Children's Assignment of Intentionality to People, Animals, Plants, and Objects: Challenges to Theory of Mind and Animism

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LOYOLA UNIVERSITY CHICAGO

CHILDREN'S ASSIGNMENT OF INTENTIONALITY TO PEOPLE, ANIMALS, PLANTS, AND OBJECTS: CHALLENGES TO THEORY OF MIND AND ANIMISM

A DISSERTATION SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL IN CANDIDACY FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF PSYCHOLOGY

BY

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Κυρίω, ἄρα γε ἐλεύθεροι εἰσίν οἱ νιοί
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CHAPTER 1

INTRODUCTION

This study seeks to explore children's understanding of the intentionality of people, animals, trees, and objects. Two areas of research are explored and critiqued for their explanations of children's intentional assignment. The first area is "theory-of-mind" literature, which examines children's understanding of the intentionality of humans. The second and much older area is "animism," which examines children's understanding of the intentionality of trees and objects.

The most prominent theory-of-mind position argues that children's understanding of their own intentionality and that of others is based on cognitive constructions, in which children gradually develop notions of their own and others' intentionality. The position of most animism research, dating back to the models of James Mark Baldwin and Jean Piaget, has been that children's understanding of intentionality is primitive and incorrect. Only with increasing maturity do children stop assigning the ability of intention to inanimate objects and cease to describe events in terms of purposive, final causes.

Both of these positions have findings that are called into question by this study. Instead, this study proposes that young children may have a fundamentally intentional view, in which intentional assignment to objects, events, and people is plausible and meaningful. It is noted in this study how several researchers have conducted biased experiments to
favor discounting the proposal that children have a intentional way of understanding events and objects.

This study seeks to provide a clearer explanation of children's understanding of intentionality by separating biological properties from intentional properties, by controlling for levels of plausibility, and by using both direct assignment and story data. Additionally, children from different SES backgrounds are utilized to see if general patterns of assigning intentionality are similar for children of comparable age. The assessment of whether or not animals intend consequences and have agency is also a focus of this study, as little research has been done in assessing children's understanding of the intentional properties of animals.

Thus, both methodological and theoretical issues involved in children's intentional assignment are examined. It is claimed that such issues have led previous investigators to underestimate or to discredit young children's understanding of intentionality. An experiment investigating children's understanding and plausibility judgments of the intentionality of entities, from inanimate to plant to animal to human, is presented.
CHAPTER 2

REVIEW OF LITERATURE

The whole history of human thought is but an unfinished attempt to answer [these questions]. For what have men been trying to find out, since men were men, but just those things: “Where do our true interests lie - which relations shall we call the intimate and real ones - which things shall we call living realities and which not?” (James, 1950, p. 299).

Throughout psychological thought (and, according to William James, the history of human thought) a critical human development is the ability to distinguish between those things that are alive and those things that are not; those things that have agency, and those things that do not; those things that act and those that are acted upon. Past and current research on "theory of mind" and animism have examined children’s attributions of intentionality to people and objects.

Intentionality

There are many different definitions, components, and ways to measure the concept of "intentionality" (Trudewind, 1991). Discussions of intentionality in psychological thought can be traced back to Franz Brentano, who suggested in 1874 that intentional direction toward physical objects distinguished the mental from the physical (Mischel, 1979, p. 96). In developmental psychology, Jean Piaget used many intentional concepts, such as schemes and beliefs. Yet there has not been a consistent definition of
intentionality that has been used within psychological literature. For example, intentionality can mean the concrete goals and purposes that guide behavior, or intending an action (not accompanying beliefs, thoughts, or desires) (Flavell, Mumme, Green, & Flavell, 1992; Tomasello, 1993). Others have claimed that intentionality reflects desires or wishes (Bruner, 1984), or beliefs in the possibility of choosing one's actions to shape one's life (Harré, 1979). Intentionality has also been operationalized as to whether an act or outcome is motivated or accidental, as both behavior and effects of behavior can be intended (Nelson-LeGall, 1985). Intentionality can also include such components as conscious awareness, self-concept, cognitive representations, and motivations (such as choosing goals and monitoring movement; Trudewind, 1991). For the purposes of this study, intentionality will be understood as the ability to have a "will" and behave "for the sake of" an end or purpose selected by an individual (Rychlak, 1994, pp. 314 - 315). Thus, abilities to desire, choose, and to intend consequences will be of focal interest.

Intentionality, or at least some definitions of intentionality, have been applied to young children as well as other species. Most researchers agree that young children, even infants, have "desires" and are "goal-directed" (Gopnik, 1993; Tomasello, 1993). Likewise, other species of animals may have a range of intentionality - from a sense of "directedness" or "satisfaction conditions" to consciousness and understanding of higher-order beliefs and desires (Pfeifer, 1993). But whether young children (before age 5) are aware of their own intentionality and the intentionality of others is open to debate, particularly in the "theory of mind" literature.
Theory of Mind

A theory of mind is the construction of commonsense psychological beliefs to explain and predict behaviors of the self and others (Gopnik, 1993). This area of research focuses on change in mental representations across the preschool years of age two to five (Astington & Gopnik, 1991; Gopnik & Wellman, 1992). The thesis is as follows: in order for children to understand and predict people's mental states and behaviors, they construct a commonsense folk psychology or theory of mind. Through this implicit theory, the behavior of themselves and others is interpreted through beliefs, desires, and intentions (Flavell et. al, 1992; Fodor, 1992). To have a "theory of mind," a child must first understand that others have mental states (such as knowledge and intentions), and then be able to predict or explain behavior by ascribing mental states to oneself or others (Montgomery, 1992). In this fashion, children's knowledge about causation may be theoretically, developmentally constructed.

It is important to note here that prominent theory of mind researchers argue that their data suggest that intentionality is not a direct first-person experience, but rather that intentionality itself is a cognitive construction that is used to explain behavior, experiences, and language (Astington & Gopnik, 1991; Gopnik, 1993). Such researchers argue that young children (before age 4) are unaware of intentionality, and that this can be evidenced by the finding that often their behavior does not match their sincere verbal report (for example, they consistently are inaccurate when asked what they believed or thought or intended to do before an experimental transformation occurred). Theory of mind researchers do not argue that children have beliefs, desires, and intentions - even 3 year
olds use terms such as "know" and "think" - but that young children do not conceptualize such mental concepts or attribute them to others until about the age of 4 - 5 (Astington & Gopnik, 1991). "Young children do not seem to believe that their own psychological states are intentional, nor do they experience them as intentional," because intentionality is not fundamentally understood by children. Instead, children "invent intentionality early in their lives to explain a wide variety of evidence" (Gopnik, 1993).

Theory of mind research has been conducted through several key tasks. The most well known task is the "false belief" task. In this experimental design, an experimenter might show a child where "Johnny" put a chocolate bar into a dresser drawer. Later, Johnny's mother comes and moves the chocolate bar to a cupboard. When four - year-olds are asked where Johnny thinks the chocolate bar is, they respond that the chocolate is in the original place (the drawer), but three-year-olds fail - they consistently point to the cupboard where the chocolate bar is NOW. This finding suggests that children are not able to make second - order representations; they are not able to understand the jump from "he knows where it is" to "he thinks he knows where it is" (Gopnik & Wellman, 1992; Perner & Howes, 1992). After consistent replication of results, theory of mind researchers suggest that three-year olds have a "copy" theory of mind - where seeing is knowing, or at best, a "fledgling theory of mind" (Hala, Chandler, & Fritz, 1992), while four and five-year-olds are more aware that their beliefs and judgments could be wrong (Taylor, Cartwright, & Bowden, 1991). By age five, however, theory of mind research claims that the child's view of the mind is fully "intentional" - where all psychological functioning is mediated and understood by mental representations (such as desires,
perceptions, beliefs, pretense, and images), including the ability of children to distinguish intentions from accidents in complex behavior (Bennett, 1984; Gopnik & Wellman, 1992).

There are several explanations for the construction of a theory of mind. Some researchers argue that children's understanding of others' intentionality comes from analogy - or from inferring mental states to others based on one's own mind. This is also called "role taking," "perspective taking" or "simulation" (Perner & Howes, 1992). However, this position has had less empirical support (Hobson, 1991). Others argue for an innate brain mechanism (that is damaged or not present in people with autism) that causes a person to believe that oneself and others are agent-centered (e.g., Leslie, 1994).

Predominant among theory of mind research, however, is the "theory-theory," or the idea that children are theory-builders, and construct a folk psychology of intentions, beliefs, and desires to predict, explain, and interpret their own behavior and the behavior of others.

The theory of mind line of research has a history in which it can, in many ways, be considered the successor (Gopnik, 1993) to Jean Piaget's cognitive theory (described below). The theory-theory explanation is a constructivist approach, similar to Piaget's genetic epistemology, with the "theory" similar to Piaget's "schema," and reinterpretation of evidence similar to accommodation and assimilation (Astington & Gopnik, 1991). However, theory of mind researchers do not use concepts of egocentrism, preoperational thought, or developmental stages. Originally, though, theory of mind was conceptualized not for children, but for the chimpanzees and apes of cognitive ethology experiments. Theory of mind was originally postulated to account parsimoniously for successes in
hiding and deception experiments with chimps and gorillas (Premack & Woodruff, 1978). These apes were imputed to have a "theory of mind" in order to predict what the human experimenter was going to do (Hobson, 1991). Accordingly, animals (or, at least apes) are thought by many investigators to have a theory of mind in order to predict behavior and thus increase their survival potential. The research paradigm of the ethologists was then used with children, exploring in a new way children's understanding of beliefs, desires, and intentions, as Jean Piaget explored over 50 years ago.

Although some researchers (e.g., Pfeiffer, 1993; Taylor, 1985) suggest that human beings are not alone in having desires and motives or in making choices, humans may differ from animals in their ability to have second-order desires (choosing or evaluating between desires) and in engaging a measure of personal responsibility. In fact, understanding when and under what conditions children assign responsibility to human actors has been undertaken through research in moral reasoning (e.g., Jose, 1990, Piaget, 1965). In this area of research, stories are read to children, who must then decide, among other issues, if an actor intended the action. Story valence (whether the story outcome is positive or negative) has been found to influence young children's judgments of the intentionality of story actors. Often, young children appear to equate the outcome of the story with the intentionality of the actor: positive events are intended, while negative events are not intended (Shultz & Wells, 1985). Another factor in such research is the foreseeability of the event, with unexpected events often judged by children as unintentional (Nelson-LeGall, 1985). Despite being a rich and complex line of research, the author noted a lack of story data examining children's assignment of intention to
animals or inanimate objects. Young children, by the age of 5, have been found to distinguish intentional (human) actions from reflexes and passive movements (Shultz, Wells, & Sarda, 1980), but does this understanding apply to animals and inanimate objects? Such stories could explore children's understanding of responsibility for behavior beyond human activity. As story situations about humans are often used in theory-of-mind research, including non-human story actors would extend this literature. Children's assignments of such mental states as belief, desire, and intention to animals and the inanimate could be more systematically examined.

Animism

To gain an understanding of the type of research conducted with children's attributions of mental states (including intentionality) to a range of inanimate objects requires a survey of the animism research literature. Animism, as broadly defined, is the attribution of life and consciousness (including intentionality) to inanimate objects (Carey, 1985, p. 15; Piaget, 1989, p. 132; Rychlak, 1981, p. 694; Sharp, Candy-Gibbs, Barlow-Elliott, & Petrun, 1985). Animism occurs when a child confuses “motive” or “quasi-psychological” causes with “mechanical cause”: children mistakenly attribute internal, intentional states as explanations for events involving inanimate objects (Bullock, 1985; Piaget, 1926, p. 205). The study of animism provides an opportunity to examine children's attributions of intentionality to a range of non-human actors and objects.

Historical Perspectives of Animism

As will be shown, current research questions the existence of animism as a widespread childhood phenomenon. Historically, however, early developmental theorists
universally and uncritically accepted the notion of childhood animism as indicative of early, primitive thought. Such theorists as William James, G. Stanley Hall, Sigmund Freud, James M. Baldwin, and Jean Piaget explained animism as due to innate instincts (biological forces), "shaping" (social forces), or sexual energy (psychic forces). In every case, they concluded that animism was a reflection of early, primitive thought.

One way in which animism was considered primitive was that children's thinking was equated with the thinking of primitive man. William James wrote (1950, vol. 2):

> The primitive savage's mind is a jungle in which hallucinations, dreams, superstitions, conceptions, and sensible objects all flourish alongside of each other, unregulated except by the attention turning in this way or in that. The child's mind is the same (p. 299).

For James, animistic or magical thinking in children was the same as the thinking of adults in non-Westernized societies. Freud expressed a similar view when he wrote "primitive man had an immense belief in the power of his wishes. Children are in an analogous psychical situation" (Freud, 1950, p. 83). Freud felt that children reflected an ancient, primitive mode of thought with their magical and animistic thinking, although he acknowledged the "difficulty of analysing children of such a tender age" (ibid., p. 127).

Another way in which animism reflected primitive thought was that it was associated with the concept of "instinct." Instinct is "acting to produce ends, without foresight of the ends, and without previous education in the performance" (James, 1950, vol. 2, p. 383). How can an intentional animism be associated with the absolutely unintentional, absolutely nonteleological concept of instinct? Instinct, according to James,
is triggered when we “perceive a certain intent,” when our feelings are “aroused” from “a wide range of objects,” including other human beings and inanimate things (pp. 414 - 415). Therefore, for James, instincts (such as the hunting instinct) are provoked by perceiving (or attributing) intentions from animate and inanimate things. Animism “provokes” our primitive instincts. It is noteworthy to mention that James continues in his discussion of instincts to attribute intentions and other anthropomorphic characteristics to animals including crustaceans, insects, birds, rodents, cats, and dogs. Apparently James was convinced that they “feel safe,” “fear the supernatural,” have “preferences,” “phobias,” and “maternal joys” (pp. 420 - 440). However, our discussion must be focused on the attributions of children, not the cognitive ethology of William James.

Another way in which animism was considered a primitive mode of thought was that it was not associated with instinct --- it was instinct. One early developmental psychologist who was convinced that children’s animism was instinctive was G. Stanley Hall. Hall reported both interview and anecdotal evidence in his Adolescence (1904) to support his view that until adolescence, children “instinctively and without teaching ascribe emotion, sense, intelligence, morality” (vol. 2, p. 211) to animals, plants, and inanimate objects. A few examples of Hall’s extreme views include the following. To young children the cat “sings, scolds, swears, smiles, laughs, talks, says words and sentences, has its own code of conduct . . . It pities, appreciates care, is sorry, cross, understands, is moody . . .” (p. 225). Plant life was also personified with intentionality. Hall reports that young children say that flowers “live,” “die,” “grow,” “sleep,”; feel fatigue, sickness, hunger, and thirst; “shake heads yes or no,” “whisper, sigh, sing, and
sob”; older children claim that flowers “love bees and butterflies,” “nestle together affectionately,” and “hate noxious parasitic insects” (pp. 204 - 205). Young children’s instinctive attributions of intentionality were extended to inanimate objects such as celestial objects (e.g., sun, moon, stars) and to natural phenomena (e.g., clouds, wind, frost, fire, water, stone). For example, the sun “gets out of bed,” “makes an effort to lift itself,” is “a wanderer at its own free will, it floats or rolls along wherever it wishes and rises when it feels disposed to do so” (pp. 169 - 170). The moon creates a sense of “abandonment” and “mild intoxication” in young children, who talk to the moon, sing to it, “offer it toys,” ask it for a kiss, ask it “to be their playmate,” “courtesy [sic] to it for luck,” and view the moon as an “external conscience” (p. 175). Stars are said by young children to love each other’s company, to talk among themselves, to cluster for sociability, say “present,” wink at each other (children wink back), children tell them their secrets and wish by them (p. 164). For G. S. Hall, natural phenomena were also anthropomorphized: for example, children think that the wind “sleeps and wakes, whistles, whispers, pipes, roars, frets, sings, howls, sob, gasps, sighs, and screams” cogent statements such as “ah,” “whew,” “look out,” “hark,” and “go away!” (p. 184). Hall claimed that young children think that animals, plants, and natural phenomena behave because they want to; nonhumans and inanimates have friends and enemies, human feelings, and the ability to communicate with children. Suffice to say, Hall also reports that children attribute human qualities, including intentionality, to fire, clouds, smoke, Jack Frost, water, stones, and so forth (pp. 164-201). For G. S. Hall, childhood was a magical time of Wonderland (or
Disneyland) in which children instinctively perceive that cats sing, flowers sob, stars wink, and the wind talks to them.

For Hall and James, animistic thought was considered primitive because of its relation to instinct. The mechanism of this instinct, however, was thought to be recapitulation. Recapitulationist doctrine was an extension of Darwin's original evolutionary theory, and was applied widely to early developmental psychology. According to the idea of "ontogeny recapitulates phylogeny" (Haeckel, 1909, p. 147), children's mental development showed the progressive evolutionary advancement of the human race. Therefore, children were said to attribute intentions to trees, to water, to fire, to the sun, etc., because these objects were important to the ancient history of the human race. For example, G. S. Hall wrote that children's feelings for trees were "indisputable": they instinctively anthropomorphized trees. Trees were said to have arms and legs (branches and roots), blood and tears (sap), dress (leaves), and skin (bark).

Young children attribute to trees the abilities to talk, to laugh loudly, to shake hands, to say good night, to scream, to scold and slap the wind, and to go to heaven (Hall, 1904, p. 211). According to Hall, children attribute feelings to trees such as shame (when leaves fall off), romantic love (falling in love with other trees), loneliness (if trees near them are felled or if children do not play around them), joy and honor (if birds build their nests in them), and anger (at the wind). Assignments of intentionality include that trees make shade just for children, watch over houses, or deliberately, selfishly refuse to give shade. Hall reports that children have conversations with trees, hug trees, love to climb trees, and feel sad if they are cut or trimmed. Hall notes that these anthropomorphic and finalistic
attributions decline during adolescence due to cognitive maturity associated with puberty (ibid.). His explanation for these previously "utterly inexplicable" findings is that children are recapitulating the history of the human race: they are instinctively and emotionally attached to trees due to our recent simian ancestry, in which our phylogenetic ancestors lived and swung among trees (p. 216).

Historically, then, the underlying theoretical explanation for children's animistic thinking was attributed to biological sources including instinct, recapitulation, and maturation. In modern times, as described, there are also biological explanations to explain why children attribute intentionality (called the "theory of mind mechanism") (e.g., Leslie, 1994). But another historical source of explanation included animistic reasoning as a result of primitive projected impulses. This view was most strongly supported by Freud's description of childhood totemism (Freud, 1950, pp. 128-130). According to this view, animism is a projection of mental properties, particularly intentionality and sexual impulses, onto things in the world (Sugarman, 1987, p. 14). Animals and objects are endowed with will because these properties are part of children's own internal life. Consequently, children may behave like animals or objects (e.g., Little Arpad's chicken behavior due to penile snippage; pp. 129 - 130), identify themselves and their parents with animals or objects (e.g., Little Hans' horse phobia as a manifestation of Oedipal fear of paternal punishment; p. 129), or talk to animals or objects (e.g., boyhood requests to dogs not to bite because of secret masturbation; p. 128). In Freud's conceptualization, children experience will and purpose as properties of a mind or self undergoing psychosexual development and attribute this mind or self to inert and nonhuman beings.
One final historical source of explanation for children’s animistic thinking was a social explanation conceptualized in the theory of James Mark Baldwin. In this theory, animism results from a confusion of the self and the world. For Baldwin, children’s animism reflects primitive society. Primitive societies, like children, are “prelogical”: there is no distinction between the mind and body, between the self and the other, between the animate and inanimate (Baldwin, 1975, vol. 4, p. 60). An animistic, magical, dynamic, mystical group consciousness pervades primitive societies - a collective identity in which the individual is merged with the identities of other people, totem animals, and objects (p. 61). People in primitive societies are an “undifferentiated mass of phenomena” (p. 60) and physical things have volitions. But, Baldwin notes, our society requires the “logical” dichotomies of mind/body, self/nonself, and inanimate/animate (p. 59). Baldwin proposes that it is through a process of social shaping that allows the child to distinguish between the animate and the inanimate. He writes “control” (human action on objects) is the “germinating distinction between persons and things” (vol. 1, p. 60). Inanimate things “stay put,” they have stability, passive motion, and can be controlled; whereas persons are “intrusive,” “projective,” “unreduced,” don’t “stay put,” and try to exert control. For a child, each person is a “self-nucleating capricious source of novelties, intrusions and moral burnings” (p. 60). As the child discovers things that can be controlled, the child realizes that other people’s bodies have similar experiences and, like the child, are also “me’s” (Baldwin, 1973, p. 8). Thus, through movement and social interaction with objects and people, the child develops a “dawning personality” (Baldwin, 1975, vol. 1, p. 61).
Throughout all of these explanations (Hall, Freud, James, and Baldwin), animism was considered to be a manifestation of primitive thought. Because animism was primitive, theoreticians explained animism through biological, innate processes (animism as due to instinct, maturation, or unfolding recapitulation) or through a combination of biological, social, and psychic processes (as due to sexual impulses, or social shaping).

None of these theoretical viewpoints has had an impact on modern studies of children's animistic thinking, perhaps because current researchers are uncomfortable in attributing children's cognitions to instinct or sexual impulses. None of these theorists considered children's attributions of intentionality as possibly due to a fundamentally intentional outlook; their views of animism as primitive and universal had an impact on the most influential animism theorist, Jean Piaget.

**Modern Explanations: Piaget**

Jean Piaget, Baldwin's intellectual successor, conceptualized animism as an example of a primitive confusion between the boundaries of the self and the world, or between subjective attributes and physical reality. This confusion, or "nondifferentiation between inner and outer experience" Piaget called *egocentrism* (Piaget, 1970, p. 272).

Unlike Baldwin who used the social world as the driving force behind dissociation, Piaget felt that each child gradually developed a sense of subjectivity through "habits of mind."

With experience, a decrease in egocentricity and corresponding denial of "anthropomorphic finalism" occurred (p. 247). Unlike Freud, Piaget postulated that animism arose not because children projected the psychical onto the physical but because they knew no boundary between them. Piaget wrote that because the child does not
have an exact limit between his own ego and the external world, the "illusions of his thought" keep the child "in ignorance of the distinction between physical and the psychical and leads him to regard the external world as endowed with these qualities at the same time" (Piaget, 1966, pp. 254 - 255). He thought that children were "ignorant" of their thoughts, and "project" them in their "entirety into things" (p. 255). Development, therefore, occurred with dissociation between the self and the world. Until dissociation was complete, however, the child's world continued to be conscious and full of intentions, and children thereby show "fragments" of "adherences" of egocentric and primitive thought, including the notion of "precausality" (Piaget, 1989, p. 170; Piaget, 1970, p. 244).

**Precausality**

Piaget developed the concept of precausality to show the presence of egocentrism in young children's causal reasoning. Like Baldwin's concept of prelogical thinking, "precausal" thinking occurred when physical properties were explained in connection with mental purposes (Piaget, 1926, p. 205; Piaget, 1970, p. 252). Precausality contained three key factors: finalism, animism, and artificialism. Finalism occurs when everything has a purpose and must be explained:

Before the age of 7-8 . . . the world is conceived as an assemblage of willed and well-regulated actions and intentions . . . with no room for inexplicable events. Everything can be justified; we need only appeal to an arbitrary factor, which is not the equivalent of chance but resembles rather the whim of all-powerful wills (Piaget, 1966, p. 254).
Animism occurs when children attribute will to objects of all kinds (Sugarman, 1987, p. 13); animism is "the attribution of purpose to things" (Piaget, 1989, p. 233) or "imputing intentional states to inanimate objects or plants" (Carey, 1985, p. 15). Artificialism assumes that children think that things take notice of them and are made for them (Piaget, 1970, p. 245). Children supposedly manifest artificialism when "things occur in the world" because humans, "important adults, or God made things the way they are" and as they always should be (Rychlak, 1981, p. 694). These three factors of precausality (finalism, animism, and artificialism) are highly interrelated. Piaget calls these aspects precausal, because they are not of a "mechanical" "true causality" (Piaget, 1970, p. 267). Precausality is postulated to occur in early childhood, before the ages of seven or eight (Piaget, 1966, p. 173).

The three factors of precausality (finalism, animism, and artificialism) are all telic: they all postulate an end state due to intentionality (the purpose of the object in finalism, the intention of the object in animism, or the intentional creation of the object in artificialism). Piaget rejected children's finalistic explanations as a legitimate way to assign causality. He states "the only questions of a truly causal nature are those relating to phenomena for which a mechanistic explanation has already been given" (Piaget, 1926, p. 203). Children's finalism was unacceptable to Piaget because there was an absence of "purely causal relations" (Piaget, 1970, p. 202). Children's tendency to assign intentionality to things was called "deep and stubborn" as children only with great difficulty freed external reality from "schemas due to internal and psychical experience" (p. 245). Children do not feel the "same need for efficient cause explanation" and "will not
understand scientific mechanical explanations” (Piaget, 1970, p. 172; Rychlak, 1981, p. 694). “Childish causality” is “confused,” “incoherent” and “is so lacking in logic”; it is full of “considerations and justifications”; “devoid of deduction and systematic [operations]” and is therefore not prelogical, but “precausal” (Piaget, 1926, p. 173; Piaget, 1970, p. 292). Animistic and artificialistic explanations are “not clear” and so “obviously do not presuppose an efficient mechanistic causation analogous to [adults]” (Piaget, 1926, p. 173). The child has a lack of interest in mechanical causality, and confuses psychical phenomena with real life. Therefore, for Piaget, children’s animistic, intentional thinking is primitive, is incorrect, and is not causal because it is not mechanistic or scientific. Piaget “rejects any notion of final-cause formulation” as legitimate scientific explanation (Rychlak, 1981, p. 687), a heritage that continues in the study of animism. That is, current researchers have questioned Piaget's findings, but have not rejected his view of children attributing intentionality to the inanimate as incorrect and precausal.

Jean Piaget proposed several stages of animistic thinking, including a "precausal level" (children before the age of 7), in which objects appeared to be alive and have intentions. Gradually, according to Piaget, maturing children attributed less intentionality and life to inanimate objects until an adult-like assessment was reached by the age of 10. Piaget noted that even if his stages of animistic thinking were not regarded as “systematic and explicit,” his findings were “at any rate a clear indication in favor of supposing that the child attributes to nature a universal purpose” (Piaget, 1989, p. 232). For precausal children, Piaget states, “finalism colours the whole of their physics”; the child’s universe is “governed by ideas of purpose both in its broad aspects and in its smallest details” (ibid.).
Piaget obviously viewed children as intentional, but he did not regard their intentional and animistic explanations as a legitimate way of understanding phenomena.

As we have seen, Piaget may have looked at final causes (children's intentional explanations) but he dismissed them as primitive or illogical. Studies that have sought to replicate or refute Piaget's findings have focused on his methodology and have not disputed this theoretical claim of intentional explanations as primitive and incorrect. As Piaget was the first and most influential researcher to systematically study animism (Looft & Bartz, 1969), other animism investigators have sought evidence for or against Piaget's pervasive animistic stages, overlooking intentionality and precluding the treatment of intentional statements as a fundamental way to understand and explain causation.

Before examining studies of Piagetian replication and refutation, it is useful to include a general summary of Piaget's findings and methods.

Piaget's View of Childhood Intentionality

Piaget concluded that children seek purpose in everything and are thereby "precausal" from approximately the ages of 2-3 until the ages of 7-8 (Piaget 1989, p. 232). From his interviews with children, Piaget derived stages of precausal reasoning. Between ages of about 3 and 12, he found that the child exhibited a sequence of three stages. Precausality occurs only in the first two stages. The first stage involves a confusion of self and things (psychological, phenomenalistic, finalistic, or magic explanations); the second stage is a transitional period when the self is in the process of differentiation (mechanical explanations mixed with artificialist, finalistic, and animistic reasoning); and the third stage is the period in which the self has been differentiated from
things (including more “rational” explanations of non-intentional reasoning; Ginsburg & Opper, 1988, pp. 94 - 95; Piaget, 1970, p. 267). Stage 3 children, to Piaget, were not considered precausal because these children did not assign causation due to intentionality of objects or divine beings, even if these older children gave crude or incorrect mechanical explanations. Thus, Piaget claimed that young children in Stage 1 or Stage 2 were unable to recognize distinctions between the mental and material, the animate and inanimate, the man-made and the naturally occurring (Sugarman, 1987, p. 6).

Piaget's specific findings suggest that “precausal” children attribute “universal purposiveness” and have a “remarkably prevalent” finalistic attitude (Piaget, 1989, p. 231). The moon exists to accompany them on a walk, the sun moves “spontaneously” and “follows children” (p. 133). Children make the sun move; the sun exists to keep people warm (p. 221). Young children state that a bench feels burning, a cloud knows it is moving, the air and wind are alive and produced by humans (Piaget, 1970, p. 3; Sugarman, 1987, p. 8). Steam engines, fire, and air “direct themselves with intelligence” and intention (Piaget, 1970, p. 219). Things notice young children, obey them, and deliberately annoy them. Waves are made for boats and swimmers (p. 84) or made by the will of the river or ocean. Rivers move due to teleological reasons (p. 100). Directly probing beliefs about intentional states, Piaget found that young children said that cars, the wind, bicycles, clocks, fires, etc., “know where they are” and can “feel a pin prick” (Carey, 1985, p. 21). From these findings, Piaget concluded that children were unable to clearly distinguish the animate from the inanimate because a confused, inadequate intentional schema, not a mechanical schema, was the only schema available for children. As noted
before, Piaget divided this schema into animism, artificialism, and finalism, but all these factors can be considered intentional explanation.

Piagetian Methods

Piaget’s method for determining animistic reasoning in children was in two formats: analyses of children’s spontaneous “why” questions and through a “clinical interview” (Sugarman, 1987, p. 7). The “why” question format involved case studies; for example, one six-year-old asked 1,125 questions over a period of a year and displayed only 13 questions that requested mechanical explanation - the rest of the questions showed signs of animism, artificialism, or finalism (Piaget, 1926, p. 254). Piaget concluded from these studies that non-differentiation between physical causality and intentional justification was the “distinguishing feature of precausal” thought. As a method for replication, spontaneous “why” questions have not been studied since Piaget.

Piaget’s clinical interview, however, has been widely used and replicated by researchers. In the clinical interview, one “gives the child a list of familiar objects,” asking the child if each object is alive, and also asking for the child's justification (Piaget, 1966, p. 151). In the course of his writings, Piaget suggested the following methodological techniques: first, he suggested that researchers not ask children “what being alive” means, because “this would be to expect them to possess the power of making abstractions.” Second, he warned researchers to avoid suggestion by “perseveration” in questioning the child. Third, he suggested beginning with familiar objects that are obviously alive or obviously inanimate to acquaint the child with the task (e.g., by asking about dogs and fish and later asking about bicycles and rivers). Questioning was to continue until a definite,
consistent systemization of thought could be discovered (e.g., to see if the child uses principles of movement to determine what is living). Fourth, Piaget suggested that the child’s “dunno” is evidence that the child is not conscious of his or her own definition and is unable to synthesize a reason (Piaget, 1966, pp. 150 - 155).

Problems with Piaget’s Paradigm: Attempts at Replication

Piaget's heritage continues today as most studies have sought to replicate or refute Piaget's findings by focusing on his methodology instead of disputing his theoretical claims of intentional attribution as an incorrect, primitive blurring of the self and world. Some researchers, for example, have replicated Piaget's methodology and noted that “primitive” animistic answers are not always found in children (Laurendeau & Pinard, 1962, p. 16). Evidence for animism is, in fact, controversial. Many studies have concluded that Piaget overestimated the pervasiveness of children's animism and pointed to inadequate methodology; for example, Piaget did not define “aliveness,” may have suggested answers, didn't use objects that were familiar to children, or misinterpreted children's lack of knowledge (Bullock, Gelman & Baillargeon, 1982; Carey, 1985, pp. 25; Deutsche, 1937; Huang, 1943; Laurendau & Pinard, 1962; Looft & Bartz, 1969). Some studies claim that by not defining what “alive” means, children may not have a clear understanding of what an experimenter requests. Does “alive” mean that the object exists, that the object is living, or that the object is active? Semantic difficulty has been cited as confusing children about the task of determining what is alive and what is not: after all, inanimate objects are neither living nor dead (Carey, 1985, p. 25). In fact, children may appear to be animistic because the dichotomous categorization that they use differs from the experimenter's. For
example, the experimenter operates on the assumption of an animate/inanimate distinction, while children may have any of the following: alive / dead, real / imaginary, real / representation, or living / nonliving (ibid.). Thus, the child is forced to try to determine which one the experimenter means, and "valiantly" attempts to decide, for example, if bicycles are alive or not (p. 34). Support for this idea comes from Looft and Bartz (1969), who note that unless specific instructions are given, children are uncertain about the distinction between "dead" and "inanimate" and do not have an abstract concept of "life." Bullock, Gelman, and Baillargeon (1982) note that an additional linguistic difficulty is the child’s limited understanding of what an explanation entails: they may know far more than they are able to express in an open-ended question.

Second, despite Piaget’s claims of not suggesting answers, some researchers have claimed that Piaget’s questions suggested intentional, animistic explanations (e.g., asking "Who put the snow there?" instead of "How did the snow get there?") (Looft & Bartz, 1969, Laurendeau & Pinard, 1962). Response bias is certainly always a possibility, as some investigators have argued that a method of difficult, individual questioning forces a young child to fabricate an explanation at any cost (with imaginative, bewildered, or random statements) [e.g., Deutsche, 1937; Huang, 1943]. However, Piaget felt that children’s explanations (whether they made up the details or not) showed valid, underlying precausal limitations because children had to rely on human-like intentionality, not physical causation, as their only causal scheme (Piaget, 1989, p. 313).

Third, other researchers have argued against Piaget’s methodology by stating that Piaget’s "familiar" objects were in fact not familiar, as children had very little experience
with steam engines, and so forth. Indeed, current research has shown that children are far more likely to attribute animistic characteristics to objects that are not familiar to them.

For example, Dolgin and Behrend (1984) tested young children's attributions of animism to pictures of a range of stimuli: living animals, dead animals, never living inanimates, mobile objects, immobile objects, man-made objects and naturally occurring objects. After asking children a series of questions (e.g., "Can X eat?" "Can X dream?" "Is X alive?"), they found that young children made more animistic errors when examined with unfamiliar or ambiguous stimuli (nonmammalian animals, self-moving, or animate-appearing inanimates), while young children rarely erred with prototypical animates and inanimates. Other studies with similar conclusions include Bullock (1985) and Nass (1956).

Fourth, children reporting that they "don't know," current researchers claim, is indicative not of an undifferentiated physical/intentional scheme, but of a lack of knowledge (especially biological knowledge) that constrains their explanations. Children and adults appeal to a systematic body of knowledge, and there is no single criterion of what being "alive" means (Carey, 1985, p. 35). The concept of "aliveness" is influenced by education and direct experience (Laurendeau & Pinard, 1962, p. 26). Children, as Bullock, Gelman, and Baillargeon (1982) note, are limited by their knowledge about what could connect cause and effect, including general knowledge of transformations and specific knowledge about particular events (pp. 233, 212). In other words, children do not lack an appreciation of mechanical events, and with greater experience and education become more accurate in attributing physical causation to physical events. Piaget himself admitted that children's answers often seemed forced and likely to have arisen only
through lack of knowledge of the topics under consideration (Sugarman, 1987, p. 9). But he felt that children's underlying tendencies of thought were best revealed through children's attempts to comprehend the unknown or the partly known. Evidence of children's widespread inventions and resistance of his countersuggestions were Piaget's justifications for the use of his method (p. 9).

Finally, other studies have pointed out limitations of Piaget's methodology by citing divergent results due to the mode of questioning children. Children who are interviewed, Piagetian style, are easily classified into his precausal stages (using qualitative data). Children who are asked yes/no questions, or who are asked to make simple choices, actions, and predictions (using frequency counts) show less animism (Bullock, Gelman, & Baillargeon, 1982; Laurendeau & Pinard, 1962, pp. 28-32; Looft & Bartz, 1969). Piaget justified his use of qualitative child explanation because he felt that unless children "justified" their answers, it would never be "possible to discriminate between their [answers] that are based on a real reasoning process and those related simply to chance, fantasy, perseveration, or to 'anythingness'" (Looft & Bartz, 1969).

In summary, these studies have noted Piagetian limitations by showing that Piaget did not adequately address the conceptual difficulties of children's varying degrees of knowledge, experience, familiarity, and suggestibility. These studies also note that the use of standardized procedures, although decreasing levels of "animism," helps to control for the personal and theoretical biases of researchers (Looft & Bartz, 1969; Russell & Dennis, 1939).
Support for Piaget

Despite all of these methodological difficulties, almost all studies have found that children (and adults) give animistic attributions at least some of the time (Carey, 1985, p. 40; Laurendeau & Pinard, 1962; Russell & Dennis, 1939). Young children do give some verbal indications of animistic thinking, especially when they are directly questioned about a variety of objects and phenomena (Berzonsky, 1987). For example, in the major replication of Piaget's findings by Laurendeau and Pinard (1962), 500 children were interviewed and the results indicated that children's anthropomorphic finalism was "inevitable" with wide support for precausality (p. 196). Their "precausal" children said that clouds move to water gardens or produce the night, and people make clouds move (p. 72); night exists because it is useful to sleep or because God made it (p. 69); and boats float because they are made for floating and the boats want to float (p. 74). Their study noted that children showed "primitive finalistic or animistic forms of precausal thinking" when giving explanations for causal phenomena (p. 219). Likewise, Landreth (1967) claimed that across age ranges, even when people watch physical experiments, a small percentage of people will give non-physical explanations (even adults, especially with unfamiliar phenomena). She concluded that most non-physical attributions are given when participants lack information and experience.

Recent Criticisms of Piaget

Most current studies have been extremely critical of Piagetian claims, particularly the claim that young children prefer intentional explanation. For example, Springer and Keil (1991) report that preschoolers have an early respect for principles of mechanism and
prefer natural mechanistic explanations over intentional explanation. They asked, in a series of experiments, questions about color transmission (how puppies, flowers, and cans get color) and had children rank-order previously written statements of causal preferences (from worst to best). They found that intentional mechanisms were considered silly or inadequate and concluded that children appreciate natural causal mechanisms; they are just unable to articulate them in an explanatory-style interview. Examining this study, however, children actually did choose intentional explanations as their second "best" choice in follow-up explanations - a finding not mentioned by the authors - [e.g., the mother dog wanted her puppy to be brown as the process by which the natural effect takes place]. Additionally, children did recognize the importance of human intentionality (e.g., in pushing a button to make a can "green"). Finally, the choices for children's rank-ordering of explanations were mostly (in some experiments, all) mechanical processes written by the authors: intentional options were not treated as serious possibilities.

Likewise, Lawson claimed that modern children have no "cognitive conflict" or "naive theory construction": their answers to the origin of biological and physical phenomena are based solely on "educational opportunities for scientific, biological knowledge" (Lawson, 1988). Children are not intentional but are "blank slates," gradually accumulating dogmatic knowledge from authority sources. Even when children were unfamiliar with biological phenomena, Lawson's participants either admitted a lack of knowledge or attributed causes as purely natural. Examining the verbatim transcript of this study, however, Lawson only interviewed three children within the same family. Lawson also asked no questions of a telic nature (for example, he did not ask for the
purposes of these biological processes but only for physical mechanisms) and he ignored animistic attributions of the children (e.g., one subject said that plants "get hungry").

Another investigator, Tunmer (1985), has also claimed that children view intentional attributions (esp. of plants or objects) as silly or inadequate. He asked children, ranging from age 4 to 7, to judge a series of sentences as "silly" or "not silly." Tunmer claimed that children, by the age of seven, could with precision select sentences as "silly" when the animate-inanimate distinction was violated (e.g., "the pencil ate the piece of cake on the table") or when a sentient-nonsentient distinction was violated (e.g., "the tree wants the babysitter to fix the toy"). But all of Tunmer's sentences about trees and inanimate objects were implausible, while his sentences about humans were plausible (e.g., "the man wants the policeman to find the money"). Thus, children may have been unfairly assessed: children could judge whether a sentence was implausible, but children were not given any plausible sentences about trees or objects. Thus, his assertion that intentional attribution to plants and inanimate objects is "unacceptable" or "silly" was supported.

New Theoretical Legitimizing Conceptualizations of Intentionality

As discussed earlier, children's intentional attributions to themselves and to other people have been examined by many researchers through a developmental, theory-of-mind paradigm. Young children have been found to impute intentional states to themselves and other people. These researchers consider intentional thinking as a constructive process within early childhood (e.g., Astington, 1991; Bretherton, 1991; Falmagne, 1985; Perner, 1991; Premack, 1991; Van den Broek & Thurlow, 1991).
A few researchers go even further (e.g., Carey, 1985; Rychlak, 1994) by arguing that children may be quite proficient in understanding events and objects in terms of final causes (purposes and intentions), although they have an understanding of efficient causes (physical processes). This proficiency occurs because children's framework for understanding events, people, and objects is fundamentally intentional. Children, for example, may assign inanimate objects intentional abilities because these abilities are reflective of their own intentionality. No parent or adult teaches such inferences, and thus animism is evidence that "the human being is natively teleological in cognitive outlook" (Rychlak, 1994, p. 250). Such events occur as children easily and readily create meanings by extending characteristics of themselves (e.g., intentionality, agency, desire, etc.) to the unknown.

One researcher who supports this view is Susan Carey. She claims that when four-year-olds are compared with ten-year-olds, younger children understand biological phenomena (death, growth, reproduction, gender, etc.) in terms of an intuitive, purposeful, and intentional framework - such as through the desires and beliefs of the actor (Carey, 1985, p. 69). Young children respond to causal questioning in terms of individual motivations and social purposes, yet by age 10 children stop attributing physical processes to intentionality (for example, the stomach does not want to digest food; the heart does not believe that it circulates blood, etc.) (ibid., p. 69). Carey argues that children have an intentional scheme for physical causation until greater understanding of the physical world replaces intentional explanation with biological knowledge (pp. 15 -
40). Hence, human beings are theory builders; from the beginning children construct explanatory structures to help them understand the world (p. 194).

Current Focus of Study

Animism, children’s attributions of intention to objects and nonhumans, is a confused and controversial area. This confusion, it is asserted, is largely due to the fact that researchers have been using problematic historical models to test their hypotheses.

As we have seen, the biological models of James and Hall are no longer considered because researchers are not comfortable in attributing animism to “instinct”; nor is the psychic model of Freud considered to any serious degree because of its sexual connotations and the difficulty of empirical testing. The models of Baldwin, and especially of Piaget, has stimulated practically all of the current research, but these models are conceptually confounded: the concept of “differentiation” mixes the grounds of social explanation, psychic explanation, and biological explanation (as children through maturation and interaction with the social world slowly develop an intentional self).

Because Piaget defined animism as attributing both intentionality and “aliveness” to inanimate objects, researchers may have been assessing two developmentally distinct areas: attributions of intentionality and attributions of biology. Consequently, studies that have followed this model have also been conceptually confounded and the results have varied enormously: some children have shown a high degree of animism, and some children have shown no animism. By separating these underlying grounds of explanation, a more clear pattern of findings can be achieved.
It is argued that animism is one manifestation of children's intentional thinking. The current Piagetian paradigm for the study of animism confuses biological and intentional properties - and researchers have sought to discredit Piaget's claims by showing that children do appreciate biological explanation and rarely, if ever, use intentional explanation. It is maintained that by studying animism in this paradigm, researchers have missed the crucial question. The question is not whether children appreciate biological explanation: clearly they do, understanding the difference between the imagined and the real, the inanimate and animate (Gelman, Spelke, & Meck, 1983; Wellman & Estes, 1986), and it is not in some confused Piagetian way. The critical question is whether children do or do not attribute intentionality to objects, to plants, to insects, to animals, and to people. Since animism is the attribution of intention to inanimate objects and nonhumans, why not directly ask children about intentions? Instead of focusing solely on biological explanation (such as asking children about whether objects are alive, have a brain, or have parents), why not include an intentional focus in a study (such as asking children if a range of objects and actors have desires, wishes, wants, or purposes)?

Support for this view comes from some studies done in Japan by Inagaki (1989). He found that children were able to distinguish anatomical and physiological properties of animates and inanimates between the ages of about 4 and 10. But when he asked questions about intentionality or mental states of animates and inanimates, children and adults had greater difficulty. Such studies indicate that although children understand the meaning of sentences using verbs such as "want," "think," "mean," "plan," "try," or "wish" (verbs
developed linguistically by the third year of life; e.g., Astington, 1991; Limber, 1973), children have greater difficulty in deciding whether inanimates and non-human animates want things or feel emotions. Limited by a lack of statistical tests and limited numbers of subjects, however, Inagaki's findings have not yet been replicated in the United States.

The viewpoint on animism that will be used for the current study is that attribution of intentionality to objects, animals, and people reflects a fundamental (not a Piagetian "primitive" or "precausal" or "incorrect") type of causal thinking. As Sugarman suggests, "the very phenomena that Piaget treats as indicative of the general impoverishment of children's [magical and animistic] thinking attest instead to its complexity and richness" (Sugarman, 1987, p. 24). Piaget was examining an important feature of children's thinking, although he used his scheme to mix biological attribution with intentional attribution and thereby to classify a widely divergent phenomenon. Instead, an alternative, minority view, as supported by Carey (1985), Inagaki (1989), and Rychlak (1994) proposes that children will attribute intentionality to a range of objects and actors as specific intentional "meaning-extension from the personally known self" (Rychlak, 1994, p. 260). Children use the known characteristics of personhood to describe attributes of other animals and inanimate objects (Carey, 1985, p. 69; Inagaki, 1989). If children of varying ages attribute intentionality to objects and actors within a study that controls for biological/intentional questioning, a new contribution, possibly a clarifying contribution, could be made to the confused area of animism, as well as extending the theory of mind literature by examining attributions of intentionality to animals, trees, and objects.

Intentional attributions are expected to be shown in children's understanding of other
objects and people, because intentionality is fundamental to the young child's conception of the world.

The present study aims to take a first step in the direction of clarifying the issues discussed above concerning animism and intentionality. A series of newly designed questionnaires will be administered to children at three age levels: kindergarten, second grade, and fourth grade. To argue that assignment of intentionality is likely to be a fundamental ability and not based on socialization, intelligence level, or education, the children will also be sampled from three very different socioeconomic levels: lower SES, middle-to-upper SES, and very high SES. The child participants will be asked questions designed to gain a greater understanding of their attributions of biological properties and intentional properties of a range of entities (humans, animals, trees, and inanimate objects). Other questions will be asked to examine whether children view intentional attribution as plausible or dismiss it as silly. Finally, questions will be asked to explore whether children attribute intentionality to humans, animals, trees, and objects in story situations, for both positive and negative outcomes. It is hoped that the questionnaires will be able to distinguish important features that have been previously overlooked, particularly in reference to the importance in separating the biological from the intentional, the necessity of controlling for plausibility, and the assignment of agency, desire, and intention across outcome to humans, animals, trees, and objects. Hypotheses are noted below.
Hypotheses and Rationale

Hypothesis 1

Previous animism research has failed to distinguish between biological attribution and intentional attribution. In the present study, it is predicted that when children are asked to make biological and intentional judgments of inanimate objects and trees, and these biological and intentional judgments are combined:

A. For some inanimate objects / trees (e.g., moving inanimates), younger children will show more "animism" than older children.

B. For some inanimate objects / trees (e.g., plants), older children will show more "animism" than younger children.

C. For some inanimate objects, no significant group differences will be found between older and younger children due to differential intentional and biological assignment.

Rationale

As discussed in the introduction, animism, or the attribution of life and consciousness to inanimate objects and trees, is a confusing and problematic area. Some research has indicated that children can show high levels of animism (Piaget, 1989; Hall, 1904), and some research has indicated that children show little or no animism at all (e.g., Lawson, 1988, Bullock, 1985). This study asserts that one problem with animism research is that investigators have failed to separate biological attributions (e.g., movement, sensation, and other aspects of life) from intentional attributions (desire, agency, and other aspects of consciousness). It is predicted that this study can
demonstrate similar divergent findings when questions about biological and intentional questions are combined. This confusion results because children may differ across age in an understanding of both biology and intentionality; these areas, it is argued, should be assessed separately. Therefore, this hypothesis will replicate earlier research by showing that depending on the object asked about, "animism" comparisons between groups will vary widely. For example, younger children may assign greater intentional and biological properties to moving inanimate objects (such as clouds or rivers) than older children (e.g., wanting to move, and being alive), thus scoring higher in animism than older children for these objects. In other cases, younger children may assign fewer biological properties to plants (e.g., properties of breathing, being alive) and thus score lower overall in animism for plants than older children. In other cases, younger children may assign greater intentional properties than older children, while older children assign greater biological properties than younger children, and thus significant group effects would be canceled out.

Hypothesis 2

When asked to judge whether a range of objects, living and non-living, have certain biological properties (vision, breathing, sensation, etc.), and keeping these properties distinct from intentionality, the following patterns will be noted.

A. Younger children will attribute fewer biological properties to living entities (humans, animals, trees) than older children.

B. Younger children will attribute more biological properties to non-living entities (inanimate objects) than older children.
Rationale

As noted in the introduction, young children's understanding of biology may differ based on amount of information and experience. Younger children are less likely than older children to have knowledge about the biological properties of a range of objects and animals. Young children also may be less sure if other animals or objects have human-like biological experiences (breathing, sensation, vision, etc.). For example, Piaget noted that young children may report that a table can feel a pin prick (Carey, 1985, p. 21).

Therefore, it is predicted that while young children ascribe more life to the non-living (which has previously been interpreted as "animism"), they will also ascribe less life to the living, suggesting that younger children make more "errors" based on their limited biological knowledge.

Hypothesis 3

When asked to judge whether a range of objects, human and non-human, have certain intentional properties (desire, purposive movement, choosing, etc.), and keeping these properties distinct from biology, the following patterns will be noted.

A. All children will assign intentional properties to humans and animals.

B. Younger children will assign greater intentional properties to non-animals (trees and inanimate objects) than older children.

Rationale

As was discussed in the introduction, according to theory-of-mind research, it is expected that by the age of the youngest participants in this study (i.e., five years), children will be able to easily assign desire, purpose, choice, and so forth to themselves
and to other people. For an understanding of trees and inanimate objects, it is expected that younger children will make greater attribution of intentional properties than older children due to a fundamental intentional understanding. To younger children, it may seem plausible that trees and objects are able to think and intend like they themselves do. As for animals, this study will extend theory-of-mind literature by examining children's understanding of the intentionality of a range of animals (e.g., dog, cat, pig, bird, bug, worm).

Hypothesis 4

In judging between two sentences, one of which is intentional and the other biological, controlling for the plausibility of these sentences will influence children's ratings of "sentence silliness."

A. When asked whether an intentional or biological sentence is more "silly," and one sentence is plausible and the other is implausible, children will have no difficulty. The silliest alternative, whether intentional or biological, will be selected.

B. When asked which of two sentences is more "silly," when both sentences are implausible or both sentences are plausible, children will have difficulty making a selection. Children will not systematically assign the silly judgment to the intentional sentence as previous research suggests.

Rationale

As was noted in the introduction, previous assessment of children's assignment of intentional properties has not been conducted in an unbiased fashion. Some researchers
(e.g., Tunmer, 1985) have suggested that children view the ability of trees and objects to desire something as inherently silly. Other researchers (e.g., Springer & Keil, 1991), have suggested that children view intentional causal ability of animals and plants as fanciful and implausible. These studies, it is argued, did not provide a plausible intentional choice for children to make, as all intentional choices were unlikely. By controlling for level of plausibility, in presenting sentences that have been judged by adult raters as silly or nonsilly, it is argued that children will 1) easily select silly sentences as more "silly," and 2) not automatically assign a judgment of silliness to intentional sentences. Thus, a more fair assessment of whether children judge an intentional attribution (e.g., desire, agency) as implausible will be made.

Hypothesis 5

In rating sentences which are either biological or intentional, and which are either plausible or silly, children will show distinct preferences.

A. Children will prefer intentional over biological sentences.

B. Children will prefer plausible over implausible sentences.

Rationale

It is suggested that children may perceive intentional sentences as more interesting and familiar (and thus preferred) than sentences describing biological properties, particularly if children do have a fundamental intentional understanding of events, objects, and people. Additionally, all children are expected to prefer the plausible over the implausible or fanciful. This hypothesis argues against early work of Piaget (1970) and Hall (1904), who as noted in the introduction, indicated that children may be
predisposed to whimsical thinking. Instead, it is argued that children will prefer sentences describing likely attributions, as Springer and Keil (1991) and Tunmer (1985) found (although these authors did not examine likely intentional attributions).

Hypothesis 6

When children are presented story descriptions which have either a positive or negative outcome, and they are then asked to assign agency to a story actor (human, animal, tree, or object), the following predictions are made:

A. For both positive and negative story outcomes, all groups of children will assign agency to humans and animals.

B. For both positive and negative story outcomes, younger children will be more likely than older children to assign agency to trees and objects.

Rationale

This measure is expected to replicate the direct attribution measure (see Hypothesis 3) by further examining children's assignments of agency (defined as the ability to desire / desire to act) to humans, animals, trees, and objects. All children are predicted to assign agency to humans and animals (e.g., a girl can want to get out her dolls; a cat can want to jump on a toy). Younger children are expected to assign greater agency to trees and inanimate objects than older children (e.g., a tree can want to drop an apple; a gumball machine can want to take money). It is also predicted that children will assign agency across story outcome, as an entity can initially want to do something even if the eventual outcome is negative (e.g., a girl can want to get out her dolls even though the
dolls are left on the floor). Thus the pattern of assigning agency to actors is expected to hold for both story outcomes.

Hypothesis 7

When children are presented story descriptions which have either a positive or negative outcome, and they are then asked to assign intention of action to a range of story actors (human, animal, tree, or object), the following predictions are made:

A. When story outcome is positive, children will continue to assign intentionality based on the animacy level of the actor.
   1. All children will judge that humans and animals can intend positive actions.
   2. Younger children will be more likely than older children to judge that trees and objects can intend positive actions.

B. When story outcome is negative, younger children are expected to differ from older children in the following ways:
   1. As found in other research, younger children will be less likely than older children to assign intention of negative acts to animate actors.
   2. Younger children will continue to be more likely than older children to judge that trees and objects have intentionality, even for negative outcomes.

Rationale

As noted in the introduction, story outcome is a highly salient feature in judging the intentionality of story actors. Adults and older children appear to understand that
story actors can intend both positive and negative outcomes, while younger children appear to follow a "valence" rule (e.g., Shultz & Wells, 1985). The valence rule is that if an outcome is positive (for example, a girl put her dolls in a doll house), then the actor intended the action. If the outcome is negative (e.g., a girl left her dolls all over the floor), then the valence rule states that young children will be more likely to judge that an actor did not intend the action. Thus assignment of intentionality across story outcome provides an excellent test to see if young children persevere in attributing intentionality to trees and inanimate objects. If it can be shown that young children continue to attribute intentionality to trees and objects, even when tree and object actions produce a negative effect, then this finding would support the view that younger children have a fundamentally intentional view of events and objects.

Hypothesis 8

When children are presented story descriptions which are either positive or negative and either foreseeably caused by an animate actor (an expected event) or unforeseeably caused by an inanimate actor (an unexpected event), children will assign desire for outcome to human, animal, and object recipients of action as follows:

A. When story outcome is positive, children's previous patterns of assigning desire to humans, animals, and objects will be augmented.

1. Children across age groups will assign people and animals high levels of desire to be the recipient of a positive, unforeseeable event caused by an inanimate object or tree.
2. Younger children will be more likely than older children to assign inanimate objects the desire for a positive, foreseeable event caused by a human or animal.

B. When story outcome is negative, children's previous patterns of assigning desire to humans, animals and inanimate objects will be diminished.

1. All children will continue to assign desire to people and animals, but this level will be greatly reduced compared to positive outcomes. For negative outcomes, children will be less likely to assign people and animals the desire to be the recipient of a negative, unforeseeable event caused by an inanimate object or tree.

2. Younger children will continue to assign greater desire to inanimate objects than older children, but this level will be greatly reduced compared to positive outcomes. For negative outcomes, younger children will be less likely to assign inanimates the desire to be the recipient of a negative, foreseeable event caused by a human or animal.

Rationale

In this hypothesis, whether or not an entity can want to be acted upon is examined. The events caused by trees and inanimate objects in these stories are unforeseeable (Nelson-LeGall, 1985) as they could not have been known or expected to occur (for example, a gumball machine gives two pieces of gum, or the gumball machine fails to give gum). Such events are due to chance and it is expected that children will judge that
humans and animals can want these events to occur, if they are positive. In contrast, if the
event caused by an inanimate object is negative, children are expected to judge that
humans and animals are unable to want an uncontrollable, mildly negative event. But
younger children, who may have not made a clear distinction between inanimate and
animate ability to desire, may continue to assign desire to inanimates, even when story
outcome is negative. This measure targets the extent to which children will assign the
capacity of desire to humans, animals, and objects, over and above intentionality (because
all recipients of action either received an unexpected, unforeseeable action, or the recipient
was an inanimate object and therefore could not have intended the action in the first
place). It is expected that younger children, in greater levels than older children, may
report that inanimate objects are able to want whatever action is done to them. Since
humans and animals can want to act on these objects, perhaps also these objects can want
the action that is done to them (for example, a toy can want to be played with, as well as
to be ripped up).
CHAPTER 3

METHOD

Participants

Three separate groups participated in this study: a main sample of children, a test-retest sample of children, and a sample of adults.

Characteristics of the Main Child Sample

Participants were 216 kindergarten, second grade, and fourth grade children (103 male, 113 female) from three areas. The first school group (34 children) was recruited from an upper class, private school located in the Sandy, Utah area. The second school group (94 children) was recruited from two public schools in the Sandy, Utah area, from a middle to upper-middle class neighborhood. The final area from which children were drawn (88 children) was from two public schools in the Magna, Utah area, a lower to upper-lower ("working") class area. Children were divided roughly equally by age and gender (see table below).
Kindergarten, second, and fourth grade children were chosen from the above schools because of their age range (4 - 10) across the Piagetian animistic age span. Children from three different socio-economic levels were chosen in order to assess if intentional attribution indicated consistent patterns of age differences across SES area.

Participants were interviewed in March and April, 1995.

All children were native English speakers, except for two children in the Sandy public school sample, and five children in the Magna public school sample (Spanish, Tongan, and Turkish languages). These few participants, however, were bilingual and were able to complete our test measures.
All children were Euro-American, except one Native American in the Sandy public school sample, and nine in the Magna public school sample (four Hispanic Americans, two African Americans, and three Asian/Pacific Islanders).

The religious background of our participants, which may have a potential to influence animistic reasoning (Sharp, Candy-Gibbs, Barlow-Elliott, & Petrun, 1985), was the following: 144 children were members of the Church of Jesus Christ of Latter-day Saints (LDS) / "Mormon" (67%); 33 children reported that they had no religion (15%); 21 children were from Protestant backgrounds (10%); 12 children were Roman Catholic (6%); two children were from families that had combinations of religions (1%); one child was Jewish (1%). This sample was obviously predominantly LDS, but this religious identification was not uniform across area. A 2 x 3 chi-square analysis combining religious identity (LDS, other) and area (Private, Sandy, Magna) was significant $\chi^2 (2, N = 213) = 13.84, p < .001$. Less than half of the private school children were LDS (44%), while approximately four-fifths of Sandy children were LDS (78%), and approximately two-thirds of the Magna children were LDS (65%).

Children's SES

Consistent with our class-level analysis, occupational level of children's parents was found to be different across the three areas. Occupation of parents, as a less obtrusive measurement of socio-economic-status (SES), was based on Nam-Powers scores (Miller, 1981). A Nam-Powers score ranges from 1 to 99, examining prestige, education, and income. More prestigious occupations gain higher scores (a physician, for example, rates a 99, while a dishwasher rates as a 2). See Table 2 below.
These scores indicate that fathers of private school children attained a very high group average, comparable to business executives, professors, and physicians. Sandy fathers attained a group average comparable to salesmen and businessmen, while Magna fathers attained a group level comparable to skilled laborers and craftsmen. To compare these differences in scores, a one-way ANOVA was conducted comparing father occupation scores across the three areas. The ANOVA revealed a significant difference between the three groups, $F (2, 202) = 34.93, p < .001$. A further Duncan test for comparing means was performed, revealing that each of the three means was significantly different from the other two. This finding indicates that there were three different levels of father occupation within this main child sample.

Occupation of mothers was also examined, but many mothers (44%) were not employed. A 2 (employed or non-employed status) x 3 (area) chi-square analysis indicated a significant relationship, with Magna mothers working more than Sandy mothers, who worked more than the private school mothers, $\chi^2 (2, N = 216) = 9.18, p <$
Additionally, mother employment status (employed or non-employed) was associated with religious background (LDS or other), χ² (1, N = 216) = 4.52, p < .05. The LDS mothers were less likely to work (50% employment) than mothers from other religious backgrounds (65% employment).

The following Nam-Powers scores were obtained for employed mothers:

**TABLE 3**

<table>
<thead>
<tr>
<th></th>
<th>Average / Median</th>
<th>Range</th>
<th>SD</th>
<th>Cases</th>
<th>Nonemployed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>66.42 / 74.00</td>
<td>13 - 99</td>
<td>22.70</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Sandy Public</td>
<td>55.52 / 56.50</td>
<td>3 - 85</td>
<td>21.03</td>
<td>46</td>
<td>48</td>
</tr>
<tr>
<td>Magna Public</td>
<td>48.94 / 49.00</td>
<td>2 - 95</td>
<td>20.35</td>
<td>59</td>
<td>26</td>
</tr>
<tr>
<td>Missing</td>
<td>. . . . . . . . . .</td>
<td>. . . .</td>
<td>. . . .</td>
<td>3</td>
<td>. . . . . .</td>
</tr>
<tr>
<td>Total</td>
<td>53.54 / 52.00</td>
<td>2 - 99</td>
<td>21.46</td>
<td>119</td>
<td>94</td>
</tr>
</tbody>
</table>

Like the scores with father occupation, mothers of private school children were employed in higher prestige jobs (at the level of sales managers) than Sandy mothers (private teachers, health assistants), with Magna mothers employed in lower prestige jobs (such as secretarial, skilled labor positions). A comparison of mother occupation scores across the three areas, using a one-way ANOVA, was significant, F (2, 118) = 4.30, p < .05. Post-hoc Duncan analysis indicated that the private school and Magna means were significantly different from each other. This result suggested that mother occupation differed between these two groups, with private school mothers at a higher employment level than Magna mothers.

All of these occupational scores, combined, indicate that the SES of the children differed across areas, with private school students in an elite, upper class strata (with most
mothers not employed), the Sandy public students in a professional, upper-middle class strata (with about half of mothers employed), and the Magna public school students in a lower / working-class strata (with most parents working).

**Children's Intelligence Measurement**

To provide a rough estimate of children's intellectual achievement, the Peabody Picture Vocabulary Test (PPVT), form M, was used (Dunn & Dunn, 1981). The PPVT raw scores were converted to age-equivalent scores. Median scores are included due to a few child outliers. The test analysis indicated that across groups, participants attained the average level for children their same age, with older private school and Sandy children attaining above-age levels. See Table 4 below.

### TABLE 4

INTELLECTUAL AGE EQUIVALENT OF VOCABULARY SCORES

<table>
<thead>
<tr>
<th>Class</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private School</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th grade (9-10 years).</td>
<td>12.66</td>
<td>12.91</td>
<td>(8.3 - 15.3)</td>
</tr>
<tr>
<td>2nd grade (7-8 years)</td>
<td>9.06</td>
<td>8.83</td>
<td>(7.2 - 10.8)</td>
</tr>
<tr>
<td>Kindergarten (5-6 years)</td>
<td>6.80</td>
<td>6.92</td>
<td>(4.1 - 7.8)</td>
</tr>
<tr>
<td><strong>Sandy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th grade (9-10 years)</td>
<td>11.73</td>
<td>12.00</td>
<td>(8.5 - 15.9)</td>
</tr>
<tr>
<td>2nd grade (7-8 years)</td>
<td>8.60</td>
<td>8.83</td>
<td>(5.8 - 12.1)</td>
</tr>
<tr>
<td>Kindergarten (5-6 years)</td>
<td>6.17</td>
<td>6.21</td>
<td>(4.4 - 8.3)</td>
</tr>
<tr>
<td><strong>Magna</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th grade (9-10 years)</td>
<td>10.82</td>
<td>9.96</td>
<td>(6.1 - 26.3)</td>
</tr>
<tr>
<td>2nd grade (7-8 years)</td>
<td>8.45</td>
<td>8.33</td>
<td>(6.1 - 13.1)</td>
</tr>
<tr>
<td>Kindergarten (5-6 years)</td>
<td>5.77</td>
<td>5.83</td>
<td>(4.0 - 7.6)</td>
</tr>
</tbody>
</table>
To examine the association of the PPVT scores across age and area, a 3 (area) x 3 (grade level) ANOVA was conducted using PPVT age-equivalent scores. Results indicated main effects for grade, $F (2, 215) = 136.12, p < .001$ and for area, $F (2, 215) = 5.09, p < .01$. There was no significant interaction between grade and area, $F (4, 215) = .58, n.s$. Duncan post-hoc tests indicated that the means between kindergartners, second graders, and fourth graders were significantly different ($p < .05$), and the means between the private school students and Magna students were significantly different ($p < .05$). This analysis indicates that for the PPVT, older children scored higher than younger children, and private school students scored higher than Magna students.

Finally, most children were owners of pets (75% of sample) or had been previous owners of pets (8%). Only 37 children (17%) had never owned pets, indicating that most children had personal experience with animals that were used as test targets in our test measures (dogs, cats, birds, etc.). All 216 children (100%) also had home access to a television set, and therefore at least some familiarity with television shows with animated characters or objects.

**Test-Retest Sample**

Twenty-four children, eight from each grade level, were tested twice to obtain test-retest correlations on our measures. These 24 students (eight from each grade level, with 10 female and 14 male students) were retested three weeks after original testing. This sample was also used to pretest measures to ensure comprehensibility. The characteristics of these children were as follows: all lived in Sandy, Utah and went to local public elementary schools; all were Euro-American, except two Native Americans; all were LDS;
all had television sets at home; 75% owned pets or had owned pets. None of these patterns was significantly different from those of the main sample, for ethnicity (Euro-American, Hispanic, African-American, Asian, Native American, Pacific Islander, Other/Missing) $\chi^2 (6, N = 240) = 12.05$, n.s.; for religion (LDS, Protestant, Catholic, Jewish, Mixed, None/Agnostic) $\chi^2 (5, N = 236) = 10.81$, n.s.; or for pet ownership status (current owner, previous owner, no pet ownership), $\chi^2 (2, N = 240) = 2.36$, n.s. The SES scores obtained for this sample included an average father occupation score of 70.29, and an average mother occupation score of 51.47 (with 12 non-employed or home-employed mothers). These occupational scores were also not significantly different from the mean of the general child sample (for father occupation, $t = 1.90$, df = 208, n.s.; for mother occupation $t = 1.09$, df = 118, n.s.). In summary, the test-retest sample of children appeared to be comparable to the main body of children. Findings on reliability will be given below.

**Adult Sample**

Adult participants were obtained in order to assist with test construction (measures are noted below) by providing ratings of sentences, stories, and an adult judgment of biological and intentional properties. Sixty undergraduate students enrolled in introductory psychology courses at Loyola University-Chicago participated. Participation in the experiment partially fulfilled a course requirement. Adults ranged in age from 17 to 37 years, (median 19 years) and included 22 male and 38 female students, a pattern of gender participation that was not significantly different from the child sample, $\chi^2 (1, N = 276) = 2.3$, n.s. Forty-three adults (72%) were freshmen, with 12 sophomores (20%) 4
juniors (7%), and 1 part-time student. Nearly all participants had home access to television sets (97%), and most participants had owned or currently owned pets (83%). These patterns of television access and pet ownership were comparable to the sample of children. Students' father occupations were obtained for 41 students (not including 4 fathers who were deceased or unemployed), with 15 students choosing not to disclose this information. The range of father occupation was from 33 to 99, with a mean score of 75.6, which was not significantly different from the average father occupation of the child sample, $t = 1.72$, $df = 242$, n.s. Adult students' mother occupation was obtained for 35 students (not including 10 mothers who were non-employed), with 15 students choosing not to disclose this information. The range of mother occupation was from 7 to 99, with a mean score of 61.6, again not significantly different from the total average child mother occupation score, $t = 1.91$, $df = 152$, n.s. The adult sample, then, appeared to be comparable to children in terms of parent occupation, gender distribution, pet ownership, and television use.

However, the adult sample was found to contain some differences from the children's sample in two areas: ethnicity and religious background. The adult sample was much more diverse than the children's sample, with 27 (45%) Euro-American, 23 (38%) Asian, 5 (8%) African-American, and 3 (5%) Hispanic students. This ethnic pattern distribution (Euro-American, Hispanic, African American, Asian, Native American, Pacific Islander, Other) was significantly different from the children's sample, $\chi^2 (6, N = 276) = 106.22, p < .001$. The religious denominations of the adults, also, were significantly different than the children's sample, with 32 (53%) Catholic students, 8 (13%) Protestant,
5 (8%) Islamic, 3 (5%) Buddhist, 1 (2%) Jewish, and 2 (3%) None/Agnostic.

Comparisons between the pattern of religious distribution (LDS, Protestant, Catholic, Jewish, Islamic, Hindi, Buddhist, None/Agnostic) indicated significant differences between the sample of adults and the sample of children, \( \chi^2 (7, N = 276) = 156.42, p < .001. \)

**Instruments**

Four test instruments were given to the main child sample as independent variables.

**Measure #1: Direct Attribution Measure**

This instrument is a questionnaire based on previous literature (Dolgin & Behrend, 1984; Inagaki, 1989) and was developed by the writer. This questionnaire asks children to make simple judgments about whether a particular object, person, or animal has intentional properties, discussed below as the Intentional Scale (the ability to think, to want something, to make choices, to know, to wish, to control movement, to want to do something). This questionnaire also asks children to make simple judgments about whether an object has certain biological properties, called the Biological Scale (the ability to see, to feel pain, to breathe, to move, to have a brain, have a heart beat, and whether the object is alive). There were seven biological property questions and seven intentional property questions asked about each object. There were 17 objects that children were assigned to evaluate their biological and intentional properties. These items included inanimate non-moving objects (book, rock), inanimate machines (computer, car), inanimate moving entities (river, cloud), plants (flower, tree), animate invertebrates (bug, worm), animate vertebrates (dog, bird), non-age similar humans (baby, lady), same-age humans (boy, girl) and children were also asked to assign these properties to themselves.
(self). All children received 9 target objects, one from each category. Each object, except for questions about the children themselves, was accompanied by a realistic, computer-generated picture of the object (Corel Draw! 4.0, 1993). These clipart pictures were utilized because of their superiority to line drawings and because the computer package contents were redistributable.

This measure was scored with ranges of 0 to 7 for the Intentional Scale, and 0 to 7 for the Biological Scale for each object, animal, or person. For example, a child that claimed that a human adult could do all of the mental properties (think, want things, make choices, know, wish, control movement, and want to do something) received a score of 7 for that category on the Intentional Scale, while a claim that a worm could only feel pain and move received a score of 2 for that category on the Biological Scale. Scores were subjected to MANOVA tests to screen for interaction effects involving gender, SES, and grade level. Additionally, all scales (biological and intentional, for both form A and form B) were subjected to a repeated measures MANOVA to examine whether an interaction effect between grade level and responses to the entire range of items occurred. Thus, with a significant repeated measures MANOVA interaction, individual one-way ANOVA (between the means of the age group for each item) could be validly conducted.

The Biological and Mental Attributions Test was found to have excellent test-retest reliability. The sample of test-retest children was used to compute a correlation between the two testing occasions (three weeks intervening). Correlations were conducted on the number of "yes" judgments for each object (scores ranging from 0 to 14) between test and retest three weeks later, as well as the score for the entire test (with a potential range of 0
to 126). Pearson's \( r \) correlations for the individual test items ranged from .41 to perfect agreement, with all individual items scoring at a two-tailed significance level ranging from \( p < .05 \) to \( p < .001 \). The entire test sum correlation was \( r = .93, N = 24, p < .001 \).

Further information on test-retest data can be obtained in Appendix D.

Measure #2: Intentional or Biological Sentence Judgment Task

This measure is based on previous literature (Tunmer, 1985) and was developed by the writer. To construct this measure, sentences involving biological and intentional properties of a boy, a dog, a tree, and a rock were generated. These sentences were then rated for plausibility by adult subjects on a continuum ranging from 1 (not silly) to 5 (very silly). Thirty-two sentences were then chosen and formed into 16 sentence pairs based on a similar or a contrasting level of plausibility (see Appendix C for adult means and sentence pair construction). Each sentence pair contained a biological sentence (for example, "the dog has muscles and bones") or an intentional sentence (for example, "the dog wants to chew up things"). Sentence-pairs were assembled as follows: 1) both silly, 2) both plausible, 3) one silly and one plausible, or 4) one plausible and one silly. See Table 5.
TABLE 5

BIOLOGICAL AND INTENTIONAL SENTENCE PAIRS

<table>
<thead>
<tr>
<th></th>
<th>Pair 1</th>
<th>Pair 2</th>
<th>Pair 3</th>
<th>Pair 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boy</td>
<td>silly - silly</td>
<td>silly - plausible</td>
<td>plausible - silly</td>
<td>plausible - plausible</td>
</tr>
<tr>
<td>Dog</td>
<td>silly - silly</td>
<td>silly - plausible</td>
<td>plausible - silly</td>
<td>plausible - plausible</td>
</tr>
<tr>
<td>Tree</td>
<td>silly - silly</td>
<td>silly - plausible</td>
<td>plausible - silly</td>
<td>plausible - plausible</td>
</tr>
<tr>
<td>Rock</td>
<td>silly - silly</td>
<td>silly - plausible</td>
<td>plausible - silly</td>
<td>plausible - plausible</td>
</tr>
</tbody>
</table>

Children were asked to decide which sentence (either the biological or intentional sentence) in each pair was "sillier," and which sentence was "liked more." For example, children had to choose whether the sentence "the tree needs water and sunshine" (biological - plausible) was 1) more silly and 2) liked better than the sentence "the tree wants to sing a song" (intentional - silly). Half of the children received sentence pairs about two objects (boy, tree), and half of the sample of children received sentence pairs about two other objects (dog, rock) for a total of 8 sentences given to each child. Each sentence-pair differed in order of presentation, with half of the sentence pairs beginning with the biological sentence, and half of the sentence pairs beginning with the intentional sentence. (See Appendix F for actual test instrument).

The questionnaire was scored in the following fashion: the proportion of intentional sentences chosen was calculated for each sentence pair and binomial tests were conducted.

Additionally, total scores for selecting an intentional sentence (ranging from 0 to 8) were computed for judgments of preference. These scores were compared through t-tests to a chance mean of 4. Thus the questionnaire was scored in the direction of intentional
sentences, ranging between 0 and 8. Scores of 4 and above indicated a preference for intentional sentences, and scores below 4 indicated preferences in favor of biological sentences.

This measure was also found to have adequate test-retest reliability. Children's scores of preference for intentional sentences over a three-week test-retest (scores ranging between 0 to 8, N = 24) was $r = .66, p < .001$. Test-retest scores of judging intentional sentences as sillier over this same period (scores ranging from 0 to 8, N = 24) was $r = .57, p < .001$. The entire test-retest correlation was $r = .76, p < .001$.

Measure #3: Assignment of Intentionality and Sensation Across Story Situations

This measure, constructed by the writer, was a series of questions following short stories. Each story contained an actor and a recipient of action. All stories contained either an inanimate object or a tree. Story actors were human, animal, tree, or object; and story recipients were human, animal, or object. There were 4 actor/recipient combinations: a human acts on an inanimate object, an inanimate object acts on a human, a tree acts on an animal, and an animal acts on an inanimate object. For example, a human and inanimate story was "This is a gumball machine. A boy put money into the gumball machine. The machine took the money and then didn't give the boy any candy." See Appendix F for remaining stories.

Several stories for each category were constructed, and after elimination by adult raters and child pretesting, two stories for each category were kept (involving a girl and her dolls, a boy and a dish, a gumball machine and a boy, a teddy bear and a girl, a cat and a toy mouse, a cow and a gate, a tree and a bird, and a tree and a pig).
Children were given the brief stories, accompanied by computer-generated pictures (Corel Draw! 4.0, 1993), and children were asked if the actor of the situation intended to do the action, intended the consequence, and if the object of the action intended the consequence. All children received 8 stories, with half of the stories containing a positive outcome, and half of the stories a negative outcome (see Table 6). Children were also asked if the actor and the object in each story situation could feel sensation (touch/pain/pressure). See Appendix F for actual test measure.

**TABLE 6**

**STRUCTURE OF STORY DATA**

<table>
<thead>
<tr>
<th>Actor</th>
<th>Recipient</th>
<th>Outcome</th>
<th>Form A</th>
<th>Form B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human...</td>
<td>Object</td>
<td>Positive</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human...</td>
<td>Object</td>
<td>Negative</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal...</td>
<td>Object</td>
<td>Positive</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal...</td>
<td>Object</td>
<td>Negative</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree.....</td>
<td>Animal</td>
<td>Positive</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree.....</td>
<td>Animal</td>
<td>Negative</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object...</td>
<td>Human</td>
<td>Positive</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object...</td>
<td>Human</td>
<td>Negative</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This questionnaire was scored across individual test items (for chi-square analysis across age groups) after logit loglinear analysis screened for SES interaction effects. The questionnaire was also scored from 0 to 4 for child attribution of sensation to humans, 0 to 4 for sensation of animals, 0 to 2 for sensation of trees, and 0 to 6 for sensation of inanimate objects.

This test was found to have excellent test-retest reliability. Test-retest children’s scores of story actors’ and objects’ intentional attributions between test and retest was $r = .68, p < .03$; for sensation $r = .95, p < .001$. The test-retest correlation for the entire test was $r = .92, p < .001$. See Appendix D for further test-retest information.

**Measure #4: The Peabody Picture Vocabulary Test**

This measure was used to assess children’s intellectual ability, ensure a basic level of comprehension, and to find out the average intellectual level for a given SES area. The PPVT is a widely used measure of intellectual achievement (Dunn & Dunn, 1981) and is especially useful for testing children because it does not require the ability to read. Children are given a series of pictures, and asked to point to the picture that represents a certain word. As the vocabulary words becomes increasingly difficult, children reach a criterion of errors and this level of attainment is calculated into a norm-referenced score. The PPVT has been extensively cross-validated and has high test-retest reliability.

**Procedure**

**Testing of Children**

To have access to children, approval from two public school districts was required. After approval was received, permission to conduct research was obtained through
interviews with four school principals and two private school administrators. Parental consent was then sought through distributing parental permission forms (see Appendix E). After signed parent consent forms were collected and children were present (one school district had year-round school and so children were either on- or off-track), teacher permission to take children from class was obtained. Children were interviewed individually in a quiet room. Face-to-face interviews were given because of the complexity of the measures and to avoid partial return of forms due to differential reading ability or lack of interest. The researcher read forms to each child and wrote down the responses to each question on the more complex attributions and story measures (direct attribution and story data). The researcher was assisted with the PPVT and the sentence judgment task by a trained female undergraduate.

Due to the high number of yes/no questions involved in this research, some precautions were taken that should be noted. Any child who indicated all "yes" or all "no" judgments to any measure was eliminated from the study, and these data were replaced. This occurred only two times (one kindergartner from Magna, and one second grader from Sandy). In addition, periodically children were asked open-ended questions after making an affirmative response to ensure valid measurement (for example, after stating that a bug could make a wish, children were asked, "what could a bug wish for?").

Interviews took from 20 to 25 minutes each (kindergartners took slightly longer). Presentation of the four measures was counterbalanced. After the interview, children received either a pencil, pen, or stickers. These small rewards were given to encourage participation in the study, as the Magna students were approximately half as likely to
return permission forms as the other, higher SES groups. Students were then returned to their classes.

Test-retest children followed the same procedure, except they were tested at home, after recruitment from Sandy LDS families (requiring only parental permission). Test-retest children were also not given the PPVT. One participant had to be replaced due to the child moving to a different city (average time between testing was 22 days).

Testing of Adults

After departmental approval, 60 adult subjects were obtained. Participants signed up for small group sessions in which they completed a packet of test measures individually. Their measures consisted of attributions of mental and biological properties (to assess an adult consensus of these attributions), a silliness rating scale for sentence judgments (to construct the sentence preference measure), and a measure that asked if story situations were “accidental,” “intentional,” “positive,” or “negative” (to provide adult consensus of these variables in order to construct the story measure). Each subject completed the packet of test materials in approximately 15 to 25 minutes. See Appendix C for adult rating packet.
CHAPTER 4

RESULTS

The results section will follow the structure outlined by the hypotheses, after an assessment of potential SES effects is noted.

SES Interaction Effects

In view of the fact that the demographic characteristics of the child sample indicated three very different SES levels, potential SES influences on children’s responses were examined. Each test measure was subjected to analyses that examined for SES and gender main effects and interactions. Procedures included the use of 2 (gender) by 3 (grade level) by 3 (SES) MANOVA for the direct attribution measure and for the sentence judgment task. Logit loglinear analysis (Stevens, 1992) examining main effects and interactions of grade level, SES, and story outcome was also used for individual, categorical test items on the story measure. After conducting these analyses, it was noted that there were few interactions or main effects for SES or for gender, although a few significant findings did appear (see Appendix B for specific items). As there was no consistent pattern of findings for SES and gender influence, it was determined that scores across area could be collapsed and children could appropriately be compared across grade levels. Hypothesis 1 is now examined.
Hypothesis 1

Hypothesis 1 stated that merging biological property attribution with intentional property attribution can produce confusing "animism" findings. It was predicted that for some cases, young children (i.e., kindergartners) would show greater animism than older children; for other cases, older children would show greater animism than younger children; and for yet other cases significant group effects would be eliminated. To test hypothesis 1 and replicate earlier work, objects and plants studied in animism research were used (i.e., plants, moving inanimate objects, machines, and non-moving inanimate objects). The dependent variable in this calculation is the total of scale 1 (biological assignments) added to the total of scale 2 (intentional assignments). Thus scores could range from 0 to 14 for each object with higher scores indicative of greater assignment. Children received questions about either a flower, computer, river, and rock; or questions about a tree, car, cloud, and book.

Scores were compared across grade level through the use of one-way ANOVA. Since eight ANOVAs were computed, separate test findings were compiled into a single table. Comparisons and means are given in Table 7
TABLE 7
MEANS AND COMPARISONS BETWEEN GRADE LEVEL AND OBJECT

<table>
<thead>
<tr>
<th></th>
<th>K (SD)</th>
<th>2 (SD)</th>
<th>4 (SD)</th>
<th>F</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower</td>
<td>2.71 (2.35)</td>
<td>2.32 (1.67)</td>
<td>2.97 (2.26)</td>
<td>.86</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Tree</td>
<td>1.59 (1.82)</td>
<td>2.56 (2.16)</td>
<td>2.51 (1.30)</td>
<td>3.28</td>
<td>2, 105</td>
<td>.05</td>
</tr>
<tr>
<td>Computer</td>
<td>2.00 (2.19)</td>
<td>1.76 (1.50)</td>
<td>2.03 (1.69)</td>
<td>.25</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Car</td>
<td>2.38 (1.93)</td>
<td>1.28 (0.66)</td>
<td>1.21 (0.74)</td>
<td>9.52</td>
<td>2, 105</td>
<td>.001</td>
</tr>
<tr>
<td>River</td>
<td>2.11 (2.31)</td>
<td>1.81 (1.05)</td>
<td>1.37 (0.65)</td>
<td>2.10</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Cloud</td>
<td>2.46 (2.68)</td>
<td>1.36 (0.93)</td>
<td>1.12 (0.33)</td>
<td>6.40</td>
<td>2, 105</td>
<td>.01</td>
</tr>
<tr>
<td>Rock</td>
<td>.63 (1.24)</td>
<td>.13 (0.35)</td>
<td>.40 (1.09)</td>
<td>2.44</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Book</td>
<td>.76 (2.78)</td>
<td>.22 (0.72)</td>
<td>.18 (0.46)</td>
<td>1.26</td>
<td>2, 105</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

As can be seen from the significance values and the means of the grades in Table 7, younger children showed greater animism than older children for judgments about a car $F (2, 105) = 9.52, p < .001$; and for a cloud $F (2, 105) = 6.40, p < .01$. For these two objects, kindergartners gave responses that were significantly higher than second graders, and significantly higher than fourth graders (Duncan post-hoc tests at .05 level). These findings occurred because younger participants assigned more biological and more intentional properties than older children. For example, younger children were more likely than older children to judge that a car is alive $\chi^2 (2, N = 106) = 18.34, p < .001$ as well as judge that a car can want to move $\chi^2 (2, N = 106) = 19.48, p < .001$. Chi-squares (2 x 3, df = 2) were arrayed in terms of yes/no answers to questions against the three grade levels. Thus hypothesis 1-A was supported; by combining the biological with the intentional, traditional animism findings can be found.
Older children also appeared to show greater animism than younger children for judgments about a tree $F(2, 105) = 3.19, p < .05$. For this object, the mean of kindergartners was significantly lower than second graders and fourth graders (Duncan, $p < .05$). This finding occurred because older participants assigned greater biological ability for a tree to breathe $\chi^2(2, N = 106) = 10.84, p < .01$ and greater attribution of a tree as being alive $\chi^2(2, N = 106) = 27.05, p < .01$. Thus hypothesis 1-B was supported. By combining the biological with the intentional, it can be concluded that animism is unexpectedly greater for older children than for younger children.

Finally, no significant group differences were seen across most inanimate objects (for the flower, $F(2, 109) = .86$, n.s.; for the computer, $F(2, 109) = .25$, n.s.; for the river $F(2, 109) = 2.10$, n.s.; for the rock $F(2, 109) = 2.44$, n.s.; and for the book $F(2, 106) = 1.26$, n.s. These findings occurred, at least in one case, because older children attributed greater biological properties, while younger children attributed greater intentional properties. For example, younger children were more likely to judge that a computer can want to do something $\chi^2(2, 109) = 6.15, p < .05$, while older children were more likely to judge that a computer has a brain $\chi^2(2, 109) = 7.20, p < .05$. Thus hypothesis 1-C was supported; combining the biological with the intentional can cancel out significant group effects, as groups differentially assign intentional and biological properties.

Repeated Measures MANOVA

The assessment of hypothesis 2 and hypothesis 3 requires extensive use of univariate tests (one-way ANOVA for 17 objects, with 2 scales each, or 34 analyses comparing means of the three grades). In order to ensure that this large number of one-
way ANOVA tests could be validly conducted, a repeated measures MANOVA was performed for each scale on the two forms. Thus, the objects across the entire range were compared against each other as well as compared against children's age levels. For all the following tests, F values are from Wilks's lambda (Λ) multivariate statistic.

For Form A, there were significant interaction effects between grade and object range for both the Intentional Scale and Biological Scale, $F(2, 107) = 1.86, p < .05; F(2, 107) = 3.09, p < .001$. For Form B, there were also significant interaction effects between grade and object range for both Intentional and Biological Scales, $F(2, 103) = 3.29, p < .001; F(2, 103) = 3.52, p < .001$. These significant interactions between grade level and object range were indicative that univariate tests could be performed to search individual items for age differences. We now turn to hypothesis 2.

**Hypothesis 2**

Hypothesis 2 stated that when children are asked to make an assignment of biological properties across a range of animate and inanimate life, younger children will make more errors. It was predicted that younger children would assign significantly fewer biological properties to things that are living, and significantly more biological properties to things that are non-living.

The dependent variable for this hypothesis is the total of the biological scale for each object (judging that an object has the properties/abilities of sight, pain, having a brain, having a heart beat, breathing, movement, and aliveness). Scores ranged from zero to seven for each of the 17 objects (self, boy, girl, baby, lady, dog, bird, bug, worm,
Each score (from 0 to 7) was then subjected to a one-way ANOVA comparing means of kindergartners, second graders, and fourth graders, with appropriate post-hoc Duncan tests. The 17 ANOVA tests are again combined into one table for ease of use.

Results are noted in Table 8 below.

**TABLE 8**

MEANS AND ONE-WAY ANOVA FOR BIOLOGICAL ASSIGNMENT (0 - 7)

<table>
<thead>
<tr>
<th></th>
<th>K (SD)</th>
<th>2 (SD)</th>
<th>4 (SD)</th>
<th>df</th>
<th>p</th>
<th>Sig. Diffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>6.99 (.11)</td>
<td>7.00 (.00)</td>
<td>7.00 (.00)</td>
<td>.94</td>
<td>2, 215</td>
<td>n.s.</td>
</tr>
<tr>
<td>Boy</td>
<td>7.00 (.00)</td>
<td>6.97 (.16)</td>
<td>7.00 (.00)</td>
<td>.99</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Girl</td>
<td>7.00 (.00)</td>
<td>6.97 (.17)</td>
<td>7.00 (.00)</td>
<td>.97</td>
<td>2, 105</td>
<td>n.s.</td>
</tr>
<tr>
<td>Baby</td>
<td>6.97 (.16)</td>
<td>7.00 (.00)</td>
<td>7.00 (.00)</td>
<td>.95</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Lady</td>
<td>6.92 (.28)</td>
<td>7.00 (.00)</td>
<td>7.00 (.00)</td>
<td>2.96</td>
<td>2, 105</td>
<td>n.s.</td>
</tr>
<tr>
<td>Bird</td>
<td>6.66 (.94)</td>
<td>6.89 (.39)</td>
<td>7.00 (.00)</td>
<td>3.16</td>
<td>2, 109</td>
<td>.05 K/4</td>
</tr>
<tr>
<td>Dog</td>
<td>6.81 (.52)</td>
<td>7.00 (.00)</td>
<td>7.00 (.00)</td>
<td>4.59</td>
<td>2, 105</td>
<td>.05 K/2 K/4</td>
</tr>
<tr>
<td>Bug</td>
<td>5.63 (1.30)</td>
<td>6.38 (1.04)</td>
<td>6.86 (.36)</td>
<td>14.15</td>
<td>2, 109</td>
<td>.001 K/2/4</td>
</tr>
<tr>
<td>Worm</td>
<td>5.32 (1.58)</td>
<td>5.86 (1.13)</td>
<td>5.97 (1.21)</td>
<td>2.43</td>
<td>2, 105</td>
<td>n.s.</td>
</tr>
<tr>
<td>Flower</td>
<td>1.68 (1.14)</td>
<td>1.76 (1.23)</td>
<td>2.26 (1.15)</td>
<td>2.53</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Tree</td>
<td>.86 (.89)</td>
<td>1.75 (1.27)</td>
<td>2.24 (1.03)</td>
<td>14.88</td>
<td>2, 105</td>
<td>.001 K/2 K/4</td>
</tr>
<tr>
<td>River</td>
<td>1.16 (1.04)</td>
<td>1.11 (.31)</td>
<td>1.09 (.28)</td>
<td>.13</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Cloud</td>
<td>1.27 (1.22)</td>
<td>.92 (.37)</td>
<td>1.00 (.00)</td>
<td>2.20</td>
<td>2, 105</td>
<td>n.s.</td>
</tr>
<tr>
<td>Comp.</td>
<td>.52 (.98)</td>
<td>.22 (.42)</td>
<td>.49 (.61)</td>
<td>2.06</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Car</td>
<td>1.38 (.83)</td>
<td>.94 (.23)</td>
<td>1.06 (.35)</td>
<td>6.22</td>
<td>2, 105</td>
<td>.01 K/2 2/4</td>
</tr>
<tr>
<td>Rock</td>
<td>.23 (.49)</td>
<td>.03 (.16)</td>
<td>.20 (.58)</td>
<td>2.32</td>
<td>2, 109</td>
<td>n.s.</td>
</tr>
<tr>
<td>Book</td>
<td>.35 (1.25)</td>
<td>.03 (.17)</td>
<td>.18 (.47)</td>
<td>1.53</td>
<td>2, 105</td>
<td>n.s.</td>
</tr>
</tbody>
</table>
As can be seen from the means of Table 8, kindergartners did assign significantly fewer biological properties to things that are living, including a bird $F(2, 105) = 6.66, p < .05$; a dog $F(2, 105) = 6.81, p < .05$; a bug $F(2, 109) = 14.15, p < .05$; and a tree $F(2, 105) = 14.88, p < .001$. Other living entities (lady, worm, and flower) received lower biological assignment from kindergartners, as well, although these differences did not produce significant $F$ tests. Therefore, hypothesis 2-A was supported; younger children did assign fewer biological properties to living things.

Kindergartners also attributed greater biological properties to one thing that was non-living, a car $F(2, 105) = 6.22, p < .01$. For all other non-living objects, kindergartners gave higher biological attribution scores than either second or fourth graders, although these differences were not significant. Therefore, hypothesis 2-B was weakly supported; younger children in all cases assigned greater biological properties to non-living things, although this difference was significant only for the car.

**Tactile Sensation**

To continue the analysis of biological attribution, the property of sensation (the ability to touch or feel pressure) for humans, animals, trees, and objects was examined. Again, in comparison to older children, younger children were expected to attribute less sensation to humans and animals, and greater sensation to trees and objects. Children were asked if story characters (refer to method section for a description of stories) could feel tactile sensation (e.g., Can a boy feel a gumball in his hand? Can a doll feel when it is being picked up?). Scores were tabulated across the four humans, four animals, two trees, and six inanimate objects included in the story data.
The total assignments of sensation across each entity were summed (0 to 4 for humans and animals; 0 to 2 for trees; and 0 to 6 for objects). One-way ANOVA compared means across grade levels of children. Post-hoc Duncan tests were performed on significant F tests. Test and significance levels are listed in Table 9.

**TABLE 9**

**CHILDREN'S MEANS IN ASSIGNING TACTILE SENSATION**

<table>
<thead>
<tr>
<th>Entity</th>
<th>K (SD)</th>
<th>2 (SD)</th>
<th>4 (SD)</th>
<th>Test</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humans (0-4)</td>
<td>3.92 (.27)</td>
<td>3.97 (.16)</td>
<td>4.00 (.00)</td>
<td>F(2, 214) = 3.06</td>
<td>.05¹</td>
</tr>
<tr>
<td>Animals (0-4)</td>
<td>3.84 (.57)</td>
<td>3.96 (.20)</td>
<td>4.00 (.00)</td>
<td>F(2, 214) = 4.02</td>
<td>.05²</td>
</tr>
<tr>
<td>Trees (0-2)</td>
<td>1.13 (.83)</td>
<td>.79 (.80)</td>
<td>.47 (.74)</td>
<td>χ² (4, 215) = 24.60</td>
<td>.001³</td>
</tr>
<tr>
<td>Objects (0-6)</td>
<td>2.64 (2.33)</td>
<td>1.21 (1.74)</td>
<td>.54 (1.42)</td>
<td>F(2, 214) = 41.79</td>
<td>.001³</td>
</tr>
</tbody>
</table>

¹ = significant Duncan difference (.05) between grades K & 4  
² = significant difference (.05) between grades K & 2 and K & 4  
³ = significant difference (.05) between all grades

As noted in Table 9 above, younger children did ascribe significantly less ability than older children for animals and humans to feel tactile stimulation. Younger children also assigned greater ability for trees and objects to sense touch or pressure. Therefore, hypothesis 2-B was supported for the biological attribution of sensation.

**Hypothesis 3**

Hypothesis 3 states that when certain intentional properties (making choices, wishing, etc.) are examined separately from biological properties, all children will attribute these properties to humans and animals, and younger children will make greater assignments to trees and objects than older children.
The dependent variable for this hypothesis is the total of the intentional scale (the seven assignments - the ability to want something, to think, to make choices, to know about things, to wish for something, to want to move and then move, and to want to do something) for each of the 17 objects. Children's scores could range from zero to seven for each object. A one-way ANOVA was conducted for each score, comparing means of kindergarten, second, and fourth graders. Means and comparisons are noted below in Table 10.
### TABLE 10

MEANS AND COMPARISONS FOR INTENTIONAL ASSIGNMENT

<table>
<thead>
<tr>
<th></th>
<th>K (SD)</th>
<th>2 (SD)</th>
<th>4 (SD)</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>Grp Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>6.92 (.32)</td>
<td>6.97 (.17)</td>
<td>7.00 (.00)</td>
<td>2.68</td>
<td>2, 215</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Boy</td>
<td>6.87 (.66)</td>
<td>7.00 (.00)</td>
<td>7.00 (.00)</td>
<td>1.41</td>
<td>2, 109</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Girl</td>
<td>6.95 (.33)</td>
<td>7.00 (.00)</td>
<td>6.97 (.17)</td>
<td>.57</td>
<td>2, 105</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Lady</td>
<td>6.95 (.23)</td>
<td>6.81 (1.01)</td>
<td>7.00 (.00)</td>
<td>.97</td>
<td>2, 105</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Baby</td>
<td>6.79 (.62)</td>
<td>6.86 (.54)</td>
<td>6.97 (.17)</td>
<td>1.27</td>
<td>2, 109</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Bird</td>
<td>5.81 (1.45)</td>
<td>6.12 (1.30)</td>
<td>6.74 (.51)</td>
<td>5.77</td>
<td>2, 109</td>
<td>.01</td>
<td>K/2; K/4</td>
</tr>
<tr>
<td>Dog</td>
<td>5.65 (1.38)</td>
<td>6.38 (1.08)</td>
<td>6.30 (1.16)</td>
<td>4.03</td>
<td>2, 105</td>
<td>.05</td>
<td>K/2; K/4</td>
</tr>
<tr>
<td>Bug</td>
<td>4.26 (2.14)</td>
<td>4.86 (1.95)</td>
<td>5.77 (1.42)</td>
<td>5.98</td>
<td>2, 109</td>
<td>.01</td>
<td>K/2, K/4</td>
</tr>
<tr>
<td>Worm</td>
<td>3.86 (2.31)</td>
<td>4.47 (2.06)</td>
<td>4.12 (2.06)</td>
<td>.73</td>
<td>2, 105</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Flower</td>
<td>1.03 (1.40)</td>
<td>.57 (.73)</td>
<td>.74 (1.36)</td>
<td>1.39</td>
<td>2, 109</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Tree</td>
<td>.73 (1.22)</td>
<td>.81 (1.39)</td>
<td>.24 (.44)</td>
<td>2.58</td>
<td>2, 105</td>
<td>n.s.</td>
<td>2/4</td>
</tr>
<tr>
<td>River</td>
<td>.95 (1.43)</td>
<td>.70 (1.02)</td>
<td>.29 (.62)</td>
<td>3.42</td>
<td>2, 109</td>
<td>.05</td>
<td>K/4</td>
</tr>
<tr>
<td>Cloud</td>
<td>1.19 (1.61)</td>
<td>.44 (.81)</td>
<td>.12 (.33)</td>
<td>9.13</td>
<td>2, 105</td>
<td>.001</td>
<td>K/2, K/4</td>
</tr>
<tr>
<td>Comp.</td>
<td>1.47 (1.57)</td>
<td>1.54 (1.32)</td>
<td>1.54 (1.29)</td>
<td>.03</td>
<td>2, 109</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td>1.00 (1.31)</td>
<td>.33 (.72)</td>
<td>.15 (.44)</td>
<td>8.51</td>
<td>2, 105</td>
<td>.001</td>
<td>K/2, K/4</td>
</tr>
<tr>
<td>Rock</td>
<td>.39 (.92)</td>
<td>.11 (.31)</td>
<td>.20 (.63)</td>
<td>1.78</td>
<td>2, 109</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Book</td>
<td>.41 (1.61)</td>
<td>.19 (.62)</td>
<td>.00 (.00)</td>
<td>1.39</td>
<td>2, 105</td>
<td>n.s.</td>
<td></td>
</tr>
</tbody>
</table>

As seen in Table 10 above, all children assigned high levels of intentional properties to humans (self, boy, girl, lady, and baby), with no significant tests between the means of groups. But, unexpectedly, there were differences between grade levels in assigning intentional properties to animals. For a bird, dog, and bug, kindergarten children
attributed fewer intentional properties than both second and fourth-grade-children. Thus, hypothesis 3-A was only half supported; children did ascribe these properties to themselves and other humans, but older children were more likely than younger children to ascribe all seven properties to animals. This unexpected difference between grade levels will be discussed later, with a comparison to adult data.

As also seen in Table 10 above, younger, kindergarten children, in comparison to older children, assigned greater intentional properties to the entities of tree, river, cloud, and car. Non-significant findings for flower, rock, and book also indicated a general trend for younger children to assign greater intentional properties than older children to these entities. Thus, hypothesis 3-B was supported.

**Hypothesis 4**

Hypothesis 4 states that when children are asked to judge between two sentences (one intentional, one biological) and state which sentence is "sillier," there will be two patterns. These patterns result from controlling the plausibility level of the sentences. First, children can easily select a more silly sentence when one sentence is obviously implausible. Second, when both sentences are silly or both sentences are plausible, children will not automatically assign the intentional sentence as sillier.

To test the first sub-hypothesis, sentence pairs were given to children (the sentence pair measure is described in the method section). Each subject received four sentence pairs in which one sentence was clearly more silly than another (for example, children were asked to judge whether the intentional sentence "The boy wants to look handsome" or the biological sentence "The boy has wings and a beak" was sillier).
The observed proportion of judgments for each sentence pair was scored in the direction for choice of the intentional sentence. Binomial tests were conducted to compute judgments against a chance (.50) level. A high proportion indicates judgment for an intentional sentence; a low proportion indicates a judgment for a biological sentence.

Results are noted below:

**TABLE 11**

INTENTIONAL SENTENCE PROPORTIONS WHEN ONE SENTENCE IS SILLIER

<table>
<thead>
<tr>
<th>Object of Sentence</th>
<th>Siller Sentence</th>
<th>Observ. Prop.</th>
<th>N</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boy</td>
<td>Biological</td>
<td>.05</td>
<td>105</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Intentional</td>
<td>.84</td>
<td>105</td>
<td>.001</td>
</tr>
<tr>
<td>Dog</td>
<td>Biological</td>
<td>.06</td>
<td>111</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Intentional</td>
<td>.93</td>
<td>111</td>
<td>.001</td>
</tr>
<tr>
<td>Tree</td>
<td>Biological</td>
<td>.07</td>
<td>105</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Intentional</td>
<td>.93</td>
<td>105</td>
<td>.001</td>
</tr>
<tr>
<td>Rock</td>
<td>Biological</td>
<td>.33</td>
<td>111</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>Intentional</td>
<td>.90</td>
<td>111</td>
<td>.001</td>
</tr>
</tbody>
</table>

As noted in Table 11, all children were clearly able to distinguish the sillier sentence, in every case, regardless of whether the sentence was biological or intentional. This ability to distinguish the sillier sentence held across age, with kindergartners judging an average of 3.28 / 4.00 sentences correctly; second graders judging an average of 3.64 / 4.00 correctly, and fourth graders judging an average of 3.71/4.00 correctly. All of these means were highly significant when tested against a chance mean of 2.00 (t = 13.34, df = 74, p < .001; t = 23.05, df = 72, p < .001; t = 28.68, df = 67, p < .001), indicating that
children were able to judge a more implausible sentence as sillier, regardless of whether
the sentence was biological or intentional. Thus, hypothesis 4-A was supported.

To test hypothesis 4-B, that children would not systematically assign intentional
sentences as silly, a similar analysis was conducted, except paired sentences were either
both silly or both plausible. Children received four pairs of sentences in these categories.
For example, in choosing between a silly/silly sentence pair, children were asked to judge
whether the biological sentence "The boy is made of macaroni and cheese" or the
intentional sentence "The boy wants to be a cantaloupe" was sillier. In judging between a
non-silly / non-silly pair, children were asked to judge whether the sentence "The boy
breathes in and out" or "The boy wants to be a fireman" was sillier. It was predicted that
children would not systematically assign the intentional sentence as sillier. Results were
scored in the direction of intentional sentences (a high score reflects assignment of the
intentional sentence as sillier; a low score reflects the assignment of a biological sentence
as sillier). See Table 12 below:
As can be seen in Table 12, for four of the sentence pairs, children did not significantly choose either a biological or an intentional sentence as more silly. For two sentence pairs, the intentional sentence was chosen significantly more (for the dog, .77, \(p < .001\); for the rock, .62, \(p < .05\)). For the other two sentence pairs, the biological sentence was chosen as significantly more silly (for a tree, .16, \(p < .001\); for a rock, .37, \(p < .01\)). Kindergartners averaged choosing intentional sentences 1.79 / 4.00; second graders 2.21 / 4.00, and fourth graders as 2.07 / 4.00. None of these means was significant against a test (chance) mean of 2.00 (\(t = -1.82, df = 74, n.s.; t = 1.82, df = 72, n.s.; t = .56, df = 67, n.s.\)). Thus, children across grades appeared to show no systematic judgment for assigning intentional sentences as sillier, supporting hypothesis 4-B.

**Hypothesis 5**

Hypothesis 5-A stated that when asked for a preference, children would prefer intentional sentences over biological sentences. To test this hypothesis, the observed
proportion of preference for the intentional sentence in each pair was calculated. Binomial tests were conducted to compute preferences against a chance (.50) level. Again, a high proportion indicates preference for an intentional sentence; a low proportion indicates preference for a biological sentence. Results are noted below:

<table>
<thead>
<tr>
<th>TABLE 13</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PREFERENCE FOR THE INTENTIONAL SENTENCE ACROSS SENTENCE TYPE</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Object of Sentence</th>
<th>Int/Bio Sentence</th>
<th>Observed Prop.</th>
<th>( N )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boy</td>
<td>Silly-Silly</td>
<td>.50</td>
<td>105</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - NS</td>
<td>.68</td>
<td>105</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Silly - NS</td>
<td>.51</td>
<td>105</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - Silly</td>
<td>.55</td>
<td>105</td>
<td>n.s.</td>
</tr>
<tr>
<td>Dog</td>
<td>Silly-Silly</td>
<td>.47</td>
<td>111</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - NS</td>
<td>.60</td>
<td>111</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>Silly - NS</td>
<td>.41</td>
<td>111</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - Silly</td>
<td>.61</td>
<td>111</td>
<td>.05</td>
</tr>
<tr>
<td>Tree</td>
<td>Silly-Silly</td>
<td>.45</td>
<td>105</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - NS</td>
<td>.62</td>
<td>105</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>Silly - NS</td>
<td>.48</td>
<td>105</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - Silly</td>
<td>.64</td>
<td>105</td>
<td>.01</td>
</tr>
<tr>
<td>Rock</td>
<td>Silly-Silly</td>
<td>.45</td>
<td>111</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - NS</td>
<td>.67</td>
<td>111</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Silly - NS</td>
<td>.48</td>
<td>111</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>NS - Silly</td>
<td>.67</td>
<td>111</td>
<td>.001</td>
</tr>
</tbody>
</table>

In Table 13 above, the six significant preferences are all for intentional sentences. Thus, for 16 possible choices, children significantly preferred the intentional sentence in
six of the sentence pairs, with the other 10 pairs showing no significant differences. In no case did children prefer a biological sentence. This preference can also be shown by calculating the total score for preference of intentional sentences. Each child received 8 sentence pairs, and could thus score from 0 to 8 for preferring intentional sentences. The total child mean was 4.37; and a t-test against a chance mean of 4.0 was conducted, $t = 4.14$, df = 215, $p < .001$. All means for each age group and for both forms (boy and tree v. dog and rock) were also above a chance mean of 4.00. Thus, hypothesis 5-A was supported.

Hypothesis 5-B stated that when asked for a preference, children would prefer plausible or non-silly sentences. Examining Table 13 above, all significant differences in preferences are for non-silly, intentional sentences. Children preferred an intentional, plausible sentence in six out of eight possible times. In no case did children significantly prefer implausible sentences, whether intentional or biological. Thus, hypothesis 5-B was supported.

**Hypothesis 6**

Hypothesis 6-A stated that children, across grade levels and story outcome, would assign agency to human and animal story actors. This hypothesis was tested by asking children if the story actor (see description of stories in the method section or Appendix F) had the ability to want to do an action. Scores for each story actor were analyzed by means of a 2 (yes/no judgment) by 3 (grade of child) chi-square analysis. Separate chi-square analyses were conducted for the positive version and for the negative version. See Table 14 below.
TABLE 14

CHILDREN'S ASSIGNMENT OF AGENCY TO HUMAN / ANIMAL ACTORS

<table>
<thead>
<tr>
<th>Can Story Actor Want?</th>
<th>Outcome</th>
<th>$\chi^2$</th>
<th>df</th>
<th>N</th>
<th>p</th>
<th>K%</th>
<th>2%</th>
<th>4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girl - want get out dolls</td>
<td>Positive</td>
<td>2.17</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>100</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>Boy - want to pick up dish</td>
<td>Positive</td>
<td>1.94</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>97</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Cat - want to jump on toy</td>
<td>Positive</td>
<td>11.05</td>
<td>2</td>
<td>111</td>
<td>.01</td>
<td>82</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>Cow - want to push a gate</td>
<td>Positive</td>
<td>9.95</td>
<td>2</td>
<td>104</td>
<td>.01</td>
<td>64</td>
<td>83</td>
<td>94</td>
</tr>
<tr>
<td>Girl - want get out dolls</td>
<td>Negative</td>
<td>3.43</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>92</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>Boy - want to pick up dish</td>
<td>Negative</td>
<td>16.37</td>
<td>2</td>
<td>104</td>
<td>.001</td>
<td>78</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Cat - want to jump on toy</td>
<td>Negative</td>
<td>2.86</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>92</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>Cow - want to push a gate</td>
<td>Negative</td>
<td>31.20</td>
<td>2</td>
<td>111</td>
<td>.001</td>
<td>53</td>
<td>76</td>
<td>100</td>
</tr>
</tbody>
</table>

As can be seen in Table 14, for the positive story version, children did not differ significantly in assigning agency to human actors. All children attributed very high levels of agency to humans, when the outcome was positive. But children did differ significantly in assigning agency to a cat and to a cow. As in the direct attribution measure (see hypothesis 3), younger, kindergarten children again assigned less intentional ability to animals, in comparison to older children.

For the negative story version, children did not differ significantly in assigning agency to a girl, but did differ in assigning agency to a boy. Kindergarten children were less likely to assign agency to a boy when the future outcome would be negative (e.g., the dish would break). In assigning agency to animals, children did not differ significantly for the cat, but kindergartners were less likely to assign agency to a cow when the outcome was negative.
Therefore, hypothesis 6-A was weakly supported. Second and fourth grade children readily assigned a high level of agency to human and animal characters regardless of story outcome. Younger children, however, assigned significantly lower estimates than did older children of agency for animals, and agency in stories that had a negative outcome. This unexpected finding for animals will be discussed later.

Hypothesis 6-B stated that younger children, for both positive and negative story outcomes, would be more likely than older children to assign agency to trees and objects. Again, 2 (yes/no judgment) by 3 (grade of child) chi-square analyses were conducted across separate outcomes. Results are noted in Table 15.

| TABLE 15 |
|-----------------|------------------|--------|--------|--------|--------|--------|--------|
|                | Can Story Actor Want? | Outcome | $\chi^2$ | df   | N     | p     | K%    | 2%    | 4%    |
| Tree - want a nest* | Positive         | 22.02  | 2      | 104  | .001  | 72    | 29    | 21    |
| Tree - want to drop apple | Positive     | 6.41   | 2      | 111  | .05   | 37    | 24    | 11    |
| Machine - want take $    | Positive        | 1.96   | 2      | 111  | n.s.  | 24    | 21    | 11    |
| T.Bear - want picked up* | Positive       | 64.41  | 2      | 104  | .001  | 83    | 09    | 03    |
| Tree - want a nest*     | Negative         | 1.33   | 2      | 111  | n.s.  | 37    | 37    | 25    |
| Tree - want to drop apple | Negative     | 12.03  | 2      | 104  | .01   | 31    | 09    | 03    |
| Machine - want take $    | Negative        | 15.77  | 2      | 104  | .001  | 49    | 14    | 12    |
| T.Bear - want picked up* | Negative       | 30.54  | 2      | 111  | .001  | 79    | 47    | 14    |

*for these objects, it is recognized that inadvertently an assessment of ability to desire something rather than a desire to act (which underlies agency) was examined.

As can be seen in Table 15, kindergartners made significantly greater agentive assignments than older children for trees and objects. In six of the eight possible story
outcomes, kindergartners gave significantly greater assignment than older children. Thus hypothesis 6-B was supported.

**Hypothesis 7**

Hypothesis 7-A stated that children would judge that humans and animals could want to act to cause a positive consequence, while younger children would judge more than older children that trees and objects could intend a positive consequence. Again, each assignment to each actor was examined using a 2 (yes/no assignment) by 3 (grade level) chi-square analysis. Results are noted below.

**TABLE 16**

**CHILDREN'S ASSIGNMENT OF INTENTION TO ACT POSITIVELY**

<table>
<thead>
<tr>
<th>Can Actor Want to?</th>
<th>Outcome</th>
<th>$\chi^2$</th>
<th>df</th>
<th>N</th>
<th>Sig.</th>
<th>K%</th>
<th>2%</th>
<th>4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girl - want dolls in house</td>
<td>Positive</td>
<td>4.39</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>100</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>Boy - want dish clean</td>
<td>Positive</td>
<td>1.94</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>100</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>Cat - want to lick &amp; play</td>
<td>Positive</td>
<td>1.64</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>92</td>
<td>89</td>
<td>97</td>
</tr>
<tr>
<td>Cow - want to open gate</td>
<td>Positive</td>
<td>9.14</td>
<td>2</td>
<td>104</td>
<td>.05</td>
<td>67</td>
<td>86</td>
<td>94</td>
</tr>
<tr>
<td>Tree - want give leaves</td>
<td>Positive</td>
<td>25.21</td>
<td>2</td>
<td>104</td>
<td>.001</td>
<td>72</td>
<td>26</td>
<td>18</td>
</tr>
<tr>
<td>Tree - want feed pig</td>
<td>Positive</td>
<td>13.14</td>
<td>2</td>
<td>111</td>
<td>.01</td>
<td>53</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>Machine - give 2 pieces</td>
<td>Positive</td>
<td>8.94</td>
<td>2</td>
<td>111</td>
<td>.05</td>
<td>37</td>
<td>18</td>
<td>09</td>
</tr>
<tr>
<td>T.Bear - say &quot;Mama&quot;</td>
<td>Positive</td>
<td>42.20</td>
<td>2</td>
<td>104</td>
<td>.001</td>
<td>72</td>
<td>14</td>
<td>06</td>
</tr>
</tbody>
</table>

As shown in Table 16, children showed few differences in assigning humans and animals the ability to intent a positive action, with the exception that kindergartners once again assigned less agency than older children to an animal. In addition, for each tree or
inanimate object, kindergartners assigned greater intentional ability than older children.

Thus, hypothesis 7-A was supported.

Hypothesis 7-B stated that when the consequence of a story action was negative, younger children would show significant outcome valence effects. Younger children were expected to be less likely to assign intention of negative acts to animate actors. Younger children were also expected to persevere in judging more than older children that trees and objects have intentionality. Again, 2 (yes/no) by 3 (grade) chi-squares were conducted.

Results are noted below.

TABLE 17
CHILDREN'S ASSIGNMENT OF INTENTION TO ACT NEGATIVELY

<table>
<thead>
<tr>
<th>Can Actor Want?</th>
<th>Outcome</th>
<th>$\chi^2$</th>
<th>df</th>
<th>N</th>
<th>p</th>
<th>K%</th>
<th>2%</th>
<th>4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girl - dolls on floor</td>
<td>Negative</td>
<td>28.16</td>
<td>2</td>
<td>111</td>
<td>.001</td>
<td>24</td>
<td>53</td>
<td>86</td>
</tr>
<tr>
<td>Boy - a dish to break</td>
<td>Negative</td>
<td>12.13</td>
<td>2</td>
<td>104</td>
<td>.01</td>
<td>08</td>
<td>31</td>
<td>45</td>
</tr>
<tr>
<td>Cat - to rip up a toy</td>
<td>Negative</td>
<td>13.02</td>
<td>2</td>
<td>104</td>
<td>.01</td>
<td>78</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>Cow - to open a gate</td>
<td>Negative</td>
<td>15.20</td>
<td>2</td>
<td>111</td>
<td>.001</td>
<td>32</td>
<td>53</td>
<td>77</td>
</tr>
<tr>
<td>Tree - to scratch bird</td>
<td>Negative</td>
<td>4.69</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>18</td>
<td>05</td>
<td>06</td>
</tr>
<tr>
<td>Tree - to hit pig w/apple</td>
<td>Negative</td>
<td>16.90</td>
<td>2</td>
<td>104</td>
<td>.001</td>
<td>31</td>
<td>06</td>
<td>00</td>
</tr>
<tr>
<td>Machine - keep gum</td>
<td>Negative</td>
<td>7.66</td>
<td>2</td>
<td>104</td>
<td>.05</td>
<td>27</td>
<td>09</td>
<td>06</td>
</tr>
<tr>
<td>T.Bear - to break arm</td>
<td>Negative</td>
<td>.95</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>03</td>
<td>03</td>
<td>00</td>
</tr>
</tbody>
</table>

As seen in Table 17, negative story outcomes did appear to influence kindergartners' assignment of intentionality. Kindergartners judged significantly more than older children that a negative action could not be intended by humans or animals.

Kindergartners, however, still judged significantly more than older children (at least in two
instances) that trees and objects could intend negative actions. Thus, hypothesis 7-B was supported.

Hypothesis 8

Hypothesis 8-A predicted that for positive story outcomes, children would assign humans and animals a desire to receive an action, with younger children assigning the desire to receive positive action to inanimate objects and trees. Children's yes/no judgments were analyzed with 2 (yes/no) by 3 (grade level) chi-square analyses and are noted below.

**TABLE 18**

**CHILDREN'S ASSIGNMENT OF DESIRE FOR POSITIVE OUTCOME**

<table>
<thead>
<tr>
<th>Can Recipient Want to?</th>
<th>Outcome</th>
<th>$\chi^2$</th>
<th>df</th>
<th>N</th>
<th>p</th>
<th>K%</th>
<th>2%</th>
<th>4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolls - &quot;be in doll house?&quot;</td>
<td>Positive</td>
<td>43.13</td>
<td>2</td>
<td>104</td>
<td>.001</td>
<td>72</td>
<td>23</td>
<td>00</td>
</tr>
<tr>
<td>Dish - &quot;be clean?&quot;</td>
<td>Positive</td>
<td>10.42</td>
<td>2</td>
<td>111</td>
<td>.01</td>
<td>82</td>
<td>47</td>
<td>17</td>
</tr>
<tr>
<td>Toy - &quot;be played with?&quot;</td>
<td>Positive</td>
<td>16.02</td>
<td>2</td>
<td>111</td>
<td>.001</td>
<td>58</td>
<td>50</td>
<td>14</td>
</tr>
<tr>
<td>Gate - &quot;be open?&quot;</td>
<td>Positive</td>
<td>18.73</td>
<td>2</td>
<td>104</td>
<td>.001</td>
<td>47</td>
<td>14</td>
<td>06</td>
</tr>
<tr>
<td>Bird - &quot;get leaves?&quot;</td>
<td>Positive</td>
<td>.95</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>83</td>
<td>89</td>
<td>91</td>
</tr>
<tr>
<td>Pig - &quot;be fed?&quot;</td>
<td>Positive</td>
<td>2.72</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>92</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>Boy - &quot;get two pieces?&quot;</td>
<td>Positive</td>
<td>.99</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>84</td>
<td>90</td>
<td>91</td>
</tr>
<tr>
<td>Girl - &quot;have t. bear talk?&quot;</td>
<td>Positive</td>
<td>2.00</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>89</td>
<td>80</td>
<td>91</td>
</tr>
</tbody>
</table>

As noted in Table 18, there were no significant differences between groups on assigning desire to animals and humans for receiving a positive outcome. This lack of significance was due to a ceiling effect; nearly all children responded that a boy, girl, pig, and bird could want to be positively acted upon (816/860 or 95% of children's responses).
Additionally, as predicted, kindergartners were much more likely than older children to state that inanimate objects could want a positive action done to them. Thus, hypothesis 8-A was supported.

Hypothesis 8-B predicted that for negative story outcomes, children would show fewer assignments of desire for an outcome in all story recipients, including humans, animals, and objects. Younger children, however, were predicted to continue to assign significantly more desire for a negative consequence to trees or inanimates. Chi-square analyses (yes/no assignment by grade) for separate outcomes are noted below:

<table>
<thead>
<tr>
<th>Can Recipient Want to?</th>
<th>Outcome</th>
<th>$\chi^2$</th>
<th>df</th>
<th>N</th>
<th>p</th>
<th>K%</th>
<th>2%</th>
<th>4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolls - &quot;be on the floor?&quot;</td>
<td>Negative</td>
<td>3.73</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>21</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Dish - &quot;break?&quot;</td>
<td>Negative</td>
<td>5.83</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>08</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>Toy - &quot;be chewed/ripped?&quot;</td>
<td>Negative</td>
<td>12.99</td>
<td>2</td>
<td>104</td>
<td>.01</td>
<td>22</td>
<td>03</td>
<td>00</td>
</tr>
<tr>
<td>Gate - &quot;break?&quot;</td>
<td>Negative</td>
<td>.32</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>05</td>
<td>05</td>
<td>03</td>
</tr>
<tr>
<td>Bird - &quot;be scratched?&quot;</td>
<td>Negative</td>
<td>3.03</td>
<td>2</td>
<td>111</td>
<td>n.s.</td>
<td>10</td>
<td>16</td>
<td>26</td>
</tr>
<tr>
<td>Pig - &quot;be hit?&quot;</td>
<td>Negative</td>
<td>.95</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>14</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Boy - &quot;get no gum?&quot;</td>
<td>Negative</td>
<td>1.98</td>
<td>2</td>
<td>104</td>
<td>n.s.</td>
<td>16</td>
<td>06</td>
<td>12</td>
</tr>
<tr>
<td>Girl - &quot;have t. bear break?&quot;</td>
<td>Negative</td>
<td>19.70</td>
<td>2</td>
<td>111</td>
<td>.001</td>
<td>03</td>
<td>11</td>
<td>40</td>
</tr>
</tbody>
</table>

As can be seen in Table 19, children assigned a much lower level of desire to all categories of recipients when the consequence was negative. Younger children assigned greater ability for wanting to receive a negative action for only one inanimate object, a toy mouse. The only other significant difference was that older children appeared to
recognize that a girl could want a negative action. Therefore, hypothesis 8-B was weakly supported, at best; children assigned lower levels of desire, and younger children only in one case assigned significantly more ability for an inanimate object to desire a negative outcome.

**Unexpected Findings: Animal Intentionality**

It was predicted that all children would assign animals a high degree of intentional abilities. This prediction, however, was not supported, as younger children surprisingly assigned fewer intentional abilities to animals than older children. This finding appears to be even more surprising when viewed in light of adult raters' judgments. Adult raters were given 6 comparable questions for each object (i.e., can the object 1) think/know, 2) make choices, 3) wish, 4) want something, 5) want to move and then move, and 6) want to do something. (To compare adults with children, the latter's judgments on the ability to think and know were combined into one score). Scores ranged from 0 to 6. Means and one-way ANOVA across items are noted below.
## TABLE 20

### ADULT VS. CHILD SCORES FOR INTENTIONAL ASSIGNMENT TO ANIMALS

<table>
<thead>
<tr>
<th></th>
<th>K (SD)</th>
<th>2 (SD)</th>
<th>4 (SD)</th>
<th>Adult (SD)</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird</td>
<td>5.16 (.12)</td>
<td>5.32 (1.05)</td>
<td>5.74 (.51)</td>
<td>3.95 (1.53)</td>
<td>20.79</td>
<td>3,169</td>
<td>.001</td>
</tr>
<tr>
<td>Dog</td>
<td>5.08 (1.04)</td>
<td>5.56 (.77)</td>
<td>5.40 (1.08)</td>
<td>4.52 (1.38)</td>
<td>7.75</td>
<td>3,165</td>
<td>.001</td>
</tr>
<tr>
<td>Bug</td>
<td>3.89 (1.73)</td>
<td>4.41 (1.54)</td>
<td>5.09 (1.05)</td>
<td>2.88 (1.95)</td>
<td>5.34</td>
<td>3,169</td>
<td>.001</td>
</tr>
<tr>
<td>Worm</td>
<td>3.54 (1.98)</td>
<td>4.08 (1.66)</td>
<td>3.79 (1.87)</td>
<td>2.63 (1.99)</td>
<td>14.47</td>
<td>3,165</td>
<td>.01</td>
</tr>
<tr>
<td>Baby</td>
<td>5.84 (.49)</td>
<td>5.89 (.39)</td>
<td>5.97 (.17)</td>
<td>5.03 (1.10)</td>
<td>18.63</td>
<td>3,169</td>
<td>.001</td>
</tr>
<tr>
<td>River</td>
<td>.92 (1.32)</td>
<td>.70 (1.02)</td>
<td>.25 (.61)</td>
<td>.17 (.52)</td>
<td>7.08</td>
<td>3,169</td>
<td>.001</td>
</tr>
</tbody>
</table>

The above means of Table 20 show a general pattern of young children to assign fewer intentional properties to animals. With age, increasing animal intentionality judgments were assigned, but adult scores indicated a dramatically reduced level of assignment. In all cases, older children assigned greater intentional ability than adults and younger children. Individual item-by-item comparisons indicated that younger children were less likely to assign the abilities of knowing, making choices, and wanting to these animals. As noted earlier, the finding for young children to assign fewer intentional properties to animals was also found in the story data.

In examining the means of other entities, again the pattern is apparent for a baby, with older children assigning more intentional ability in comparison to both younger children and adults. Adults in this case were far less likely to assign a baby the ability to wish $\chi^2 (3, N = 170) = 14.44, p < .001$ and to make choices $\chi^2 (3, N = 170) = 12.53, p < .01$. But for inanimate entities, such as a river, responses followed the predicted pattern,
with younger children assigning greater intentional abilities than other participants. This above finding for animals will be discussed in the following section.
CHAPTER 5
DISCUSSION

This study has an underlying theme of striving to clarify children's understanding of the intentional abilities of a range of living and non-living entities. One way to clarify this understanding is through noting methodological problems in previous animism research. Children's animism (the attribution of life and consciousness to trees and objects) was extended by separating biological assignment from intentional assignment across a range of both living and non-living things. It was shown that separating these assignments provides clearer patterns of findings. Younger children did appear to make more biological "errors" by assigning more biological properties to the non-living. Given this finding, it would appear that biological animism (ascribing life to inanimate objects) may be based on young children's limited biological knowledge, rather than to a systematic assignment of life to the non-living.

But even when problematic biological attributions were separated from these animistic assignments, it was shown that young children do make significantly higher assignments of intentional properties to objects and trees than older children (for example, assigning these entities the ability to know, wish, want to move, have agency, etc.). All children also readily assigned themselves intentional abilities.
This apparent ability of young children to have telic understanding of other people as well as objects is an interesting paradox for theorists who seek to comprehend children's understanding of intentionality. For example, social constructionists like Harré have theories in which it is claimed that one learns that oneself and others have a free will (or agency). Harré says specifically that our culture teaches us, or gives us a model about being a "person" and from this each person deduces the sense of being a "self" (Harré, 1979). His position would argue that theory-of-mind research is wrong, as this sense of agency would be socially developed, rather than cognitively developed. But the research reported here argues against a social constructivist view because the children who were the youngest, across all SES areas, manifested telic understandings, and these understandings even were extended to objects and trees.

Piaget, on the other hand, instead of subscribing to the view of social constructionists, viewed the telic understanding of young children as primitive and precausal. Other researchers, namely Hall, Baldwin, and Freud, also viewed this early state of children as reflecting a "primitive" nature. If this view is true, then teleology is primitive and reflective of our earliest, primitive cognitive functioning, when dissociation between self and other has not occurred yet. Hence, the social constructionists would be wrong (with their tabula rasa view of culture etching a capacity to feel a sense of agency or will). But the present study argues the "primitive" view of self/ other confusion, in the sense that even the youngest children very clearly assigned themselves intentional abilities.

Prominent theory-of-mind researchers, such as Gopnik (1993), view children's telic understanding or sense of their own intentionality as a cognitively developed
construction or theory to explain events. This theoretical position claims that children’s
telic understanding is not based on true first-person experiences, but is illusory. Hence,
the “primitive” researchers would be wrong, with their view of a basic confusion of the
self and the world - - the theory of mind position would claim a sense of intentionality is
cognitively constructed over time, not primitively present. This study cannot disprove the
illusory claim, only that findings seem to indicate that children are very much certain of
their own intentional abilities. And the present study also suggests that children, in many
cases, do assign intentionality to non-humans, even trees and objects - and there appears
to be no consensus from theory-of-mind research on why children would cognitively
create such an illusion.

There is an interesting conflict among these three positions. All of these opinions,
oddly enough, criticize teleology or reject this capacity in human behavior. But they do it
on conflicting grounds: social constructionism calling teleology “socially shaped,”
Piagetian theory calling teleology “primitive,” and theory of mind calling teleology
“illusory.” How is this intentional view developed? Is it inborn, developed, shaped?
Does it exist only with environmental stimulation, physical maturation, only in a confused
way, or does it not exist at all? None of these positions provides a satisfactory answer.
Instead, this study argues that young children seem to view intentionality of both animate
and inanimate as a legitimate way to view events (in story and sentence contexts),
especially when these assignments are plausible (not fanciful) and when outcomes are
positive. In view of these preferences and judgments of children, it can be suggested that
such assignment of intentionality resonates with children’s fundamental understanding.
Yes, children do understand physical and biological processes, but they also, at least some of the time, make intentional assignments to objects and events. Instead of criticizing their intentional assignments, or biasing measures in attempts to show that such an ability does not exist, why not examine these purposeful causes and consider it as one way, an easier and preferred way, to view the world?

Thus, this study sought support for such a position by examining children from different grades and areas. It was predicted that younger children would reflect a fundamental understanding by assigning greater or similar levels of intentionality than older children for all objects, trees, animals, and people. However, this prediction was not supported for animal intentionality. Let us return to this issue.

Contrary to predictions, young children assigned fewer intentional properties to animals (e.g., bug, worm, dog, bird) than older children, although all groups of children assigned a high level of intentional properties to humans. It was thought that younger children, in comparison to older children, would be more likely or as likely to assign intentional properties across a wide range of objects. Younger children gave significantly greater assignment for trees and objects, but they gave significantly less assignment of intention to animals. This finding occurred in both the direct attribution measure and in the story measure.

In examining children's responses for intentional assignment to animals, an interesting pattern was shown. Older groups of children assigned greater intentional properties to animals than younger children. But adults assigned lower levels of intentional properties to animals than all groups of children. If this study were composed
of longitudinal data, the pattern would resemble an inverted "U," with young children assigning lower levels of intentionality, then as children age, assigning greater intentionality, then showing a decline into adulthood. If this pattern is valid, it would be an interesting addition to theory-of-mind research, by showing that children's understanding of the minds of animals continues to undergo refinement across childhood and into adulthood. However, as this study is cross-sectional, such trends over time cannot be assessed; additionally, the adult subjects used in this study were from an entirely different population. Nevertheless, the question remains of why older children assign very unlikely intentional properties (such as wishing or choosing) to such animals as worms and bugs while adults do not make such assignment.

A more likely reason than a developmental trend for this finding is the extreme salience of the animate / non-animate distinction in test measures. Children were presented pictures and stories that always contrasted a human or animal against a tree or inanimate object. Older children seemed to have systematically assigned intentional properties based on an animal / non-animal distinction, by assigning intention to humans and animals and discounting intention to plants or inanimate objects. Fourth-grade-children's scores reflect a ceiling effect for animals, including worm, bug, bird, dog, and also, interestingly, baby. Older children assigned the abilities for these entities to think, choose, and wish, in much greater frequency than adults. Other research (e. g., Taylor, Cartwright, & Bowden, 1991) suggests that even four to five-year-old children are accurate in their judgments about the limited cognitive abilities of infants. Thus, in this experimental procedure, older, 4th-grade-children appeared to assign intention based on
animate categorization (assigning intention only to humans or animals), while younger children were less certain. These young kindergartners appear to have assigned animal intentionality based on an estimate of probability (the more similar to a human, the more probable an animal experiences intentionality) or on an estimate of desirability (the happier the outcome, the more probable the animal experiences intentionality). Thus, these young children could still have a fundamental, intentional view, but one that is influenced by the known characteristics of personhood and of desirability.

In fact, the influence of desirability in young children's judgments of intentionality can be shown in the story data, and this finding has implications for theory-of-mind research. When a story outcome was positive, all groups of children judged that humans could 1) want to do the positive action, and 2) want to be the recipient of a positive result. But when a story outcome was negative, younger children made significantly fewer judgments that a human could 1) want to do the negative action, and 2) want to be the recipient of a negative result. This finding seems to support the valence rule in assigning intentionality - if the effect is positive, it was intended, if the effect is negative, it was not intended. But note here that desire to be the recipient of an action has nothing to do with the intention of the actor. This is because in all of the stories, human recipients experienced the effects of the action of a non-intending inanimate object. This distinction is important because this question was not assessing intentionality, but children's judgments of the ability for a range of objects and animals to desire an outcome.

This examination of desirability has implications for theory of mind research because often false belief tasks involve an unexpected event (e.g., there are pencils, not
candy, in the box; the chocolate bar that was in a drawer is hidden in a cupboard). When very young children are asked if they themselves (or another person) knew before what really was in the box, they mistakenly state that they (or someone else) had always known (that there were pencils in the box, or that a non-present child would now know where the chocolate is). From such findings theory-of-mind researchers have suggested that young children do not have an awareness of their own minds or of their intentionality (Gopnik, 1993).

Although this study examined older children (the youngest group was between the ages of four and six), this research suggests a different interpretation for the false belief tasks. Even the youngest participants in this study assigned themselves abilities of thought, desire, knowledge, and intention in the direct attribution task. But when unexpected events were examined in the story data (as unexpected story events are also examined in many false belief tasks), kindergartners readily stated that humans were unable to want to be the recipient of negative events, and humans definitely were able to want to be the recipient of a positive event. Therefore, in theory-of-mind research, young children may be responding to the valence or unforeseeability of the event, rather than to their understanding of knowledge or intentionality. "Knowing" that there are pencils in the box or that there is chocolate in a cupboard could be a matter of young children assigning themselves or other humans a positive outcome to an unexpected event, rather than an accurate assessment of their beliefs or intentionality. Thus, the nature of the task may be influencing children's reports of their intentions and cognitions, such that to adults
it appears that young children reverse their statements, "confuse" their own intentionality, and claim to know the impossible.

This claim that desirability influences assignment of intentionality is similar to "just world" reasoning in which young children may report that good is automatically rewarded and evil automatically punished - even if justice is administered by inanimate things (Jose, 1990; Piaget, 1965). In the present study, young children were likely to suggest that good events can be intended or desired, and bad events can not be intended or desired, with dramatic changes in assignment for all levels of animacy (objects, people, animals, and trees). Thus, because it is good to have a nest, a tree can desire a nest and even want to contribute leaves for the nest. Because it is good for dolls to be in a doll house, both a girl and her dolls can desire this outcome. Because it is good to get two gumballs, a gumball machine can want to give two pieces and a boy can want to get two pieces. Likewise, perhaps, because it is good to know where the chocolate is, a boy that wants the chocolate will now know where it is, even when it was unexpectedly switched. Perhaps because it is good to know what is really in the box, the young child wants this positive outcome, and therefore knows that there were pencils all along. Thus, children may be answering questions about knowledge in terms of desire, rather than in terms of intentionality or belief. If it is positive, it is able to be desired. If it is negative, it is automatically unable to be desired.

This study also showed that when given an unbiased choice, children appreciate intentional attributions. This study noted methodological limitations of research that made intentional attributions fanciful and implausible. Some studies have suggested that
children view intentional attributions of trees and objects as inherently silly, and biological attributions as more plausible. Instead, this study distinguished between the biological and the intentional but also controlled for level of plausibility. It was noted that children do judge sillier sentences as silly, but they also have great difficulty in choosing a sillier sentence when both sentences are silly or both plausible. Thus, this study indicated no consistent pattern or support for the assertion that intentional sentences are always judged as more silly. It was also shown that children have a clear preference for plausible, intentional sentences. Sentences about plausible intentionality are more interesting, more appealing, and it is argued, more meaningful and related to children's understanding of the intentional properties of people, animals, trees, and inanimate objects.

As with all studies, there are limitations that should be noted in this research, including potential methodological and sampling problems. One limitation was that all children came from a predominantly LDS area, and responses could be representative only of a limited population. However, animism studies have noted little or no effects for religious affiliation (e.g., Sharp et al., 1985). Furthermore, chi-square tests between LDS children and non-LDS children across each individual test items of the present study indicated very few significant differences (of all the measures, the only findings were that 2 sentences were likely to be more preferred by LDS children than non-LDS children).

Another limitation that should be noted was the differences between children and adults. Adults were from a different population, and to add to this problem there was a difficulty in comparing measurements. As adults were tested before children, to aid in measurement construction, the direct attribution measure for adults was not complete
(e.g., they received 11 assignments [children received 14 assignment questions] for 15 objects [children received 17 objects]). This added difficulty made overall patterns difficult to compare between adults and children, although individual judgments (e.g., the ability of a tree to make a choice) could still be assessed between groups (see Appendix A).

A further sampling difficulty was that children from the lower SES area had a lower rate of returning permission forms, thus providing a sample based on availability rather than random sampling. Issues of confidentiality, according to school principals, were of primary concern to many of these parents. However, two lower SES schools were sampled, and a sufficient number of children was obtained for statistical purposes.

Another limitation of these data is that they were almost entirely composed of forced-choice or yes/no assignments. It could be argued that children are limited by such assignment and their scores would not be reflective of measurement that was capable of greater variance. It is acknowledged that even adding a "don't know" category would have improved the quality of the data. An additional problem with forced-choice data is that one is limited in the use of appropriate statistical procedures. However, this attribute of the measures can also be considered a strength, as children only were required to make simple, concrete choices after being shown realistic pictures. Since a third of this study's participants were of kindergarten age, it was determined that simple choices would be preferable to open-ended questions or to pointing scales, especially due to the number of judgments that children were required to make. It should be noted that measures were designed to make choices very clear for children. Bias was avoided by always providing a
comparison of the inanimate to the animate, and children were asked to select the most likely option. The study was designed to see to what extent children would assign intentional properties, so children were asked to commit one way or another. Through this forced assignment, a clearer picture of animism and related research was obtained.

Another limitation should be noted for the story measure: it is possible that questions about ability ("e.g., can a boy want to get two gumballs?") may have been interpreted by younger children as a question of story comprehension ("e.g., did the boy want to get two gumballs?"). It would have been better to have asked children questions about ability before the story scene was read to children. Future research could assess this possibility of differential response before and after story outcome, particularly in qualifying the implications made to theory-of-mind research. Nevertheless, the direct attribution measure ("Can a boy want something?") paralleled the positive outcome stories, indirectly supporting that children did view such questions as asking about ability, rather than comprehension. Additionally, some animistic language remained in the stories that could have influenced some of the story findings. But the strength of the story measure, despite problematic construction, was in its simplicity. Actor motive, actor goal, attainment difficulty, and other story variables (e.g., Jose, 1988) were eliminated, leaving a basic event description and very clear questioning in which to assess whether children would assign intentional abilities to humans, animals, trees, and objects.

Implications for Future Research

This study suggested that keeping the biological separate from the intentional is critical in understanding whether children are assigning judgments based on the animacy
level of the object or on a limited level of knowledge. Future research could provide
greater understanding by keeping the intentional and biological grounds separate, rather
than continuing to confound them.

Future research could also be directed at exploring children's understanding of the
intentional properties of animals across childhood and into adulthood, to further explore
when children assign intentionality based on animal status, and when children assign
intentionality based on a more adult-like inference of cognitive ability.

Finally, future research could be directed toward an understanding of children's
desirability for unexpected events. It is noteworthy, for example, to mention that two
related research fields - memory for unexpected events, and knowledge about unexpected
events - appear to conflict. For example, a young child may very accurately remember an
unexpected event in a story situation (e.g., Davidson & Hoe, 1993), yet inaccurately judge
that he or she always knew that an unexpected event would occur (e.g., Gopnik, 1993).
As suggested in this study, perhaps it is not memory or knowledge that is being assessed
with false belief tasks, but instead children's assignment of desirability. Future research
could explore how the desirability of an event influences children's responses and masks
their fundamental, telic understanding of the world.
APPENDIX A

GROUP DIFFERENCES IN BIOLOGICAL AND INTENTIONAL ASSIGNMENT
APPENDIX A

GROUP DIFFERENCES IN BIOLOGICAL AND INTENTIONAL ASSIGNMENT

* = $p < .05$  ** = $p < .01$  *** = $p < .001$

Group Differences in Assigning Aliveness

![Graph showing group differences in assigning aliveness](image)

Entity

Percentage
Group Differences in Assigning Breathing

Group Differences in Assigning Movement
Group Differences in Assigning Sight

Group Differences in Assigning a Heart Beat
Group Differences in Assigning Ability to Make Choices

Group Differences in Assigning the Ability to Wish
Group Differences in Assigning the Ability to Want to Do Something (Agency)

Group Differences in Assigning the Ability to Want to Move
Group Differences in Assigning the Ability to Want Something

Group Differences in Assigning the Ability to Think/Know
Child Differences in Assigning Thought

Child Differences in Assigning Ability to Know
APPENDIX B

SES AND INTERACTION EFFECTS
Each questionnaire given to children was assessed for potential interactions and main effects. "High SES" refers to private school students, "Upper SES" refers to Sandy students, and "Lower SES" refers to Magna students. Findings are noted below.

**Biological Scale**

For the direct attribution measure, the scores of 216 children for the biological scale (score of 0 to 7) were subjected to a 2 (gender) by 3 (grade level) by 3 (area of child) ANOVA for each of the 17 objects. Cells containing 5 or fewer subjects were not subjected to analysis. Three of the objects indicated unexpected interactions or main effects, including a bug, dog, and tree.

**Gender Interactions**

For the bug, a main effect for grade level $F(2, 109) = 22.11, p < .001$ was qualified by a grade by gender interaction $F(2, 109) = 5.06, p < .01$. Female kindergartners attributed fewer biological abilities than the other sample groups ($M = 5.20$ as compared to overall mean of 6.27).

For the dog, main effects for gender and grade level were qualified by a grade by gender interaction $F(2, 105) = 5.08, p < .01$. Male kindergartnen males were less likely to assign biological properties to a dog than other sample groups ($M = 6.58$ as compared to overall mean of 7.00).
Area Effects

For the tree, a significant main effect for area was noted $F(2, 105) = 4.85, p < .01$, with students from the lower income area assigning fewer biological properties to trees.

Summary of Biological Scale

For this scale, it was concluded that kindergartners provided most of the variability in assigning biological properties to animals; either male or female kindergartners assigned fewer properties. These gender findings were considered noteworthy, but not critical as the study primarily was interested in age differences. The significant area difference for the tree, however, could be more important, as children from a lower - SES background assigned fewer biological properties. In examining the individual scores, the property of breathing was the only significant individual item across area $\chi^2(2, N = 106) = 6.75, p < .05$. In this case, children from a higher SES group may be more aware of the process of photosynthesis and thus differ in assigning this property than children from a lower SES group.

Intentional Scale

For the intentional scale, the same analyses were conducted, 2 (gender) by 3 (grade) by 3 (SES area) ANOVA for each object. One finding was significant; a significant grade main effect for the rock was qualified by an grade by gender interaction $\chi^2(2, N = 109) = 4.50, p < .05$. Male kindergartners were more likely to assign intentional properties to a rock ($M = .61$) than other groups (group $M = .23$). However, comparisons across individual intentional items (e.g., ability to choose, want, etc.) did not note any significant differences between groups.
Summary of Measure #1: Direct Attribution Measure

Both the biological and intentional assignment scales showed very few interactions or main effects other than main effects for grade level.

Measure #2: Sentence Silliness/Preference

The total number of intentional sentences chosen (range of 0 to 8 per child) was calculated for both sentence silliness and sentence preference. These scores were then subjected to a 2 (gender) by 3 (area of child) by 3 (grade level) ANOVA. For sentence silliness, form A, no significant interactions were found, only a main effect for grade level. For sentence silliness, form B, no significant interactions or main effects were found. For sentence preference for form A, no significant interactions or main effects were found, and for sentence preference for form B, no significant interactions or main effects were found. Thus the sentence measure appeared to show no interactions that would influence the findings already noted.

Measure #3: Story Data

Each question was subjected to a logit analysis (Stevens, 1992), in which several variables and variable interaction terms are used to predict the pattern of a categorical response. Each intentional question was submitted to a logit analysis analyzing grade of child, SES level of child, and story outcome valence (positive or negative) and interaction terms of these variables.

Agency Questions

The only agency question that appeared to indicate an area/SES effect was for the tree/bird story, with a best-fitting model for the main effect of area $\chi^2 (15, N = 215) =$
36.07, \( p < .001 \). This effect occurred due to one-half of the lower-SES 4th graders indicating that a tree could want to let a bird take leaves, while 95\% of 4th graders from the other two areas indicated that a tree could not want to let a bird take leaves.

Therefore, for this one question, a significant main effect was found for children's SES area.

**Intention Questions**

For the intention-to-cause a consequence questions, 3 of the 8 questions had an area interaction. For the boy, an area by grade level interaction was the best fitting model \( \chi^2 (9, N = 215) = 128.44, p < .001 \). Searching for the difference between groups with a 2 (y/n) by 3 (age) across area and form chi-square analysis indicated that for this question, upper SES 4th graders were more likely to say that a boy could want a dish to break, while kindergartners were less likely to assign a boy the ability to want a dish to break \( \chi^2 (2, 94) = 6.07, p < .05 \). For the gumball machine, an interaction between outcome and area was the best-fitting model \( \chi^2 (12, N = 215) = 39.25, p < .001 \), with all private school 4th graders reporting that a gumball machine could not want to give two pieces of gum \( \chi^2 (2, 18) = 7.20, p < .05 \). Finally, for the teddy bear, an area interaction was the best-fitting model \( \chi^2 (15, 215) = 105.71, p < .001 \). In examining where differences between groups occurred (yes/no judgment by age across area and outcome), it was found that lower-SES kindergartners were more likely to say that a teddy bear could want to say "Mama" \( \chi^2 (2, N = 41) = 22.18, p < .001 \) while upper SES 4th graders all said that a teddy bear could not want anything \( \chi^2 (2, N = 41) = 18.91, p < .001 \). Therefore, for the intention-to-cause questions, SES did appear to qualify findings for three out of the eight test items,
particularly for inanimate objects. Younger and lower-SES children appeared to attribute more intention to inanimate objects, while older and higher-SES children attributed less intention to inanimate objects.

Desire to Receive Outcome Questions

Three out of the eight questions indicated an SES interaction. These included the questions about a pig and a bird, with best fitting models a grade level by area interaction $\chi^2 (9, N = 215) = 132.91, p < .001; \chi^2 (9, N = 215) = 109.68, p < .001$. In these cases, 4th grade and higher SES children were more likely to assign an animal the desire for a negative consequence, and kindergarten children were less likely to assign an animal the desire for either consequence. The toy mouse question also indicated a grade by area interaction as the best-fitting model $\chi^2 (9, N = 215) = 43.36, p < .001$. Upper SES 4th graders were more likely to say that a toy mouse can NOT want to be played with $\chi^2 (2, N = 47) = 10.52, p < .01$. High SES kindergartners were more likely to say that a toy mouse can want to be played with $\chi^2 (2, N = 18) = 10.50, p < .01$, while upper SES kindergartners were more likely to say that a toy mouse can want to be ripped up $\chi^2 (2, N = 47) = 13.33, p < .01$. Younger upper class children gave higher attributions of desire to inanimate objects, but older upper class children assigned few judgments of desire.

Summary for SES Effects on Story Measure

In summary, for the story measure, some responses did vary depending on the SES group sampled, but there were no consistent patterns across questions. For agency, lower-SES children appeared to attribute greater agentive ability to one of the trees than other children. For intention of consequences, younger, lower-SES children assigned
greater intentionality to inanimate objects. For desire, younger and higher-SES children assigned greater ability to desire to inanimate objects. Therefore, these effects did not show a consistent pattern of influence; but depended on the question and the object.

Overall, most significant patterns indicated main effects for age and outcome, rather than interactions with children's SES area.

**Gender Influences on Story Measure**

For analysis of gender influence on story data, a series of Fisher exact tests were conducted (to control for the presence of empty cells), comparing yes/no judgment by gender across grade level, area, and outcome for the 24 questions of agency, intention of consequence, and desire for outcome. Only two findings were significant; upper SES kindergarten girls all judged that a tree could want to give leaves to a bird (Fisher exact test, \( p < .01 \)); and lower SES second grade girls were more likely to say that a dish could want to be clean (Fisher exact test, \( p < .05 \)). These two effects were the only significant gender effects noted.
APPENDIX C

ADULT RATING MEASURES
Sentence Rating Scale:
Please rate the following sentences for their silliness (not how true they are).
1 = not silly at all; 5 = very silly.

1-----------------------2-----------------------3----------------------4------------------------5
not at all  a little  somewhat  pretty  very
silly     silly     silly     silly     silly

Practice:
   1. The queen ate the kitchen sink.
   2. The man decided to travel to another state.

Ratings:  

   1. The boy is made of macaroni and cheese. 4.51
   2. The boy wants to be a fireman. 1.05
   3. The tree wants a bird to build a nest. 3.02
   4. The rock wants to sprout legs and run. 4.45
   5. The tree wants to sing a song. 4.03
   6. The tree wants to give fruit to people. 2.62
   7. The rock is full of minerals. 1.35
   8. The tree wants to make air for people to breathe. 2.52
   9. The rock feels pain when it is broken. 3.97
  10. The boy has eyes and a tummy. 1.43
  11. The boy wants to be a slice of pizza. 3.87
  12. The tree needs to brush its teeth. 4.60
  13. The tree wants to dance in the sky. 4.23
  14. The tree has arms and legs. 3.05
  15. The tree wants to give shade to people. 2.53
  16. The dog wants to be an opera singer. 4.43
  17. The dog has leaves and branches. 4.53
  18. The dog has legs and teeth. 1.10
19. The dog wants to protect the house.  
20. The rock wants to fly like a bird.  
21. There is sand inside the rock.  
22. The rock has eyes and a tummy.  
23. The rock wants to jump up and down.  
24. The boy has wings and a beak.  
25. The boy wants to be a cantaloupe.  
26. The boy breathes in and out.  
27. The boy wants to look handsome.  
28. The tree needs water and sunshine.  
29. The tree wants to grow taller.  
30. The tree has leaves and branches.  
31. The rock wants to be part of a building.  
32. The rock needs to brush its teeth.  
33. The rock wants to be a rock.  
34. The rock is a big piece of dirt.  
35. The dog wants to chew up things.  
36. The dog has muscles and bones.  
37. The dog wants to be an octopus.  
38. The dog is a big piece of dirt.  
39. The rock wants to be part of a sculpture.  
40. The dog can grow wings.  
41. The tree wants to be a home for a squirrel.  
42. The boy wants to be part of a building.  
43. The boy wants to hold the ceiling.  
44. The rock wants to be part of a mountain.  
45. The tree breathes in and out.  
46. The tree needs to eat.  
47. The tree wants to give firewood to people.  
48. The tree wants to have a swing so children can play.
Final Sentence Combinations for Children's Measures (Based on Adult Means):

<table>
<thead>
<tr>
<th>Form A</th>
<th>Sentence 1</th>
<th>Sentence 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Contrasting</td>
<td>1.02 (Biological)</td>
</tr>
<tr>
<td>2.</td>
<td>Similar (NS)</td>
<td>1.35 (Intentional)</td>
</tr>
<tr>
<td>3.</td>
<td>Similar (S)</td>
<td>4.42 (Biological)</td>
</tr>
<tr>
<td>4.</td>
<td>Contrasting</td>
<td>1.42 (Intentional)</td>
</tr>
<tr>
<td>5.</td>
<td>Similar (S)</td>
<td>4.40 (Biological)</td>
</tr>
<tr>
<td>6.</td>
<td>Similar (NS)</td>
<td>3.10 (Intentional)</td>
</tr>
<tr>
<td>7.</td>
<td>Contrasting</td>
<td>1.92 (Biological)</td>
</tr>
<tr>
<td>8.</td>
<td>Contrasting</td>
<td>2.82 (Intentional)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Form B</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Similar (S)</td>
<td>4.51 (Biological)</td>
</tr>
<tr>
<td>2.</td>
<td>Contrasting</td>
<td>1.03 (Intentional)</td>
</tr>
<tr>
<td>3.</td>
<td>Contrasting</td>
<td>1.43 (Biological)</td>
</tr>
<tr>
<td>4.</td>
<td>Similar (NS)</td>
<td>1.05 (Intentional)</td>
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<td>5.</td>
<td>Contrasting</td>
<td>1.13 (Biological)</td>
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<tr>
<td>6.</td>
<td>Similar (NS)</td>
<td>2.53 (Intentional)</td>
</tr>
<tr>
<td>7.</td>
<td>Similar (S)</td>
<td>4.60 (Biological)</td>
</tr>
<tr>
<td>8.</td>
<td>Contrasting</td>
<td>2.25 (Intentional)</td>
</tr>
</tbody>
</table>

Resulting Sentence Pairs:
1. The dog has muscles and bones OR The dog wants to be an octopus.
2. The dog wants to protect the house OR The dog has legs and teeth.
3. The dog can grow wings OR The dog wants to be an opera singer.
4. The dog wants to chew up things OR The dog has leaves and branches.
5. The rock has eyes and a tummy OR The rock wants to grow legs and run.
6. The rock wants to be part of a sculpture OR The rock is a big piece of dirt.
7. There is sand in the rock OR The rock wants to jump up and down.
8. The rock wants to be part of a mountain OR The rock feels pain when it is broken.

1. The boy is made of macaroni and cheese OR The boy wants to be a cantaloupe.
2. The boy wants to look handsome OR The boy has wings and a beak.
3. The boy has eyes and a tummy OR The boy wants to be part of a building.
4. The boy wants to be a fireman OR The boy breathes in and out.
5. The tree needs water and sunshine OR The tree wants to sing a song.
6. The tree wants to give shade to people OR The tree needs to eat.
7. The tree needs to brush its teeth OR The tree wants to dance in the sky.
8. The tree wants to grow taller OR The tree has arms and legs.
Adult Rating Scale #2: Biological and Intentional Attributions

Check your answers:

1. Which of the following people or objects CAN SEE THINGS?

| ____ Yourself | ____ mommy | ____ boy | ____ baby |
| ____ girl | ____ tree | ____ bird | ____ bug |
| ____ worm | ____ dog | ____ rock | ____ river |
| ____ book | ____ cloud | ____ flower |

2. Which of the following people or objects CAN THINK AND KNOW THINGS?

| ____ dog | ____ book | ____ rock | ____ cloud |
| ____ worm | ____ Yourself | ____ bird | ____ bug |
| ____ mommy | ____ tree | ____ flower | ____ river |
| ____ baby | ____ girl | ____ boy |

3. Which of the following people or objects HAS A HEART BEAT?

| ____ cloud | ____ rock | ____ book | ____ dog |
| ____ bug | ____ bird | ____ yourself | ____ worm |
| ____ river | ____ flower | ____ tree | ____ mommy |
| ____ baby | ____ boy | ____ girl |

4. Which of the following people or objects CAN CHOOSE WHAT THEY WANT?

| ____ yourself | ____ girl | ____ boy | ____ baby |
| ____ mommy | ____ dog | ____ bird | ____ bug |
| ____ worm | ____ tree | ____ flower | ____ river |
| ____ cloud | ____ book | ____ rock |

5. Which of the following people or objects BREATHE?

| ____ rock | ____ book | ____ cloud | ____ river |
| ____ yourself | ____ girl | ____ boy | ____ baby |
| ____ flower | ____ tree | ____ worm | ____ bug |
| ____ mommy | ____ dog | ____ bird |

6. Which of the following people or objects CAN WISH FOR THINGS THEY HAVEN'T GOT?

| ____ cloud | ____ book | ____ rock | ____ bug |
| ____ worm | ____ tree | ____ flower | ____ river |
| ____ mommy | ____ dog | ____ bird | ____ baby |
| ____ yourself | ____ girl | ____ boy |
7. Which of the following people or objects **MOVE**?

<table>
<thead>
<tr>
<th></th>
<th>yourself</th>
<th>cloud</th>
<th>tree</th>
<th>bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>book</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mommy</td>
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</table>

8. Which of the following people or objects **CAN WANT TO MOVE AND THEN MOVE**?

<table>
<thead>
<tr>
<th></th>
<th>mommy</th>
<th>flower</th>
<th>baby</th>
<th>bug</th>
</tr>
</thead>
<tbody>
<tr>
<td>yourself</td>
<td>-----------</td>
<td>--------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>book</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rock</td>
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<td></td>
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9. Which of the following people or objects **ARE ALIVE**?

<table>
<thead>
<tr>
<th></th>
<th>bug</th>
<th>bird</th>
<th>dog</th>
<th>baby</th>
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</thead>
<tbody>
<tr>
<td>worm</td>
<td></td>
<td>girl</td>
<td>tree</td>
<td></td>
</tr>
<tr>
<td>river</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>yourself</td>
<td></td>
<td>book</td>
<td></td>
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</tbody>
</table>

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10. Which of the following people or objects **CAN WANT SOMETHING**?

<table>
<thead>
<tr>
<th></th>
<th>rock</th>
<th>mommy</th>
<th>book</th>
<th>cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>flower</td>
<td></td>
<td>yourself</td>
<td></td>
<td></td>
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<tr>
<td>baby</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>worm</td>
<td></td>
<td>bird</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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11. Which of the following people or objects **CAN WANT TO DO SOMETHING**?

<table>
<thead>
<tr>
<th></th>
<th>river</th>
<th>bird</th>
<th>mommy</th>
<th>yourself</th>
</tr>
</thead>
<tbody>
<tr>
<td>baby</td>
<td></td>
<td>worm</td>
<td>rock</td>
<td>flower</td>
</tr>
<tr>
<td>book</td>
<td></td>
<td>girl</td>
<td>bug</td>
<td>boy</td>
</tr>
<tr>
<td>tree</td>
<td></td>
<td>dog</td>
<td>cloud</td>
<td></td>
</tr>
</tbody>
</table>
Adult Rating Measure #3: Positive / Negative, Accidental / Intentional Event Descriptions

Events judged for outcome valence (positive/negative) and purposive action (accidental/intentional).

1. A ladder breaks.
2. You find money.
3. Finding a lost pet.
4. A dog is run over by a car.
5. A dog runs away.
7. Getting a hug.
8. A baby throws up.
10. Spilling milk.
11. Protecting the house.
12. A bird builds a nest.
13. A cup breaks.
15. Keeping high water away.
17. Animals fighting.
18. Having a pet dog die.
19. Feeding a hungry animal.
20. A dog that bites.
21. A dog that rescues people.
22. A dog that protects people.
23. Having a tree fall.
24. Finding a stray dog.
25. Using trees that have fallen for firewood.
26. Using rocks that have rolled down for making walls.
27. A horse trips and falls.
28. A person wins the lottery.
29. An apple falls into a girl's hand.
30. A horse is walking along and steps on something.
31. A person wins a sweepstakes contest.
32. A vending machine takes money without giving any candy.
33. The computer won't work when you need it to work.
34. A dog chases a cat into a tree.
35. A girl finds a pencil under the couch cushion.
36. A horse bumped into a tree and apples fell.
37. The tree branches caught the kite.
38. The boy kicked a ball and it broke a window.
39. The goat ate some clothes.
41. The girl forgot to feed the goldfish and it died.
42. The horse slipped and fell on a boy.
43. The boy climbed a tree and a branch broke.
44. The tree dropped an apple and fed a hungry deer.
45. The man saw a ladder and used it to climb over the fence.
46. The rock rolled down the hill and hit a house.
47. The baby stepped on the cat's tail.
48. The big dog kept the puppy safe.
49. The boys played a video game.
50. The cow started kicking and kicked a bad man.
51. The children found a tree that could be used as a swing.
52. The dog fought another dog.
53. The hammer fell and hit a nail just right.
54. The girl hit her little sister.
55. The girl pet the cat.
56. The horse was walking along and stepped on some flowers.
57. The table holds the food up, away from the floor.
58. The girl got out some dolls and played house.
59. The dolphin saved the boy from drowning.
60. The man stubbed his toe.
61. The boy tripped to make the class laugh.
62. The girl woke up with gum in her hair.
63. The dog rolled in the garbage.
64. The boy bumped into a man at a movie and popcorn spilled.
65. The cow kicked the football.
66. The girl fed the ducks.
67. The hammer fell and broke a cup.
68. The horse fell and broke the bully's arm.
69. The boy fed the deer and the deer licked the boy's hand.
70. The telephone wire caught the balloon.
71. The girl put some toys away.
72. The bird got twigs from a tree to make a nest.
73. The girl left the water on and the birds came to drink.
74. The mommy dog fed her puppies.
75. The tree gave leaves to a bird to use as a nest.
76. The girl threw water on another girl.
77. The tree fell over and smashed a car.
78. The cow kicked over the bucket of milk.
79. The man chopped down a tree.
80. The boy helped his friend with some homework.
81. The boy bumped into another boy and kept him from falling.
82. The boy found a quarter in a telephone booth.
83. The tree dropped an apple and hit a dog in the head.
84. The cat scratched the boy's face.
85. The girl spilled her milk on her friend.
86. The rock rolled down the hill and became part of a wall.
87. The cat chewed the toy and ruined it.
88. The dog chewed up the shoe.
89. The girl put a puzzle together.
90. The hammer fell and hit a man's foot.
91. The baby picked up a toy and it made a sound.
92. The wall keeps the water away.
93. The picture makes the wall pretty.
94. The boy washed some dishes.
95. A man drives a car.
96. The car takes a dog to the vet.
97. The girl enters a contest.
98. The girl does not win.
99. The girl wins.
100. A tree grows fruit.
101. The boy finds money.
102. The boy uses money to buy medicine.
103. The boy uses money to buy cigarettes.
104. The fence breaks.
105. The fence keeps the sand away.
106. The dog licks the boy.
107. The boy cuts up the house plant.
108. The boy gives the plant water.
109. The children have liver for lunch.
110. The children have cookies for lunch.
111. The bird builds a nest in the tree.
112. The vending machine gives extra candy.
113. The boy kicks a ball.
114. The ball makes a goal.
115. The ball breaks a window.
116. The computer works better than the man hoped.
117. The girl threw her dolls and broke them.

Summary of Adult Ratings of Story Situations:
- Inanimate objects cannot intentionally do an action, either positive or negative
- Trees cannot intentionally do an action, either positive or negative.
- Animals can intend action, either positive or negative, although mistakes are not intended.
- Humans can intend action, either positive or negative, although mistakes are not intended.
- 90% or greater agreement on whether an outcome was positive or negative.
APPENDIX D

RETEST DATA
APPENDIX D

RETEST DATA

N = 24; Interval of 3 weeks

**Direct Attribution Measure:**

(total of judgments, range 0 to 14, between time 1 and time 2)

<table>
<thead>
<tr>
<th>Item</th>
<th>r</th>
<th>p  (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>.76</td>
<td>.001</td>
</tr>
<tr>
<td>Boy/Girl</td>
<td>1.00</td>
<td>.001</td>
</tr>
<tr>
<td>Lady/Baby</td>
<td>.72</td>
<td>.001</td>
</tr>
<tr>
<td>Bird/Dog</td>
<td>.81</td>
<td>.001</td>
</tr>
<tr>
<td>Bug/Worm</td>
<td>.85</td>
<td>.001</td>
</tr>
<tr>
<td>Flower/Tree</td>
<td>.81</td>
<td>.001</td>
</tr>
<tr>
<td>River/Cloud</td>
<td>.41</td>
<td>.05</td>
</tr>
<tr>
<td>Comp/Car</td>
<td>.66</td>
<td>.01</td>
</tr>
<tr>
<td>Rock/Book</td>
<td>.74</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Entire Test</strong></td>
<td>.93</td>
<td>.001</td>
</tr>
</tbody>
</table>

**Sentence Judgment Task**

(total of choosing the intentional sentence, range 0 to 8, between time 1 and time 2).

<table>
<thead>
<tr>
<th>Item</th>
<th>r</th>
<th>p  (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preference</td>
<td>.66</td>
<td>.001</td>
</tr>
<tr>
<td>Silliness</td>
<td>.57</td>
<td>.01</td>
</tr>
<tr>
<td><strong>Entire Test</strong></td>
<td>.76</td>
<td>.001</td>
</tr>
</tbody>
</table>

**Story Attribution Measure**

(total of judgments for intention / sensation, range 0 to 24, between time 1 and time 2).

<table>
<thead>
<tr>
<th>Item</th>
<th>r</th>
<th>p  (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>.68</td>
<td>.001</td>
</tr>
<tr>
<td>Sensation</td>
<td>.95</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Entire Test</strong></td>
<td>.92</td>
<td>.001</td>
</tr>
</tbody>
</table>
APPENDIX E

PARENT PERMISSION FORM
Dear Parent/Guardian:

My name is Elizabeth Szendre. I am a graduate student at Loyola University of Chicago and I am conducting a study for my dissertation. This study has been approved by the Jordan School District and the Granite School District.

Park Lane Elementary (Granite Elementary/Magna Elementary/Lake Ridge Elementary/Waterford) is one of the schools to be invited to participate in this research study. We ask your permission for your child to be included in this study.

The 25-minute interview will involve asking children what they think about pictures of animals, objects, and people. The game-like interview will be fun. The answers your child gives us will help us to learn more about how children think and how their thoughts are similar or different from adults.

Your child's answers will be confidential. No one will know what answers your child has given. No one will know the identity of the children. If you or your child decide at any point to stop participation, for any reason, you are free to withdraw from the study.

If you would like your child to participate, please return this form by April 5th. Only children with a signed permission form will be tested. If you have any other questions about this project, please give me a call (call Liz at 943-4899).

Thank you,

Elizabeth Szendre

Parent Permission

Yes, my child _____________________________ may participate in this study. I understand that my child may withdraw from the study at any time and that all information will be held in strict confidence.

Parent/Guardian Signature _____________________________ Date _____________________________
APPENDIX F

CHILD QUESTIONNAIRES
**Direct Attribution Measure:**

<table>
<thead>
<tr>
<th>Biological Scale</th>
<th>Intentional Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can a _____ see things?</td>
<td>Can a _____ think?</td>
</tr>
<tr>
<td>Can a _____ feel pain?</td>
<td>Can a _____ want something?</td>
</tr>
<tr>
<td>Does a _____ have a brain?</td>
<td>Can a _____ make choices?</td>
</tr>
<tr>
<td>Does a _____ have a heart beat?</td>
<td>Can a _____ know about things?</td>
</tr>
<tr>
<td>Does a _____ breathe?</td>
<td>Can a _____ make a wish?</td>
</tr>
<tr>
<td>Does a _____ move?</td>
<td>Can a _____ want to move and then move?</td>
</tr>
<tr>
<td>Is a _____ alive?</td>
<td>Can a _____ want to do something?</td>
</tr>
</tbody>
</table>

Each presentation: human, inanimate entity, and animate entity

**Form A**

<table>
<thead>
<tr>
<th>Presentation 1:</th>
<th>Form B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower</td>
<td>Tree</td>
</tr>
<tr>
<td>Baby</td>
<td>Lady</td>
</tr>
<tr>
<td>Computer</td>
<td>Car</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presentation 2:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>Self</td>
</tr>
<tr>
<td>Bird</td>
<td>Dog</td>
</tr>
<tr>
<td>River</td>
<td>Cloud</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presentation 3:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bug</td>
<td>Worm</td>
</tr>
<tr>
<td>Rock</td>
<td>Book</td>
</tr>
<tr>
<td>Boy</td>
<td>Girl</td>
</tr>
</tbody>
</table>
**Sentence Judgment Task:**
For each sentence:
1. Which sentence is more silly?
2. Which sentence do you like better?

**Form A:**

**DOG**
1. The dog has muscles and bones. OR The dog wants to be an octopus.
2. The dog wants to protect the house. OR The dog has legs and teeth.
3. The dog can grow wings. OR The dog wants to be an opera singer.
4. The dog wants to chew up things. OR The dog has leaves and branches.

**ROCK**
5. The rock has eyes and a tummy. OR The rock wants to grow legs and run.
6. The rock wants to be a sculpture. OR The rock is a big piece of dirt.
7. There is sand inside the rock. OR The rock wants to jump up and down.
8. The rock wants to be part of a mountain. OR The rock feels pain when it breaks.

**Form B**

**BOY**
1. The boy is made of macaroni and cheese. OR The boy wants to be a cantaloupe.
2. The boy wants to look handsome. OR The boy has wings and a beak.
3. The boy has eyes and a tummy. OR The boy wants to be part of a building.
4. The boy wants to be a fireman. OR The boy breathes in and out.

**TREE**
5. The tree needs water and sunshine. OR The tree wants to sing a song.
6. The tree wants to give shade to people. OR The tree needs to eat.
7. The tree needs to brush its teeth. OR The tree wants to dance in the sky.
8. The tree wants to grow taller. OR The tree has arms and legs.
Assignments of Intentionality and Sensation to Story Characters:

Form A

1. This is a gumball machine. A boy put his money into the gumball machine. The gumball machine took the money and then gave the boy two pieces of candy.
A. Can a gumball machine want to take money or is it just there?
B. Can a gumball machine want to give two pieces of candy or is it an accident?
C. Can a boy want to get two pieces of candy?
D. Can a gumball machine feel the gumballs inside it?
E. Can a boy feel gumballs in his hand?

2. Here's a picture of a tree and a bird. The bird went to build a nest in the tree. Then the tree scratched the bird.
A. Can a tree want to have a nest in it?
B. Can a tree want to scratch a bird?
C. Can a bird want to be scratched?
D. Can a tree feel when a bird lands on it?
E. Can a bird feel with its feet when it lands on the tree?

3. Here's a cat and a toy mouse. One day the cat jumped on the toy. When the cat was finished, the toy had been licked and played with.
A. Can a cat want to jump on a toy?
B. Can a cat want to lick and play with a toy?
C. Can a toy want to be licked and played with?
D. Can a cat feel the toy with its paws?
E. Can the toy feel the cat's claws?

4. Here's a girl and her box of dolls. One day the girl got out her dolls. When she was finished playing with them, the dolls were all over the floor.
A. Can a girl want to get out her dolls?
B. Can a girl want to have her dolls all over the floor?
C. Can dolls want to be on the floor?
D. Can a girl feel when she picks up a doll?
E. Can a doll feel it when a girl picks it up?

5. Here's a tree and a pig. One day the tree dropped an apple. The apple fell and fed the pig.
A. Can a tree want to drop an apple?
B. Can a tree want to feed the pig?
C. Can a pig want to be fed?
D. Can a tree feel an apple dropping?
E. Can a pig feel an apple in its mouth?
6. Here's a teddy bear and a girl. The girl picked up her bear. Then the teddy bear's arm broke.
   A. Can a teddy bear want to be picked up?
   B. Can a teddy bear want to break its arm?
   C. Can a girl want the teddy bear's arm to break?
   D. Can a teddy bear feel when it is being picked up?
   E. Can a girl feel when she picks up the teddy bear?

7. Here's a boy and a dish. The boy walked over to sink full of dishes. The boy picked up a dish in the sink and the dish was clean.
   A. Can a boy want to pick up a dish?
   B. Can a boy want a dish to be clean?
   C. Can a dish want to be clean?
   D. Can a boy feel a dish when he picks it up?
   E. Can a dish feel it when the boy picks it up?

8. Here's a picture of a cow. One day the cow walked into a barn. The cow pushed a gate. The gate broke.
   A. Can a cow want to push a gate?
   B. Can a cow want to break a gate?
   C. Can a gate want to break?
   D. Can a cow feel when it pushes the gate?
   E. Can a gate feel the cow pushing it?
Form B
1. This is a gumball machine. A boy put money into the gumball machine. The gumball machine took the money and then didn't give the boy any candy.
   A. Can a gumball machine want to take money or is it just there?
   B. Can a gumball machine want to keep the candy or is it an accident?
   C. Can a boy want to have no candy?
   D. Can a gumball machine feel the gumballs inside it?
   E. Can a boy feel gumballs in his hand, when he finally gets them?

2. Here's a picture of a tree and a bird. The bird went to build a nest on the tree. Then the tree let the bird have leaves for the nest.
   A. Can a tree want to have a nest?
   B. Can a tree want the bird to have leaves?
   C. Can a bird want to have leaves from a tree?
   D. Can a tree feel when the bird lands on it?
   E. Can a bird feel with its feet when it lands on a tree?

3. Here's a cat and a toy mouse. One day the cat jumped on the toy. When the cat was finished, the toy had been chewed and ripped up.
   A. Can a cat want to jump on a toy?
   B. Can a cat want to chew and rip a toy?
   C. Can a toy want to be chewed and ripped?
   D. Can a cat feel the toy in its paws?
   E. Can a toy feel the cat's claws?

4. Here's a girl and her box of dolls. One day the girl got out her dolls. When she was finished playing with them, the dolls were in a dollhouse.
   A. Can a girl want to get out her dolls?
   B. Can a girl want to have her dolls in a dollhouse?
   C. Can dolls want to be in a dollhouse?
   D. Can a girl feel when she picks up a doll?
   E. Can a doll feel it when it is picked up?

5. Here's a tree and a pig. One day the tree dropped an apple. The apple fell and hit the pig in the head.
   A. Can a tree want to drop an apple?
   B. Can the tree want to hit a pig in the head?
   C. Can a pig want to be hit in the head?
   D. Can a tree feel an apple dropping?
   E. Can a pig feel the apple?
6. Here's a teddy bear and a girl. The girl picked up her bear. Then the teddy bear said, "Mama."
   A. Can a teddy bear want the girl to pick him up?
   B. Can a teddy bear want to say, "Mama?"
   C. Can a girl want a teddy bear to say "Mama?"
   D. Can a teddy bear feel the girl picking him up?
   E. Can a girl feel when she picks up the teddy bear?

7. Here's a boy and a dish. The boy walked over to a sink full of dishes. The boy picked up a dish and the dish broke.
   A. Can a boy want to pick up a dish?
   B. Can a boy want the dish to break?
   C. Can a dish want to break?
   D. Can a boy feel a dish when he picks it up?
   E. Can a dish feel when it is picked up?

8. Here's a picture of a cow. One day the cow walked into a barn. The cow pushed a gate. The gate opened.
   A. Can a cow want to push a gate?
   B. Can a cow want to open a gate?
   C. Can a gate want to be open?
   D. Can a cow feel when it pushes the gate?
   E. Can a gate feel the cow pushing it?
REFERENCES


Behavioral and Brain Sciences, 16, 196-197.


(Original work published 1932)


VITA

The author, Elizabeth Nebeker Szendre, was born in Anaheim, California, on March 7, 1970.

In August, 1988, Ms. Szendre entered Brigham Young University, where she graduated summa cum laude with the degree of Bachelor of Science in psychology in April, 1991. From 1988-1991, she was selected as a Trustee's Scholar and Hinckley Scholar and received the Mark K. Allen Award for Outstanding Graduating Senior in Psychology.

In August, 1991, Ms. Szendre entered the doctoral program in developmental psychology at Loyola University of Chicago. From 1991-1995, Ms. Szendre was the recipient of the Jacob K. Javits Fellowship, awarded by the U. S. Department of Education. She completed the Masters of Arts degree in May 1993. From 1995-1996, Ms. Szendre was the recipient of Loyola University's Schmitt Dissertation Fellowship, to assist in completion of the Doctor of Philosophy degree.
DISSERTATION APPROVAL SHEET

The dissertation submitted by Elizabeth N. Szendre has been read and approved by the following committee:

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Loyola University Chicago

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the committee with reference to content and form.

The dissertation is, therefore, accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

April 4, 1996
Date

Joseph F. Rychlak
Director's Signature