and Falkowski (1975) have used Piaget's basic stages, preoperational, concrete, and formal, and have found that their results do show these stages, the studies have not dealt with early concept development.

McGhee (1971) examined children's humor to see how the kind of humor children used related to cognitive level in other areas. He examined the relationship between the development of humor and the level of cognitive thought of school-age children and was able to relate the child's comprehension of non-related tasks to the appreciation of humor. He did not, however, study the early concept development, since he did not use young children in his sample.

Although the terms used are slightly different, the stages of moral development presented by Kohlberg (1969) are based on the developmental ideas of Piaget. Each stage of moral development is determined by the reasoning children use in determining answers to moral questions. The resulting stages appear in an invariant sequence comparable to those stages presented by Piaget.

Smaller aspects of larger concepts have been examined by a number of researchers in different disciplines. These studies, for the most part, corroborate the stage-related developmental changes of thought that Piaget has described. The language concepts "different" (Webb,

Oliveri, & O'Keefe, 1974), and "older" and "younger" (Kiczaj & Lederberg, 1977; Looft, 1971; Kratochwill & Goldman, 1973) are examples of the application of developmental stage changes in the child's development of a concept. These latter studies found that preschool children do pay attention to size when choosing the younger or older member of a pair, ignoring the actual age and other functional cues in the situation.

In a study of the effects of irrelevant cues on the child's ability to focus on a concept, Johnson, Warner and Silleron (1971) found that older children (7 to 9 years) are less affected by irrelevant cues than are preschool children. This finding may be related to a number of explanations. Several investigations of the effect of how information is presented to the preschooler on his ability to generalize concepts have been done. Sigel and McBane (1967) suggested that young children interpret objects as being complete and are thus less able to generalize information gained from the object to novel items, whereas they have to assume and develop more ideas about information gained from pictures. Becker, Rosner, and Nelson (1979) also found that the mode of training had an effect on the child's ability to generalize to novel items, especially at low elaboration levels. Again, objects were less generalizable than were pictures. This finding was explained in part using Nelson's (1972, 1974) theory of concept development, in which she suggested that the object training of young children that is common in our society, may actually hinder the child's ability to generalize ambiguous items as concept exemplars.

The Need for a Piagetian Approach as it Relates to Children's Understanding of Obesity

Children often form ideas about how things happen in the world with little actual teaching by adults. The information that the child internalizes into his cognitive structure is often very different than what the adult expects. Children experience events in the environment from a different point of view than adults do, and what they understand from an experience may be very different from what the adult understands. This stems from the fact that the egocentrism of young children affects understanding of experience to a greater extent and in a different way than the form of egocentrism found in adults (Piaget, 1950).

When considering the concept of obesity, questions arise for educators and parents. Piaget's theory of cognitive development can provide the framework for beginning to answer questions concerning how children can be taught about obesity and what they can be taught about it. This framework also allows the discovery of the content of the stages children go through in the process of developing the concept of obesity. It gives the researcher a chance to see what ideas children have as they are learning about and internalizing the relationships involved in the concept of obesity.

Piaget used his biological background to study the development of the child's thinking using structural terms and ideas. He formed a structural theory by describing the development of specific concepts such as time, number, space, and speed. The reasoning used by the

child when dealing with each of these specific concepts forms the basis for the basic stages of Piagetian theory. More important to the present study is the systematic examination that Piaget made of the relationship between the logical thinking processes involved in the mental processes of conservation, causality, identity, and classification to such areas of thought as the origin of night, the reality of dreams, the floating properties of objects, and the thoughts concerning movement (Piaget, 1965a, 1965b). These relationships are used in this study to explain the thought processes seen in developing the concept of obesity.

Examination of thought processes such as those mentioned above were made possible because of the general nature of Piagetian theory, which is a study of children's thought founded on the development of certain concepts. The concept of obesity is similar to those areas of thought examined by Piaget, and will be better understood when examined from a Piagetian developmental viewpoint. The study of the concept of obesity needs such a framework if one is to find out how children come to understand the cause of obesity.

Studies on this topic have been nonexistent to this time. The only studies regarding obesity in children other than those dealing with etiology, obtained information on the social non-acceptance of obese children by their peers (Young & Audzej, 1979).

This study investigated how children develop the concept of obesity by finding out first just what children do think, and then examining the reasons children give for those thoughts. The relationship of the

processes of identity and causality to the concept development of obesity are also examined, with particular attention made to the idea of décalage.

The Study in Piagetian Terms

The general aim of this study was to examine the thinking of non-obese children about obesity using the structural-developmental framework of Piaget. (A discussion of Piagetian terms and concepts can be found in Appendix A.) The Piagetian concepts of causality and identity were used as frameworks for examining décalage in the developing concept of obesity. Piaget has used both causality and identity in his examination of children's understanding of natural phenomena as well as with physical objects (Piaget, 1968). His work formed the foundation for other studies concerning the relationship between identity and causality. Gouin-Decarie (1966) found that another human is the first object to become permanent for the infant. Bell (1970) found similar results. Piaget further suggested that children's ideas of identity come from their perception of their own bodies, and that later this perception is generalized to objects. Piaget demonstrated that although preoperational children do not understand functional relationships of the environment precisely, that is, they are unable to conserve, they do appreciate certain aspects of identity (Piaget, 1968). This basic understanding may come as a result of the children experiencing growth of their own bodies.

In a study with Voyat, Piaget showed that children were able to understand their own identity despite changes in size, but were less likely to accept the continuing identity of a plant as it changed in appearance. Only later were children able to see identity of objects (Piaget, 1968). DeVries expanded this concept and demonstrated that the identity does occur in children before the ability to conserve occurs (DeVries, 1969). The present study examined the interrelationship of causality and identity with respect to both social and physical objects. In particular, the interrelations of the two concepts as they pertained to the development of the concept of obesity were studied.

Variables to be Studied

The child's development of the concept of obesity is hypothesized to parallel his development of the understanding of the concepts of causality and identity of social and physical objects. In addition, it is hypothesized that concepts develop differentially with respect to social and physical objects, and that social concepts develop before physical concepts. To investigate these assumptions, the child's abilities in both conservation and causality tasks were examined using both physical and social objects. The following tasks were used:

Physical Conservation--A combination of tasks involving substance and volume were used to assess the child's understanding of the concept that physical objects remain the same regardless of a change in shape.

Physical Causality--The child's ideas and thinking processes were examined through the use of an interview on the origin of night. Night is a physical, nonsocial item and was used to examine causal thinking about physical things.

In order to relate the causal thinking of children about obesity to their causal thinking about physical causality, it was necessary to find out how they think about physical events. Only when the child is able to perceive that events have causes can he even begin to think about what those causes may be.

Social Identity--To determine the child's ability to conserve social objects, questions and pictures involving fat and non-fat people were presented to the child in an interview setting. (These pictures are in Appendix B.)

Social Causality--An interview about how and why people get fat was administered to the child in order to determine the level of thinking used by the child. This was an application of causal thinking to social objects.

Hypotheses

(1) Children's thinking about obesity will demonstrate a stage sequence which reflects a structural change in the child's cognitive ability. This sequence will be similar to the sequence found in other areas of thought.

(2) The child's cognition concerning obesity (social causality) will develop along parallel lines with social identity, physical causality, and physical conservation.

(3) Décalage among the social and physical tasks will be as follows:

a) Social identity will develop earlier than will physical conservation because identity is achieved for social objects before physical objects and identity appears before conservation.

b) The child's understanding of the causes of obesity will begin to develop earlier than will the understanding of physical causality, but will take longer to reach a level of formal understanding.

Chapter 2

METHODOLOGY

General Overview

The major procedure followed was to examine the responses of three age groups (4,5; 8,9; 12,13) of children on their understanding of the conservation and causality as they relate to both physical and social objects. The age groups were selected to include children that may be in the preoperational, concrete operational, and formal operational stages of thought according to Piagetian theory.

Sample

The sample was comprised of 96 children ranging in age from 3 years 6 months to 13 years 6 months. There were 16 boys and 16 girls in each age group (4,5; 8,9; 12,13). The subjects were recruited from acquaintances of the author and from three local nursery schools and day-care centers. The lack of random sampling, though a possible flaw, appears to be of little importance because of the nature of the investigation. Development occurs in a stage sequence, so the fact that one group of children may progress to various stages at different ages is not important to the present study, which was planned to examine the development of the stage sequence.

The criteria for sample selection was:

1. Parental permission and cooperation

2. Chronological age

   There were 32 children in each of the age groups as described above.

3. Gender

   There were 16 boys and 16 girls in each age group, making a comparison between the responses on each task according to gender possible.

Demographic Characteristics of the Sample

Parental Education

The educational background of the parents of the children in the sample was very homogenous, with the great majority of fathers (n = 69) having Ph.D.s, and another 6 having master degrees. This is typical of a small town having a major university as the major employer, and must be considered when interpreting results of a study. Sixty-six of the mothers of the children had at least a bachelors degree.

Parental Occupation

Of the 96 subjects, 3 had fathers employed in blue collar jobs, with the majority of the remaining fathers employed in professional occupations. The mothers of the children were, for the most part, homemakers (n = 44). The remaining mothers were: students (n = 11), educators (n = 16), professionals (n = 7), secretaries (n = 12), and other occupations (n = 6).

Physical Size

The sample included only children that do not exceed the weight for age/height given on a standard height-weight chart (National Center for Health Statistics, 1976)(Appendix E). This eliminated the possible

effect of a child's experience of being fat on the sequence of his developing the concept of obesity. The concept of obesity has a sequence of development for the general population of children which must be documented before it can be used to examine the sequence for special groups of children (i.e., obese children).

Procedure

The children were interviewed individually in their school, in their home, or in the interviewer's home. The interviews took between 20 min and 45 min depending on the amount of detail given by the child. All of the interviews were tape recorded and scored independently at a later time by two raters. Four tasks were administered to each child: a measure of the child's concept of physical conservation, a measure of his concept of physical causality (origin of night), a measure of the child's concept of the conservation or identity of social objects, and a measure aimed at discovering the child's thinking about obesity. The demographic information was obtained through a parental questionnaire given to each parent before or during the child's interview. (Information from parent interview is found in Appendix C.)

Instruments

Physical Conservation Task

The child's ability to conserve physical, non-social objects was measured by using the clay and water conservation task. These concepts included the conservation of substance and the conservation of volume.

According to Piaget, horizontal décalage takes place in the development of the conservation of different substances, with conservation of substance occurring at 6-7 years of age, and conservation of volume at 11-12 years of age.

The child was presented with two balls of clay, equal in size and asked if the two balls had the same amount of clay. If the answer was no, the child was instructed to do whatever he/she thought was needed in order to make them the same. When the child was satisfied that the balls were equal, the examiner took one of the balls and rolled it into a sausage shape as the child watched. The child was then asked, "which piece of clay has more clay in it," and was then asked why that answer was given. If the child was able to see that both clay pieces contained the same amount of clay, and used a logical reason, the "other child" problem was given. The child was told that another child had said that the sausage had more clay in it because it was longer, and what did he think about that answer. At that point the examiner rolled the sausage back into a ball, and separated it into two smaller balls. The child was then asked which had more clay, the one ball or the two balls, and was questioned as to why. The subject was then told that the other child said that the two balls had more clay because there were two of them and only one of the other. The child was asked what he thought of that answer.

If the child was able to conserve on the first two tasks, the next two questions of this part of the task were asked. If the child failed to conserve on either of the first two tasks the testing on

this part of the interview was terminated and the interviewer moved to the next section. The child also must have been able to withstand the incorrect answers given by "the other child." That is, the child must have been sure enough of his answers not to be convinced that another answer might be correct and his incorrect.

The child was given two jars filled with equal amounts of water, and asked if he thought the jars did indeed have the same amount of water. After agreeing that they were equal, the examiner put one ball of clay into one of the jars, and asked the child what would happen if he put the other ball into the other jar. The child was questioned about the change, if any, of the water level and why he/she answered as he did. The examiner then removed one of the balls and changed its shape. Again the child was asked what would happen to the water when the new shaped clay was put back into the water. The child's answer was examined in as much detail as possible through different probe questions in order to provide as clear a picture as possible of the child's understanding of what happens to cause the water to rise in the jar.

Rating Scale for Physical Conservation

0: No answer or all incorrect answers with no explanation.

1: Preoperational

The child answers correctly but cannot explain his answer, he answers incorrectly but with a perceptual explanation, or he answers incorrectly but uses only one dimension to explain his answer. He cannot conserve shape. He will focus either on the action that takes place (the flattening) or on the resulting appearance. The child will neglect to see that the final appearance is determined by the action.

2: Transitional

The child is able to explain a correct response in only one of the first two tasks. This response shows that the concept has begun to develop, but it is incomplete. The child cannot conserve shape all of the time. The answers given are uncertain.

3: Concrete: Conservation of clay, but not when displacing water

The children are able to adequately explain both of the first two conservation of substance tasks, and are able to resist both counter suggestions. They use negation, identity or compensation to explain their answers. They are not able to conserve volume.

4: Transitional: Conservation of clay in water, but reasoning inadequate

Although the child is able to conserve volume, the reasoning used is at a very low level. He/she may use perceptual reasons and may still make errors in this reasoning.

5: Conservation of volume with inconsistent reasoning

The child is able to explain the equal water level using equal volume of the clay for only one of the tasks. He/she uses a one-way relationship.

6: Formal operations

The child is able to conserve volume and also able to give explanations related to equal volume consistently, regardless of the transformation of the clay. He uses logical identity, reversibility, or compensation in his explanations.

Scoring

Each subject was assigned a single score based on their answers and reasoning and related to the rating scale given above. Reliability was established by the independent rating of two raters of 49 subjects. Agreement was seen in all of the cases, resulting in a reliability rating of 100 percent.

Physical Causality Task: The Origin of Night

Laurendeau and Pinard's (1962) measure of the origin of night was used to examine how the child thinks about a familiar physical phenomenon that is relatively free of societal and moral connotations. This measure of artificialistic thinking on the part of the child in his explanation of night is, according to Laurendeau and Pinard, as well as Piaget, a reliable indication of precausal thought. Three areas of thought about the origin of night have been outlined by Laurendeau and Pinard (sleep, the clouds, and the disappearance of the sun) and were used in directing the questioning of the subjects.

Instructions

Each child was asked the following questions, although the wording varied with the age of the child so that the words used were familiar ones. Only information introduced by the child in responding to the questions was used in the probing questions. All responses were tape recorded for later rating.

A. General Questions asked to all children

Do you know what the night is?
Tell me, what is night?
Why is it dark at night?
Where does the night come from at night?
What makes it night?

B. Alternate Sections

In answer to the above questions the child usually regards either one of the three different phenomena as the origin of night: (1) sleep, (2) clouds (or black "air"), or (3) the disappearance of the sun.

According to the answers given by the child, the appropriate series of questions below were asked to each child. The child's answers were used to indicate further questions necessary to determine which of the alternate sections was appropriate. If the child changed the direction of answers during the questioning the questions from the new section were also asked.

Section 1. Sleep

Do you sleep, sometimes, during the day? Can we sleep during the day?
Is it dark when we sleep in the daytime?
Then, why is it dark at night?
Why is it dark only at night?
Are there times when it is night and you do not sleep?
When you stay up late at night, is it dark outside?
Then, how is it that it is dark when you do not sleep?

Section 2. Clouds (or black "air")

Where do these clouds come from? What makes these clouds?
How does . . . [the child's answer] . . . make the clouds?
What does he make them with?
Why do these clouds come only at night?
Can white clouds make it night?
Why do you say that . . . [the child's answer] . . . ?
During the day, are there clouds some times?
Then why, when there are clouds in the daytime, is it not dark like at night?
At night, is it black clouds which take the place of white ones, or white clouds which turn black?
Where do the white clouds go at night?

Section 3. Disappearance of the sun

Can you explain how it becomes dark when the sun is gone?
Where does the sun go at night?
Why does the sky become dark at night?
Is the sun always there during the day?
When it rains do we see the sun?
Then, why is it not dark like at night, when it rains?
Then, why is it dark only at night?

C. Concluding questions (asked of all children)

Can we make the night in this room? If I pull the blinds down?
Will it be dark if I pull the blinds?
Then, how is it? Where does the dark in the room come from?
And the dark outside, what is it?
When it is light, why is it light?
What makes it day?

Rating Scale for Physical Causality Task

The scale developed by Laurendeau and Pinard (1962) describes the changes in the child's reasoning about the causes of night and the scale was used in the present study. Adaptations to Laundreau and Pinard's scale were made. These adjustments were based on the 1975 study concerning the child's development of the concept of where babies come from (Bernstein & Cowan, 1975). The numbers assigned for use in analysis appear in parentheses.

Stage 0 (0) Incomprehension or Refusal

These children do not answer the questions at all. They remain speechless or give associations that do not really answer the questions asked.

Stage 1 Absolute Artificialism

These children usually begin by explaining the night in a finalistic manner. In most cases further questions will elicit artificialistic explanations (i.e., action of God). He feels that night is manufactured or controlled directly by the agent.

Substage 1A (1) Finalistic Interpretation

These children do not yet state their interpretations in a precise artificialistic form: they merely explain the night on the basis of its finality, or its usefulness to man.

Substage 1B (2) Finalistic and Artificialistic, or exclusively Artificialistic Interpretations

The children express most explicit artificialistic beliefs but they are still intermingled with finalistic remarks. They often begin their explanation with finalistic remarks.

Stage 2 Semiartificialistic and Semiphysical Interpretation

Substage 2A (3)

The child uses artificialism in a more disguised form: the fabricating agent is still necessary, but now uses natural, physical elements (e.g., clouds, fog, sun, and so on) or, more rarely, artificial material (e.g., the smoke from trains or houses). He/She will often add animistic elements.

Substage 2B (4)

This stage is an addition to Laurendeau and Pinard's scale, and is taken from Bernstein & Cowan (1975). The explanations are semiphysical and semianimistic, but there is no trace of artificialism per se. There are more physical elements and less animistic elements used than were seen in level 3, but the explanations still contain both.

Stage 3 Absolute Physicalism

The child does not use artificialistic notions, but explains the night by the action of strictly physical and natural elements, although not necessarily congruent with reality.

Substage 3A (5) Physicalism Still Tainted with Finalism or Animism

The child's explanations of the origin of night is natural, but the explanation is saturated with finalistic beliefs relating night to sleep and day to work. The celestial bodies or meteors responsible for the forming of the night are sometimes explicitly considered to be alive. The child is characterized as being satisfied with strictly astrological or meteorological solutions.

Substage 3B (6) Physicalism Freed from Precausality

The child's interpretation of the origin of night sheds all remnants of precausal thinking. The child uses complete physical explanations.

Scoring

Each subject was given a single score for this task according to the overall answers given to all of the questions, and corresponding to the appropriate substage or stage of the rating schedule. The responses for 49 of the subjects were independently scored by two raters. The raters agreed in all but seven responses, giving an 86 percent reliability rating. In each case the difference in score was only one level and were not consistently higher or lower. The scores of the same rater were used throughout the study.

Social Identity: The Interview Concerning the Stability of Being Fat or Thin

In order for the child to be able to think about the causes of obesity he must be able to recognize the fact that some people can be, and in fact are, fatter than other people, regardless of extraneous factors. He must be able to conserve identity despite extraneous factors such as age, size, and clothing.

The task to determine the child's ability to recognize and conserve social objects was developed in order to assess this ability. It was assumed that the conservation concept used in this task was similar to that used in the conservation of physical objects.

Procedure

The child was shown a sequence of pictures of a variety of shapes and sizes of individuals, of both children and adults (see Appendix B). Each picture was a full view of the individual. The pictures used

were independently classified as being fat or not fat by four adults not otherwise involved in the investigation. Only pictures in which all of the adults classified them as fat or not fat were used. The children were asked to say whether they thought each picture was of a fat or not fat person as they were shown the pictures individually. In each case they were asked why they said the person in the picture was either fat or not fat.

If the child was able to answer correctly for most of the pictures, as determined by the interviewer, and with reasons that indicated that he did have some idea of how a fat person differs from a person who is not fat, he was presented with the second part of this sequence. The next aspect of the task was developed in order to discover whether the child was able to recognize that even though a person changes in appearance (in fatness) he is still the same person.

The children were shown a pair of pictures in which the person was fat in one picture and not fat in the other, and asked if they thought that the pictures were of the same person or of different people. They were then asked what was different, or the same about the person in the picture, depending on what they answered to the first question. Their reasons for answering as they did were probed until the reasoning they were using became clear. Those children who answered that the people were the same in both pictures were then asked which picture they thought came first, and whether the other one <u>could</u> have been first. This was asked as one indication as to whether or not the child saw obesity as a reversible process.

Those children who were able to complete the second task correctly were then presented the third part of this task. The children were shown four pictures of a single child, in which he was fat in two and thin in two. The interviewer arranged the four pictures in a fat, thin, fat, thin or reverse sequence and asked the child if the boy in the pictures was fat in any of the pictures. The starting picture of the sequence was randomly varied. If the children were able to pick out the two fat pictures, they were told that these pictures were taken of the same boy over a two year period. They were asked if it was possible for a person to go from being fat, to being thin, to being fat? If the children said that it was possible, they were then asked what might cause it.

The children who have been successful in the previous tasks were then shown another group of pictures, In these, a single child, who varied from being fat and not fat, was shown at four different ages. The child was asked to put the pictures of the boy in a sequence, according to his age (all but one child was able to do this with no problem) and then the child was asked if the boy was fat in any of the pictures. Those children who identified at least one picture as being fat was asked how they thought that had happened. They were asked what happened to make the thin baby into a fat baby, and then into a boy who was not fat.

How many of these tasks were given to an individual was determined by the child's ability to answer the questions correctly. Whenever it was clear that the child was not able to complete the task, it was stopped.

Rating Scale

The rating scale for this measure was developed for the present study from the results of a pilot interview with 11 children ranging in age from 3 years 2 months to 13 years 8 months. The responses displayed similarities in levels of reasoning to those reported by Bernstein and Cowan (1975). The scale is as follows:

Level 0: Preoperational

The children at this level seem to be guessing when determining whether the person is fat or not fat. The reasons, if given, have no connection to the picture. Often they will simply say they are fat because they just are.

Level 1:

At this level the identification of fatness is determined by the size of the picture, the tallness or shortness of the person, or other extraneous factors. There are still many errors made with some guessing. The children will often determine the fatness of a person by the clothing he is wearing.

Level 2:

In this level of reasoning there are static identifications in that the children are apt to focus on one aspect of the person in the picture. They may say that the person is fat because he has a fat stomach. They often will give as their reason for saying that someone is fat that he is fat in his _____, naming a single part of the body. When questioned as to whether the person is fat anywhere else they will say no, only in his arm, or middle, etc.

Level 3:

This is a transitional stage of ability to reason. The child at this level makes fewer mistakes in the identification of fatness but does still see the person in the second task as going in only one direction. There is no reversibility. Whether they state that a person goes from fat to thin or thin to fat often depends on which picture they saw, and so focused on, first. Other children may just think that all people start thin, but once a person gets fat they stay fat.

Level 4: Concrete Operational

This level can be referred to as one of intuitive personal identity. The children realize that the person in the picture can go in either direction (fatter or thinner), but their reasoning is vague. They will often state, usually correctly, that a person just looks fat, or not fat, but not able to explain why they think so. They respond that the boy can go from fat to thin to fat to thin, but can give no explanation.

Level 5:

Another transitional stage, this level includes thinking that sees the reasons for weight change as singular. These children often explain the change in the boy of different ages as being entirely due to eating or to age, with no mention of the relationship between the two.

Level 6: Formal Operational

Systematic operational thinking is seen at this level. The children answer all of the questions about obesity included in the social identity task consistently correctly, using a variety of logical reasons. They understand that a growing child can change his weight, and that eating, exercising, and physical growth are involved and interrelated. They are able to think about the possibility of events and situations in abstract terms.

Scoring

The subjects' responses were considered as a whole and given a single score according to the above scale. The number of correct responses as well as the reasons given for the responses were taken into account. It was not necessary for all of the child's responses to be at a single level. Each child was given the score indicating the level in which most of the responses seem to fall. A reliability rating of 76 percent agreement was reached by the independent rating by two raters of 49 subjects. The difference in ratings were no larger than one level in any case.

Social Causality: The Interview About Obesity

To find out what the child thinks about how people get fat, the clinical method of inquiry was used. The method made it possible for the interviewer to probe and to pursue the thinking of each individual child. The interviewer began with a general outline of questions to explore, and then let the child's responses guide the direction of inquiry from that point. There were basic questions that all children were asked at some time during the interview in some form. Because the terminology used when talking about obesity becomes part of an individual's language very early in our culture, often before the actual understanding of those terms, it was necessary to ask some questions in a variety of ways in order to see what ideas mentioned by the child were really understood. All of the terms that the children were questioned about were first introduced by the children themselves. Only after the children indicated their line of thinking did the interviewer begin to probe deeper into that thinking. The questions asked were open-ended, and the direction of the interview depended on the individual child's responses.

The importance of the clinical method of investigation for examining concept development in children was demonstrated by Piaget. Many of the techniques that he formulated can be seen in The Child's Conception of the World, in the form of investigations of the child's concept development of various aspects of the world (Piaget, 1965).

The clinical method of investigating childrens' thought is not without dangers, however. In the introduction to The Child's Conception

of the World, Piaget carefully outlined the care that must be taken to ensure that answers given by the child are accurately interpreted by the interviewer. The interviewer must be very careful to probe the child's thinking without in any way directing the thought. How the child responds is often indicative of the motives behind an answer and must be correctly evaluated. Piaget pointed out the necessity for the interviewer to be able to tell the difference between different types of answers children might give. They might, for example, answer at random, saying anything that come to their minds at the time, or they may give an answer that they think the interviewer wants to hear. They might invent an answer using words that they have heard but really do not know the meaning of. They also may simply answer something in order to satisfy the interviewer, or they might answer after thinking about the question for some time. This last instance would be different from children who answer with an immediate response, because the latter would indicate that the children had thought about the question and had formed an answer that they felt sure about, rather than simply coming up with an answer. The probing questions are ways of discovering which approach the child is using. The interviewer should not assume anything about the knowledge the child is expressing. Clarifying questions must always be asked if the child's answer is unclear in any way. The clinical method of inquiry is difficult and takes much practice to carry out and to get meaningful responses.

Although difficult, the clinical method of investigation is advantageous over the objective test and the direct observation of the child's actions if one wants to determine the child's level of thinking (Piaget, 1965). The test method is rigid in that it suggests answers to the child, and may lead to answers to questions that are complete guesses, simply because there were several choices from which to choose.

Direct observation of the child also has severe limits in that only part of the child's knowledge can be determined--only that which can be seen through overt behaviors. There is no way to see beyond the child's behaviors to the reasoning and beliefs that may be the cause of those behaviors.

By using a combination of these methods with a working hypothesis, Piaget found that the clinical method took advantage of the positive aspects and negated the weak aspects of both techniques.

Procedure

When investigating the child's ideas about the causes of obesity, the interviewer asked basic questions to all of the subjects. Each child was asked these basic questions which, in turn, determined the follow up probe questions. The interviews were administered individually, and in the case of a few of the younger children were combined with the interview concerning social identity discussed earlier. The questions were not always asked in the same order, but were included at some time during the interview. Each question was

probed until it was indicated that the child had answered in as much detail as possible.

Because of the wide use of terms involved in eating as well as in gaining and losing weight, it was not assumed that children understood the terms they used until they explained them. This included such terms mentioned by the children as fat, calorie, diet, and exercise.

Each interview included the following questions during this part of the interview:

What does the word fat mean?
What does a fat person look like?
How do people get fat?
How long does it take a person to get fat?
Can anyone get fat?
If a person is fat can they get rid of that fat?
Why are some people fat and some people not fat?
Can everybody lose fat by _____ (child's answer)?
Where does fat come from?
Where does fat go when a person gets rid of fat?
What is fat?

Some probe questions for specific lines of thought came from the pilot study, and included such questions as the following:

What is a diet?
What is a calorie? How does a person know how many calories will make him fat?
What does exercise have to do with getting fat?
Once a person loses fat can they get fat again?
What makes some people fatter than other people?
How much is "too much" food?
What happens to food to make it into fat?
Do only fat people have fat on their bodies?
How does a person know when to go on a diet?
How does a person know when he is fat?
Can two people eat the same amount of food and one get fat and the other not get fat?

How do you know when you lose fat?
Would you get fatter if you ate a bowl of lettuce or if you ate a bowl of candy?

Rating Scale: Social Causality

A rating scale was developed based on the answers given in a pilot study using 18 children, ranging from the age of 3 years 4 months to 13 years 8 months. Analysis of their answers indicated that the responses showed similar types of thinking as those found in Laurendeau and Pinard's (1962) causality scale for the origin of night. A scale for the development of the concept of obesity was then developed encompassing the measures of artificialism, finalism, animism, and physical explanations used in the Laurendeau and Pinard scale, which has been described in an earlier section of this paper. The levels developed for the concept of obesity are as follows:

Stage 0 (0) Lack of Comprehension

These children do not answer the questions at all. They remain speechless or give associations that do not answer the question asked.

Stage 1 Absolute Precausality

Substage 1A (1)

The children in this stage answer the question of how a person gets fat as if the question had been where does a person get fat. They show no reversibility.

Substage 1B Finalism (1)

These children answer the question of how a person gets fat by stating the usefulness of fatness to man. The answers are not yet precisely artificial, and they will still answer "why" before they will "how."

A baby makes you fat.
He was born that way.
. . . going to get baby.

Substage 1C (2) Finalism and Artificialism

The child expresses explicit artificialistic beliefs but may still include animism. The belief that God or man causes fatness is expressed. Animism is seen in that calories might be seen as things with volition.

> You might push in the back and make your stomach push out and be fat.
> . . . fat because the calories are tired of sitting around and so make you fat.

To the question of how a person gets rid of fat, the child may offer having an operation as a solution.

Stage 2 (3) Transitional: Semiphysical and Semipsychological

These children use explanations that are almost always coupled with finalism. The artificialism is more disguised in that a fabricating agent is necessary, but the agent uses natural physical elements. They may also add animistic elements.

> A person is fat only in certain places.
> You are fat because something is wrong with your stomach.
> Big foods make you fat.
> A short person is fat.
> A tall person is fat.
> . . . he's fat because he has big shoulders.
> A person hiccups and then he is thin.
> Sugar makes you fat.

Often the responses indicate that the child believes that one particular type of food makes a person fat. The food that is often mentioned is candy.

Stage 3 (4) Absolute Physicalism

These children use primarily physical explanations to explain fatness, although they may still show a hint of finalism and egocentrism. They use words such as "ought to" and "should" to explain the causes of fatness. Their use of physical explanations are very inconsistent in that they may use precausal thinking in the same sentence they use physical explanations. It is not unusual at this level for the children to say that fatness comes from eating food, but be unable to explain any further. They may also mention that

exercise has something to do with getting fat, but again not know how, or that it is also related to food.

> . . . you run off the fat by exercise.
> Some are fatter because they digest faster.

Stage 4 (5) Disappearance of Artificialism

These children are able to explain that fatness comes from both a lack of exercise and from eating food, but are unable to explain the relationship between the two. They talk about calories but cannot explain what a calorie is. They know most of the fat terms, but lack the complete understanding of what the terms mean and how each fits into the picture. The question about what happens to fat when a person loses weight confuses these children when they realize that they don't know, or have only a partial idea.

Stage 5 (6) Physicalism Freed from Precausality

The children now give completely physical explanations for fatness and can explain all of the terms they used. Not only do children understand the relationships involved, but they are able to explain them in logical ways. Children using formal thought in this task indicated they were able to try out possible results mentally in a deductive way. This ability was demonstrated in their explanations of possible relationships among factors that contribute to obesity.

> Food is used as a body fuel.
> Food is the energy source measured in calories.
> Calories are burned by the body doing exercise.
> It is necessary to do exercise to use up calories and to limit the amount of calories through diet.

Scoring

The subjects were given a single score for this part of the interview, based on the above rating scale. Percent agreement was 81 percent based on the independent rating of 49 subjects. All of the differences were one level apart.

Table 1

Measures Related to Piagetian Stages of Causal Thinking

Piagetian Stage	Physical Conservation (Substance/Volume)	Physical Causality (Origin of Night)	Social Identity (Pictures)	Social Causality (Interview)
Preoperational	0 no answer 1 no explanation	0 no answer 1 finalistic 2 artificialistic	0 guess 1 uses extraneous factors 2 static identity	0 lack of comprehension 1 finalistic 2 finalistic, artificialistic, animistic
Transitional	2 inconsistent	3 semi-artificialistic & semi-physical	3 no reversibility	3 semi-physical & semi-psychological
Concrete Operational	3 conserves clay but not when displacing water	4 physical explanation but still some finalism or animism	4 intuitive identity senses reversibility, but reasoning faulty	4 physical explanation with hint of egocentrism
Transitional	4 conserves in water reasoning inadequate 5 conserves in water reasoning inconsistent	5 physical explanation but still some finalism	5 inconsistent reasoning, lack relationship between causes	5 physical explanation inadequate or inconsistent reasoning
Formal Operational*	6 conserves in water consistent good reasoning	6 physical explanation with no precausality	6 systematic identification	6 physical explanation with no precausality

Note: Level 6 is labeled formal operational thought but does not strictly adhere to what is described by Piaget as overall formal thought. In this instance it refers more to the disappearance of precausal thought and the dependence on logical causal processes in understanding the measures used in this study. Scientific concepts involved in most studies of adolescent formal thought were not included in the present study so cannot be confirmed or disproved. It is understood, then, that formal thought, as labeled in this study, is considered only for the measures used.

Chapter 3

QUANTITATIVE ANALYSIS

This study was based on Piagetian cognitive theory. The measures used were chosen so that they were indicators of specific aspects of development. The component operations of causality and identity were therefore chosen to compare the child's thinking about obesity to the ideas and stages of cognitive development that Piaget has discussed. Piaget has established that the child's thinking develops in a sequence of stages. This study examined these stages with regard to obesity by measuring the child's thoughts about obesity in several ways. Social causality, social identity, physical causality and physical conservation were measured and the levels of thinking were compared to each other and to Piaget's stages of cognitive development. Both correlation between the measures and the similarities and differences among the measures were examined. These procedures provide an extension of Bernstein and Cowan's (1975) examination of the child's cognitive thought relating to people. The present study used a similar methodology to Bernsteins and Cowan's investigation of the child's concept development of where babies come from. Both examinations were of the development of social based concepts.

The following statistical procedures were used to test the hypotheses of the present study and to gain information beyond the hypotheses about children's thinking about the causes of obesity.

1. Frequency Distributions--The number of children in each stage of thought for each task measured was computed and presented as percentages of the total age group in order to offer support for the hypothesis stating that the stages of thinking about and understanding the causes of obesity develop with increasing age.

2. Analyses of Variance--A multivariate analysis of variance (MANOVA) was computed to test for effects of age and gender for the measured tasks as a whole, and based on the results, separate analyses of variances of the individual task by age were computed. The analyses were computed on physical conservation, physical causality, social identity, and social causality for age effects, and the resulting effects examined by the Tukey post-hoc analysis to locate specific age effects.

3. Chi-square--Chi-square analyses were computed between each pair of measures to obtain an index of the preoperational and operational décalage of the tasks. The analyses were planned to discover whether or not knowing that a child was thinking preoperationally or operationally on one task would be indication that the child was thinking at the same level on another task.

4. Comparison of Tasks--Correlations were calculated to trace the development of the ability to perform in one task with relation to the progress of other measured tasks. In particular, they were planned to see if children's thinking about the causes of obesity (the social causality task) developed in a parallel manner to the other tasks of the investigation.

5. T-tests--One-tailed t-tests were calculated to test the hypothesized décalage of social identity and physical conservation and of social causality and physical causality. Other analyses were performed in order to gain additional information about unpredicted decalages. These t-tests were two-tailed.

Frequency Distribution

Examination of Hypothesis 1, children's thinking about obesity demonstrates a stage sequence similar to the sequence followed in the development of other concepts and was begun by completing a frequency distribution of the scores for each of the four tasks. The resulting distribution is seen in Table 2, presented in the form of percentages of children scored as giving responses in each level of thought. The developmental nature of each task, physical conservation, physical causality, social identity and social causality can be seen in that the younger children gave lower level responses than those responses given by the older children. The level of response for each of the measured tasks increased with age and occurred in a simple to complex sequence. These results agree with Piagetian theory which states that development occurs in a sequence. Hypothesis 1 is confirmed; social causality does develop in a developmental sequence which is similar to the other measured tasks. The only slight variation in sequence occurred with regard to physical conservation, in which several of the older children demonstrated that they were not able to conserve substance and yet were demonstrating a higher level of thought in the other tasks.

Table 2

Distribution of Subjects by Age and Developmental Level in Each Task

	Age	N	0	1	2	3	4	5	6
Physical Conservation	4-5	32	3	97	0	0	0	0	0
	8-9	32	3	22	10	12	3	22	28
	12-13	32	0	22	0	0	0	6	72
	Total	96	2	47	3	4	1	9	33
Physical Causality	4-5	32	0	34	19	22	22	3	0
	8-9	32	0	0	0	6	19	25	50
	12-13	32	0	0	0	0	3	13	84
	Total	96	0	11	6	9	15	14	45
Social Identity	4-5	32	3	6	44	41	6	0	0
	8-9	32	0	0	6	10	47	31	6
	12-13	32	0	0	0	0	10	47	16
	Total	96	1	2	17	17	20	26	17
Social Causality	4-5	32	9	25	3	47	16	0	0
	8-9	32	0	0	0	6	78	16	0
	12-13	32	0	0	0	3	16	65	16
	Total	96	3	8	1	19	37	27	5

Note: Distribution given in percentages.

Additional support for the sequence of development of the measured tasks came from examination of the mean responses of the children on each task. These means can be seen in Table 3. The parallel development of social causality with the other tasks can be seen in that each age group showed an increase in the level of response.

Analyses of Variance

Hypothesis 1, concerning stage sequence, was also examined through the use of multivariate analyses of variance. MANOVA was first computed for task, age, and gender effect based on the within task scales. Results indicated strong age effect for all tasks, $p < .0001$, a gender effect only on the social causality task, $F(1) = 4.52$, $p < .036$, and no age x gender effects. These results can be seen in Table 4. Wilks' criterion demonstrated no overall gender effect, and no overall gender x age effect. The Wilks' criterion for overall age effect was significant, $F(1) = 30.80$, $p < .0001$.

The only significant effect for gender appeared in the social causality task, $F(1) = 4.52$, $p < .036$. Tukey post-hoc analyses determined significance between the means of male and female responses on the social causality task at the 4-5 year old age group, $q(1) = .35$, $p < .05$.

Oneway Analyses of Variance were computed for each task by age. Tukey post-hoc analyses found significant differences between each age group for every task, lending strong support for an age-related developmental sequence on all tasks. Table 5 depicts these results.

Table 3

Mean Scores by Age and Gender on Each Task

Age	Gender	N	Physical Conservation		Physical Causality		Social Identity		Social Causality	
4	male	8	.87		1.62		2.12		2.00	
	female	8	1.00	.97	2.87	2.41	2.50	2.41	2.37	2.34
5	male	8	1.00		2.37		2.50		2.00	
	female	8	1.00		2.75		2.50		3.00	
8	male	8	5.12		5.50		3.87		4.00	
	female	8	3.12	3.69	5.12	5.19	4.50	4.22	4.12	4.09
9	male	8	3.25		5.12		4.00		4.00	
	female	8	3.25		5.00		4.50		4.25	
12	male	8	4.62		5.75		5.25		4.62	
	female	8	4.00	4.84	5.62	5.81	5.50	5.34	4.87	4.94
13	male	8	4.75		6.00		5.37		5.00	
	female	8	6.00		5.87		5.25		5.25	
Total %			3.17		4.47		3.99		3.79	

Table 4

Age, Gender and Interaction Effects on Each Task

Task	Age Effect			Gender Effect			Age Gender Interaction Effect		
	F	df	p	F	df	p	F	df	p
Physical Conservation	43.63	2	p < .0001	0.36	1	N.S.	1.34	2	N.S.
Physical Causality	119.02	2	p < .0001	0.58	1	N.S.	5.39	2	N.S.
Social Identity	106.21	2	p < .0001	2.66	1	N.S.	0.82	2	N.S.
Social Causality	74.96	2	p < .0001	4.52	1	p < .036	0.79	2	N.S.

Table 5

Age Effects for Each Task

Task	Age	Mean	Age Effect F	df	p	q[a]
Physical Conservation			43.61	2	.00001	1.20
	4-5	0.97	All means significantly different			
	8-9	3.69				
	12-13	4.84				
Physical Causality			114.49	2	.01	.68
	4-5	2.41	All means significantly different			
	8-9	5.19				
	12-13	5.81				
Social Identity			104.75	2	.01	.58
	4-5	2.41	All means significantly different			
	8-9	4.22				
	12-13	5.34				
Social Causality			72.54	2	.01	.62
	4-5	2.34	All means significantly different			
	8-9	4.09				
	12-13	4.94				

[a]Tukey post-hoc analyses at $p < .05$ level.

Correlations

Hypothesis 2 said that the child's understanding of the causality of obesity (social causality) would develop along parallel lines with the other measured tasks. This prediction was examined through the use of correlations. The scores of the children in the social causality task were compared to the scores of the other tasks. Results of these analyses showed that the increase in scores in the task were related to increases in scores of all the other tasks, confirming Hypothesis 2. Table 6 shows the correlation coefficients for each pair of measures at each age group and for the sample as a whole. All of the coefficients are significant for the total sample.

The relationships between the other tasks add to the information about the development of the concept of obesity. Not only is the social causality task significantly correlated with all of the other measured tasks for the total sample, $p < .001$, it is also significantly correlated with all tasks for all ages except for that of physical conservation at age 4-5, $r = .33$, and age 12-13, $r = .25$. In general, the task of physical conservation was the least correlated to the individual age groups in the other tasks. These low correlations may be due in part to the fact that there was little variance in this task for the younger and older age groups. For example, most of the younger children (4-5 years) were nonconservers and most of the older children were conservers. This reduced variance produced low correlations for the separate age groups, but when the sample was analyzed as a whole, the large variance from the younger to older ages resulted in a greater r for the total.

Table 6

Correlation Between Tasks

Task	Age	Physical Causality	Social Identity	Social Causality
		r	r	r
Physical Conservation	4-5	.20	.09	.33
	8-9	.38*	.18	.33*
	12-13	.20	.06	.25
	Total	.66****	.62****	.62****
Physical Causality	4-5		.11	.39**
	8-9		.34*	.46***
	12-13		.32*	.57****
	Total		.75****	.71****
Social Identity	4-5			.40*
	8-9			.54****
	12-13			.42*
	Total			.78****

*p < .05
**p < .01
***p < .005
****p < ,001

Comparison of the correlation coefficients of the present study with the coefficients of Bernstein and Cowan's (1975) study of the development of the child's concept of human reproduction found very similar results. Bernstein and Cowan also found significant relationships between each pair of tasks, demonstrating that the two concepts involved, human reproduction (as examined by Bernstein and Cowan) and obesity (as examined in the present study) develop in similar developmental patterns.

Development theory is based on the assumption that higher level thought processes depend on the development of lower level concepts which form the base for the higher concepts. One way to begin to examine the relationship between the higher and lower levels of understanding is through the use of Chi-square analyses.

Chi-Square Analyses

Hypothesis 3 predicted direction of décalage for the understanding of social identity and physical conservation and of social causality and physical causality. Chi-square analyses were used to see which of the pairs of tasks were understood by the children at a preoperational level and which were understood at an operational level in order to begin to examine the décalage present. The scores for each task were coded so that 2 x 2 tables were constructed for each pair of tasks using preoperational (Preoperational and Transitional levels) and operational (Concrete operational and higher levels) stages of thought. Chi-square analysis is a method of demonstrating the décalage of children's cognitive development on specific measures in that it makes it possible to

determine if one of a pair of measures is understood at a higher level of thought than the other. The 2 x 2 tables that were constructed are in Table 7. Included in the table are Chi-square values, significance level, and contingency coefficients (measures of the extent of association).

Hypothesis 3 predicted the following sequence of development of the 4 tasks measured:

Young children:

Social Identity > Physical Conservation

Social Causality > Physical Causality

Older children:

Physical Causality > Social Causality

The predictions about the relationship between the social and physical causality tasks were made for both younger and older children rather than for the sample as a whole. In order to try to examine these relationships, Chi-square tables were constructed for the 3 individual age groups. These individual 2 x 2 tables can be found in Appendix G. Few statistics could be computed for the individual age Chi-square tables because of the small cell frequencies, but examination of the tables did indicate the trend of development for the different age groups. The 4-5 year old group scores indicated that social identity may begin to reach operational thought before physical conservation, although statistics were not conclusive. The relationship between the causality tasks was not clearly indicated even by examination of the tables. The tables for the older children with regard to social and physical causality

Table 7

Chi-square Comparisons Between Measures

	χ^2	P	CC
1. Physical Conservation by Physical Causality	30.22	$p < .001$	.50
2. Physical Conservation by Social Causality	32.20	$p < .001$	.52
3. Physical Conservation by Social Identity	36.69	$p < .001$	.54
4. Physical Causality by Social Causality	43.92	$p < .001$	.57
5. Physical Causality by Social Identity	44.76	$p < .001$	.58
6. Social Identity by Social Causality	50.69	$p < .001$	.60

1.

Physical Conservation \ Physical Causality	P	0	Row Total
P	26	24	50
0	0	46	46
Column Total	26	70	96

2.

Physical Conservation \ Social Causality	P	0	Row Total
P	29	21	50
0	1	45	46
Column Total	30	66	96

3.

Physical Conservation \ Social Identity	P	0	Row Total
P	33	17	50
0	2	44	46
Column Total	35	61	96

4.

Physical Causality \ Social Causality	P	0	Row Total
P	22	4	26
0	8	62	70
Column Total	30	66	96

5.

Physical Causality \ Social Identity	P	0	Row Total
P	24	2	26
0	11	59	70
Column Total	35	61	96

6.

Social Identity \ Social Causality	P	0	Row Total
P	27	8	35
0	3	58	61
Column Total	30	66	96

Note: P indicates preoperational thought; 0 indicates operational thought.

also were not clear, indicating that some other type of analysis was needed.

Chi-square analyses of the total sample were used to test the predictions of Hypothesis 3 by discovering which of a pair of tasks children were first able to understand on an operational level. It appeared from examining these 2 x 2 tables that the children first demonstrated operational thought in the physical causality task, then in the social causality task, third in the social identity task, and last in the physical conservation task. Some of these findings are surprising in that it had been hypothesized that the social measures would be understood earlier than the physical measures. It was found that the part of the hypothesis predicting operational thought about social identity would occur before operational thought about physical conservation was confirmed.

Besides the relationships that were predicted from the hypothesis, other sequences of development appeared from the Chi-square analyses. Trends were discovered which were used for further examination of décalage of the development of the concepts related to learning about obesity. T-tests were used to investigate further the predictions of direction of décalage and also to examine possible sequence of the other related pairs of tasks. The relationships examined through t-tests were:

social identity > physical conservation
social causality > physical causality

physical causality - physical conservation
social causality - physical conservation
physical causality - social identity
social causality - social identity

T-tests

Another method for examining the relationships of measures that were predicted by hypothesis 3 is by looking at the difference between the means of the level of understanding of the measures. To do this t-tests were computed. Responses on each task were rescaled to insure that a preoperational, concrete operational, and formal operational response on each task would be given the same weight in the analyses. The t-tests were based on the five stages of thought: preoperational, transitional, concrete operational, transitional, and formal operational. T-tests were computed between tasks to ascertain which of each pair of tasks was understood at a higher level, and to allow comparison across age groups. Those tasks predicted to develop in a definite direction by hypothesis 3 were tested by 1-tail t-tests, and those tasks comparisons planned to add information about how the remaining tasks are related to the development of the concept of obesity were tested with 2-tailed t-tests. Because of the problems associated with multiple t-tests, Dunn's procedure for controlling Type 1 errors was used and a probability level of .003 was chosen for significance. Results of these statistics can be found in Table 8.

For the younger children, social identity was found to occur at a higher level of understanding than physical conservation, $t(31) = 4.84$, $p < .0001$, confirming the prediction in hypothesis 3. The difference between the means of social and physical causality was not significant for the 4-5 year olds; however, the finding does not necessarily

Table 8

Difference Between Rescaled Means on Paired Measures

Age	Paired Measures		t	p
	Physical Conservation	Physical Causality		
4-5	1.00	1.75	-4.63	$p < .0001$
8-9	3.22	4.19	-3.62	$p < .001$
12-13	4.06	4.81	-2.61	$p < .014$
Total	2.76	3.58	-5.86	$p < .0001$
	Physical Causality	Social Identity		
4-5	1.75	1.53	1.27	N.S.
8-9	4.19	3.22	5.02	$p < .0001$
12-13	4.81	4.34	3.95	$p < .0001$
Total	3.58	3.03	5.57	$p < .0001$
	Social Causality	Social Identity		
4-5	1.78	1.53	1.86	$p < .07$
8-9	3.09	3.22	-.89	N.S.
12-13	3.94	4.34	-3.23	$p < .003$
Total	2.94	3.03	-1.15	N.S.
	Social Causality	Physical Causality		
4-5	1.78	1.75	.19	N.S.*
8-9	3.09	4.19	-7.23	$p < .0001$*
12-13	3.94	4.81	-8.94	$p < .0001$*
Total	2.94	3.58	-6.81	$p < .0001$*
	Social Causality	Physical Conservation		
4-5	1.78	1.00	6.26	$p < .0001$
8-9	3.09	3.22	-.47	N.S.
12-13	3.94	4.06	-.44	N.S.
Total	2.94	2.76	1.25	N.S.
	Social Identity	Physical Conservation		
4-5	1.53	1.00	4.84	$p < .0001$*
8-9	3.22	3.22	0.0	N.S.*
12-13	4.34	4.06	.91	N.S.*
Total	3.03	2.76	1.82	$p < .03$*

*Denotes 1-tailed test.

conflict the predictions of the hypothesis. Hypothesis 3 stated that social causality would appear earlier than would physical causality, but would take longer than physical causality to reach a level of formal thought. The data suggest the possibility that the development of social causality may have begun earlier than 4-5 years of age. Based on the progression of means of the older age groups, it is possible that by age 4-5 years, the age of the youngest children in the present sample, the change in décalage had already begun to occur. Both the 8-9 year old and 12-13 year old age groups showed significant mean differences between the causality tasks. Understanding of the physical causality task appeared at a higher level than understanding of the social causality task. The prediction of hypothesis 3, social causality would appear earlier but take longer to reach a formal level of understanding than physical causality was only partially confirmed, but not disproved.

No prediction was made about the relationship of physical conservation and physical causality or about the relationship of social identity and social causality, but examination of the Chi-square tables and the results of the t-tests suggest that children become operational first on the physical causality task and then on the physical conservation task. $\underline{t}(31) = 4.63$, $\underline{p} < .0001$. The relationship between the social tasks was not as clear. Chi-square results for the total sample and for separate age group samples show mixed findings. Examination of the t-test results indicated that young children may begin to develop the social causality before social identity, but that if so the concept of social causality begins to develop at an earlier age than 4-5 years.

This study does not look at ages younger than 4-5 and so cannot confirm or disprove this. Children at 4-5 years showed a slight indication toward higher understanding of social causality than of social identity, $\underline{t}(31) = 1.86$, $\underline{p} < .07$, although not enough to call it a trend. By 8-9 years of age the difference had disappeared, but by 12-13 years of age a change in the sequence of understanding seemed to have occurred. The older children demonstrated that they were thinking at a higher level on the social identity task than on the social causality task, $\underline{t}(31) = 3.23$, $\underline{p} < .003$. These relationships between tasks are important in the understanding of the sequences children follow as they learn to understand the causes of obesity.

Chapter 4

QUALITATIVE ANALYSIS

The purpose of this chapter is to examine the children's responses in more detail in order to respond to the questions indicated in the hypotheses. Statistical evaluations have found the development of the concept of obesity to occur in a developmental sequence. The overall development of the 4 tasks can be seen in Figure 1 and the development of each individual social task seen in Figures 2 and 3. The individual responses will be examined by looking at each stage of cognitive thought for the social measures. Results of physical measures will be found in Appendix E.

Social Identity

Preoperational

The major aspect of this task was to examine one step children go through in understanding the causes of obesity. An important prerequisite for understanding the cause of fatness is that the child must first recognize when a person is fat.

For the most part, the 4 and 5 year olds made up the majority of the sample giving preoperational responses on this task. Only five of the children 8 years of age or older gave indication that they were using less than concrete operational thought, and 3 of those children were in a transitional stage between preoperational and concrete operational thought. An interesting pattern present in all of these

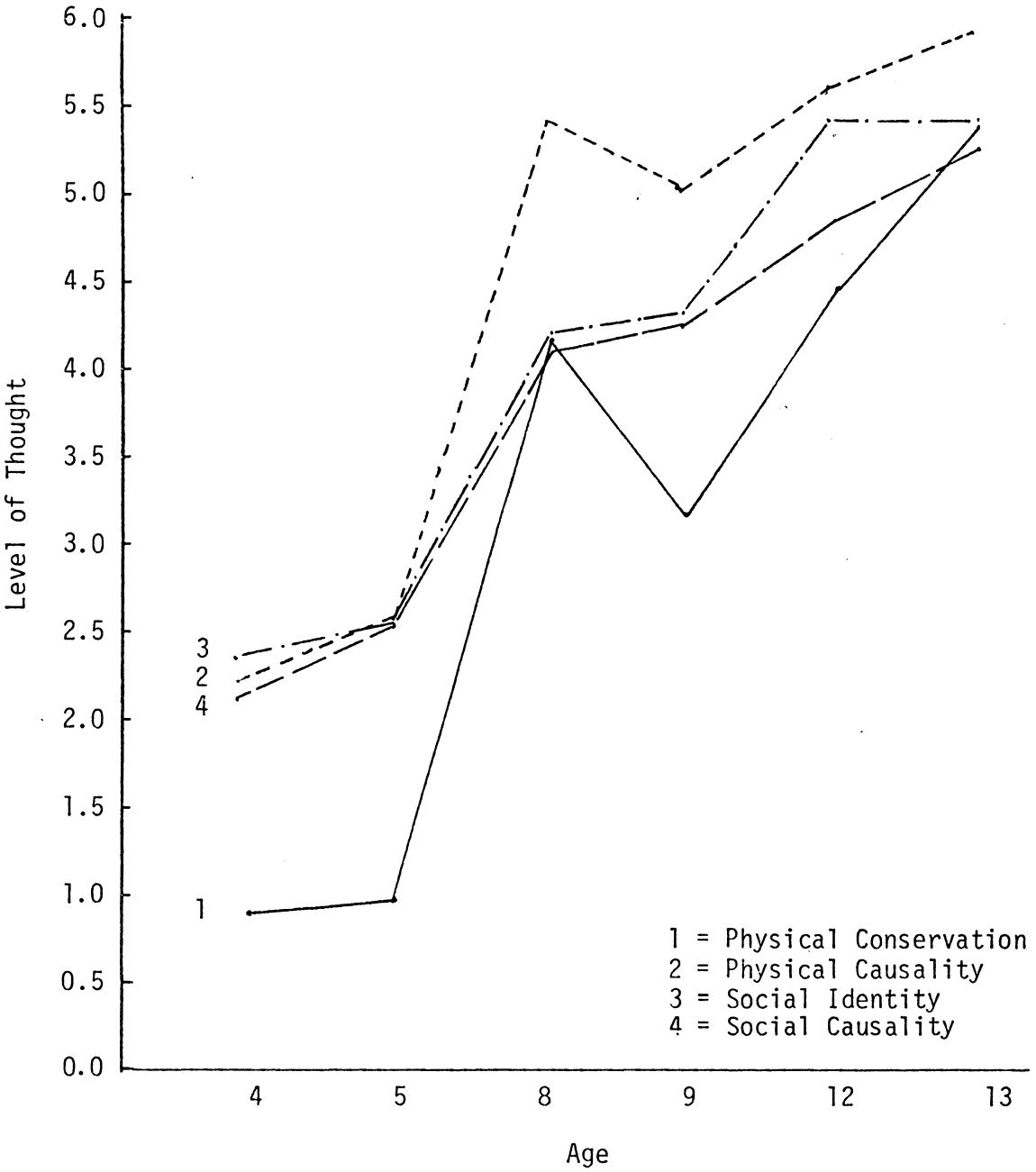

Figure 1. Mean level responses for individual ages on the measured tasks.

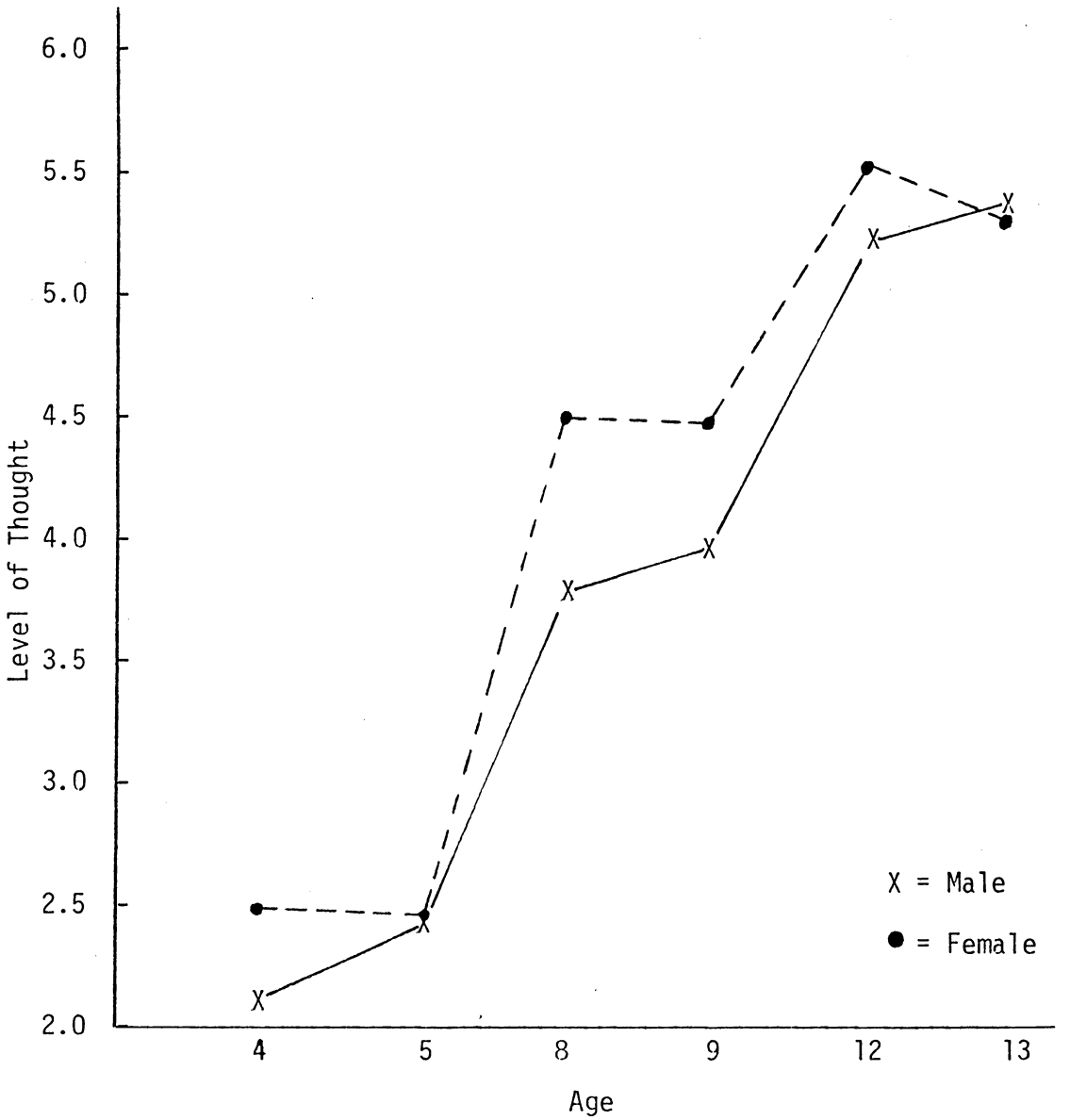

Figure 2. Mean level responses for individual ages and gender for the social identity task.

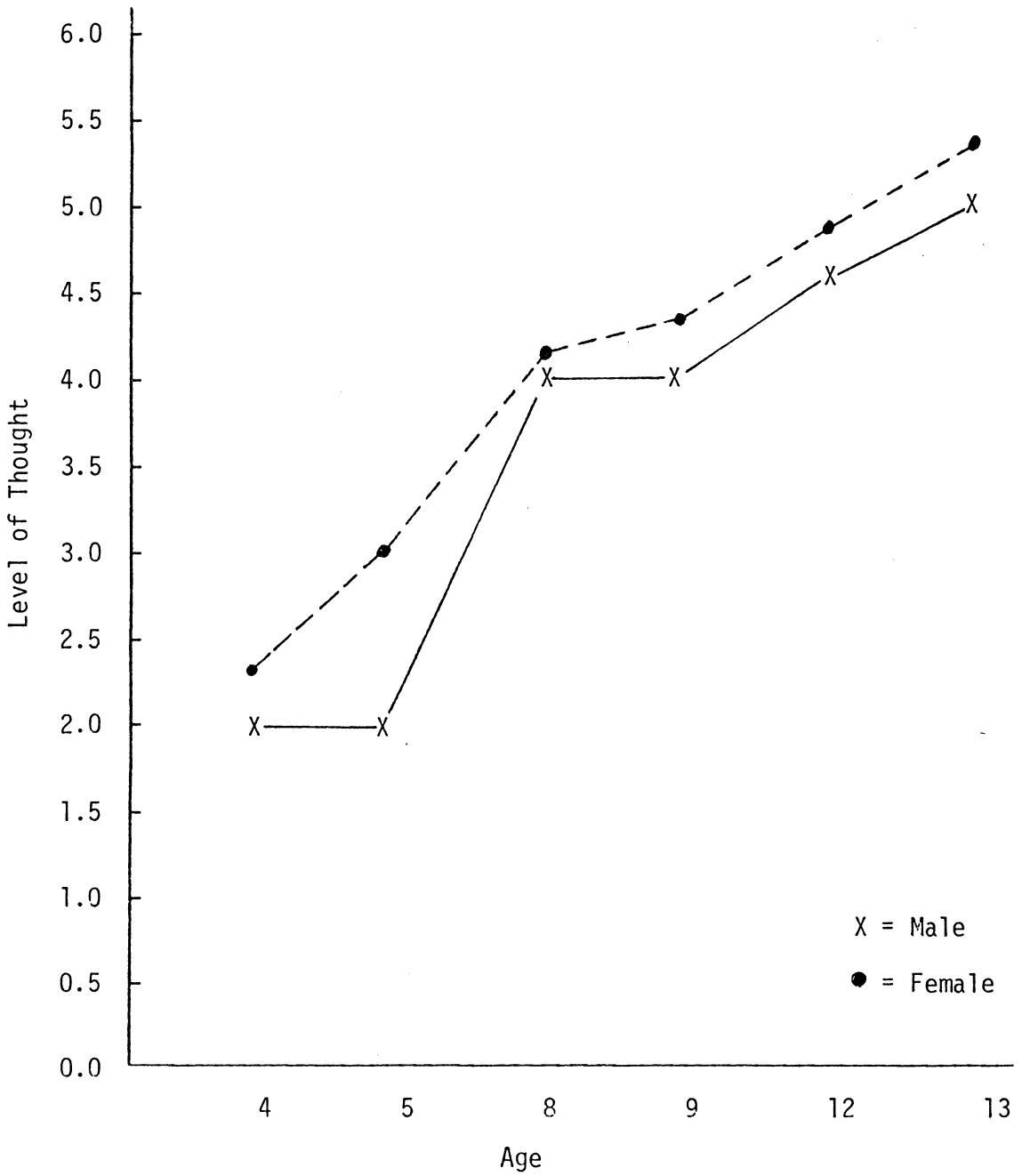

Figure 3. Mean level responses for individual ages, age groups and gender for the social causality task.

children's responses was that they were also scoring at lower levels than the majority of children in all tasks (Figure 1). The tendency to score higher levels in the physical tasks than the social tasks that was seen in the older age groups as a whole was not seen in this group of children. They were scoring lower in everything. The increased understanding of the physical tasks had not yet occurred. All but one of the children in the preoperational level were at least able to identify most of the people in the pictures as fat or not fat correctly. The one child who did not (age 3 years 10 months), seemed to be guessing on every picture and was wrong most of the time. When she gave a reason other than "just is," she said such things as "he's tall," or "he's little." When questioned as to whether a person's big shoulders would make that person fat, she answered that it would. Few of the other children voiced this. It was impossible to tell, however, whether this response actually indicated belief by the child that the bigness of a person's shoulders made the difference or whether this was just a guess.

Two of the children seemed to consistently judge the fatness of a person on their physical size. Although they seemed to be guessing on some of the pictures, they were often correct in their decision. The reason that the level one children gave for stating that the two women in part 2 of the social identity task (pictures in Appendix B) were different people often was, "I don't know." Most of the children in this level still saw the women as being different women.

A slightly higher level of reasoning was used by 14 of the preschool children and 2 8-9 year olds. Level 2, although scored as a higher level is still in the preoperational stage of cognitive thought. The responses characteristic of this level of thought often involved the labeling of a person as fat because of a single aspect. The fat person seemed easier for these children to identify because the child would point to, or state, that the person had a fat stomach. These children made errors with those people who were not very fat or those who were not very thin. They had a great deal of difficulty deciding whether those in the pictures were fat or not fat, and in one case the child picked only two of the pictures as being of fat people. Both pictures were of people who were extremely fat, and the child said that they were fat only in the stomach.

The real differences between the different levels of thought in the social identity task was seen in the 2nd, 3rd, and 4th parts of the task (see Appendix B). In these parts the children had to explain why they answered as they did in more detail.

Thirteen of the preschoolers and three 8 and 9 year olds used a transitional level of thinking, which was most characterized by a definite statement of nonreversibility. They would say that the pictures of the lady in part 2 were of different people, often giving the difference in fatness of the ladies as the reason saying that they thought they were of different people. When shown the four pictures of the boy at two different weights, the children in level 3

(transitional) said that it was not possible for the boy to go from being fat, to being thin, to being fat. They said that once a person gets fat, he stays fat.

Concrete Operational

Typical of level four children, those using concrete operational thought, was that they made few identification errors. These children were able to pick out fat and not fat people, and were able to give some reasons for their decisions. They usually indicated more than one area of fatness. When questioned further into their thinking, however, their reasoning became unclear.

For the most part, the concrete thinkers were able to respond that the boy in the four pictures could go from being fat to thin to fat, but usually could not explain why. About half of these children answered that the lady in the two pictures (one thin and one fat) were of different ladies. They gave as the reason for them being different, "because one was fat and the other was thin," and that "the hair was different." Only when the people were the same in all respects except weight were the children at this level of thought able to accept the fact that the people were the same. Until they exceeded the concrete level of thought the extraneous factors often got in their way. The other half of the level 4 children were able to see that the women were the same in the two pictures, but these children also had trouble with explaining why they were the same. They used such explanations as "her hair is the same," or simply stated they just were.

One of the main differences between the child thinking concretely about social identity and those children in the lower levels was the ability of the higher level of reasoning child to see the reversibility of fatness. The explanation of why one can go from fat to thin and thin to fat is still not developed, even though they do know intuitively that it is possible. This question of how the boy in part 3 went from being a thin baby to a fat baby to being a thin boy brought a variety of explanations, including several from children who said that the boy was not fat in any of the pictures. The other explanations were vague, dealt mostly with food, and in many cases, were physically impossible.

> (How did he go from looking like this to looking like this?) He ate too much or something. (How did he then get thin?) Dieting. He went on a diet. (Any other possible reasons?) No.
>
> (How . . .) Babies are always skinny when they come out of mothers' tummys, then he got fat. (How?) He eats too many sweets. (Then how did he get thin again?) His tummy went down. (How?) I don't know.
>
> (How . . .) He eats a lot, then goes on a diet.
>
> (How . . .) He grows a little bit. (Did that make him fat?) Babies just are chubby.
>
> (How . . .) He grew. When you are born you are skinny because you don't have any muscles yet and then when you get a little older you get it. (How?) I don't know.

Throughout these responses the hint of finalism appeared. The children understood that the weight of a person was reversible and often that eating food might be involved in some way, but they still seemed to have the idea of "that's the way it is." All but four of the 8 or 9

year old level 4 children scored at the same or lower level in their understanding of social causality. Level 4 was the highest level achieved by any of the 4 and 5 year old children.

About one-third of the 8 and 9 year old children gave explanations indicating that their cognitive understanding about social identity was in a transitional level between concrete operational and formal operational thought. Approximately half of the 12-13 year olds gave responses indicative of level 5. These children were able to give logical explanations for all of the identity tasks, although the reasons as to how and why the process of getting fat and thin occur were often singular or incomplete.

> (How did the boy go from looking like this to looking like this?) As a baby he might not be very active and as he learned to walk he got more active. (Any other reasons?) He ate a lot.
>
> (How . . . . ?) As a baby he is fat. Most babies are fat, and he looks it. (Then what happened?) He grew.
>
> (How . . . ?) A baby is just young. Then he got chubby when he ate too much. He lost a little weight as he was getting a little older and when he was older he was thinner. (Is it due to his getting older?) Yes.

These children seemed to have more understanding of the reversibility of human fatness and were better able to identify people who are and are not fat, although their logic about the causes still seemed to be focused on outward appearances.

An interesting concept that appeared in several interviews, both of the 12 and 13 year olds and the 8 and 9 year olds was that babies are supposed to be fat, or that most babies <u>are</u> fat. This idea seemed

to be more prevalent among the older children, indicating that it may be an idea that increases with the child's awareness of fatness. Following are the responses of two 13 year olds who stated this feeling clearly:

> (in response to the pictures of the boy at different ages) As a baby he's fat, then he grows up more. He may stay the same fatness but he just gets taller. (Are all babies fat?) It is normal for babies to be fat.
>
> (same question) In this picture he ate a lot. (2nd picture) In this one it looks like he's fat, but he's not, he just has extra skin. He might eat and eat so when he grows he looks all right. People who don't get chunky as babies aren't really tall and strong later.

Both of these boys gave responses that overall were transitional (level 5). The latter explanation showed that the boy knew that food and growth are involved in how you look, but that he had many misconceptions about the relationships involved. His responses in the questions about social causality also reflected these misconceptions. The terms and ideas he expressed during the interviews of social identity and social causality are very reflective of those presented by mass media. Without having the understanding of the relationships he expressed what he had heard from television, peers, parents, and other outside sources.

The influence of the mass media on the development of the child's concept of obesity appeared quite often in the responses of the 12 and 13 year olds. Several of the younger children had mentioned the "Special K" pinch, and even more of the older children did in response to the question "How does a person know he is fat?" The

children in the lower levels of thinking simply explained that if you could grab anything on your stomach you were fat. Once the child was able to understand what pinching an inch was actually measuring (level 6) he was more apt to describe the relationship between that inch and weighing, and then take into account the person's height and bone structure.

The children not yet comprehending these relationships were the ones most likely to explain how to lose weight by using gimmicks they had seen on television. Mike answered that a good way to lose fat was "to get a pill that makes you not hungry." He extended his discussion by adding:

> or get a cereal that expands in your stomach when you drink water and that makes you not hungry. You go to the bathroom a lot and that makes you lose weight, and that's about it.

This boy has more knowledge about weight control than the child who says simply, "junk food makes you fat because it just sits in your stomach," but he has a lot to learn and internalize about the relationships involved between eating, exercise, and good health. The foundations for this understanding can be seen in his answers, but there must be some clarifications and additions before he reaches a formal level of understanding.

Formal Operational

Not until the child reached the level of formal operational thought in the task of social identity was he able to relate what he saw in the pictures to what he understands. There were only two 8 and

9 year olds who demonstrated the understanding through their responses, although 14 of the 12-13 year olds were indicating level 6 responses. Both of the 8-9 year old children also showed a high level of understanding of social causality. In fact, one of the children demonstrated formal thought in all areas of the investigation except social causality and the other in all areas except physical causality. The aspect of their explanation that was different than the explanation of the children in transition was that these two children were able to understand that a person's weight change involved both the amount of food taken in and an exercise factor. Children thinking on a formal operational level of all ages were connecting the eating of food and the amount of exercise a person got to their fatness, and often included comments about a person's bone structure or muscle build. They were less likely to state that the person was just fat or thin, but used more analytic reasoning to explain why they thought the person was fat or thin. The children using this type of reasoning included the 5 12-13 year olds who had also reached level 6 in the social causality task.

Social Causality

Cognitive growth shows a great leap between the ages of 5 and 8 years, as was seen in Figure 3 in all of the areas included in this study. This leap fits into Piaget's view of cognitive growth perfectly, in that the children go from preoperational to a concrete operational thinking between these ages. Piaget found that the change occurs at about 7 years of age, and the leap we found supports this. It is

important to remember at this point the nature of the present sample. Most of the children came from upper middle class homes where education is stressed. We might expect the children to reach higher levels of thought at an earlier age although retaining the same sequences and trends characteristic of all children. Whether they did reach the higher levels we do not know, but we do know that they did follow similar age trends put forth by Piaget.

We saw from the correlation analyses that the 4 and 5 year olds were handling social tasks with a somewhat higher level of thinking than they were the physical tasks but at 8 and 9 there is a switch that held through the 12 and 13 year old group. The children then seemed to be better able to explain the physical tasks of the study than they were the social tasks concerning obesity. That is, they were more apt to respond at a higher level of reasoning on the physical questions. One explanation for this is that between 5 and 8 the child enters school, where he begins to study specifically the causes of physical events. The question concerning night and day, and the effect of the sun is a problem that is often studied in the first few grades (State Department of Education Curriculum Guide for Elementary Grades, 1978). Social understanding, on the other hand, comes from interaction with others on a personal level and takes longer to experience.

According to Piaget, the child usually enters the formal operational stage of cognitive thought at about 11 years of age. It became obvious from examining the data of the present investigation that the process of entering the formal level of thought about specific tasks may begin at an even earlier age than 11. There were 8 and 9 year olds

demonstrating formal thought in particular tasks of the study and others that were in the transitional level leading to formal thought. The examination of the data also reinforced the fact that not all people enter formal thought at age 11 since a number of the 12 and 13 year olds of the investigation were not demonstrating formal thought on any of the tasks, and most were not demonstrating formal thought on more than one or two tasks. Piaget, in fact, has said that many people never reach the stage of formal thought. That cannot be examined in the present study, but the findings do not rule it out.

Preoperational

We saw through statistical analysis that the kind of thinking the child demonstrated in this task was a good measure of his overall level of cognitive development. The 4 and 5 year olds of the sample gave responses indicating understanding from level 1 of preoperational thought through level 4, concrete operational thought; the 8-9 year olds gave responses ranging from level 2 (preoperational) to level 6 (formal) and the 12-13 year olds' responses were all in level 4 to level 6, with all but three children demonstrating at least level 5 reasoning ability in this task. The children presented responses at all levels of understanding allowing examination of the developing ideas at each level.

Although not at a significant level, the females in the sample seemed to respond with a higher level of understanding than the males (see Figure 3). This was the only task for which this trend was found for all age

groups (Figure 1). It may be that the effect of the American culture on the females of the society is the cause of this trend. Females are still expected to be more socially oriented than their male counterparts, although the equal opportunity movement is attempting to change it.

Typical of responses of level 1 children were those containing little information of where a person gets fat, or of who gets fat, or how a person gets fat. These responses indicate no reversibility in the process. Examples of level 1 responses from the 4 and 5 year olds were:

> (How do people get fat?) Eat so much. (Eat so much of what?) I don't know. (Why are some people fat and some not fat?) They have babies in their tummies. (Can a person get not fat if you are fat?) No.
>
> (How do people get fat?) They grow [indicates tall]. (Can anyone get fat?) No. Uh, I don't know. (If someone is fat can they get rid of that fat?) No, they stay fat.
>
> (How do people get fat?) Eats lots of food. (Can anyone get fat by eating a lot of food?) Sometimes they get real small. (If a person is fat, can they get rid of that fat?) No, you stay fat. (Why are some people fat and some people not fat?) If people be fat they get fat. People be big--are fat, little--not fat.

These children are not indicating that they actually see a difference in the physical height of a person and the person's weight. Often the response indicated that tall people were fat, or that for some children, short people were fat. The last child quoted above was indicating that little people, or children were not fat. These ideas are finalistic. The ideas that the level 1 child presents

indicate that he understands that the size of people are pre-set by something, although he doesn't know by what.

As they move into level 2 the children are more apt to use artificialistic reasoning, and in the case of fatness in particular, animistic thoughts intermingled with finalism. They described the pictures of people of different weight in a broader way than those children in level 1 had done, but they still only used precausal explanations. Tommy (aged 3 years 10 months), who said that a person could lose weight (fat) by "punch in the stomach," showed clear artificial reasoning. This same child had no explanation for why some people are fat and others are not fat, but he did say that only old people get fat.

The largest number of the 4 and 5 year olds responded with explanations showing understanding at level 3, or a transitional level between preoperational and concrete operational thought. This is an earlier age than Piaget found this level to emerge, but the sample is different from Piaget's. Although traces of artificialism, animism, and finalism remain, the child has begun to see that there are physical causes of fatness. The responses of the level 3 children were hesitant, and they used many words that they had heard but did not know what they meant. This was clear from their responses to questions about what diet, or exercise, or even of what too much food meant. Many children in this transitional level answered the question of "How do people get fat?" with the same words--They eat too much.

These same words were found in all age groups and at all levels of thinking from level 3 up, but the difference in the responses that followed the statement was that the children of level 3 were not able to explain what they meant by eating too much. This was true for the 4 and 5 year old level 3 children and for the 2 8-9 year old level 3 children. The children classified as thinking on a higher level were able to explain in various degrees of detail what they meant by "eating too much."

Typical of the transitional level 3 answer was that given by Gary, who began by saying that the munchkins make you fat. He also suggested that too much food could get you fat. When asked who could get fat he immediately suggested that "Big Bird" could get fat because he was big. Another child (4 years 6 months) said that a person can "eat and then you go up." He was not able to clarify what he meant, but would just move his arms as to indicate growth. These types of answers show the semiphysical, semipsychological reasoning that is typical of this level of thinking. Answers, for the most part, of level 3 children do not show reversibility through any action by the person himself. Over and over these children said that a person eats a lot and grows up. That's it. He can't lose it. Once you are fat you stay fat. Size of people was important to the children at this level in that they related physical size (often age but not stated as such) to whether a person could get fat.

The only way that was mentioned that a person could lose weight was through some action other than by the person who was fat. One way

was to have a baby. Those children who suggested this method of getting rid of fat made no mention of sex, but the examples they used were connected to the pictures of women, or they would talk about their mother getting not fat by having a baby. This idea of losing weight by having a baby further points out that the child's idea of fatness is different from the adult's idea of fatness.

There were a couple of interesting responses that mixed artificialism and finalism into the explanation of how a person could get rid of fat through an outside agent. From the same child who said that Big Bird was fat we heard:

> (Can a person get rid of fat once he is fat?) Sure. You take in water, and if you hiccup, and all of your food that you ate, and it comes out, and then you are thin again. (Are there any other ways to get rid of fat?)--child whispers about going to the bathroom.

At first it was unclear whether or not the child was talking about throwing up the food, but further inquiry into what he meant indicated that he was seeing the process as more of a magical one rather than a physical one. Another child responded to the question by saying that "You could ask God to get rid of the fat."

An interesting difference between the transitional level response and the explanation of the concrete operational child was in the type of food mentioned. The transitional level 3 preschool child often mentioned food, but put all food into a single category. The food had no relationship to anything else. To them, all food was the same, and was in some way connected with growing. The only comment made by

these children about the differences of food was that the size of the food might be important. It was the "big" food that makes you fat, or it was a single food.

Almost all of the preschoolers in level 3 were able to express themselves well verbally and were able to explain fairly well what they were thinking. However, even those who were extremely capable in expressing themselves showed the same thinking patterns as the less expressive children in the same level. An example of how children in this transitional stage combined the physical and artificialistic mechanisms was seen by Sue who related getting fat to eating too much Pepsi or having a baby. To her these reasons were the same; however, she saw one as not reversible and the other as reversible. She said, "if you get fat from too much eating Pepsi you can't get rid of it. You stay fat, just like Granddad." Her response indicated that pregnancy would be only a temporary state of fatness and this was seen in the responses of several level 3 children which indicated that their concept of obesity was not firmly established. Children can be distracted by physical change even though it is not connected to adding to the fat layer. The extremely concrete nature of how having a baby causes one to be temporarily fat can be seen clearly in Sue's explanation.

> (How does a person get rid of the fat?) . . . and our mommy, having a baby and she will get fat, and when they take him out, her back will pop and she will be just the same size as she was.

Sue showed through her explanation that she has a low level of understanding of the biological process of getting fat. She also had scored a low level on the social identity task (level 1). Although being very verbal, and able to talk comfortably with someone that she did not know, she was not able to demonstrate an understanding that she did not have. She simply used many words that she had heard. It may be that at this level of cognitive functioning the child relates the term fat to any person who is large, no matter what the cause or durability of the cause. The 2 8-and 9-year-olds who were using level 3 reasoning on this task also were among the 5 children thinking preoperationally on the social identity task.

Only one 12 year old boy gave a level 3 (transition between preoperational and concrete operational) response to the social causality task. His level of understanding in the other tasks were also lower than most children his age (5 in physical conservation, 4 in physical causality, 4 in social identity). The kind of explanations he gave in all areas indicated that his cognitive development was typical of the 8-and 9-year-olds in the sample. This simply points out the individuality of the rate of cognitive development. The sequence that this child is following may be the same as the other children of the sample; it is perhaps occurring at a slower rate.

Concrete Operational

Most of the 8-and 9-year-olds (24) reached concrete operational thought level in the social causality task. According to Piagetian

theory, this was to be expected, for he saw the concrete stage of thought beginning at about seven years of age. The explanations of the eight children who were not in the concrete operational stage fell into a transitional level between concrete and formal operational thought or, in the case of two of the eight, into the transitional level between preoperational and concrete operational level. Level 4 was the highest level any of the 4-and 5-year-olds reached, with 5 of the children giving concrete reasoning. This is not inconsistent with Piagetian theory, because the majority of the younger children were preoperational. It also is not unusual for 5 12-13 year olds to be using concrete reasoning on the social causality task.

The level 4, or concrete operationally thinking children were, overall, the most verbal children of the preschool sample. It is hard to tell whether they talked more because they had more to say or whether they had more to say because they had a better grasp of the words, but they did demonstrate a greater understanding of the causes of fatness than the children of the same age operating in the lower levels of thought. The five preschoolers who demonstrated concrete thinking gave primarily physical explanations to the questions about fatness that were much like the responses given by the older level 4 children. This is not to say that they no longer showed egocentrism; they did, but in a more physical way. The explanations for fatness they gave were based mainly on food and eating, but lacked the understanding of what relationships were involved in getting fat that were seen at higher levels of thought. The process of getting fat still

seemed to have a feeling of finalism about it, although this was not explicitly expressed.

By the time children have reached the concrete level of understanding the causes of obesity, they have shed the artificial aspect of explanations, but they still may show some finalistic ideas or egocentrism occasionally. There were a couple of children who seemed to realize that anyone could get fat, but when asked if they had any fat on their body, acted as if they had been asked a very ridiculous question.

The idea that anyone could get fat was acknowledged by the concrete thinker, but it seemed to be closely connected to the concept of good or bad food. Many of these children spoke about what you "should" or "shouldn't" eat but were unable to tell why. The number of "bad" foods the children were able to mention were also limited, as is seen in the following:

> . . . (Eating what kind of food makes a person fat?) Things like candy, potatoes, things like that. (Why do those foods make you fat?) I don't know about that. (How much would you have to eat to get fat?) You'd just have to eat every day some candy.
>
> (What kind of food makes you fat?) Candy, cookies, and that kind of food. (Why do those foods make you fat?) They have sweet in them.
>
> (What kind . . . ?) Junk--chocolate and peanut butter and all that stuff. (Why do they make you fat?) It is fattening because of the sugar.
>
> (What kind . . . ?) All foods, well, you just know what are the right kinds of food. (How?) You just do.

The term "too much" appeared quite often in the explanations about fatness of the preschoolers, but none of those children who used the

term were able to explain what they meant by it. The effect of listening to adults talk was evident in that the words used by the adults often turned up in the children's explanations, as did some of the ideas about losing or gaining weight. The following responses of Jean are an example of this:

> (How does a person get fat?) Eat sweets. Sugar. (Who can get fat? Anyone?) if he eats too much. If you go on a diet you won't get fat. I'm getting on a diet. (What is a diet?) Something that makes you skinny. (What do you do on a diet?) Eat good food. Broccoli's my favorite, and corn and meat. (Why are they good food?) That makes you strong. (Are there other ways to get rid of fat?) Drink milk. I always drink milk all the time. (Why are some people fat and some people not fat?) Some people eat too much. (How much is too much?) Just too much. (Where does fat go when you lose it?) Gets into your stomach--and you get skinny.

Using terms without really understanding them was also common in the responses of older level 4 children. Many of these children used terms like exercise, diet and, in some cases, calorie, but demonstrated through their inability to describe what they meant by those terms that they were simply using them in a context in which they had learned them. The following responses were all these children could say to explain the term "diet," even though they had used it to explain how a person could lose fat.

> (What is a diet?) You eat less stuff. You eat stuff that's not fattening. (What would you eat?) I don't know.

> (What's a diet?) Not eating much food. (What food would you eat on a diet?) Not really sweets. Well, good food, not 6000 calories a day. Like eggs for breakfast, cottage cheese.

> (What is a diet?) You don't eat so much. Just eat like a salad or some crackers. (Why?) Uh. I don't know.
>
> (What is a diet?) Quit eating sugars. (What kind of food would you eat?) Meat probably, apples. (Why would you eat those foods?) I don't know.
>
> (What is a diet?) You lose weight. (How?) Don't eat as much. (What kind of food would you eat?) Special food--meat, I guess.

Several of the children of both age groups talked about eating less food without mentioning that they were talking about a diet. The information that was given was the same, however, as was given by children talking about diets. Neither explanation was complete nor very accurate. The idea that a person should eat certain foods was mentioned by many children at this level and was stated clearly by 8-1/2 year old Julie:

> (How does a person get fat?) Eat candy and stuff like that. He don't eat much milk, meat and stuff he is supposed to eat. (How does a person get rid of fat if he is fat?) If they start eating good food and stuff they're supposed to eat they might. I mean if you're born pretty fat and you're getting pretty fat, you'll be fat for the rest of your life. (What goods would be good to eat if you didn't want to get fat?) The four food groups. (As much as you want?) Yeah, if you don't get too full.

The lack of understanding about the relationship of fat and food and exercise was seen in the explanations of the concrete operational thinkers of the question of "What happens to fat when a person loses weight? How does it get off your body?" The child operating at this level of thought was thrown by this question. Most of them just sat there for a moment and then said in a puzzled tone of voice that they

did not know. The explanations that were given were those that were directly related to the individual's experience. Some reported what they had been told and others related an experience of a relative, often neither being accurate. These are typical of explanations that were given by the level 4 child.

> (Where does fat go?) It falls off. (How does it fall off?) It goes away inside of you. (How?) You don't eat so many things.
>
> (Where does the fat go?) You just digest it, you go to the bathroom.
>
> (Where does the fat go?) It sorta disintegrates. The fat can't stand not having as much food anymore so it just kinda disintegrates.
>
> (Where does fat go?) It runs out.
>
> (Where does the fat go?) It could be like skin molecules. They go into the air when they die. (Is that what happens to fat then?) Yeah.
>
> (Where does the fat go?) I think it goes through digestion and splits into pieces.

They were not able to deal with the problem of where fat goes concretely since it occurs inside the body. Many of them resorted to the concrete explanation of explaining that it gets off your body by your going to the bathroom. This explanation of 4 year 9 month old Jenny is a good example of how the concrete thinker will use the experiences they have had to explain the causes of getting fat and the ways to get rid of that fat.

> (How do people get fat?) When they eat too much and fill up on junk or maybe they get pregnant. (What foods make you fat?) Candy and sweet stuff. (Can a person get rid of fat if they are fat?) Yeah, if they run a lot or swim. (What will that do?) They

> run and get skinny. (How?) I don't know. (Where does the fat go when it leaves a person's body?) Back into their body. When you go to the bathroom it runs away. (Can a person get fat again after they have gotten rid of it?) Yeah, eat more junk.

The role of exercise in losing fat was also discussed by children in this level of thought by using terms that they had heard in a variety of ways. Several children of all ages mentioned the activity of exercise as having something to do with losing weight, but they did not relate it directly to the disappearance of fat. Exercise was seen as being separate from eating, and often as a means of building muscles or making you strong, not as a method to get rid of fat. Mike (8 years 8 months) when asked what he meant by exercise said that exercise was "like running, and sit-ups," and that its purpose was "It makes you sweat." Mary (7-1/2 years), on the other hand, said that exercise "builds up your bones and helps you get skinny," but was unable to explain how it did either.

Another child operating in level 4 introduced the idea of exercise as a form of finalism. She saw exercise as the tool for something happening physically to make you thin again. Another method she mentioned for instantly getting rid of "fat" was to have a baby. Her responses are interesting in that she included several of the aspects typical of the concrete operational answer.

> (How do people get fat?) Eat too much. (Can anyone get fat?) Yes, my mommy was fat when I was in her tummy. (Can a person get rid of fat if they are fat?) Yes. (How?) Exercise. (What do you mean by exercise?) You kinda hop. (What does that do to help get rid of fat?) Your tummy goes back in [demonstrates]. (Are there other ways to get rid of fat?) You stop eating and do

> exercise. (Do you stop eating all food?) Candy, and don't eat ice cream for supper. (Why should you not eat candy or ice cream?) [no answer] (Why are some people fat and some people not fat?) Some people have a baby and some eat too much and not exercise. (Where does fat go when it goes off your body?) My mommy never told me.

Even though the general understanding of the causes of obesity for many of the children seemed as being at the concrete operational level, the answers they gave throughout the interview were not consistent. In the questioning about certain aspects of the concept the children even reverted back to giving precausal explanations. Inconsistency, then, is a key word when examining the responses of the level 4 children to the questions about obesity. For example, by the time children have reached the concrete level of thought they were able to pick out the food that was more fattening most of the time. The reasons they gave for their choice, however, were another story. They gave explanations ranging to one being "better for you," it's "good for you," to "it will help your body." Several children in this group were still relating fatness to the size of the food. These departures from what would be expected from concrete thinkers points out the fact that children in different levels of thought exhibit a variety of thought patterns, both less advanced and more advanced than the majority of their reasoning. Following are some of the explanations the children gave, demonstrating this variance of responses seen in level 4. These are explanations given for why eating spaghetti would make a person fatter than eating the same amount of lettuce:

Meat somehow gets you fatter.

Because I just think that way.

Well, the meat is OK, but the sauce and stuff is not that good for you.

It has additives.

It has more sugar and is not as good for you.

I think it has more fat.

It's a real food.

They take the good stuff out of it.

Spaghetti has more in it. Lettuce is thin.

Level 5 indicated another transitional level of reasoning, between concrete operational thought and formal operational thought. The main difference between this type of thinking and concrete thinking (level 4) is that children now began to use the terms surrounding obesity correctly, and see obesity, or fatness, as something that happens to your body as a result of something you have done. It can be called a level of partial understanding. An example of this partial understanding came from Gene (13 years 4 months) who added additional terms in his explanation.

> (What makes a person fat?) It's in your genes. If you have big bones you will look like you are fat, or you could eat a whole lot and build up extra calories, and they don't have any place to go so they are stored in the fat cells. Eventually, you just get bigger.

It seems that learning the terms commonly used by our society when talking about obesity comes before understanding those terms. Most of the children operating in the transitional level (level 5) used the

correct terms (diet, calorie, exercise, etc.) and in many cases used them correctly. When questioned, however, about the meaning of the terms they used, their explanations tended to be inconsistent or they tended to be incomplete. It was clear that they were beginning to put the pieces of the concept together, but there were still holes in their understanding. Children who were in a transitional level between concrete operational and formal operational thought were beginning to realize that there was a relationship between food, exercise, and fat. This understanding was beginning to develop but still had many gaps as well as misconceptions about the relationships. The explanations of the causes of obesity were now physical, but areas such as what happens to the fat were still fuzzy. One child said that she really didn't know what happened to it, but "maybe your body might use it for something else." A complete understanding of the processes would not have allowed her to give that explanation. Some other responses to the question "What does exercise have to do with losing fat" by these level 5 children were:

> It makes you perspire which makes you lose weight. You are exercising your heart and building up your muscles.
>
> It makes you sweat and lose water. It makes fat into muscle.
>
> You burn the sugar by exercise.
>
> It keeps you moving and your fat goes to muscle. Fat will jiggle until it is muscle.
>
> You run off the food. You use up the energy like the fat.

> You burn off the fat and replace it with muscle. If you eat more, muscle goes away and fat replaces it.
>
> It wears the fat down. (How?) I'm not sure.

These answers indicate that although the children were aware that exercise was involved in some physical way, they did not know how. Not until the child reaches the level of formal operational reasoning was this understanding of the relationships between the various aspects of causes of obesity demonstrated.

Formal Operational

This level of analytic thinking occurred in the social causality task only after the child progressed through all lower levels in the other three tasks. Statistical analyses indicated that the social causality concept was the last to develop completely to the formal stage. Of the five children receiving scores indicative of formal thinking in social causality, all but one of them also received scores indicating that they were thinking at the formal level in all of the other tasks as well.

Examples of formal thought about the question about the role of exercise in weight loss are:

> When you exercise, you use energy. If you don't have enough energy in what you eat, your body uses what is stored.
>
> When you exercise you use up so many calories for doing something, like running.

Most of the responses from the children thinking at the formal level were connected to several questions, so that their explanations

of the relationships between different aspects of the concept of obesity were explained during their discussion of how people get fat, how people lose fat, what is exercise, to name only a few. For example, George explained what a calorie was by saying that it was "a measure of a unit of food energy." He then went on to describe what fat was, by saying "It is a build up of calories that your body can't use. It uses what it needs for energy and the rest builds up as fat." When combined with the other explanations to the questions in the interview it was clear that George did understand the processes involved in human weight change.

The question "Where does fat go when a person loses weight?" seemed to encourage the level 6 child to explain the relationship between eating, exercise, and becoming fat, as well as any single question in the interview. This question was often answered with information that indicated that they did understand the relationships between the causes of obesity. Some of the responses to this question began:

> When you exercise the body uses energy. If it does not have enough in the food it takes in it will use what is stored.
>
> Fat is just burned up slowly with exercise.
>
> Fat is stored energy. It's turned into energy and is burned off.
>
> It is burned up. It is used to produce energy. When you exercise it is used rather than eating more.

Until the child understands this relationship he will talk about getting rid of fat in concrete ways, such as going to the bathroom, sweating it off, turning it into muscle, or as one boy said, "it

drips off." The children who used formal reasoning to answer this question also answered the rest of the questions equally well.

The five children whose explanations used formal thinking were different from the other children in the sample in that they had been able to put together in a logical way information that they had acquired from various sources. Although part of their information most likely came from school classes, schooling did not seem to cause the difference. Most of these children were in the same school system, and many even in the same classes, and yet these five were able to understand and internalize the causes of obesity whereas the other 26 children in the 12 and 13 year old sample were not. The difference must have taken place in the development of the individual's cognitive structure. According to Piaget (1972) the social environment of children, which includes school, plays a role in their progression from concrete to formal thought in that it may hasten or retard the development of formal structure, but the cognitive structure must be developed to the point of allowing formal thought.

The low number of children thinking about obesity on a formal level does not conflict with Piagetian theory. Piaget noted that all people do not reach formal thought in all areas. It may be that a person reaches a formal level of thinking only in those areas that are stimulating and interesting to the individual (Piaget, 1972).

Chapter 5

CONCLUSIONS AND IMPLICATIONS

In the United States obesity is a major health problem. Various researchers have written about the incidence of obesity as well as the causes and the effects of obesity. The present study is the first to examine the development of the concept of obesity. Solving a problem is difficult unless one is aware of the separate aspects involved in the problem. Being aware of the sequence followed in the development of the concept of obesity needs to be understood before programs aimed at influencing concept development can be instituted. The sequence followed by children in understanding about obesity has been documented in this study.

Hypotheses

1. Children's thinking about obesity will demonstrate a stage sequence which reflects a structural change in the child's cognitive ability. This sequence will be similar to the sequence found in other areas of thought.

An analysis of variance showed that the understanding of the causes of obesity develops in a definite developmental sequence. The level of that development is dependent on age, with the younger children demonstrating thinking at lower levels than those demonstrated by the older children. Substantive examples of each level of thought about obesity appear in Chapter 4.

Results of this study indicate that the development of the concept of obesity follows stages that are very similar to those found in previous studies of the development of various other concepts. The understanding of obesity develops in three cognitive stages related to the preoperational, concrete operational, and formal operational thought as suggested by Piaget. Similar stages were found in the development of the concepts of death (Kane, 1979), ecology (Owley, 1976), and moral development (Kohlberg (1969). The concept that has been examined in a method most similar to the method used in the present study was the one concerning the origin of babies (Bernstein & Cowan, 1975).

The present study and Bernstein and Cowan's study have added to the body of knowledge about the aspects of cognitive development dealing with people. Many of the findings of Bernstein and Cowan's study of the development of the concept of human reproduction parallel those of the present study. Both studies demonstrated that children seemed to be able to handle physical objects with respect to causality earlier than they were social objects. The trends of development found in all areas of the studies were similar.

The transitional levels between stages were the levels of thought where children showed any unsureness in reasoning. At these levels the explanations given by the children were less firmly stated and often contained explanations (explaining an event or occurrence) that were not congruent with the statements they made at other times in the interview. Although subjective, the tone used by the children in making their responses in the interview often seemed to indicate how sure the children

were of their explanations. At these levels of disequilibrium the children were simply trying out explanations based on their experiences that would at some future time, with alterations, put their cognitive structures back into equilibrium. According to Piagetian theory, firm explanations are not made until this equilibrium is acquired.

The transitional levels of understanding of social causality are indicative of disequilibrium in children's thinking about obesity. Althought many of the children might at first have appeared to be thinking on three different levels on different tasks, on closer observation it was shown that they were actually performing at one stage and two related transitional levels of thought. Elkind (1981) and Kohlberg (1976) have both suggested that it might be a good time during a period of transitional thinking to encourage cognitive development by presenting new material to the child that is one level above the level of performance. The fact that children show transitional thinking indicates disequilibrium, and that their cognitive structures are able to handle new experiences.

2. The child's cognition concerning obesity (social causality) will develop along parallel lines with social identity, physical causality, and physical conservation.

This hypothesis was strongly supported by the findings. The age effects found in the analyses of variance were significant for social causality and all other tasks measured. This examination of the means for each task showed similar increases according to age (see Table 3).

This seems to indicate that the child's thinking about the causes of obesity does develop along parallel lines to all of the other measured tasks.

3. Décalage among the social and physical tasks will be as follows:

   a) Social identity will develop earlier than will physical conservation because identity is achieved for social objects before it is for physical objects and identity appears before conservation.

   b) The child's understanding of the causes of obesity will begin to develop earlier than will the understanding of physical causality, but will take longer to reach a level of formal understanding.

This hypothesis was only partially supported because the direction of the décalage changed as the children became older and indicated thinking on a higher developmental level. The results of the analyses showed that the understanding of the causes of obesity did begin earlier than the understanding of physical conservation; yet by age 12-13 years most of the children still had not reached the formal level of reasoning. Only five of the 32 children in the oldest group were operating at a formal level of thought in the social causality task. T-tests supported the assumptions made by the hypothesis (see Table 7), as did results of Chi-square analyses (see Table 6). The 4- and 5-year olds of the sample did begin to grasp the concepts of social identity before the concept of physical conservation and the concept of social causality before the concept of physical causality, but by 8-9 years of age this relationship had begun to change.

This change of direction in décalage may be related to the ability of the child to understand reversibility. The problem of examining the pattern of décalage in the understanding of different concepts is complicated by multiple influences. According to Piaget (1968), the first object to become permanent for the young child is another human. This indicates that the concept of social identity may be the first identity concept to be acquired. Piaget has also said that in order for a child to be able to think on a concrete level the concept of reversibility is necessary. Both of these abilities are involved in the understanding of causality.

For 4- and 5-year-olds, object permanence is the factor involved in the thinking about causality, because these children are thinking at a preoperational level and are not able to understand reversibility. It is no surprise then that the younger children of the sample scored higher on the social causality task and social identity task than they did on the physical conservation task.

Much change seemed to occur in the thinking of the children from the youngest group to the 8- 9-year-olds. Many of the 8- 9-year olds were thinking on a concrete level, making the reversibility factor important. The effect of the children's ability to comprehend reversibility was seen in their understanding of both physical and social tasks. The change in the pattern of décalage reflected this in that physical causality occurred at a higher level of understanding than did social causality.

Humans cannot be manually manipulated as clay and water can, nor can change in the size of people be seen as quickly as the change from

day to night can be seen. The switch (physical causality now at age of 8- 9-years-old, understood at a higher level than social causality) in the understanding of social and physical tasks that occurred with the 8- 9-year-olds seemed to mark the entrance into the concrete operational stage of cognitive thought. These children showed a greater understanding of physical causality than they did of social identity, although both tasks were understood at higher levels than were scored by the 4- 5-year-olds. Direction of décalage at this time seemed to be related to the ease with which the child could handle the task concretely. The sequence of level of understanding of the measured tasks by the 8- 9-year-olds was as follows: first, physical causality; second, physical conservation; and third, both social tasks. This sequence of acquisition of tasks was also followed by the 12- 13-year-olds with the addition of a differentiation of understanding between the social tasks. The older children scored higher on social identity than they did on social causality. By the time children are 12- 13-years old the physical tasks seem to be well developed, with 72 percent of the children operating at a formal level on the conservation task and 84 percent thinking formally on the causality task. The social tasks seemed to be more difficult to understand at a formal level, with only 22 percent of the sample operating at the formal level on the social causality task. The results were in the same direction as those found by Bernstein and Cowan (1975).

Therefore, the first part of Hypothesis 3 was confirmed in that social identity did begin to develop at an earlier time than did physical

conservation. The difference between the means for the tasks was significant for the 4- 5-year-olds, $t = 4.84$, $p < .0001$, and for the sample as a whole, $t = 1.82$, $p < .03$.

The second part of the hypothesis, stating that the child's understanding of the causes of obesity would begin earlier but take longer to reach a formal level of understanding, was partially confirmed. Only the sequence at the two older age groups showed significantly higher mean scores for either task, but the direction was toward higher level understanding on the physical causality task than on the social causality task.

Although no prediction was made concerning the development of décalage in the physical tasks or the social tasks, the analyses gave information adding to the knowledge concerning the development of the concept of obesity. Children at each age group and as a total sample scored at significantly higher levels on the physical causality task than they did on the physical conservation task. This may have been a result of the school environment. The school system in which all of the sample attended introduces the concept of day and night as it relates to the planets in the first few grades (State Department of Education Curriculum Guide for Elementary Grades, 1978).

The direction of the sequence of development of the social tasks was not as clearly indicated by the analyses as was seen in the physical tasks. The younger children scored slightly higher on the social causality task than they did on the social identity task, but the older children reversed the trend and scored significantly higher on the social

identity task than they did on the social causality task. Chi-square results added information to what was known about the development of the social tasks. According to the 2 x 2 Chi-square tables (see Table 6), most of the change from preoperational to operational thought about the social tasks as measured in the present study occurred between the ages of 4- 5-years and 8- 9-years.

Implications

The present study has begun to explore how children learn to understand the concept of obesity. The sequences children follow as they develop cognitive skills that are used in understanding the causes of obesity have been documented for various ages of children.

Several important implications have been discovered from the findings of this investigation.

1. It was found that there is a sequence that children follow in learning about obesity which changes as children get older. This sequence can be used as a base for the development of an educational experience to enhance the development of the concept. Further research needs to be carried out to discover whether or not the sequence children follow when learning to understand the causes of obesity is invariant. A longitudinal study might provide additional information about the invariance of the sequence by following the development of the individual over a number of years; however, since there is no way to measure directly the child's internal cognitive structure about obesity, reasoning can only be measured by observing and listening to what children do and say.

There is no guarantee that the child will be interviewed at the proper time to show change in levels of internal cognitive structure because growth occurs at different rates in every individual.

2. Responses of children in the present study showed that children do not understand the terms they use to explain obesity, even by the time they are in the 7th or 8th grade. This implies that educational experiences need to be designed to promote the understanding of the terms used in the description of the causes of obesity, with the aim of encouraging understanding of the causes of obesity. Experimental research needs to be carried out to determine such appropriate educational strategies for each level of understanding.

3. Results of the present study suggested that the sequence of understanding of the measured tasks changes as children reach a concrete operational level of thought. Younger children understand the social tasks at a higher level than they do the physical tasks, and the older children understand the physical tasks at a higher level than they do the social tasks. Research needs to be undertaken to discover ways to encourage children to reach their potential level of understanding in all areas, no matter what their age. One possible additional area of study is to apply Piagetian principles to the findings of the present study in order to make the development of the concept of obesity an active learning process. Guides such as Piaget in the Classroom, edited by Schwebel and Raph (1978) and Children and Adolescents by Elkind (1981) can be used to apply the Piagetian principles to the specific aspects of obesity. After the teacher discovers the child's level of

understanding of the tasks in the present study, the information gained about the sequence of the development of the concept of obesity can be used to supply material and information concerning the gaining and losing weight to the child.

Conclusion

The concept of obesity develops in an age-related developmental sequence, going from preoperational, concrete operational, to formal operational thought. Children first begin to gain an understanding of social objects, and change the direction of their understanding when they reach concrete thought. At that point they begin to understand physical tasks at higher levels than they understand social tasks. The attainment of the understanding of the concept of obesity depends on the formation and understanding of the concepts of identity and causality, and is limited by the level of cognitive thought of these tasks. The décalage shown in the development of overall physical and social concepts of identity/conservation and causality is different for preoperational thinking children and for operational thinking children, demonstrating the importance of the concreteness of the concept involved. These findings confirm and elaborate the postulations of Piagetian theory.

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APPENDICES

APPENDIX A

PIAGETIAN FRAMEWORK: CONCEPTS AND TERMS

Piagetian Framework: Concepts and Terms

In Piaget's view, intelligence consists of two interrelated processes, organization and adaptation. These are functional invariants in that they exist in all stages of development. Organization involves the process of putting schemes together in a meaningful way so that the individual's environment makes sense. Adaptation, on the other hand, involves the process of actually changing the cognitive structure by the individual in order to be able to make sense of the environmental experience. The process that makes this structural change possible is called equilibration (Piaget, 1950, 1968).

By equilibration Piaget means that all people are constantly striving to make the experiences they have fit together in a meaningful way. Children are constantly coming into contact with new experiences that do not immediately fit into their existing cognitive structures causing them to be in a state of disequilibrium. To a lesser extent, the same is occurring with the adult. Something must happen in order for the individual to understand how to react to this new experience. For the infant this new experience might mean a different shaped nipple. It might mean a new math problem for the older child, and the adult might be faced with a new boss at work. All of these experiences require the mind to function if the individual is to adapt. Equilibration involves two different processes

working together to incorporate experiences into the individual's cognitive structure. Although always occurring together, the balance between assimilation and accommodation varies from situation to situation, depending on the newness of the experience. Assimilation and accommodation can be defined as follows:

Assimilation is the taking in, or adding new information to already existing schemes. It is the more primitive of the two processes in that it does not require any structural change to produce equilibrium (Piaget, 1950).

Accommodation is the process of shifting or modifying the existing schemes in order to take care of new experiences. The individual must take the new experience in and then integrate it into his/her cognitive structure to develop a new scheme that is more appropriate for the new experience or information. This process involves a structural change in order to achieve equilibrium (Piaget, 1950).

Equilibration is a very important aspect of Piaget's theory and plays a major role in concept development. It involves the forming of a mental balance that is achieved through the assimilation and accommodation of conflicting experiences and perceptions the individual faces throughout his life.

Piaget has described cognitive development in four stages, each reflecting a different type of thought process, and each with a qualitatively different cognitive structure. How a person's thinking fits into a certain stage is based on fundamental ideas, which must

be explained in order for one to understand the present study. The following constructs need definitions:

Scheme. The scheme is the basic unit of Piagetian thought which can be defined as an organized pattern of behavior. These behavior patterns or habits form part of a person's daily routine and begin to form very early in life. One very common early scheme is that of sucking. This scheme is modified and changed as the individual experiences new objects in his environment. All schemes involve activity on the part of the individual, in that the scheme describes the things that the child does (Ginsburg & Opper, 1979).

Egocentrism. According to Flavell (1963), the concept of egocentrism in the young child "denotes a cognitive state in which the cognizer sees the world from a single point of view only--his own--but without knowledge of the existence of viewpoints of perspectives and, a fortiori, without awareness that he is the prisoner of his own" (p. 60). The children, then, believe that they are the center of the universe and they are unable to look at the world from any point of view other than their own. The reason for this is that they cannot retain simultaneous awareness of themselves and the universe. Piaget points out, however, that this does not mean that children are selfish in the way in which we associate the term in adults. They do not, at this point, have the choice of action, but their beliefs are regulated by their cognitive structure. If we understand egocentrism of the young child to be this type of reasoning, then the process of becoming less egocentric and more reality-oriented is a major task in

cognitive development. Although it does appear in every stage of development, egocentrism affects behavior in different ways at various ages. The form that it takes changes, and its influence decreases with increasing age. The child's ability to understand the difference between cause and effect, between dreams and reality, and between subjective and objective, all depend to an extent on decreasing egocentrism in the form described by Piaget as being typical of the young child (Formanek & Gurian, 1976). The decrease of egocentric beliefs is demonstrated by the understanding of the above principles appearing. Also, such egocentric reasoning as artificialism, animism and centration show a decrease as the higher level logic appears.

Operations. Piaget refers to operations as internalized action. They are the mental equivalents of behavioral schemes, and are never isolated in the individual's mental structure. These mental plans form the basis for later, more involved mental schemes which are reversible. The fact that operations are linked together to form an organized network of behaviors is actually the base of what Piaget calls organization. This is a major aspect of Piagetian theory.

Structure. By structure Piaget is referring to "the organizational properties of intelligence, organizations created through functioning and inferable from the behavioral contents whose nature they determine" (Flavell, 1963, p. 17). Structures change with age, and are the major areas of study in Piagetian theory. Because structure cannot be observed directly, researchers must infer much about it through other means. Keats et al. (1978) defined a structure

by saying that it is information about relationships between elements or events that is stored within the organism. These two explanations of cognitive structure are similar in that they both see structure as a self-regulating property within the thought processes. When structures become organized into systems, with the properties of a group, they have formed what is called a stage. The formation of new structures promotes movement into a new stage of development. The individual is constantly forming new structures through the process of equilibration in order to form coherent and stable patterns of thought that lead to a sequence of invariant stages which have been described in detail by Piaget (Piaget, 1950; Flavel, 1963; Ginsburg & Opper, 1979).

Conservation. Conservation refers to the broad concept that is demonstrated by the child's understanding that certain properties of a substance remain the same despite transformations of other properties. Being able to conserve is a major acquisition in the development of logical thought.

A child must learn to distinguish a number of ways in which a material can be transformed. The major ways are substance, weight and volume. These concepts develop in similar developmental stages but at different times. Most children first develop the concept of conservation of substance at about 8 to 10 years of age, conservation of weight at about 10 to 12 years of age, and finally conservation of volume at about 12 years of age or older. The age that each of these concepts are obtained may vary, but they will develop in the

same order (Ginsburg & Opper, 1979). Piaget calls this overlapping horizonal décalage. Bell describes decálage as the child's ability at a given time to perform with varying degrees of success on tasks involving the same basic mental operations but presented in different contexts. Until about 11 or 12 years of age the child's concrete thinking limits his ability to apply what he has learned to be true in one situation to another situation.

Causality. Important to the present study is the children's ability to see cause and effect. To do this they must be able to see the difference between subjective and objective reality. According to Piaget, children cannot understand the principle of cause and effect until they are able to recognize that they are not the center of the universe, that is, that man does not always cause things to happen. Young children often do not ask how things happen, they seem to simply accept cause and effect as given.

Piaget has examined in detail what he calls precausal thinking, in which he pinpoints some of the thoughts children have about events before they are able to truly understand cause and effect relationships. The precausal concepts are (as described by Flavell, 1963, 1977; Ginsburg & Opper, 1979);

> Realism--This is the tendency to make real and tangible those things that are not tangible.
>
> Animism--This is the tendency to attribute feelings and consciousness to inanimate objects and events. The preoperational child, because of his egocentrism, thinks that everything in the world is alive, just as he is, and that nonliving objects have emotions and intentions like his. According to Piaget this is one of the earliest forms of precausal thinking.

Finalism--The child sees everything in the world as being created by man for the use of man. The child thus sees any two events that coincide as having some causal relationship, with either being the cause of the other.

Artificialism--This concept is similar to finalism in that the child sees everything as being made by man or God. These beliefs stem from egocentric beliefs that because the child can make things, everything has been made by somebody. All events are explained by the action of someone, and have their own purpose.

Summary

Children in the preoperational stage of thought use thinking that is dominated by perceptual processes. Their thinking is often characterized by describing the logical processes they are unable to perform rather than by what they are able to do.

The changes from preoperational thinking to concrete operational thinking may begin as early as five years of age in our culture, and gradually continues to develop until nine or ten years of age. The logical processes lacking in younger children, such as classification, conservation and seriation, appear gradually during this period as children incorporate the necessary concepts into their cognitive structures. This process is a progressive building process that each child must master on his own. Giving children opportunities to discover and expand their thinking at each step will facilitate the development.

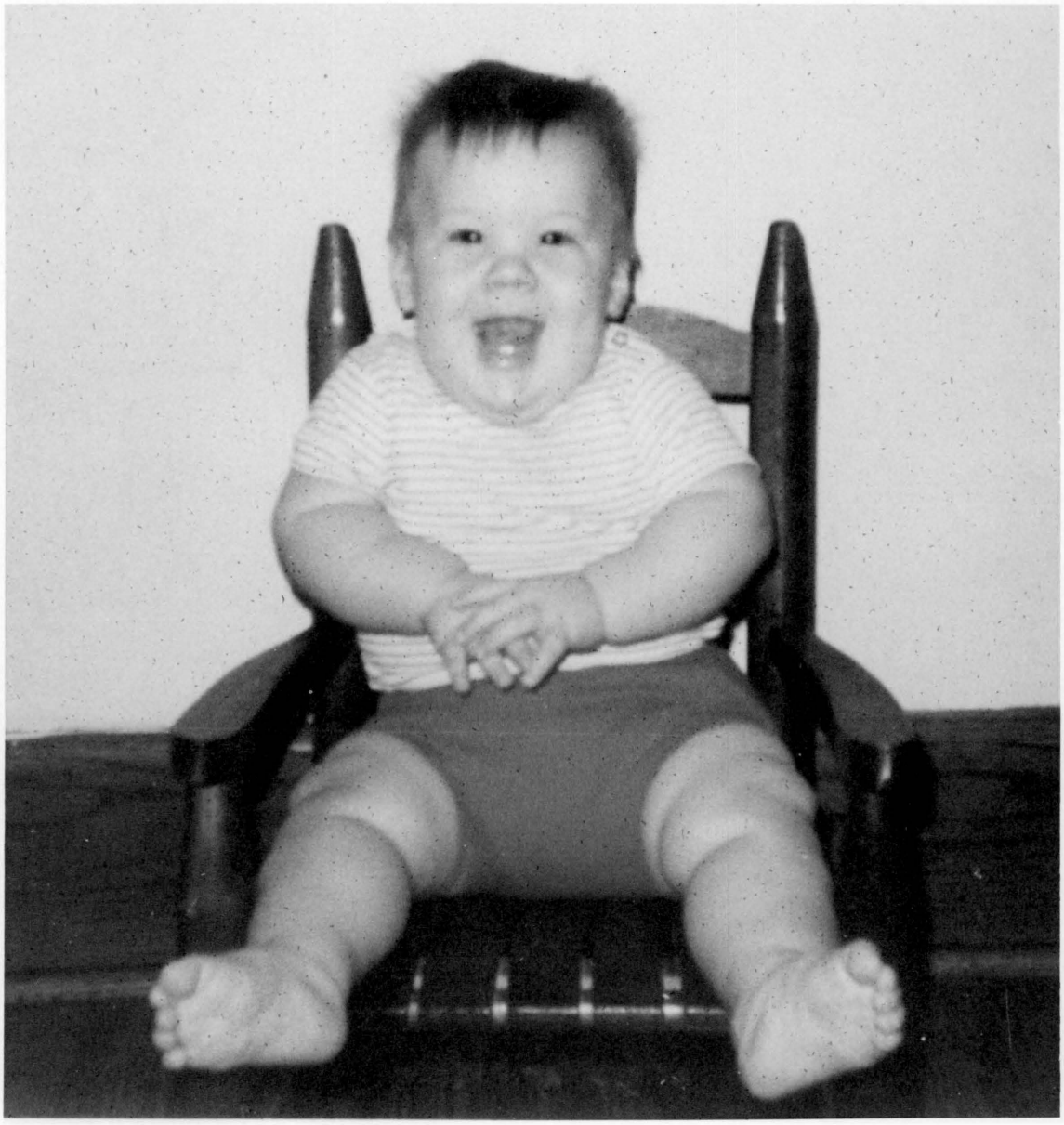
Flavell (1972) discussed a variety of strategies that have been used to classify and explain sequential developmental sequences that form Piaget's cognitive stages. He examined several problems that

may arise in investigations trying to locate sequences and ways to help minimize the possible effect on the results. He pointed out that once the methodological problems have been reduced there may still be conceptual problems that must be considered. To make the interpretation of sequential studies more meaningful, he presented a classification system for the description of the relationship between causal concepts in the sequence. His classification system was not unrelated to Piagetian theory and the system developed in the present stage.

Davison, King, Kitchener, & Parker (1980) have proposed a stage model for cognitive-social developmental sequences that show the structural change of the child's reasoning. This model sees a stage sequence as developmental with potential points of equilibrium and disequilibrium being related to structural change, and thus providing a new method for examining stage sequence. It seems to be a method for looking at transitional stages.

APPENDIX B

SOCIAL IDENTITY INSTRUMENT

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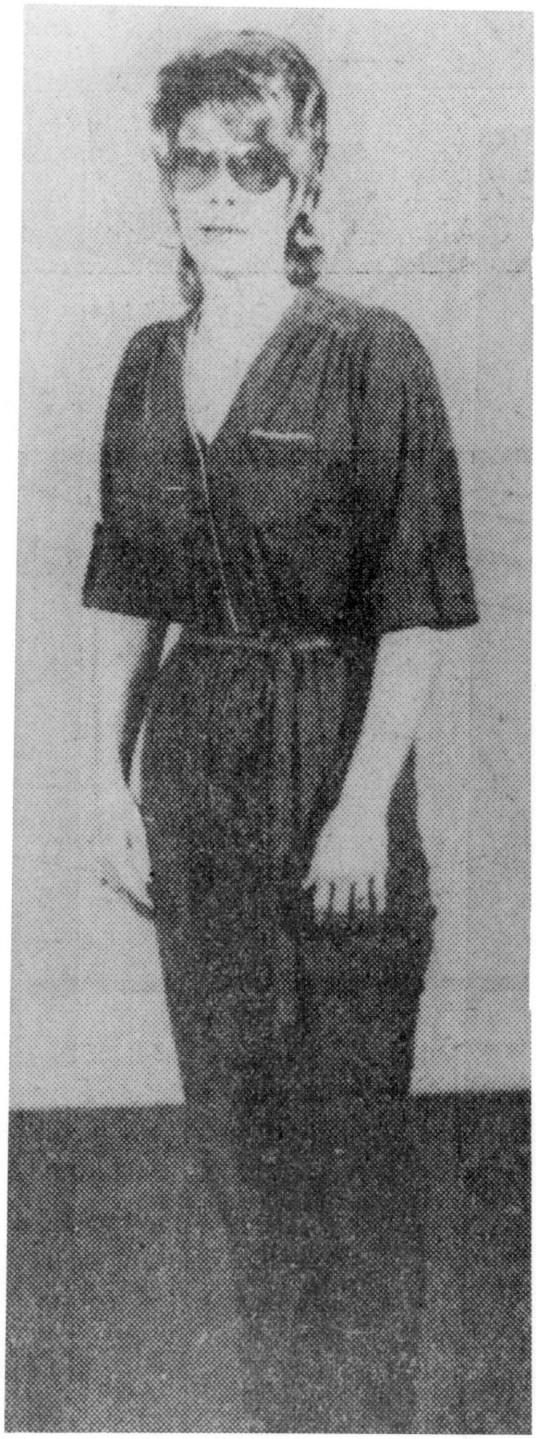

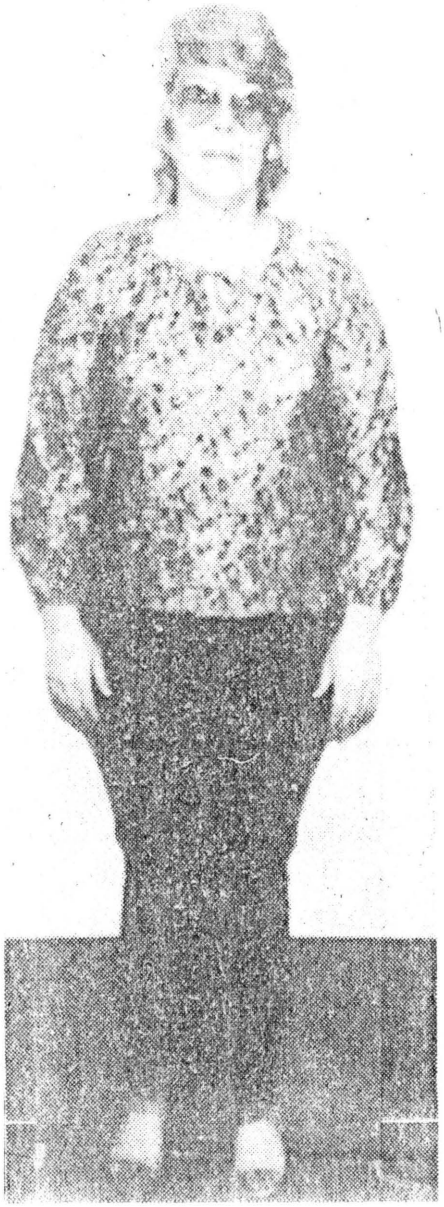

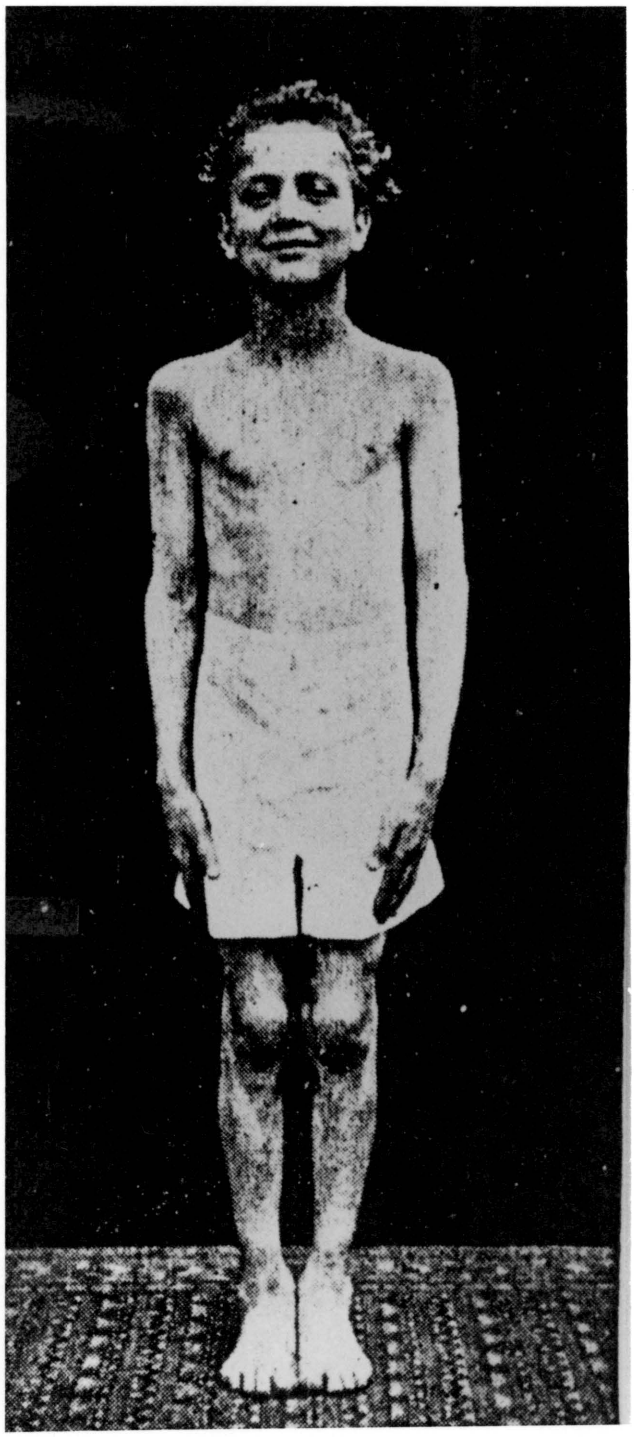

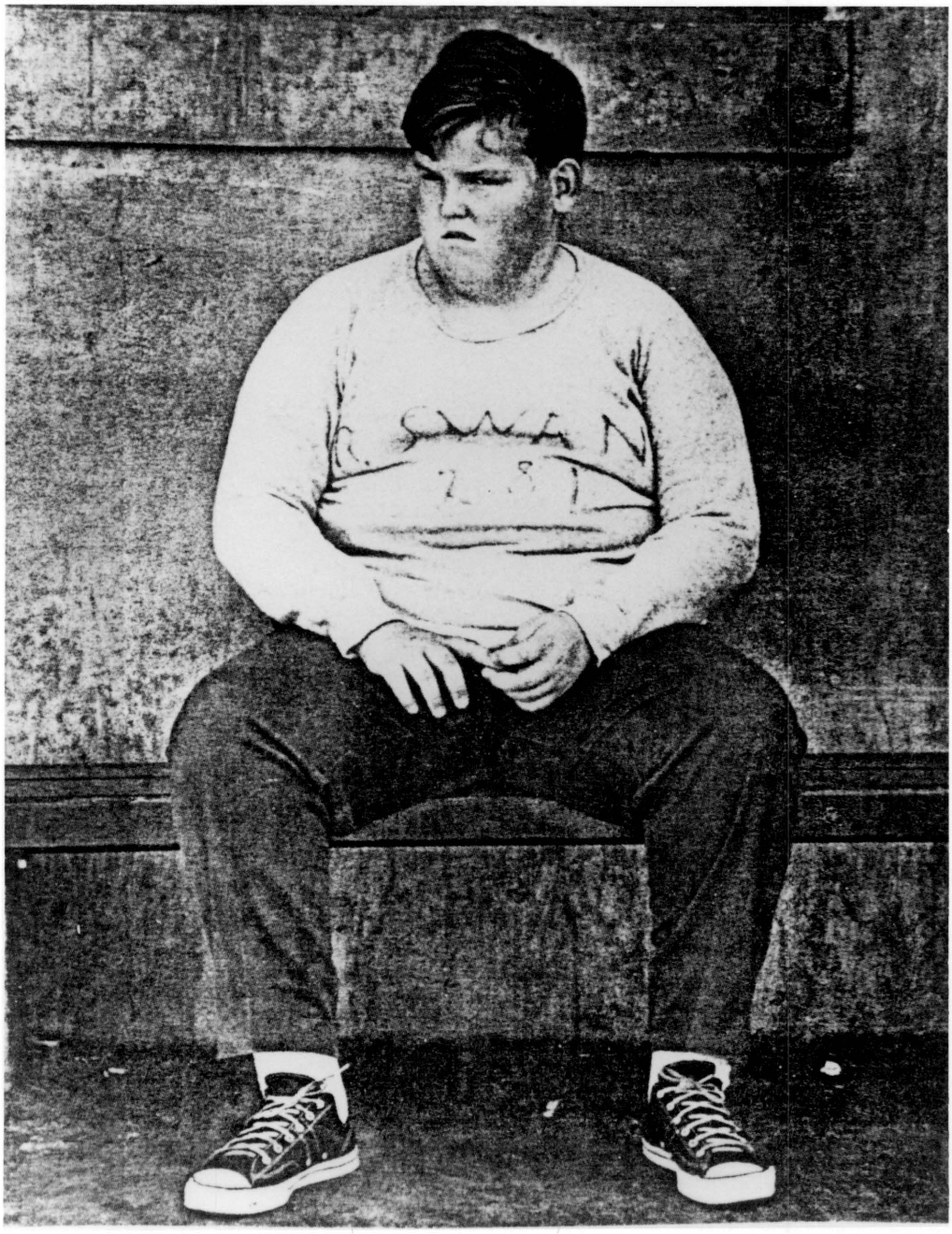
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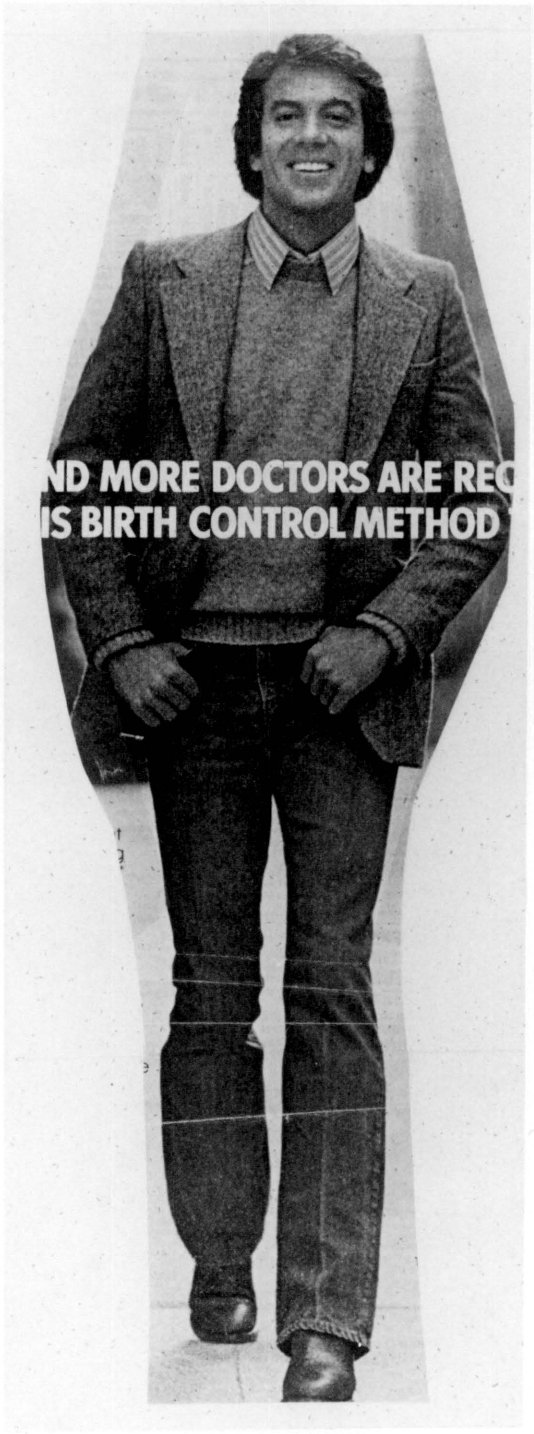
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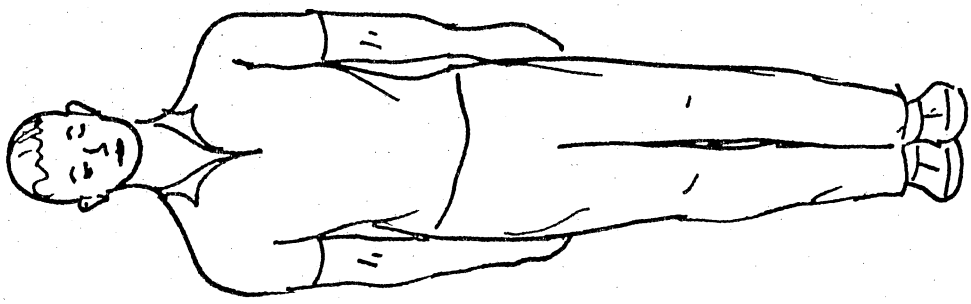
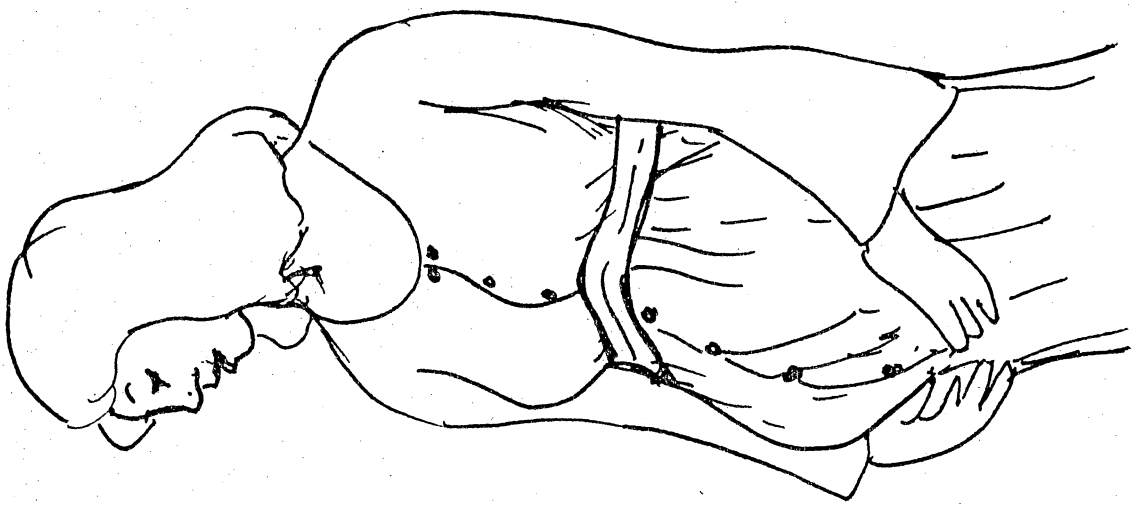
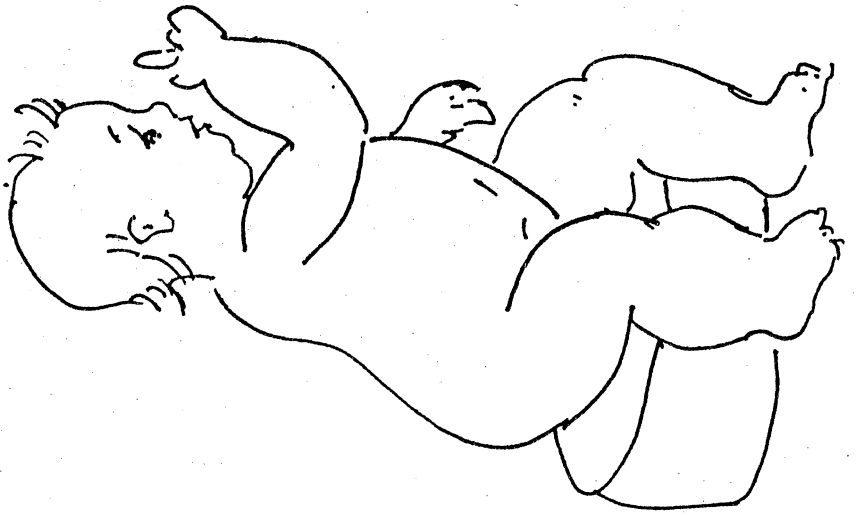
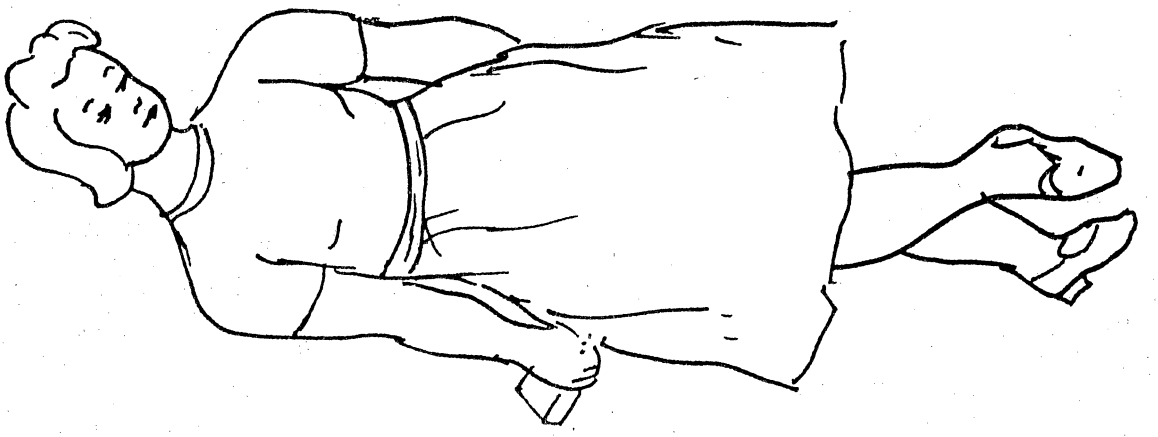
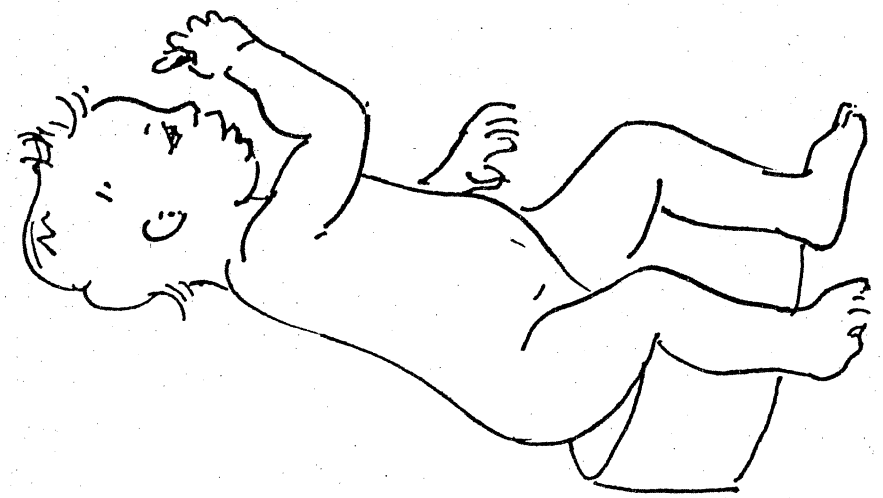
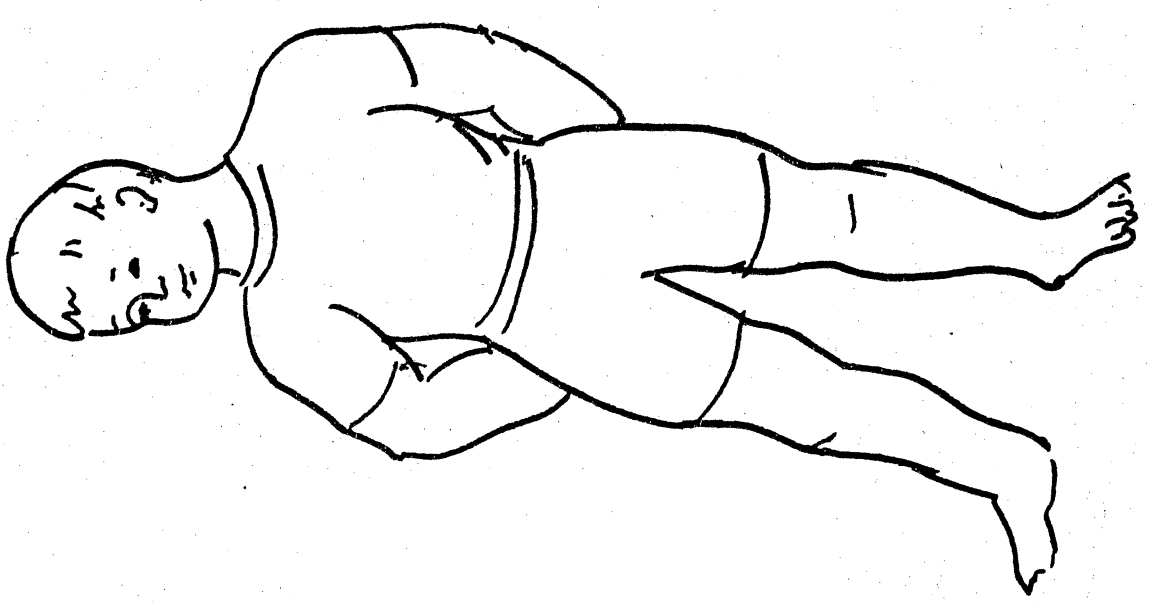


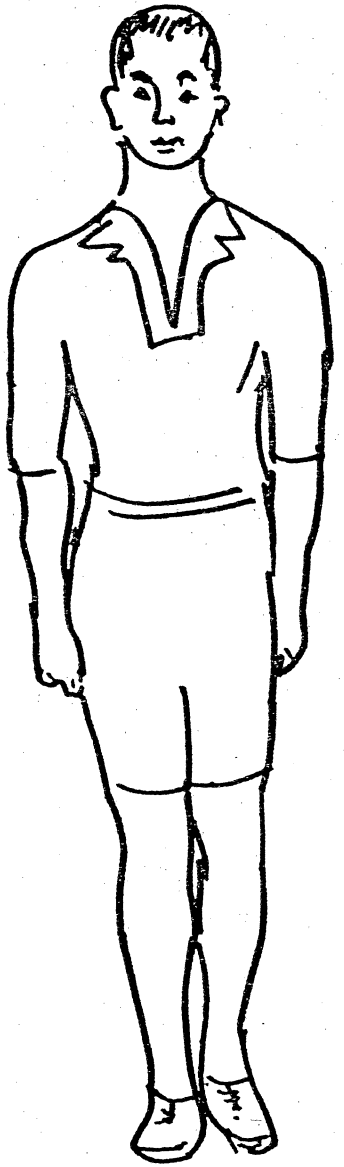


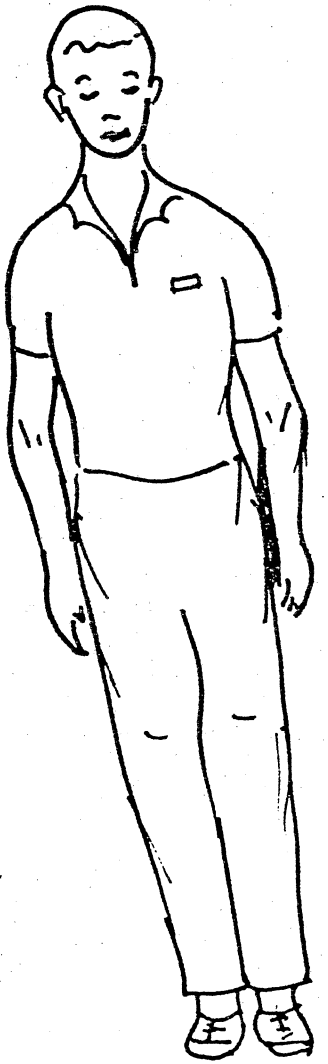


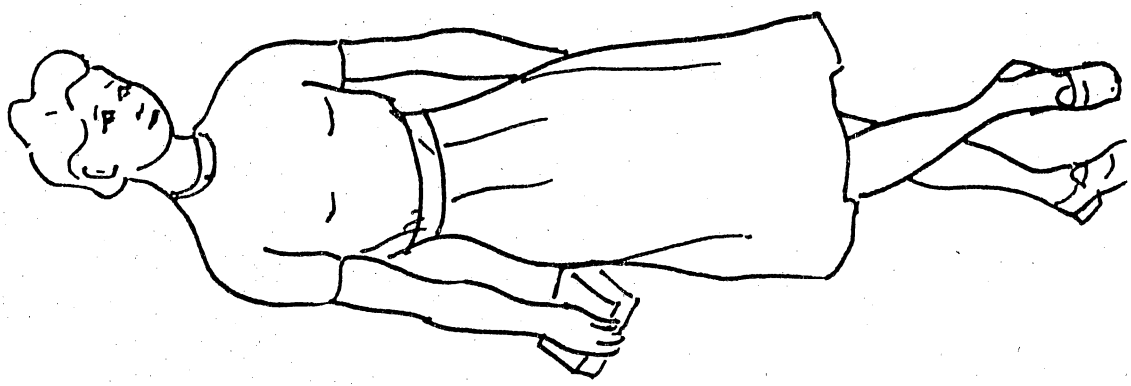


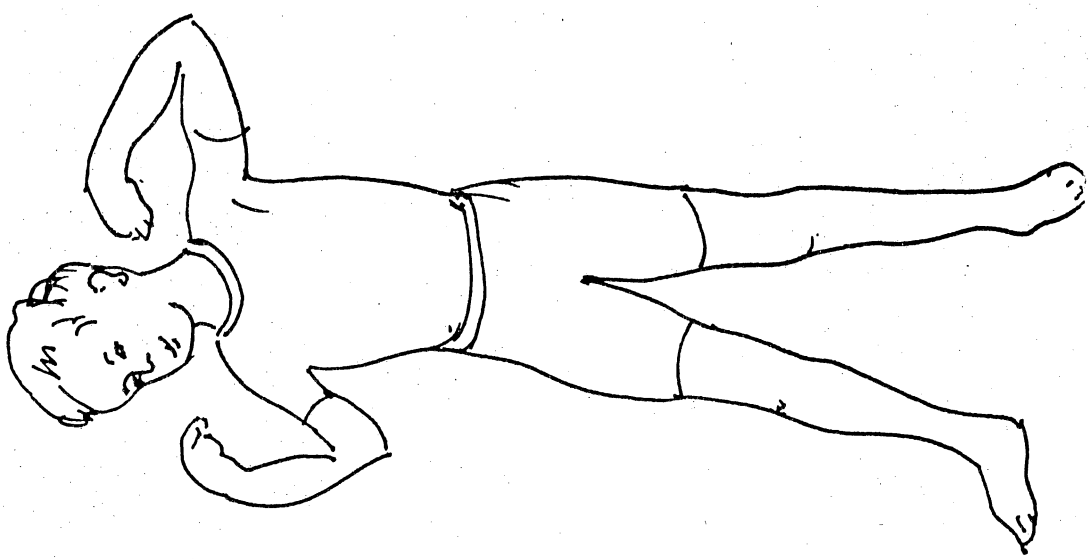












APPENDIX C

DEMOGRAPHIC CHARACTERISTICS OF SAMPLE

No.	Sex	Age	Mother		Father		No. siblings
			Educ.	Occ.	Educ.	Occ.	
1	M	12:6	MA	Teacher[a]/Housewife	PhD	Professor	3
2	M	13:0	Business college	Secretary	PhD	Professor	2
3	M	8:0	BA	Library Asst	PhD	Professor	1
4	F	8:1	MA	Student[a]	PhD	Professor	1
5	M	5:1	MA	Student[a]	PhD	Professor	1
6	F	11:6	Nursing school	Nurse	BA	Personnel manager	2
7	M	11:8	MS	Housewife	PhD	Professor	1
8	M	8:8	MS	Housewife	PhD	Professor	1
9	M	4:7	BA	Housewife	PhD	Professor	2
10	M	7:3	BA	Housewife	PhD	Professor	2
11	M	11:11	BA	Housewife	PhD	Professor	2
12	M	7:10	MA	Student	PhD	Professor	1
13	F	12:7	MA	Student	PhD	Professor	1
14	F	9:3	HS	Housewife	HS	U.S. Postal Employee	3
15	F	11:8	Some college RN Diploma	Housewife	PhD	Professor	1
16	F	11:8	MA	Housewife	PhD	Professor	1
17	F	8:6	BA	Housewife	MA	Advertising manager	0
18	F	7:8	Some college	Student	PhD	Professor	1
19	M	5:6	Some college	Student	PhD	Professor	1
20	M	11:2	MA	Music/student	PhD	Professor	2
21	M	4:10	BS	Homemaker[a]	PhD	Professor	1
22	F	12:9	BA	Homemaker[a]	PhD	Professor	2
23	M	13:1	BA	Homemaker	PhD	Professor	1
24	F	13:2	MA	Homemaker	PhD	Professor	3
25	M	11:7	MA	Homemaker	PhD	Professor	3
26	M	8:3	EdD	Guidance Counselor	MS	Senior design engineer	2
27	F	7:7	MA	Student	PhD*	Professor	1
28	M	9:6	MA	Student	PhD*	Professor	1
29	F	13:0	Some college	Housewife	PhD*	Professor	1
30	F	11:6	Some college	Student	HS*	Machine mechanic	2
31	M	12:2	Some college	Dance inst.	PhD	Professor	1
32	M	11:6	Some college	Housewife	PhD	Professor	1
33	F	13:5	HS	Housewife	Law	Lawyer	2
34	F	9:4	HS	Housewife	Law	Lawyer	2
35	M	13:6	3 yrs college	Housewife	PhD	Professor	2
36	F	4:2	Some college	Secretary	Law	Lawyer	0
37	F	4:10	BA	Homemaker	PhD	Professor	1
38	F	4:4	MA	College instructor	MA	Student	0
39	F	4:2	MA	Student	PhD	Professor	1
40	M	3:10	Some college	Secretary	HS	Highway foreman	1
41	M	4:3	MA**	Speech therapist	Some college	Industrial management	2
42	F	4:10	MA	N.S. Teacher	PhD	Professor	1
43	F	9:0	EdD	Nursing[a] student	BS	Agency manager	1
44	M	13:4	BA	Homemaker	MA	Plant manager	3
45	M	4:5	Some college	Homemaker	MA	Student	1
46	M	4:0	MA	Student	MA	Professor/minister	2
47	F	3:11	MA + 40	Learning D. teacher	MA	Professor/minister	1
48	F	4:5	HS	Asst. director math lab	MA	Professor/minister	1
49	M	4:3	HS	Homemaker	MA	Student/instructor	2
50	F	8:3	BA	Substitute teacher	PhD	Professor	1

No.	Sex	Age	Mother		Father		No. siblings
			Educ.	Occ.	Educ.	Occ.	
51	F	8:3	BA	Substitute teacher	PhD	Professor	1
52	F	7:5	BA	Homemaker	PhD	Professor	2
53	M	12:8	BA	Homemaker	PhD	Professor	2
54	F	7:6	BA	Student	PhD*	Professor	0
55	M	12:9	MA	Homemaker	PhD	Professor	1
56	M	8:0	BA	Teacher	PhD	Professor	1
57	M	11:6	BA	Teacher	PhD	Professor	1
58	F	11:11	MA	Teacher	EdD	Professor	3
59	F	11:6	MA	Teacher	PhD	Professor	2
60	F	8:1	MA	Teacher	PhD	Professor	2
61	F	9:2	MA	Teacher	EdD	Professor	3
62	F	13:6	PhD	Home economist	EdD	Research genetiast	2
63	M	12:0	PhD	Home economist	EdD	Research genetiast	2
64	F	12:3	BA	Homemaker	PhD	Professor	0
65	M	12:8	BA	Music teacher	PhD	Professor	2
66	M	4:10	BA	Homemaker	PhD	Professor	2
67	M	4:5	BA	Teacher	MA	School principal	1
68	M	7:9	PhD	College administrator/ professor	PhD	College administrator	1
69	M	4:5	MA	Librarian	Some college	Photographer	0
70	F	4:9	MA	College instructor	MBA	Financial analyst	0
71	M	4:6	Some college	Homemaker	PhD	Professor	1
72	M	4:10	BS	Pharmacist	MS	Student	2
73	F	4:3	Some college	Personnel assist.	MA	Student/instr.	1
74	M	4:1	PhD	Research associate	PhD	Research associate	1
75	M	9:8	Some college	Homemaker	PhD	College administrator	2
76	F	13:4	BA	Secretary	PhD	Professor	2
77	F	12:4	BA	Homemaker	PhD	Professor	2
78	M	9:0	BA	Homemaker	PhD	Professor	2
79	F	7:8	MA	Accountant	MFA	Artist	1
80	F	9:5	BA	Homemaker	PhD	Psychologist	2
81	M	4:7	Some college	Homemaker	VMD	Veterarian	2
82	F	4:3	BA	Homemaker	MS	Chemical engineer	1
83	M	7:7	Some college	Secretary	PhD	Professor	0
84	F	8:6	BS	Secretary	PhD*	Professor	1
85	F	8:8	HS	Homemaker	Some college	Insurance agent	1
86	F	3:10	Some college	Office manager	BA	W.I.N. coordinator	0
87	F	4:11	BA	Secretary	BA	Sales representative	1
88	F	4:9	BS	Homemaker[a]	PhD	Sales representative	0
89	F	4:9	BA	Student	BA	Business manager	1
90	F	4:7	Some college	Draftsman Secretary/teller	PhD	Professor	2
91	F	4:9	BA	Student	BA	Business manager	1
92	M	9:7	MA	Teacher	PhD	Professor	1
93	M	8:7	MA	Student	MA*	Student	0
94	M	9:1	BA	Homemaker	PhD	Professor	3
95	M	8:10	Some college	Homemaker	Some college	Radford Arsenol	0
96	F	12:6	Nursing school	Homemaker	BA	Stock broker	2

*Father not living in home.
**ABD
[a]Taught public school previously.

APPENDIX D

CHI-SQUARE TABLES FOR INDIVIDUAL AGE GROUPS

Chi-Square Tables for Individual Age Groups

Age	Measures*	χ^2	p	CC
4-5	SOCID-PHYCAUS	0.00	1.00	.15
	SOCCAUS PHYCAUS	0.07	.78	.15
	SOCCAUS-SOCID	0.00	1.00	.11
8-9	PHYCAUS-PHYCONS	1.56	.21	.34
	SOCID-PHYCONS	0.64	.42	.23
	SOCCAUS-PHYCONS	1.56	.21	.34
	SOCID-PHYCAUS	0.14	.71	.24
	SOCCAUS-PHYCAUS	1.28	.26	.42
	SOCCAUS-SOCID	5.70	.02	.51
12-13	SOCCAUS-PHYCONS	0.00	1.00	.09

Key: PHYCONS = Physical Conservation
PHYCAUS = Physical Causality
SOCCAUS = Social Causality
SOCID = Social Identity

4-5

PHYCONS \ PHYCAUS	P	0	Row Total
P	24	8	32
0	0	0	0
Column Total	24	8	32

PHYCONS \ SOCID	P	0	Row Total
P	30	2	32
0	0	0	0
Column Total	30	2	32

PHYCONS \ SOCCAUS	P	0	Row Total
P	27	5	32
0	0	0	0
Column Total	27	5	32

PHYCAUS \ SOCID	P	0	Row Total
P	23	1	24
0	7	1	8
Column Total	30	2	32

PHYCAUS \ SOCCAUS	P	0	Row Total
P	21	3	24
0	6	2	8
Column Total	27	5	32

SOCID \ SOCCAUS	P	0	Row Total
P	25	5	30
0	2	0	2
Column Total	27	5	32

8-9

PHYCONS \ PHYCAUS	P	0	Row Total
P	2	9	11
0	0	21	21
Column Total	2	30	32

PHYCONS \ SOCID	P	0	Row Total
P	3	8	11
0	2	19	21
Column Total	5	27	32

PHYCONS \ SOCCAUS	P	0	Row Total
P	2	9	11
0	0	21	30
Column Total	2	30	32

PHYCAUS \ SOCID	P	0	Row Total
P	1	1	2
0	4	26	30
Column Total	5	27	32

PHYCAUS \ SOCCAUS	P	0	Row Total
P	1	1	2
0	1	29	32
Column Total	2	30	32

SOCID \ SOCCAUS	P	0	Row Total
P	2	3	5
0	0	27	27
Column Total	2	30	32

Chi-square Tables for Individual Age Groups (Continued)

12-13

PHYCONS	PHYCAUS P	PHYCAUS 0	Row Total
P	0	7	7
0	0	25	25
Column Total	0	32	32

PHYCONS	SOCID P	SOCID 0	Row Total
P	0	7	7
0	0	25	25
Column Total	0	32	32

PHYCONS	SOCCAUS P	SOCCAUS 0	Row Total
P	0	7	7
0	1	24	25
Column Total	1	31	32

PHYCAUS	SOCID P	SOCID 0	Row Total
P	0	0	0
0	0	32	32
Column Total	0	32	32

PHYCAUS	SOCCAUS P	SOCCAUS 0	Row Total
P	0	0	0
0	1	31	32
Column Total	1	31	32

SOCID	SOCCAUS P	SOCCAUS 0	Row Total
P	0	0	0
0	1	31	32
Column Total	1	31	32

APPENDIX E

WEIGHT AND HEIGHT PERCENTILE TABLE

(Ages 3 1/2-5 1/2, 7 1/2-9 1/3, 11 1/2-13 1/2)

Age (Years)	Boys Wt in lbs 10%	50%	90%	Ht in in. 10%	50%	90%	Age (Years)	Girls Wt in lbs 10%	50%	90%	Ht in in. 10%	50%	90%
3 1/2	30.4	34.3	39.1	37.8	39.3	41.1	3 1/2	29.5	33.9	40.4	37.1	39.2	41.5
4	32.1	36.4	41.4	39.1	40.7	42.7	4	31.2	36.2	43.5	38.4	40.6	43.1
4 1/2	33.8	38.4	43.9	40.3	42.0	44.2	4 1/2	32.9	38.5	46.7	39.7	42.0	44.7
5	35.5	40.5	46.7	40.8	42.8	45.2	5	34.8	40.5	49.2	40.5	42.9	45.4
5 1/2	38.8	45.6	53.1	42.6	45.0	47.3	5 1/2	38.0	44.0	51.2	42.4	44.4	46.8
7 1/2	48.5	57.1	68.7	47.2	50.0	52.7	7 1/2	46.6	55.2	65.6	47.0	49.3	51.9
8	51.2	60.1	73.0	48.5	51.2	54.0	8	48.6	58.1	69.9	48.1	50.4	53.0
8 1/2	53.8	63.1	77.0	49.5	52.3	55.1	8 1/2	50.6	61.0	74.5	49.0	51.4	54.1
9	56.3	66.0	81.0	50.5	53.3	56.1	9	52.6	63.8	79.1	50.0	52.3	55.3
9 1/2	58.7	69.0	85.5	51.4	54.3	57.1	9 1/2	54.9	67.1	84.4	50.9	53.5	56.4
11 1/2	69.2	81.0	104.5	55.0	57.8	60.9	11 1/2	66.1	83.2	106.0	55.0	58.3	61.8
12	72.0	84.4	109.6	56.1	58.9	62.2	12	69.5	87.6	111.5	56.1	59.8	63.2
12 1/2	74.6	88.7	116.4	56.9	60.0	63.6	12 1/2	74.7	93.4	118.0	57.4	60.7	64.0
13	77.1	93.0	123.2	57.7	61.0	65.1	13	79.9	99.1	124.5	58.7	61.8	64.9
13 1/2	82.2	100.3	130.1	58.8	62.6	66.5	13 1/2	85.5	103.7	128.9	59.5	62.4	65.3

Taken from NCHS Growth Charts, 1976.

APPENDIX F

QUANTITATIVE ANALYSIS OF PHYSICAL MEASURES

PHYSICAL CONSERVATION

Piaget has described in detail the décalage children follow in learning to conserve (1950). The present study used a combination of conservation tasks in order to include the aspects involved at each stage of thought; substance (concrete operational) and volume (formal operational). Children seemed to have begun thinking at a lower level on this task than on any other task in the study. All of the 4-5 year olds were thinking preoperationally on this task.

The child's ability to conserve then takes a great leap at the 8 year old level (Figure 4). There were only 8 children in the combined 8 and 9 year old group who were still operating on the preoperational level of thought in this task (levels 0, 1), and 3 children who were showing indications that they were in the transitional level 2. Only 4 children gave responses indicative of the concrete operational level while 17 were answering with transitional (4, 5) or higher levels. According to these results, 23 of the 12-13 year olds were conserving at a formal level and 2 were in transition (level 5). However, 7 of the 12-13 year olds were still unable to conserve and were scored as being preoperational. Children seem to go through the levels of thought in this task (physical conservation) at a faster rate than they do other areas of inquiry.

An examination of the responses showed that 8 and 9 year olds do give answers which, according to Piagetian theory, they would be expected to give, and they also give responses that are typical of both

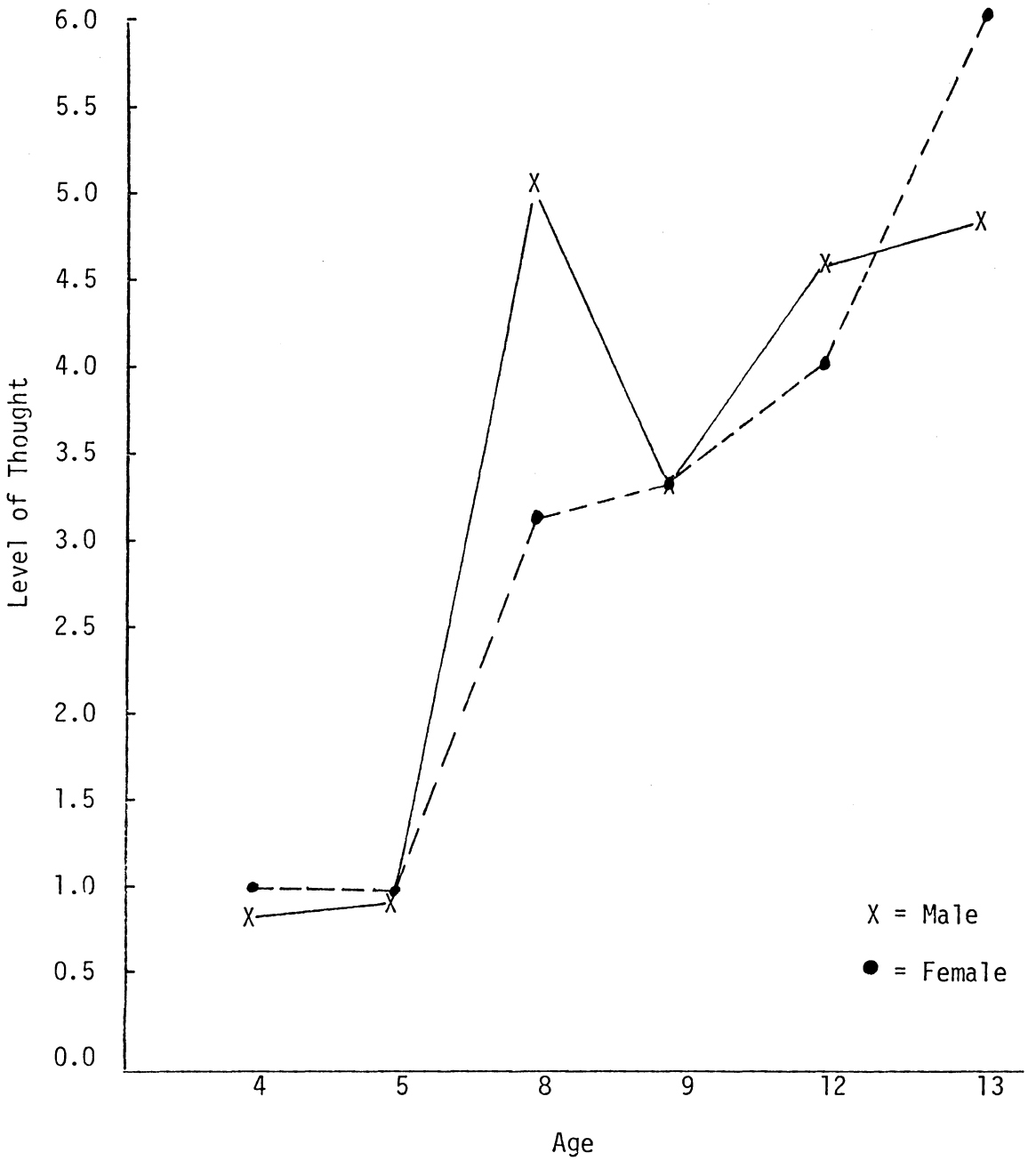


Figure 4. Mean level responses for individual ages, age groups, and gender for the physical conservation task.

older and younger children. The 7 individuals (12-13 years of age) who were in the preoperational stage gave the same kind of responses as younger children and with the same reasons.

Preoperational

Before the age of 7 or so, the child is in the preoperational level of thought (Piaget, 1950). The 4 and 5 year olds in the sample all scored no higher than 1 on the physical conservation task. That is, all of the children were operating on a preoperational level of thought. The answers given to questions concerning the conservation of substance by these children were based mostly on visual perception. The children who answered that one of the pieces of clay did, in fact, have more clay answered "it's longer," "it's bigger," or in several instances "because it's round." There were more answers in favor of the long, rolled out piece of clay, but there were also several children who said that the ball had more clay than the long piece. The reason given for choosing the ball was "I rolled it out." The answers of the children in the second task tended to indicate the belief that the single ball had more clay because "it is bigger." The children were given the suggestion that the two balls have more clay because there are two of them and only one of the other, but none of the children were willing to change their decision if they had chosen the single ball. Preoperational thinking is characterized by visual perception, which was demonstrated by all children in the preoperational level in the physical conservation task.

The 12-13 year old level 1 children gave the same kind of answers on this first task as the younger children. At first the interviewer thought perhaps the children had misunderstood the questions, but the questions were repeated in order to rule out simple misunderstanding by the children, and in several cases the children themselves repeated the questions. These nonconservers responded that one or the other pieces of clay in the first section of the task did have more clay, and they also gave precausal reasons for their answers. In a recent article, Kagen (1980) discussed this kind of response and said that it was not unusual; the children were simply thinking beyond the task. The explanations given by the children in this instance, however, did not seem to reflect an overthinking. The children hesitated and then gave clearly precausal reasons for their responses. Five of the 12-13 nonconservers did respond with formal reasoning on the second physical task, the origin of night, but only one of them scored a level 6 (formal) on the social identity task and none reached a formal level of thinking on the social causality task. They were indeed thinking at a lower level of understanding than the other children of the same age group included in this sample.

As the children began to develop the ability to conserve substance they showed greater variance in their responses. Although they became able to see that the rolled out ball and the other ball had the same amount of clay because "they started out the same and you didn't change it," the three children in level 2 (all 8-9 years old) were not able to transfer this understanding to the task comparing a single ball

to two smaller balls, even though they watched the interviewer form the 2 balls from a single one. They all said that the 2 balls had more clay than the single ball. Two of them said that the reason the 2 balls had more clay was because 2 was more than 1, but the third child added a new dimension. Jason (8 years of age) said that the reason the two balls had more clay was that "if you flatten these, it makes it a little bigger." Even though still incorrect, Jason was beginning to do some calculating about cause in his head rather than depending entirely on perceptual clues.

Concrete Operational

Children in the concrete stage were able to conserve substance with no trouble but were completely unable to deal with volume. Levels 4 and 5, the transitional levels between concrete operational and formal thought showed the continuing development of the concept of conservation. These children were able to conserve substance and were beginning to gain insight into the conservation of volume which, according to Piaget, is the last type of conservation to develop. The difference in the explanations between the child in level 4 and the child in level 5 show steps in the development. The level 4 child typically said that the water level for the second ball would be the same because the "clay is the same clay" but was very hesitant as to why that would affect the water level. The child in level 5 gave an adequate explanation for the first volume task, but gave an inaccurate response for the second with incorrect reasoning.

> (What will happen to the water level?) It will go up about the same. (Why?) both balls have the same amount of clay. (Why will that affect the water?) UH . . . (2nd task with changed shape) The water will go a little lower. (Why?) Because it's smushed now.
>
> (What will happen to the water level?) It will probably go about the same because there is the same amount of clay and the same amount of water. (2nd task) It will go a little lower. (Why?) Because it's flatter.

In fact, all of the children responding with transitional reasoning (levels 4 and 5) gave correct reasoning responses for the water level with the ball and incorrect for the second task (the flattened clay), affirming the progression that Piaget had suggested as the sequence for the acquisition of conservation (Elkind, 1969). All but one of the children answered that the water level would be lower in the second task because the clay was flatter. The one child who did not see the level as being lower said that the clay would float. When asked why she thought it would float, she answered, "something flat will always float."

Formal Operational

Children able to conserve on a formal level had no problem explaining their responses and gave reasons that have been suggested by Piaget as being typical, such as identity, reversibility, or compensation.

PHYSICAL CAUSALITY

The discussion about where night comes from showed a much greater range of thinking by the preschoolers than the conservation task had. Seventeen of the 4-5 year old children were using preoperational thought, 7 were in transition between preoperational and concrete operational, and 8 were already using concrete thought. Only 2 of the 8-9 year olds and none of the 12-13 year olds demonstrated preoperational thought on this task (Figure 5). Piaget has said that physical conservation precedes causation, but the findings of this study did not confirm that. Chi-square analyses found children tend to become operational on physical causality before physical conservation, and correlation between the physical tasks found a positive significance of the differences of means with causality being higher. This indicates that perhaps being able to conserve is not a prerequisite for causation as has been suggested.

Preoperational

Preoperational thought was indicated by the children's use of artificialistic explanations for the origin of night. Some children simply expressed finalistic reasons when asked "What is night?"

> It's time to go to bed.
>
> When you go to bed.

These children did not have any other explanations, even when their reasoning was questioned further. They indicated that that was just

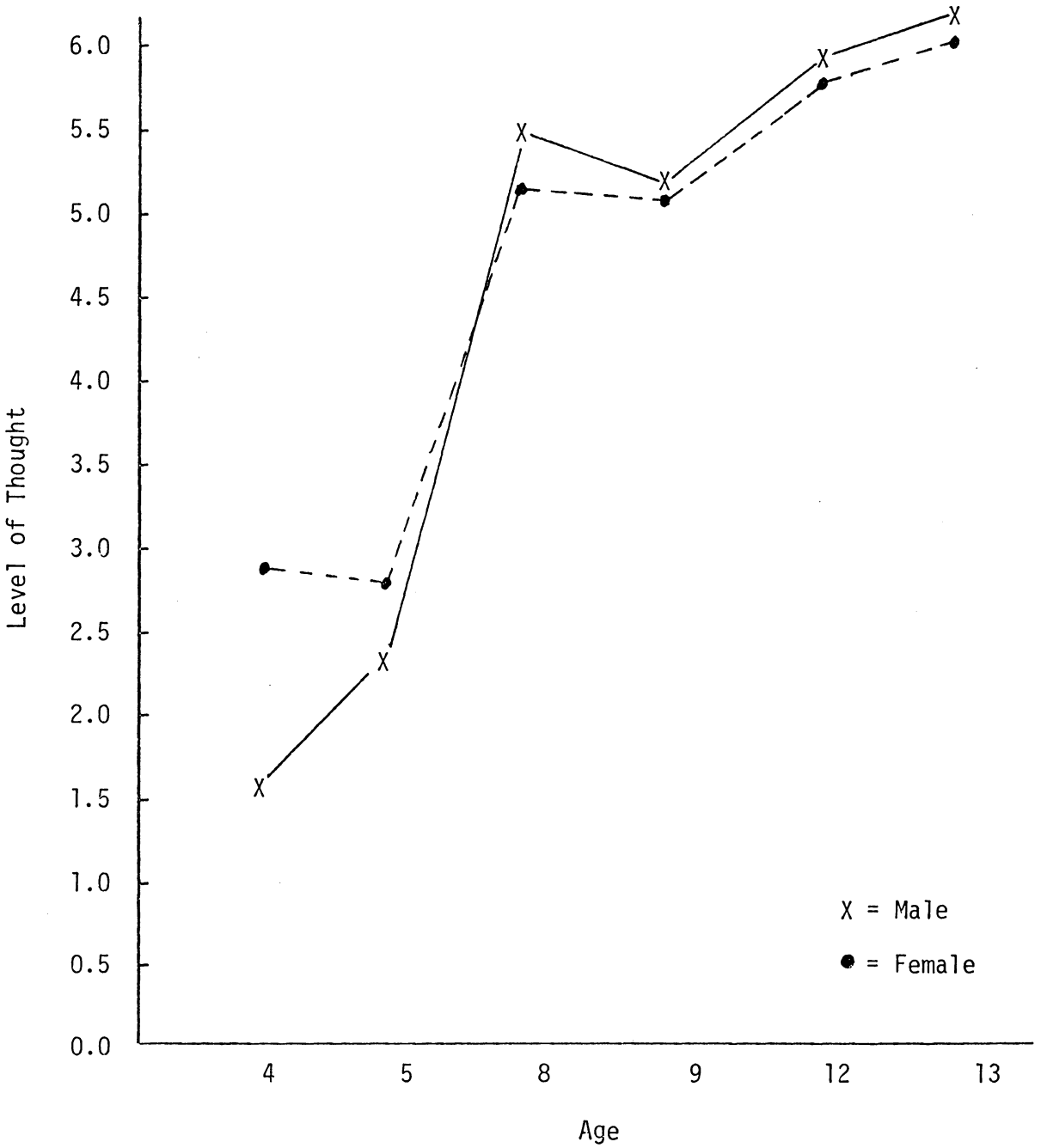


Figure 5. Mean level responses for individual ages, age groups and gender for the physical causality task.

the way it was. The two events happen at the same time and so, according to preoperational thinking children, must cause each other.

> When I have to go to sleep. (What does it look like at night?) Dark. (Why) Because I have to go to sleep. (Why is it dark at night?) Because it has to be.

Other children at this level of thinking simply said that they did not know why it was dark at night.

> You have to go to bed. In the morning you have to go to school. (What does it look like at night?) Dark. (Why?) I don't know. (Do you sleep sometimes in the day?) Yes. (Is it dark?) Yes. (Why is it light in the day when you are awake?) I don't know.

Children in a slightly more complex level of preoperational thought (level 2) demonstrated expression of explicit artificialistic explanations. These explanations are often surrounded with finalistic statements such as the following from level 2 children:

> . . . time to go to bed. (What does it look like?) Dark. (What makes it dark?) I don't know. (Why is it dark when you sleep?) Jesus makes it.

> . . . when you eat and pray. (What makes light?) God. (What makes dark?) God.

> . . . when it's dark--to make you go to bed. (Where does the dark come from? I guess from outside. (Why is it dark at night?) Because that's when God makes it dark.

One child in this level also added a magical aspect to the artificial explanation for night. This idea was stated by Jenny in this way:

> (Where does the dark come from?) It comes from God. He makes it dark with his wand.

The lowest response of the 8 and 9 year olds was the transitional level between preoperational and concrete operational thought (level 3). Artificialism was still seen in the responses of these children, although in a more disguised form. One child, for example, said that the clouds may come from smoke. He also said that the reason for night was that the sun was behind the clouds. He did not understand the process of the earth's rotation around the sun and yet he was using semiartificialistic and semiphysical explanations for the night.

> (What is night?) When the sun goes behind the clouds, and the moon gives a little light of its own, but not enough to make it light. (How does it get dark?) The world has no light of its own, and the sun is behind a cloud, and there's a special cloud that the light can't go through.

Along with the semiartificialism in the responses, there often were animistic elements included in the explanation. This can be seen in Sue's account of what causes night:

> (What is night?) When you sleep and it's dark. (What makes it dark?) It's the end of the day and the sun goes to sleep and the moon comes out. (Where does the sun go?) It goes inside the clouds and you can't see it. (Why is the sky dark?) It's supposed to be dark because that's when the sun goes to sleep.

Concrete Operational

The child who used concrete operational thought no longer showed any artificialism, although there were still some hints of animism mixed in with semiphysical reasoning. The responses of these children hinted that the reasons for night were due to physical events, but the reasons stated were not always natural. Finalistic beliefs were still prominent, as can be seen in the following explanations:

(Why is it dark?) The sun moves over around the earth.

(Why is it dark? The sun comes around. (Around from where?) Just around. (Why is it not dark when it rains?) The clouds let some light through.

(What are clouds?) The sun sucks up water and makes clouds.

Children in the concrete operational level often used pronounced animistic explanations to take the place of the artificial ideas expressed by the children in the lower level of reasoning. One of the detailed explanations given by the 8 and 9 year olds came from 7-1/2 year old Laura:

(What is night?) The time of day that it's dark. The sun goes down and the moon comes up. (Where does the sun go?) It goes behind the mountains. It's way up in the sky but it looks like it's coming down, and it just kinda fades away. (What makes it dark?) I guess it's part of our solar system. (What does the sun do when it's dark?) It sets. (Where?) On the other side of the mountains. (Does it do anything or is it just sitting there?) Just sitting there. (What causes the daylight?) The moon has its turn and the sun has its turn. When the moon gets finished, the sun comes out and when the sun gets finished, the moon comes out. (How do they decide whose turn it is?) When the air gets lighter the sun comes out and when it gets darker the moon comes out. (Why is it not dark when it rains and you can't see the sun?) The sun is still out but the clouds hide it. (What are clouds?) They are tiny little water droplets. (How do they get there?) The air brings up the moisture. (Why is it not dark?) If it gets light the sun comes out.

A mixture of semiphysical and semianimism responses were seen in the following answers:

(What is night?) When you go to sleep. (What does it look like at night?) Dark. (Why is it dark?) The sun isn't out. (Where is the sun?) It's sleeping. (Where

> is it?) Way into the clouds, and it goes to sleep in its bed. (Where does this happen?) In the clouds. (What are clouds?) I don't know. (What color are the clouds at night?) Black. (In the day?) White. (Are the clouds at night the same clouds as in the day, or different clouds?) Different. (Where are the white clouds at night?) They go between the black ones, or maybe they just turn into black ones.
>
> (What is night?) Dark. (Why is it dark?) The sun goes down and shines on a different country. (How does it do that?) It just goes down and swoops up at a different country. (When it goes down where does it go?) Behind the trees and mountains. (What then is night?) The moon is out. (Where does it come from?) It comes from a different country. (Can we see the sun when it rains?) Sometimes you can. (Where is it when you can't see it?) Just hiding somewhere behind the trees. (Why is it not dark then?) The sun is still shining through a crack.

One-fourth of the 8 and 9 year olds demonstrated that they were in transition between concrete operational and formal operational thinking in the development of the understanding of physical causality. Although not as pronounced as in earlier levels, there were still occasional indications of finalism or animism in their responses. At this level the responses contained mainly physical explanations, although those explanations seemed to be incomplete, or not always true to fact. The child often began with finalistic remarks and then expanded them to include physical explanations when asked more specific questions. An example of this type of reasoning is shown by the following 9 year old:

> (What is night?) It's dark and you go to bed. (Why is it dark?) The sun goes over to the other side of the world. (How does it get there?) The world goes around the sun. (What makes it light?) I don't know . . . well, when the sun is here it lights up everything. (What are

clouds?) They are white puffy things up in the sky that come around sometimes. (What are they?) Evaporated stuff. (What kind of stuff?) Water.

The range of explanations given by the children at this transitional level vary. Not everything they said fell into any one level, but the overall impression they gave was that they were on the way to understanding the actual causes of night. The older children who gave similar responses also were scored as being in transition.

Formal Operational

After the sharp leap by the 8 and 9 year olds in the understanding of what causes night (Figure 5), the child's understanding of the details and relationships continued to increase, ending with the greatest number of children reaching the formal level of any of the tasks in the investigation. Not only did 27 of the 32 12 and 13 year olds reach formal thought on physical causality, but 43 of the 96 children in the entire sample did.

When the child was given a score of 6 in the physical causality task, it indicated that he gave completely physical explanations for night, with no hint of any precausal reasoning. The explanations dealt with the earth's rotation around the sun and logical explanations for the light, dark, and clouds. The fact that half of the 8 and 9 year olds were able to respond at a formal level of thought in this task indicated that perhaps the children in our culture progress through the levels of cognitive thought at a more rapid rate than Piaget had indicated. They knew and could explain the causes

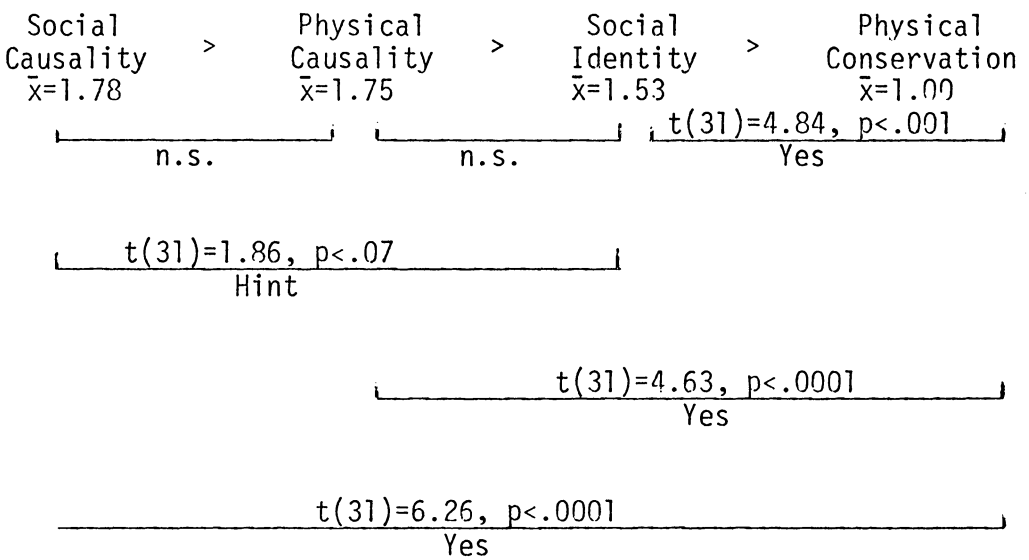
of night as well as many of the 12 and 13 year olds. This may be due to the level of education available in our society today.

APPENDIX G

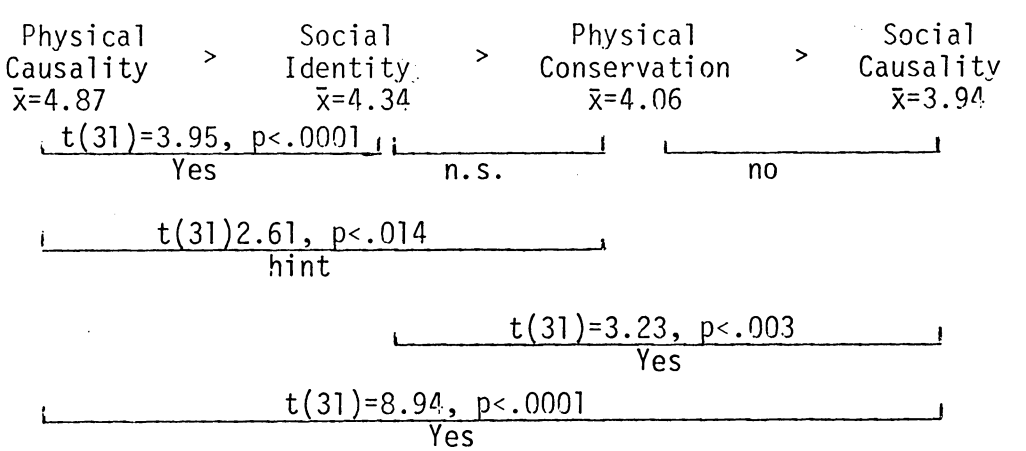
PROPOSED MODEL

The following diagrams show not only the relationships of Hypothesis 3, but also indicate the sequences of understanding of the measured tasks that younger and older children seem to follow as they develop the concept of obesity, as determined by the analyses in this investigation.

A. Younger children (ages 4-5)--sequence of understanding of measured tasks.



B. Older children (ages 12-13)--sequence of understanding of measured tasks.



In the diagram labeled younger children, physical causality is placed before the task of social identity in the sequence of development on the basis of the separate age group Chi-square, 2 x 2 table, which indicates that physical causality may become understood at an operational level before social identity does (see Appendix), and from the overall Chi-square analysis for the two tasks which shows that physical causality becomes understood at an operational level before social identity does for the sample as a whole, $\chi^2 = 41.76$, $p < .001$. The placement of social causality as being understood at a higher level than physical causality came from Hypothesis 3. Results from both χ^2 and the t-test were inconclusive so placement relied on theory. Social identity had means significantly lower than those of physical conservation and was placed before physical conservation in the sequence.

The sequence of understanding of the measured tasks for the older children also was based on a combination of analyses, results and hypotheses. It was hypothesized that physical causality would be understood at a higher level than would social causality by the older children. This was confirmed by the t-test, $t(31) = 8.94$, $p < .0001$, so physical causality was placed before social causality in the diagram. T-test analyses also found that older children responded with higher level reasoning on the physical causality task than on the social identity task, $t(31) = 3.95$, $p < .0001$, and higher on the social identity task than on the social causality task, $t(31) = 3.23$, $p < .003$.

The variance of the scores for the 12-13 year olds on the physical conservation task resulted in a lower than expected probability level between the physical causality task and the physical conservation task. Although 7 subjects (12-13 years of age) were not conserving and thus scored a 1 on the task, all of the remaining subjects scored a 5 or 6. On the physical causality task, however, all of the older subjects (12-13 years of age) indicated that they were operating on a formal or transitional level of thought. These facts show a trend towards a higher understanding on the physical causality task than on the physical conservation task, $\underline{t}(31) = 2.61$, $\underline{p} < .014$, acceptable even though not at a $\underline{p} < .006$ level. An additional supporting factor for the placement of physical causality before physical conservation comes from the t-test between the 2 tasks for the 8-9 year olds, which finds physical causality being understood at a significantly higher level than physical conservation, $\underline{t}(31) = 3.62$, $\underline{p} < .001$.

These patterns describe for the first time the direction of the décalage of identity and causality tasks as they develop in the level of understanding of the thinking of children related to the concept of obesity. As children go from preoperational thinking to concrete operational thought their pattern of concept learning changes. It was hypothesized that physical causality and conservation would begin to develop at a later time than the social tasks measured, which although not confirmed, was not disproved for the younger children. The hypothesis indicating that thinking about social causality as it relates to obesity would take longer to reach a formal level of understanding

was supported by the data. These proposed models suggest that the measured tasks of the present study do develop along parallel lines but that the development may be independent. The understanding of the tasks occurs in the indicated sequence; however, it is not clear that the tasks understood at higher levels are prerequisites for the tasks at lower levels of understanding. Research needs to be developed to investigate this possibility.

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THE CHILD'S CONCEPT OF OBESITY

by

Jane A. Wolfle

(ABSTRACT)

The objective of this study was to investigate children's thoughts about human fatness, and then to see how those thoughts about obesity reflect the child's cognitive growth. Piaget's developmental framework was used to demonstrate that the changes which occur in the children's thinking about obesity follow the same developmental lines as their thinking about other problems. The concepts of identity and causality were used in the study to examine children's thinking about both physical and social objects.

Four tasks were administered to three groups of children representative of Piaget's stages of cognitive thought: preoperational (4- 5-years-of-age), concrete operational (8- 9-years-of-age), and formal operational (12- 13-years-of-age). A clay and water task was used to measure conservation of objects, and Laurendeau and Pinard's Origin of Night questionnaire was used to measure physical causality. Thinking about identity as related to social objects was examined by a picture task and a clinical interview was used to measure causality as it relates to obesity of social objects, i.e., people.

An age-related sequence of increasing complexity occurred in the development of the concept of obesity. Parallel development of social

causality with the other measured tasks was indicated by significant correlations. Chi-square analyses indicated that children tend to think on the same absolute level (preoperational or operational) on the measured tasks.

Analysis of data through use of Chi-square 2 x 2 tables and t-tests indicated that children progress in a different sequence of understanding according to their age. Younger children understand social causality before they understand physical causality or social identity. Physical conservation is the least understood of the tasks for the 4-5 year olds. Once children are able to think on a concrete level of reasoning, they understand physical causality at a higher level than they do social identity, physical conservation, and social causality. The understanding of obesity is at the lowest level of all tasks for 12-13 year olds.

These findings expand Piagetian literature to include a specific example of the application of the concepts of identity and causality to the development of a concept (obesity) dealing with people. It was shown that the understanding of obesity in humans is the last of the measured tasks; i.e., physical conservation, physical causality, social identity, and social causality to be understood on a formal level. The information from this investigation can be used to plan programs for children to help them obtain the information about obesity at a level they can understand and internalize. The findings can also be used as a guide for longitudinal studies on the same topic.