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The Development of Identity in Preschoolers

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by

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ABSTRACT

The primary goal of this study was to investigating the extent to which young preschoolers (e.g., 3-year-olds) understand identity in terms of what an object does rather than in terms of either what the object looks like or what its inside properties are. My primary guiding research questions are on *what* basis do preschoolers construct identity judgments. Unlike previous research, which has focused primarily on one pair of qualities (insides/outsides), this study includes diverse pairs in order to investigate different levels/qualities of organization that characterize preschoolers' judgments of identity constancy. I predicted that a transition may occur between the ages of 3- and 5-years-old: a shift from a focus on behavior/action to a focus on insides as foundational to identity judgments. One hundred and seventy-four 3- and 5-year-olds recruited through 11 area preschools participated in one out of 3 phases of testing session. This study was able to access the organization structure and developmental patterns in preschoolers' identity judgments under two analytic strategies: independent phase analysis and across phase analysis. The results suggest that 3- and 5-years-old do not seem to consider behavior/action as central to identity in a causal paradigm. I failed to replicate Sobel et al. (2007) in the context of Phase 1, and I found alternative developmental pathways in terms of consistency in preschoolers responding. Five-year-olds show consistency in their responding, but this consistency is not in one direction (e.g., essentialist thoughts) as Sobel et al. suggested. The results also point to the possibility that younger preschoolers (e.g., 3-year-olds) are still in a transition period. Further research is needed to investigate which developmental patterns are more legitimate as a representation of preschoolers' identity judgments. Sobel et al's study, in its original methodology, needs to be replicated with more economically and educationally diverse samples as these two factors seem play a role.

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The Development of Identity in Preschoolers

Understanding that things in the world maintain their identity despite changes in their appearance has long been considered a benchmark for children's cognitive development (De Vries, 1969; Piaget, 1968). From knowing that your father remains your father despite his looking like a Goblin when dressed up for Halloween; to knowing that a cat remains a member of the cat category despite being altered in appearance to look like a dog; to knowing that a quantity of water remains the same quantity despite being transferred to a taller, thinner container—all of these forms of understanding involve the construction of conceptual invariants of varying degrees of complexity. Early childhood marks a key developmental period of emergence for conceptual invariants, but both their nature and developmental course remain ongoing points of contention in the developmental literature.

In Piaget's (1954, 1968) theory of early childhood cognitive development, the emergence of object permanence in infancy actually engenders the first conceptual invariant of identity: existence. By the end of the infancy period, the young child can maintain the constancy of an object's existence despite a change in its perceptual availability to the child. This *qualitative* invariant ushers in the early childhood period and is later followed by the emergence of other qualitative conceptual invariants, such as an understanding of constancy in individual and generic identity in which children maintain the sameness of an individual *as* an individual or *as* a member of a class of individuals despite a transformation in appearance (De Vries, 1969). Piaget (1968) explicitly contrasted these qualitative invariants of identity understanding with the *quantitative* invariants (e.g., height, width, length, liquid quantity) that classically form

children's notions of conservation (i.e., knowing that water transferred from a small, wide container to a taller, thinner container still comprises the same *amount* of water, even though it looks like there is more water in the taller, thinner container). Quantitative invariants of conservation, according to Piaget (1947), don't emerge until the end of early childhood, by 6 to 7 years. Whereas qualitative invariants of identity understanding require nothing more than the dissociation of permanent from variable qualities, quantitative invariants of conservation require higher-order, operative processes such as reversibility and transitivity (Piaget, 1947, 1968).

Thus, Piaget argued that, developmentally, the concept of identity comes before that of conservation:

> The essential characteristic of preoperational (that is, preconservational) identity…is that it deals with simple qualitative invariants, without any quantitative composition. For example, in the pouring of liquids, even a 4 or 5 year old, who maintains that the amount of water has changed, will admit that it is 'the same water,' in the sense that the nature of the matter 'water' has not changed even if the quantity of that matter has changed. Similarly, if he draws his own body as he was when he was little and again as he is now, he will recognize that it is still the same individual, even if he is bigger in size ('It's still me'). (1968, p. 19)

Classic work by De Vries (1969) on preschoolers' construction of invariance in understanding of generic identity confirmed this developmental sequence. In De Vries' study, preschoolers were first familiarized with a cat and then presented with the same cat wearing either a dog or rabbit mask. Three-year-olds treated the cat now wearing a mask as something frightening and acted as though the cat had transformed into a monster,

believing that its identity had changed with the appearance change. The persistent failure of 3-year-olds to maintain the cat's identity *as a cat* across this transformation in appearance, however, was replaced by 5 years of age with an understanding that the cat remained a cat even though it looked like a dog or rabbit. Thus, DeVries demonstrated that preschoolers by 5 years had already acquired *qualitative* invariants of identity, even though these same 5-year-olds failed on conservation tasks involving quantitative invariants.

Piaget's (1968) acknowledgement of a "preoperational notion" (p. 30) of identity developing well in advance of the emergence of conservation skills has been largely ignored in modern research on the development of identity understanding. In fact, modern research on children's understanding of identity routinely presents Piaget as having suggested that children fail to establish conceptual invariants of identity (both individual and generic, or kind identity) until they first show consistent signs of developing *quantitative* invariants in the form of conservation skills, typically at the end of the early childhood period. By conflating qualitative (identity) and quantitative (conservation) invariants, modern research has argued that Piaget viewed the preschooler throughout the early childhood period as an "externalist" with respect to the notion of identity. In other words, researchers over the last couple of decades have charged that Piaget believed children before the ages of 6 to 7 to be bound to surface-level, variable, appearance properties of objects, meaning that they fail to understand identity constancy at all during early childhood (e.g., Gelman, 2000, 2003; Gelman & Wellman, 1991; Gutheil & Rosengren, 1996).

With this mischaracterization of Piaget in place, a growing body of literature has emerged demonstrating preschoolers' precocious understanding of the "non-obvious," the hidden layers of underlying invariance that order the surface world of appearances (Gelman, 2000, 2003; Gelman & Wellman, 1991; Gottfried & Gelman, 2005; Gutheil, Gelman, Klein, Michos, & Kelaita, 2008; Newman & Keil, 2008; Waxman, Medin, & Ross, 2007). This work has promoted the view of preschoolers as *essentialists*, already endowed in early childhood with a mature core of domain-specific conceptual invariants for organizing the world and their experience of it on the basis of underlying, unobservable realities, or essences (Gottfried & Gelman, 2005; Keil, 1992; Newman & Keil, 2008; Simons & Keil, 1995). Psychological essentialism entails an implicit, naïve belief in some internal, underlying property or quality—an essence—that makes an object what it is, both as a unique individual and as a member of a kind (Gelman, 2000, 2003, 2004; Medin & Ortony, 1989). Most readily applied to living kinds but also extendable to all natural kinds as well as artifacts, this naïve belief construes an essence in causal terms: essences are a level of reality that underlies and determines the observable level of appearance. Developmental investigations of the extent to which an essentialist bias is already evident in the thinking of young children have generally relied on evidence from three key empirical paradigms—transformation/transplant, adoption, and causal explanation paradigms—all designed to index critical properties of essentialist thought (Gelman, 2003).

Transformation/transplant paradigms target preschoolers' belief in maintenance of individual and kind identity despite a transformation of the organism's external appearance (e.g., Gelman & Wellman, 1991; Gottfried, Gelman, & Schultz, 1999;

Gutheil & Rosengren, 1996). *Adoption* paradigms also target preschoolers' belief in identity maintenance across a change, but for these paradigms, the change derives from the external circumstances surrounding an organism's upbringing—e.g. a baby cat is adopted by a family of dogs—and captures the extent to which preschoolers privilege essential nature over external nurture in the establishment of individual and kind identity (e.g., Atran et al., 2001; Gelman & Wellman, 1991; Waxman, Medin, & Ross, 2007). Finally, *causal explanation* paradigms target preschoolers' belief in the causal significance of properties endogenous to an organism (or artifact) for what the organism (or artifact) does: its behavior, activity, and causal impact on the world (e.g., Gelman & Gottfried, 1996; Gottfried & Gelman, 2005; Sobel, Yoachim, Gopnik, Meltzoff, & Blumenthal, 2007). When one looks across these paradigms at the extent to which preschoolers 1) maintain an object's identity and kind membership despite observable changes in the object's appearance or external circumstances and 2) appeal to something beyond that which is immediately observable as the causal basis for what the object is, a solid empirical foundation for claims of an essentialist bias or stance in preschoolers is evident in children as young as 4 to 5 years. Taken together, transformation/transplant, adoption, and causal explanation paradigms provide persuasive evidence for at least the rudiments of an essentialist stance during the preschool years, seen specifically in 4- to 5-year-olds' preservation of individual and kind identity across transformations in external appearance, decidedly nativist leanings in predicting an organism's developmental outcome, and appeals to unobservable, endogenous factors when explaining an organism's causal properties (Gelman, 2000, 2003).

Many researchers have also argued that some form of an essentialist stance is already in place at the start of the early childhood period, at least by age 2 (e.g., Gelman, 2003, 2004). By this view, preschoolers throughout the early childhood period construct conceptual invariants of identity by penetrating beneath the surface of the observable. However, evidence in favor of some degree of psychological essentialism as early as 2 years is inconsistent and subject to interpretational debate, raising the possibility, in turn, that young preschoolers may order their worlds in effectively non-essentialist ways.

Studies involving both adoption and causal explanation paradigms, for example, have yielded no evidence of an essentialist stance in children before the age of 4. In one of the few adoption paradigm studies to employ populations younger than 4 years, Hirschfeld and Gelman (1997) reported chance level responding for 3-year-olds, in marked contrast to the consistent nativist stance of the 5-year-olds in their sample. 3-year-olds, in other words, unlike 5-year-olds, were as likely to claim that a pig raised with cows would act like a cow as they were to claim that the pig would act like a pig. In the context of causal explanation paradigms, evidence against an essentialist stance in 3-year-olds is even stronger. Specifically with respect to Sobel et al.'s (2007) paradigm, researchers presented children with various objects that activated a machine when brought in contact with the machine and then asked the children to identify another object—from among objects that were either externally or internally-similar to the target object—which would be likely to produce the same consequence. Preschoolers as young as 4 years picked objects which had similar insides to the target object that activated the machine, suggesting that by this age children tie an object's causal properties to its insides or internal structure and privilege these insides over the object's external

appearance when predicting what an object does. 3-year-olds, however, appealed significantly more often to outward appearance than to internal properties and identified similar *looking* objects (at the level of outward appearance) as those most likely to activate the machine. In other words, 3-year-olds showed an *externalist bias* in their responding (Sobel et al., 2007).

To the extent that evidence exists in support of 3-year-olds' looking beyond appearance to deep, hidden regularities, the evidence is decidedly mixed and often fraught with interpretation problems. For every result demonstrating young preschoolers' move beyond appearance there exists a result demonstrating their firm entrenchment in appearance. Gelman and Wellman (1991), for example, showed that 3-year-olds rely on category information over appearance when making predictions about the insides of an object (e.g., judging that a lemon, in contrast to an orange balloon, is more likely to have the same kind of insides as an orange); the authors suggested that by age 3, children distinguish insides from outsides and attune to non-obvious internal properties as establishing commonality among members of a kind even in the face of conflicting surface appearance. However, Peskin and Olson (2001) showed that 3-year-olds actively struggle with predictions of behavior when faced with an organism that is dressed up as another such that their appearance conflicts with their real identity (e.g., a cat wearing a sheep suit); under these circumstances, 3- but not 5-year-olds appealed to how the organism looked when predicting its behavior, even to the point of suggesting that a dog wearing a bird costume could fly.

Perhaps the most consistent evidence in favor of young preschoolers' essentialist stance comes from work on inductive inference in preschoolers (Gelman, 2003). In this

work, preschoolers are presented with the picture of a natural kind member, either living or nonliving (e.g., a squirrel, yellow tulip, sugar cube), provided with a label to denote category membership (e.g., this is a squirrel), and given specific information about this target member, ranging from internal part information to behavioral and origin information (e.g., it has eggs inside, eats bugs, comes from the sea). Preschoolers are then presented with the picture of a different but similar-looking natural kind and one of the same natural kind but dissimilar-looking—category membership via labeling for both being established—and asked whether each of the new objects has the properties of the original target object. Under these circumstances, children throughout the early childhood period—and even extending earlier into infancy—reliably generalize nonobvious properties to perceptually-dissimilar members of the same category, not to similar looking members of another category, suggesting that category membership, not similarity of appearance, drives inductive generalization (Gelman & Coley, 1990; Gelman & Markman, 1986, 1987; Welder & Graham, 2001).

This interpretation of preschoolers' inductive generalization has come under fire, however, given its erroneous conflation of labels with category membership. Sloutsky and colleagues (e.g., Fisher & Sloutsky, 2005; Sloutsky & Fisher, 2004; Sloutsky, Kloos, & Fisher, 2007) have invoked Piaget's (1929) notion of nominal realism to suggest that, for preschoolers, labels constitute featural, indispensable properties of objects and consequently are foundational to the *perceptual* similarity of objects, rather than serving as conceptual indices of categorical membership. In fact, converging evidence targeting the mechanisms underlying young children's inductive generalization and controlling for conflation of label and category membership points to appearance similarity rather than

category membership as the basis for preschoolers' inductive generalizations (Sloutsky et al., 2007), with inductions based on category knowledge emerging gradually between early and middle childhood (Fisher & Sloutsky, 2005; Sloutsky & Fisher, 2004).

Thus, unlike studies of psychological essentialism with 4- to 5-year-olds, those that target younger ages have demonstrated little to no systematic evidence in favor of an essentialist bias. What, then, is the nature of children's understanding of identity before 4 years? What potentially unique organizational qualities might characterize preschoolers' judgments of identity when they are 3 years old? In the literature on psychological essentialism, children's development of identity constancy is routinely framed in either/or terms. *Either* the child appreciates constancy of identity across an outward transformation and thinks as an essentialist, *or* she/he fails to do so and therefore is an externalist, focused only on appearance without understanding the invariance of identity despite an appearance change. *Either* the preschooler is an externalist, *pre-conceptually* bound to the surface, variable, ephemeral world of appearance, *or* the preschooler is an essentialist, *conceptually* looking beneath the surface of variability to extract underlying invariants. Such framing establishes the development of identity constancy as a shift from an absence to a presence in the repertoire of the child. However, a more developmentally-appropriate question is not *whether* preschoolers judge identity to be constant but on what basis do they construct identity judgments of constancy and how does this basis change across development (Mohr, 1978). This reframes the developmental question of conceptual qualitative invariants to involve an investigation of the different levels of organization that reliably characterize preschoolers' judgments of identity constancy.

What, then, is the nature of the qualitative invariants to which young preschoolers appeal in their identity judgments prior to the emergence of an essentialist stance at 4 to 5 years? Piagetian-inspired work on children's construal of self-identity suggests a potential answer. When asked to describe themselves, 3- to 5-year-olds reliably respond in terms of the activities they can and do perform, prompting Keller, Ford, and Meacham (1978) to assert that "activity is indeed the most salient dimension of the self-concepts of preschool children" (p. 488). Extending work by Guardo and Bohan (1971), Mohr (1978) targeted older children's reflective understanding of identity invariance by asking 6, 8, and 11-year-olds to explicitly address what sorts of hypothetical transformations would be required to alter the nature of their personal identity (e.g., children were asked "What would you have to change about yourself for you to become your best friend?"). Across middle childhood, a standard developmental trend emerged that consisted of decreasing appeal to external, physical characteristic-based transformations and an increasing appeal to internal, psychological transformations. However, Mohr's study additionally revealed a middle level consisting of children's predominant reliance on *behavioral* transformations as foundational to identity change; in Mohr's words, "behavior-based categories (of personal identity) are a developmental predecessor to internal categories" (p. 428). This work suggests that an understanding of constancy in an organism's identity *in terms of regularities in how the organism acts* may serve as the developmental foundation out of which an essentialist understanding of identity grows.

Could a similar sequence—from behavior or activity-based judgments to internal or essence-based judgments—mark the development of preschoolers' pre-reflective notions of identity in early childhood? That is, consistent with Piagetian thought, could

the constancy of something's identity first exist for the young preschooler in the patterning of its activity, in what it does—a dynamic activity of becoming, not a static condition of being—before becoming differentiated from that activity and reified as a causal antecedent for that activity in the form of an essentialist stance? Work on preschoolers' essentialist bias largely treats an organism's (or object's) activity as an outcome or dependent variable; preschoolers are commonly asked to predict what will happen to an organism's functioning after a transformation to either the organism's external appearance or to its internal properties. To the extent that an organism's activity itself is manipulated as an independent variable in these studies, such a manipulation commonly accompanies that of an organism's external, appearance characteristics, resulting in a conflation of external appearance—how an organism looks—and the activity it performs—what is does. Yet Shipley (2000) has critically documented that 3- and 5-year-olds, when asked to explain to an "alien" puppet what various organisms on earth are, rely far more on what the organism does—on its behavior—than on how it looks in their explanations.

In fact, Shipley (2000) demonstrated that 3- and 4-year-olds privilege the behavior of an animal over both its insides and its outer appearance in their determination of the animal's identity. Preschoolers in her study were presented with descriptions of animals made by a traveling puppet; in these descriptions, the puppet reported on animals that acted like a certain kind of animal (e.g., "it eats meat like a tiger and roars like a tiger") but had either the insides of another animal (e.g., "but it has the brain and lungs of a camel") or looked like another animal (e.g., "but it has humps on its back and a long neck like a camel"). Preschoolers, faced with these conflicting reports, were asked to

establish the identity of the animal (e.g., "is it a tiger or a camel?"). For a majority of both 3- and 4-year-olds, behavior outweighed both appearance and insides in their judgments of animal identity, demonstrating the salience of an organism's activity in young preschoolers' notions of identity.

Recent work on the spontaneous, self-generated narratives of preschoolers further substantiates the developmental precedence of activity-based judgments relative to internal/essence-based judgments in early childhood. Nicolopoulou and Richner (2007) investigated the nature of character representation in the naturalistic story-telling of 3- to 5-year-olds and found support for reorganizational change in how preschoolers portrayed the characters in their stories. Whereas 4- and 5-year-olds constructed agentive and mentalistic characters with basic psychological or "internal" properties like intentions, desires, and beliefs, 3-year-olds employed nonpsychological characters, describable predominantly in terms of the actions they performed. What Nicolopoulou and Richner identified as a "developmental shift in character representation from actors to agents to persons" (p. 423) dovetails with a potential transition between 3 and 5 years in preschoolers' construal of identity from activity-based to increasingly essentialist-based.

The Current Study

The current study is designed to investigate the extent to which young preschoolers (e.g., 3-year-olds) understand identity in terms of what an object does rather than in terms of either what the object looks like or what its inside properties are. Specifically, I have taken Sobel et al.'s (2007) paradigm and modified it to include manipulations not just of how objects look and of what insides the objects have but also of how objects *act* to see whether younger preschoolers use the actions of an object to

predict the extent to which that object will activate a machine when placed on the machine. I am interested in examining whether 5-year-olds rely on insides in their identity judgments whereas 3-year-olds conversely rely on external appearance or an object's act and would choose behavioral/action over external appearance when offered the choice. Therefore, I suggest that a transition may occur between the ages of 3- and 5-years-old: a shift from a focus on behavior/action to a focus on insides as foundational to identity judgments.

Method

Participants

This study focused on 3- and 5-years-old preschoolers. A total of 174 participants were recruited through 11 area preschools in Albuquerque, NM. There were a total of three phases in this study. Participants were recruited and randomly assigned to complete one of the three phases. Sample characteristics for each phase are as follows:

Phase 1. The participants were fifty-six 3- and 5-year-olds: twenty-six 3-year-olds (15 boys, 11 girls, M_{age}=41.96 months, *SD*=3.8 months), and thirty 5-year-olds (19 boys, 11 girls, M_{age}=63.37 months, *SD*=3.5 months). There were no differences in the mean age of boys and girls in any age group. The Phase 1 sample was recruited from 6 different preschools and was ethnically diverse, with 54% European American, 23% Hispanic American, and 23% unspecified. Participants were predominantly working and middle class (9% below the poverty level, 21% 20-50K, 21% 50-80K, 43% greater than 80K, 5% Other). Of the parents, 13% had completed high school, 25% had earned a bachelor's degree, 27% had earned a master's degree, and 34% had earned a doctoral degree. Sample characteristics for those included in the analysis (n=56) are reported in

Table 1.

Table 1
Sample Characteristics of Participants in Phase 1

	N (%)		
Variable	*3-year-olds*	*5-year-olds*	*Total*
Gender			
Boys	15 (57.7)	19 (63.3)	34(60.7)
Girls	11 (42.3)	11 (36.7)	22 (39.3)
Race and ethnicity			
European American	14 (53.8)	16 (53.3)	30 (53.6)
Hispanic American	5 (19.2)	8 (26.7)	13 (23.2)
Other*	7 (26.9)	6 (20.0)	13 (23.2)
Household income			
Less than $20,000	3 (11.5)	2 (7.4)	5 (9.4)
$20,000 - $ 50,000	6 (23.1)	6 (22.2)	12 (22.6)
$50,000 - $ 80,000	2 (7.7)	10 (37.0)	12 (22.6)
Greater than $80,000	15 (57.7)	9 (33.3)	24 (45.3)
Parents education			
High school	2 (7.7)	5 (17.2)	7 (12.7)
Bachelor's degree	8 (30.8)	6 (20.7)	14 (25.5)
Master's degree	7 (26.9)	8 (27.6)	15 (27.3)
Doctoral degree	9 (34.6)	10 (34.5)	19 (34.5)

Note. * Parent choose not to reveal child's race and ethnicity

Phase 2. The participants were sixty-one 3- and 5-year-olds: thirty-one 3-year-olds (21 boys, 10 girls, M_{age}=43.99 months, *SD*=4.3 months), and thirty 5-year-olds (16 boys, 14 girls, M_{age}=63.37 months, *SD*=4.9 months). There were no differences in the mean age of boys and girls in any age group. The Phase 2 sample was recruited from 5 different preschools and was ethnically diverse, with 61% European American, 18% Hispanic American, 5% Native American, 2% Asian American, 2% African American,

and 12% Unspecified. Participants were predominantly working and middle class (11 % below the poverty level, 20% 20-50K, 16% 50-80K, 50% greater than 80K, 3% Other). Of the parents, 16 % had completed high school, 23% had earned a bachelor's degree, 26 % had earned a master's degree, and 32 % had earned a doctoral degree. Sample characteristics for those included in the analysis (n=61) are reported in Table 2.

Table 2
Sample Characteristics of Participants in Phase 2

	N (%)		
Variable	*3-years-olds*	*5-years-olds*	*Total*
Gender			
Boys	21 (67.7)	16 (53.3)	37(60.7)
Girls	10 (32.3)	14 (46.7)	24 (39.3)
Race and ethnicity			
European American	19 (65.5)	18 (62.1)	37 (63.8)
Hispanic American	6 (20.7)	5 (17.2)	11 (19.0)
Native American	0 (0.0)	3 (10.3)	3 (5.2)
Asian American	1 (3.4)	0 (0.0)	1 (1.7)
African American	1 (3.4)	0 (0.0)	1 (1.7)
Other*	2 (6.9)	3 (10.3)	5 (8.6)
Household income			
Less than $20,000	2 (6.7)	5 (17.2)	7 (11.9)
$20,000 - $ 50,000	6 (20.0)	6 (20.7)	12 (20.3)
$50,000 - $ 80,000	5 (16.7)	5 (17.2)	10 (16.9)
Greater than $80,000	17 (56.7)	13 (44.8)	30 (50.8)
Parents education			
High school	2 (6.5)	8 (27.6)	10 (16.7)
Bachelor's degree	6 (19.4)	8 (27.6)	14 (23.3)
Master's degree	8 (25.8)	8 (27.6)	16 (26.7)
Doctoral degree	15 (48.4)	5 (17.2)	20 (33.3)

Note. * Parent choose not to reveal child's race and ethnicity

Phase 3. The participants were fifty-seven 3- and 5-year-olds: twenty-nine 3-year-olds (12 boys, 17 girls, M_{age}=42.24 months, *SD*=4.5 months), and twenty-eight 5-year-olds (13 boys, 15 girls, M_{age}=63.50 months, *SD*=4.1 months). There were no differences in the mean age of boys and girls in any age group. The Phase 3 sample was recruited from 9 different preschools and was ethnically diverse, with 30% European American, 29% Hispanic American, 5% Native American, 2% Asian American, 4% African American, and 30% Unspecified. Participants were predominantly working and middle class (14 % below the poverty level, 21% 20-50K, 19% 50-80K, 44% greater than 80K, 2% Other). Of the parents, 25 % had completed high school, 25% had earned a bachelor's degree, 29 % had earned a master's degree, and 21 % had earned a doctoral degree. Sample characteristics for those included in the analysis (n=57) are reported in Table 3.

Families with children ages 3 and 5 years received a letter explaining the study and had the opportunity to sign a consent form. Thereafter they returned it to the preschools along with a questionnaire asking basic demographic data, including the child's age, sex and ethnicity, parental education and income level. In addition, the Principal Investigator recruited children ages 3 and 5 years at area preschools by being available in the main lobby to provide interested parents information about the current study.

Each phase in the current study was designed to be child friendly and to not place too great of a task demand on the participants. If the participant was unwilling to continue participation, a second attempt in completing testing of the participant would be

made on the following day. Each participant received a toy upon completion of the phase of the study in which they participated.

Table 3
Sample Characteristics of Participants in Phase 3

	N (%)		
Variable	*3-years-olds*	*5-years-olds*	*Total*
Gender			
Boys	12 (41.4)	13 (46.4)	25(43.9)
Girls	17 (58.6)	15 (53.6)	32 (56.1)
Race and ethnicity			
European American	12 (28.6)	6 (33.3)	17 (30.9)
Hispanic American	7 (39.3)	9 (22.2)	16 (30.9)
Native American	0 (0.0)	3 (11.1)	3 (5.5)
Asian American	1 (3.6)	1 (3.7)	2 (3.6)
African American	1 (3.6)	0 (0.0)	1 (1.8)
Other*	7 (25.0)	8 (29.6)	15 (27.3)
Household income			
Less than $20,000	2 (7.1)	6 (21.4)	8 (14.3)
$20,000 - $ 50,000	6 (21.4)	6 (21.4)	12 (21.4)
$50,000 - $ 80,000	6 (21.4)	5 (17.9)	11 (19.6)
Greater than $80,000	14 (50.0)	11 (39.3)	25 (44.6)
Parents education			
High school	2 (7.1)	12 (42.9)	14 (25.0)
Bachelor's degree	9 (32.1)	5 (17.9)	14 (25.0)
Master's degree	8 (28.6)	8 (28.6)	16 (28.6)
Doctoral degree	9 (32.1)	3 (10.7)	12 (21.4)

Note. * Parent choose not to reveal child's race and ethnicity

General Procedure

Once the parent or guardian gave consent for their child to participate in this study, participants were asked to complete the phase of the study which was in accordance with their consent forms. For each phase of the study, a preschool provider escorted the participant to a quiet room of their preschool where the experimenters were waiting. The participant was asked to sit at a table next to the experimenter and was tested individually. After the initial introduction between the participant and the experimenter, the participant was invited to play a laptop computer game with the experimenter. The participant was told that he/she would see some blocks and would be asked some questions about the blocks. Throughout the duration of each testing phase, the preschool provider remained present in the room (seated behind the participant) and was instructed to refrain from contributing in any way while the participant was performing the task.

Design and Materials

All phases of the study involved the presentation of an animation with a machine and blocks (i.e., blue squares, pink ball, and red diamond, etc). Participants were asked to reason about the causal properties of the blocks. The machine in the animation — modeled after the "blicket" detector in Sobel et al. (2007) — was a box that lights up and plays music when a block is placed on top it. A total of 27 blocks were involved in different animations (9 blocks were used in each phase). The blocks varied on three dimensions: 1) their insides, 2) their outsides, and 3) the action they perform. Specifically, the blocks used in each phase either varied on whether they had a white pin in the center of the block or not (insides), whether they had the same shape and color or not (outsides) and whether they displayed the same or a different motion (action). Each phase involved

three trials and each trial involved three blocks—a target object and two alternative objects that differed on a particular property (e.g., insides, outsides or action) they shared with the target object. Each of the three trials used in Phases 1, 2 and 3 began by having participants presented with a target object that appeared to activate the machine when the object was placed on the machine. Participants were then asked to decide which of two alternative objects would also activate the machine. In Phase 1, the two alternative objects differed on whether they shared the same *insides* or *outsides* with the target object. In Phase 2, the two alternative objects differed on whether they shared the same *outsides* or *action* with the target object. In Phase 3, the two alternative objects differed on whether they shared the same *insides* or *action* with the target object. The presentation order of the three trials within each phase was randomly determined across participants.

Warm up

At the beginning of each testing phase, participants were given a warm-up activity to ensure that they could point to the objects and respond to the experimenter. In the warm-up animation, participants were presented with four blocks of differing sizes and colors (i.e., a small green triangle, a big yellow square, a mid-size blue square, a red diamond) and were asked to point to the biggest one, then the red one, then the smallest one, and lastly the blue one. If the participant failed to answer or responded incorrectly, corrective feedback was given by the experimenter.

Phase 1: Insides vs. Outsides

Phase 1 focused on whether children privilege insides or outsides when asked to make inferences about the causal property of objects and employed a methodology modified after Sobel et al. (2007). At the beginning of the testing session, a machine and

three blocks were presented in the animation on a laptop and the participants were told that they were going to play a game with a very special machine. The nine blocks used in phase 1 were divided into three sets of three blocks (see Figure 1). In each set of three blocks, one object was the target object that was a certain shape and color (e.g., square and blue) and had something inside it (e.g., had a white pin inserted into a hole that was covered by a dowel inserted into the hole, hiding the contents of the hole). The next object (alternative object A) shared the same outsides, shape and color, as the target object (e.g., square and blue) but differed on the insides (e.g., did *not* have a white pin inserted into a hole). The last object (alternative object B) shared the same insides as the target object (e.g., had a white pin that was inserted into the hole) but differed from the target object in terms of its outsides, shape and color (e.g., triangle and yellow).

In the animation (see Figure 2), participants were shown each of the objects and were shown the dowel inserted into each of the objects and the contents of the hole. Specifically, the animation showed a hand removing the dowel of each object, with the experimenter labeling the outsides of the object and the insides of the object for the participant. For example, the experimenter played the animation, and when the hand in the animation selected the first object, the experimenter said, "This one is blue and it has a little white thing inside." Then the animation showed the participant the second object and the experimenter said, "This one is empty and it is blue." Finally the animation

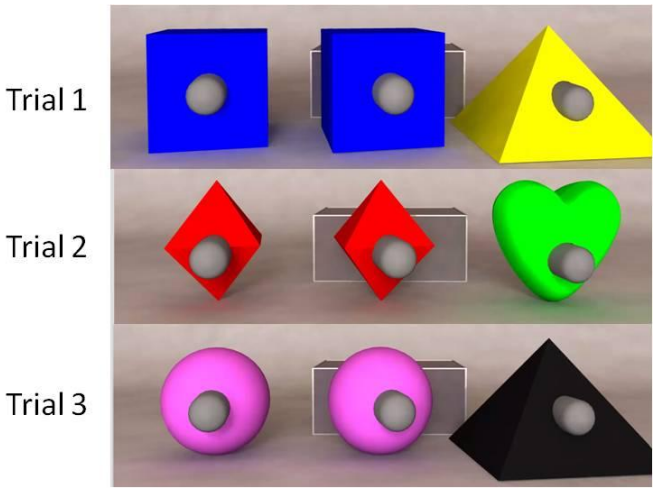

Figure 1. An example of stimuli from Phase 1 and 2. Each row represents a set of objects for a trial. In each trial, the target object is the object in the center. The two alternative objects are on both sides. There are two versions (A vs. B) for each set of objects for each trial. The outside similar alternative object is on the left side of the target object in the A version of stimuli set. The outside similar alternative object is on the right side of the target object in the B version of stimuli set. The trials and versions of stimuli sets presented in each phase are randomly assigned to each participant.

showed the child the third object and experimenter said, "This one is yellow and it has a little white thing inside." After the insides were shown to the participant, the animation featured a hand putting the dowels back in place so that the insides were no longer visible. The above scene sequence was repeated with the experimenter saying, "Let's look at them again." Then, the animation showed the hand selecting the target object and placing it on the machine, which caused the machine to light up and play music. Following the animation, the experimenter said, "Look at that, it makes the machine light up and play music!" The experimenter then would ask, "Can you point to another one that can make the machine light up and play music?" Participants were not given any feedback on their answers. Once a participant pointed to the object he/she thought could make the machine light up and play music, the experimenter would then ask the participant, "Why did you pick that one?" to investigate the reasoning the child offered for his/her choice of a

particular object (alternative object A or alternative object B). Once the participant answered the question or stated he/she did not have an answer to the question, the next trial would start, using three new objects. The procedure continued until the participant completed the three trials (presented in random order across participants) or indicated she/he no longer wanted to participate.

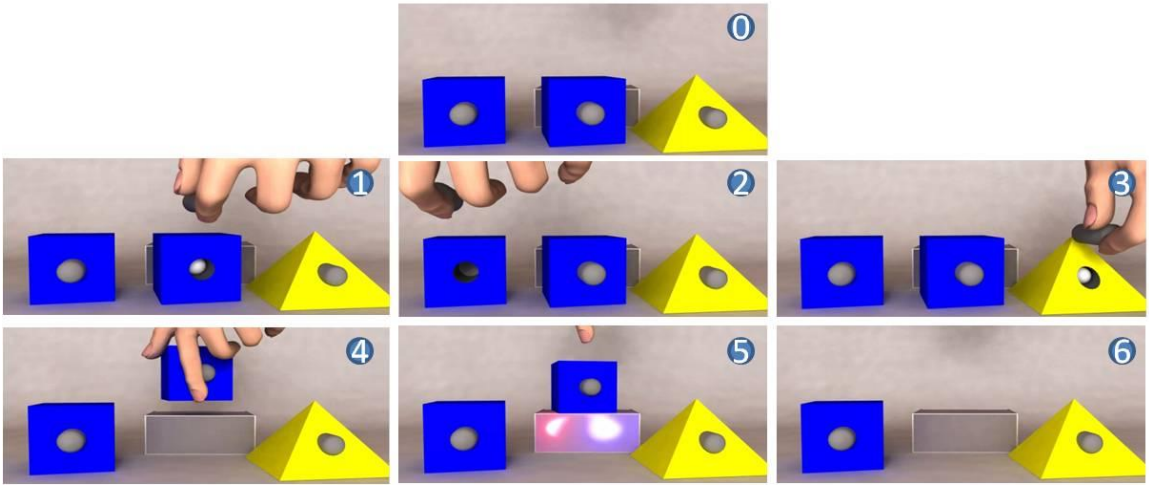

Figure 2. This is a sample scene sequence in a testing trial animation from Phase 1. Each scene represents a moment in the animation. (0) Test begins. (1) A hand removes the dowel of the target object in the center. (2) A hand removes the dowel of the alternative object A on the left. (3) A hand removes the dowel of the alternative object B on the right. (4) A hand picks up the target object and places it on the machine. (5) The machine lights up and play music after the target object is putting on it. (6) The target object is removed from the machine. Before it displays scene (4), the experimenter says "let's look at them again"; scene (1), (2) and (3) are repeated; then the animation moves on to scene (4), (5) and (6).

Phase 2: Outsides vs. Action

Phase 2 employed the same methodology as Phase 1 but focused on whether children privilege *outsides* or *action* when asked to make inferences about the causal property of objects. The nine blocks used in Phase 2 were divided into three sets of three blocks (see Figure 1).

The target object would be of a certain shape and color (e.g., blue square) and displayed a certain action (e.g., spinning). The next object (alternative object A) shared the same outsides as the target (e.g., blue square) but displayed a different motion than the target object (e.g., jumping). The last object (alternative object B) differed from the target object in terms of its outsides (e.g., yellow triangle) but displayed the same action as the target object (e.g., spinning).

Participants were shown each of the objects and the action of each of the objects (see Figure 3). Specifically, the animation showed a hand selecting each object, with the experimenter labeling the outsides of the object and the action of the object to the participant. For example, the experimenter played the animation, and when the hand in the animation picked up the first object, the experimenter said, "This one is blue and it spins." Then the animation showed the participant the second object, and the experimenter said, "This one jumps and it is blue." Finally the animation showed the participant the third object, and the experimenter said, "This one is yellow and it spins." The above scene sequence was repeated with the experimenter saying, "Let's look at them again." Next, the animation showed the hand selecting the target object and placing it on the machine, which caused the machine to light up and play music. Following the animation, the experimenter said, "Look at that, it makes the machine light up and play music!" The experimenter then said, "Can you point to another one that can make the machine light up and play music?" Participants were not given any feedback on their answers. Once a participant pointed to the object he/she thought could make the machine light up and play music, the experimenter would then ask the participant, "Why did you pick that one?" to investigate the reasoning the child offered for his/her choice of a

particular object (alternative object A or alternative object B). Once the participant answered the question or stated he/she did not have an answer to the question, the next trial would start, using three new objects. The procedure continued until the participant completed the three trials (presented in random order across participants) or indicated she/he no longer wanted to participate.

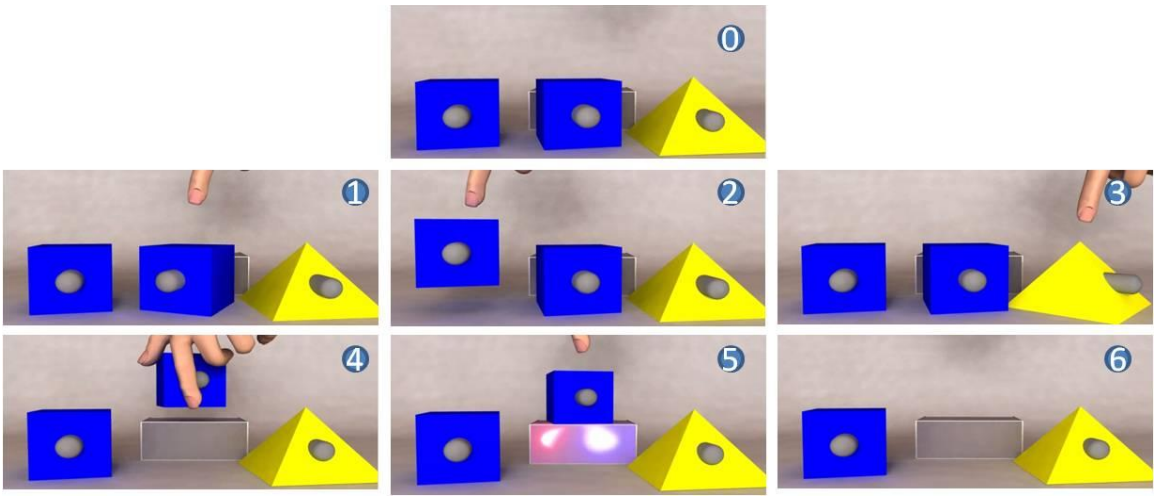

Figure 3. This is a sample scene sequence in a testing trial animation from Phase 2. Each scene represents a moment in the animation. (0) Test begins. (1) A hand points at the target object's action (e.g., spinning). (2) A hand points at the alternative object A's action (e.g., jumping) on the left. (3) A hand points at the alternative object B's action (e.g., spinning) on the right. (4) A hand picks up the target object and places it on the machine. (5) The machine lights up and plays music after the target object is put on it. (6) The target object is removed from the machine. Before it displays scene (4), the experimenter says "let's look at them again"; scene (1), (2) and (3) are repeated; then the animation moves on to scene (4), (5) and (6).

Phase 3: Insides vs. Action

Phase 3 employed the same methodology as Phase 1 but focused on whether children privilege *insides* or *action* when asked to make inferences about the causal property of objects. The nine blocks used in Phase 3 were divided into three sets of three blocks (see Figure 4). In each set of three blocks, all of which shared the same shape and color (e.g. blue square), one object (the target object) had insides (e.g., had a white pin

inserted into a hole that is then covered by a dowel inserted into the hole, hiding the contents of the hole) and displayed a certain action (e.g., spinning). The next object (alternative object A) shared the same insides (e.g., had a white pin inserted into a hole) but displayed a different motion than the target object (e.g., jumping). The last object (alternative object B) differed from the target object in terms of its insides (e.g., did not have a white pin) but displayed the same action as the target object (e.g., spinning).

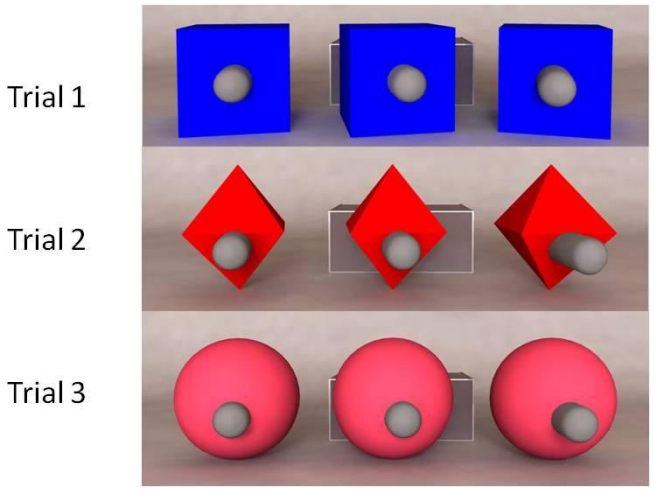

Figure 4. An example of stimuli from Phase 3. Each row represents a set of objects for a trial. In each trial, the target object is the object in the center. The two alternative objects are on both sides. There are two versions (A vs. B) for each set of objects for each trial. The inside similar alternative object is on the left side of the target object in the A version of stimuli set. The inside similar alternative object is on the right side of the target object in the B version of stimuli set. The trials and versions of stimuli in each test phase are randomly assigned to each participant.

Participants were shown each of the objects and the action of each of the objects (see Figure 5). Specifically, the animation showed a hand selecting each object and removing the dowel, with experimenter labeling the inside of the object and the action of the object to the participants. For example, the experimenter played the animation and when the hand in the animation picked up the first object, the experimenter said, "This one has a little white thing inside and it spins." Then the animation showed the

participants the second object, and the experimenter said, "This one jumps and it has a little white thing inside." Finally the animation showed the participants the third object, and the experimenter said, "This one is empty and it spins." After the insides were shown to the participants, the dowels were put back in place. The above sequence was repeated with the experimenter saying, "Let's look at them again." Next, the animation showed the hand selecting the target object and placing it on the machine, which caused the machine to light up and play music. Following the animation, the experimenter said, "Look at that, it makes the machine light up and play music!" The experimenter then asked, "Can you point to another one that can make the machine light up and play music?" Participants were not given any feedback on their answers. Once a participant pointed to the object he/she thought could make the machine light up and play music, the experimenter then asked the participants, "Why did you pick that one?" to investigate the reasoning children offer for their choice of a particular object (alternative object A or alternative object B). Once the participants answered the question or stated they did not have an answer to the question, the next trial would start, using three new objects. The procedure continued until the participants completed the three trials (presented in random order across participants) or indicated she/he no longer wanted to participate.

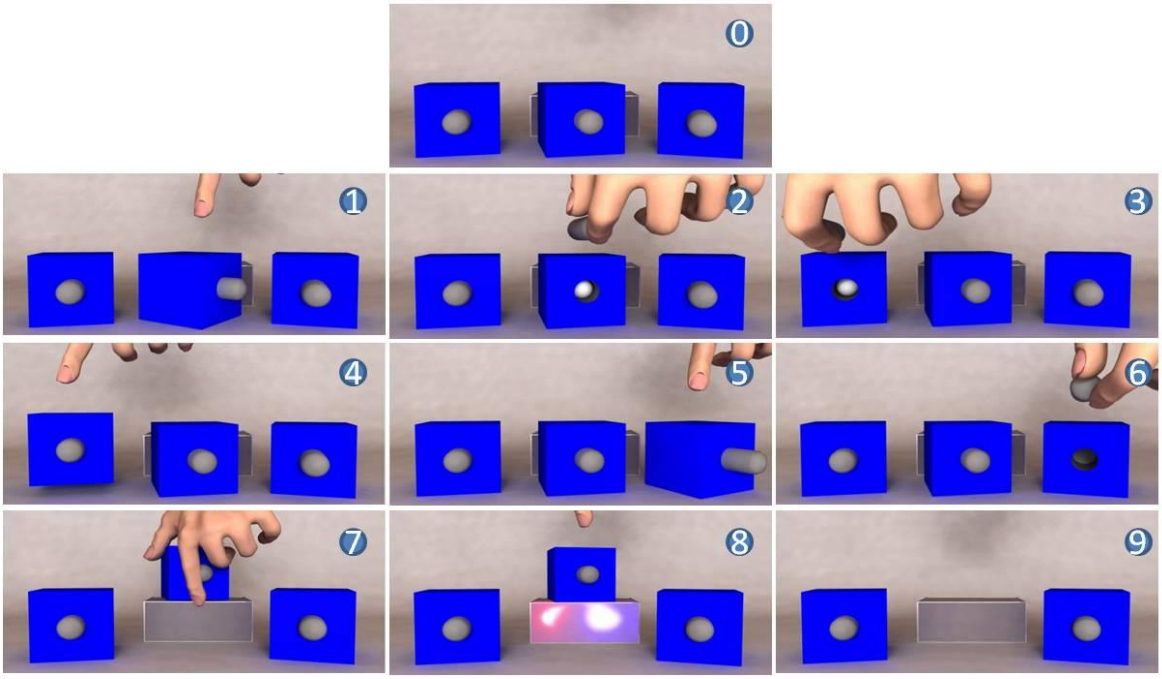

Figure 5. This is a sample scene sequence in a testing trial animation from Phase 3. Each scene represents a moment in the animation. (0) Test begins. (1) A hand points at the target object's action (e.g., spinning). (2) A hand removes the dowel of the target object in the center. (3) A hand removes the dowel of the alternative object A on the left. (4) A hand points at the alternative object A's action (e.g., jumping) on the left. (5) A hand points at the alternative object B's action (e.g., spinning) on the right. (6) A hand removes the dowel of the alternative object B on the right. (7) A hand picks up the target object and places it on the machine. (8) The machine lights up and plays music after the target object is put on it. (9) The target object is removed from the machine. Before it displays scene (4), the experimenter says "let's look at them again"; scene (1), (2) and (3) are repeated; then the animation moves on to scenes (4), (5), (6), (7), (8) and (9).

Data collection Training, Quality Control, Data Coding and Prediction

I designed and conducted training sessions for the undergraduate research assistants (URAs) who were involved in this study. All URAs were blind to the hypotheses of this study. After extensive training, and performance tests, I assigned the URAs to the following groups based on their performance, test results and time availability: recruiting team, testing team, video checking team, data coding and entering team, data double checking team. I selected a team leader for each team based on the

individual's dedication to the research project and his/her prior lab effort and performance. The team leader's responsibilities were: 1) coordinate and supervise the daily frontline work of the URAs' research activities; 2) collect responses/feedback from URAs and preschool coordinator and report quickly to me for further action plans; and 3) implement action plans with their teams accordingly. All participants were videotaped throughout the procedure for data recording and coding purposes. For the purpose of protecting participants' information, only the URAs who were in the testing group and video checking group had access to the video tapes. These individuals did not have access to any other data or biographic information (except age, gender and preschool) regarding the participants.

The URAs in the testing teams were paired, each pair including one tester and one recorder. The recorder would fill out the answering sheet to record the child's response. The URAs in the video checking team would double check the completed answering sheets based on the video tapes, to make sure child's answers were correctly recorded. The team leader of the video checking team would randomly check their work, and upon finding problems, make corrections. The coding of the video tapes was straightforward. The URAs in the data coding and entering team were also paired. After the initial coding and entering of the data, all data was double checked back to back by different paired URAs. The URAs accurately coded and entered 99% of the responses. The two experts (team leaders) of the data coding and entering team went through a final check of all the data. If any questions/disagreements arose, the team leader and I would meet and come to an agreement to resolve the ambiguity.

I looked across the three trials to determine the frequency with which each child chose one of the two alternatives to compute a score of 0 to 3 for each child (0 = never chooses alternative object A, 1 = chooses alternative object A on 1 of 3 trials, 2 = chooses alternative object A on 2 of 3 trials, etc.). I then planned to compare the mean frequency of an object choice between 3 and 5-year-olds to determine if the two age groups differ in their object choice. I predicted the following results. For Phase 1, I predicted that significantly more preschoolers would fall into the internal response category (selecting the internally-similar objects on the majority of trials) than would be expected by chance in the 5-year-old group but not in the 3-year-old group. For the 3-year-olds, significantly more preschoolers would fall into the external response category (selecting the externally-similar object on the majority of trials) than would be expected by chance. For Phase 2, I predicted that significantly more preschoolers would fall into the behavior/action response category (selecting the behavioral/action-similar object on the majority of trials) than would be expected by chance in the 3-year-old group but not in the 5-year-old group. For the 5-year-olds, preschoolers would not differ from chance in their choice of a behavioral/action-similar object vs. an externally-similar object. For Phase 3, I predicted that significantly more preschoolers would fall into the behavioral/action response category (selecting the behavioral/action-similar object on the majority of trials) than would be expected by chance in the 3-year-old group but not in the 5-year-old group. For the 5-year-olds, significantly more preschoolers would fall into the internal response category (selecting the internally-similar objects on the majority of trials) than would be expected by chance.

Results

Preliminary analyses

As a first step in the analyses, I examined whether there was an effect of the order in which the object sets were presented. Preliminary analyses revealed no effect of order in either Phase 1 (for 3-year-olds, Kruskal–Wallis test, $\chi 2[5, N = 26] = 3.19$, p=.671, ns; for 5-year-olds, Kruskal–Wallis test, $\chi 2\ [5, N = 30] = 4.86$, p=.433, ns), Phase 2 (for 3-year-olds, Kruskal–Wallis test, $\chi 2[5, N = 31] = 6.92$, $p = .227$, ns; for 5-year-olds, Kruskal–Wallis test, $\chi 2[5, N = 30] = 2.79$, $p = .732$, ns), or in Phase 3 (for 3-year-olds, Kruskal–Wallis test, $\chi 2[3, N = 29] = 3.82$, $p = .148$, ns; for 5-year-olds, Kruskal–Wallis test, $\chi 2\ [3, N = 28] = 3.22$, $p = .200$, ns).

Second, I examined whether participants' responses to the three object sets differed. Analyses revealed that participants were not more likely to select one alternative object over another as a function of object set in either Phase 1 (for 3-year-olds, Cochran's $Q[2] = 1.60$, p=.449, ns; for 5-year-olds, Cochran's $Q[2] = 4.20$, p=.122, ns), Phase 2 (for 3-year-olds, Cochran's $Q[2] = 1.08$, p=.582, ns; for 5-year-olds, Cochran's $Q[2] = 2.33$, p=.311, ns), or in Phase 3 (for 3-year-olds, Cochran's $Q[2] = 0.00$, $p = 1.000$, ns; for 5-year-olds, Cochran's $Q[2] = 2.10$, $p = .350$, ns). Therefore, the data of the participants' choice pattern from the three trials were combined for subsequent analyses, to make an overall total score that ranged from zero to 3. These data are shown in Tables 4, 5, and 6, as well as the pattern of choice expected by chance responding.

Third, although I had no specific hypotheses regarding gender differences in participants' responses, I conducted a Welch t test, which is robust when two sample sizes are unequal (Boneau, 1960; Kohr & Games,1974; Posten, 1984; Schmider, Ziegler,

Danay, Beyer,& Buhner, 2010, Winer, 1971), to investigate any gender differences. No effect of gender emerged in the sample in either Phase 1 (for 3-year-olds, Welch *t* [21.33] = 1.73, *p* = 0.098, ns; for 5-year-olds, Welch *t* [20.76] = .51, *p* = .622, ns), in Phase 2 (for 3-year-olds, Welch *t* [14.05] =- .75, *p* = .467, ns; for 5-year-olds, Welch *t* [27.87] = 1.55, *p* = .133, ns), or in Phase 3 (for 3-year-olds, Welch *t* [19.59] =1 .15, *p* = .264, ns; for 5-year-olds, Welch *t* [23.58] = 1.82, *p* = .081, ns). Therefore, participants' gender was omitted from further consideration.

Plan for Main Analyses

Two main sets of analyses were conducted to test the hypotheses. The first analysis set was an independent phase analysis to examine the preschoolers' choice patterns at each phase. The second analysis set was an across phase analysis to examine whether preschoolers' choice patterns in one phase would fit into their responding in another phase in the same domain of identity understanding.

Table 4

Summary of Number of Participants Making Internal Causal Responses Based on Condition

Condition	*Number of Internal Reponses Out of 3 Trials (% of N)*				*Mean*	*SD*
	0	*1*	*2*	*3*		
Phase 1 (External vs. Internal)						
3-year-olds (*N* = 26)	6 (23.1)	6 (23.1)	9 (34.6)	5 (19.2)	1.50	1.068
Expected by chance	3.25	9.75	9.75	3.25		
5-year-olds (*N* = 30)	9 (30.0)	2 (6.7)	8 (26.7)	11 (36.7)	1.70	1.264
Expected by chance	3.75	11.25	11.25	3.75		
Total (*N* = 56)	15 (26.8)	8 (14.3)	17 (30.3)	16 (28.6)	1.61	1.171
Expected by chance	7	21	21	7		
Phase 3 (Behavioral/action vs. Internal)						
3-year-olds (*N* = 29)	3 (10.3)	7 (24.1)	13 (44.8)	6 (20.7)	1.76	.912
Expected by chance	3.63	10.88	10.88	3.63		
5-year-olds (*N* = 28)	3 (10.7)	10 (35.7)	10 (35.7)	5 (17.9)	1.61	.916
Expected by chance	3.50	10.50	10.50	3.50		
Total (*N* = 57)	6 (10.5)	17 (29.8)	23 (40.4)	11 (19.3)	1.68	.909
Expected by chance	7.13	21.38	21.38	7.13		

Note. Coding: For each trial, the preschoolers were given a score of one if they chose the internally-similar object and zero if they chose the non-internally- (externally or behavioral/action) similar object.

Table 5

Summary of Number of Participants Making External Causal Responses Based on Condition

Condition	*Number of External Reponses Out of 3 Trials (% of N)*				*Mean*	*SD*
	0	*1*	*2*	*3*		
Phase 1 (Internal vs. External)						
3-year-olds (*N* = 26)	5 (19.2)	9 (34.6)	6 (23.1)	6 (23.1)	1.50	1.068
Expected by chance	3.25	9.75	9.75	3.25		
5-year-olds (*N* = 30)	11 (36.7)	8 (26.7)	2 (6.7)	9 (30)	1.30	1.264
Expected by chance	3.75	11.25	11.25	3.75		
Total (*N* = 56)	16 (28.6)	17 (30.3)	8 (14.3)	15 (26.8)	1.39	1.171
Expected by chance	7	21	21	7		
Phase 2 (Behavioral/action vs. External)						
3-year-olds (*N* = 31)	1 (3.2)	11 (35.5)	13 (41.9)	6 (19.4)	1.77	.805
Expected by chance	3.88	11.63	11.63	3.88		
5-year-olds (*N* = 30)	6 (20.0)	3 (10.0)	15 (50.0)	6 (20.0)	1.70	1.022
Expected by chance	3.75	11.25	11.25	3.75		
Total (*N* = 61)	7 (11.4)	14 (23.0)	28 (45.9)	12 (19.7)	1.74	.911
Expected by chance	7.62	22.88	22.88	7.62		

Note. Coding: For each trial, the preschoolers were given a score of one if they chose the externally-similar object and zero if they chose the non-externally (internally or behavioral/action) similar object.

Table 6

Summary of Number of Participants Making Behavior/Action Causal Responses Based on Condition

Condition	*Number of Action Reponses Out of 3 Trials (% of N)*				*Mean*	*SD*
	0	*1*	*2*	*3*		
Phase 2 (Behavioral/action vs. External)						
3-year-olds (*N* = 31)	6 (19.4)	13 (41.9)	11 (35.5)	1 (3.2)	1.23	.805
Expected by chance	3.88	11.63	11.63	3.88		
5-year-olds (*N* = 30)	6 (20.0)	15 (50.0)	3 (10.0)	6 (20.0)	1.30	1.022
Expected by chance	3.75	11.25	11.25	3.75		
Total (*N* = 61)	12 (19.7)	28 (45.9)	14 (23.0)	7 (11.4)	1.26	.911
Expected by chance	7.62	22.88	22.88	7.62		
Phase 3 (Internal vs. Behavioral/action)						
3-year-olds (*N* = 29)	6 (20.7)	13 (44.8)	7 (24.1)	3 (10.3)	1.24	.912
Expected by chance	3.63	10.88	10.88	3.63		
5-year-olds (*N* = 28)	5 (17.9)	10 (35.7)	10 (35.7)	3 (10.7)	1.39	.916
Expected by chance	3.50	10.50	10.50	3.50		
Total (*N* = 57)	11 (19.3)	23 (40.4)	17 (29.8)	6 (10.5)	1.32	.909
Expected by chance	7.13	21.38	21.38	7.13		

Note. Coding: For each trial, the preschoolers were given a score of one if they chose the behavioral/action-similar object and zero if they chose the non-behavioral/action-(internally or externally) similar object.

Independent Phase Analyses: Insides vs. Outsides (Phase 1)

Descriptive statistics for the sample characteristics are presented in Table 1. The participants' task was to choose one of the alternative objects (Object A & Object B) that they thought could make the machine light up and play music. For each trial, the

participants were given a score of 1 if they chose the internally-similar object and 0 if they chose the externally-similar object. Three-year-olds chose the internally-similar objects on approximately 50% of the trials (M = 1.50, SD = 1.07), whereas 5-year-olds chose the internally-similar objects on approximately 56.7% of the trials (M = 1.70, SD = 1.26).

The data were compared against chance responding. Because two of the expected values were below five, I collapsed the data into two choice patterns: internal responses (selected the internally-similar objects on 2–3 of 3 trials), and external responses (selected the internally-similar objects on 0–1 of 3 trials). Three-year-olds were internal responders 54% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .845, ns. Five-year-olds were internal responders 63% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .200, ns.

Next, I examined the proportion of preschoolers' responses that were consistent over all 3 trials, and compared it against chance responding. I collapsed the data into two choice patterns: consistent responses (selected the internally-similar objects on 0 or 3 of 3 trials), and inconsistent responses (selected the internally-similar objects on 1 or 2 of 3 trials). Three-year-olds were consistent responders 42% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .557, ns. Five-year-olds, however, were consistent responders 67% of the time, a marginally trend toward significant responding more often than would be expected by chance (50%), binomial tests, p = .09.

Independent Phase Analysis: Outsides vs. Action (Phase 2)

Descriptive statistics for the sample characteristics are presented in Table 2. The participants' task was to choose one of the alternative objects (Object A & Object B) that they thought could make the machine light up and play music. For each trial, the participants were given a score of 1 if they chose the externally-similar object and 0 if they chose the behavioral/action-similar object. Three-year-olds chose the externally-similar object on approximately 59.1% of the trials (M = 1.77, SD = .805), whereas 5-year-olds chose the externally-similar object on approximately 56.7% of the trials (M = 1.70, SD = 1.02).

The data were compared against chance responding. Because two of the expected values were below five, I collapsed the data into two choice patterns: behavior/action responses (selected the behavioral/action-similar objects on 2–3 of 3 trials), and external responses (selected the behavioral/action-similar objects on 0–1 of 3 trials). Three-year-olds were external responders 61% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .281, ns. Five-year-olds were external responders 70% of the time, significantly more often than would be expected by chance responding (50%), binomial tests, p = .043.

Next, I examined the proportion of preschoolers' responses that were consistent over all 3 trials, and compared it against chance responding. I collapsed the data into two choice patterns: consistent responses (selected the externally-similar objects on 0 or 3 of 3 trials), and inconsistent responses (selected the externally-similar objects on 1 or 2 of 3 trials). Three-year-olds were consistent responders 23% of the time, significantly less

often than would be expected by chance responding (50%), binomial tests, $p = .003$. Five-year-olds, in contrast, were consistent responders 40% of the time, no more often than would be expected by chance responding (50%), binomial tests, $p = .362$, ns.

Independent Phase Analysis: Insides vs. Action (Phase 3)

Descriptive statistics for the sample characteristics are presented in Table 1. The participants' task was to choose one of the alternative objects (Object A & Object B) that they thought could make the machine light up and play music. For each trial, the participants were given a score of 1 if they chose the internally-similar object and 0 if they chose the behavioral/action-similar object. Three-year-olds chose the internally-similar object on approximately 58.6% of the trials ($M = 1.76$, $SD = .91$), whereas 5-year-olds chose the internally-similar object on approximately 53.6% of the trials ($M = 1.61$, $SD = .92$).

The data were compared against chance responding. Because two of the expected values were below 5, I collapsed the data into two choice patterns: internal responses (selected the internally-similar objects on 2–3 of 3 trials), and behavioral/action responses (selected the internally-similar objects on 0–1 of 3 trials). Three-year-olds were internal responders 66% of the time, no more often than would be expected by chance responding (50%), binomial tests, $p = .136$, ns. Five-year-olds were internal responders 54% of the time, no more often than would be expected by chance responding (50%), binomial tests, $p = .851$, ns.

Next, I examined the proportion of preschoolers' responses that were consistent over all 3 trials, and compared it against chance responding. I collapsed the data into two choice patterns: consistent responses (selected the internally-similar objects on 0 or 3 of 3

trials), and inconsistent responses (selected the internally-similar objects on 1 or 2 of 3 trials). Three-year-olds were consistent responders 31% of the time, a trend towards significantly less often than would be expected by chance responding (50%), binomial tests, $p = .061$. Five-year-olds were consistent responders 29% of the time, significantly less often than would be expected by chance responding (50%), binomial tests, $p = .036$.

Across Phase Analyses

In addition to examining preschoolers' choice patterns at each phase, I was interested in looking into whether preschoolers' choice patterns in one phase would fit into their response patterns in another phase in the same domain of identity understanding. In other words, did preschoolers have a general preference across phases with respect to any particular quality of an object (e.g., internal, external or behavioral/action)? To investigate this question, I conducted comparisons of participant responding across phases: 1) internal vs. non-internal (e.g., outsides or behavioral/action) causal conditions (Phase 1 and Phase 3); 2) external vs. non-external (e.g., insides or behavioral/action) causal conditions (Phase 1 and Phase 2); and 3) behavioral/action vs. non-behavioral/action (e.g., insides or outsides) causal conditions (Phase 2 and Phase 3).

Across Phase Analyses: Internal vs. Non-internal Causal Conditions (Phase 1 and Phase 3)

I combined the data of Phase 1 (insides vs. outsides) and Phase 3 (insides vs. behavioral/action) because the two alternatives for both phases are internal vs. non-internal quality. Specifically, for each trial, the participants were given a score of 1 if they chose the internally-similar object and 0 if they chose the non-internal (external behavioral/action) similar object. Summaries of preschoolers making internal causal

responses are presented in Table 7 (based on age). Three-year-olds chose the internally-similar objects on approximately 54.55% of the trials (M = 1.64, SD = .988), whereas 5-year-olds chose the internally-similar objects on approximately 55.17% of the trials in the internal vs. non-internal domain (M = 1.66, SD = 1.101).

The combined data of Phase 1 and Phase 3 were compared against chance responding. I collapsed the data into two choice patterns: internal responses (selected the internally-similar objects on 2–3 of 3 trials), and non-internal responses (selected the internally-similar objects on 0–1 of 3 trials). Three-year-olds were internal responders 60.0% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .177, ns. Five-year-olds were internal responders 58.9% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .237, ns.

Table 7

Summary of Number of Participants Making Internal Causal Responses Based on Age

Age	*Number of Internal Reponses Out of 3 Trials (% of N)*				*Mean*	*SD*
	0	*1*	*2*	*3*		
3-year-olds						
Phase 1 (*N* = 26)	6 (23.1)	6 (23.1)	9 (34.6)	5 (19.2)	1.50	1.068
Expected by chance	3.25	9.75	9.75	3.25		
Phase 3 (*N* = 29)	3 (10.3)	7 (24.1)	13 (44.8)	6 (20.7)	1.76	.912
Expected by chance	3.63	10.88	10.88	3.63		
Total (*N* = 55)	9 (16.4)	13 (23.6)	22 (40.0)	11 (20.0)	1.64	.988
Expected by chance	6.88	20.63	20.63	6.88		
5-year-olds						
Phase 1 (*N* = 30)	9 (30.0)	2 (6.7)	8 (26.7)	11 (36.7)	1.70	1.264
Expected by chance	3.63	10.88	10.88	3.63		
Phase 3 (*N* = 28)	3 (10.7)	10 (35.7)	10 (35.7)	5 (17.9)	1.61	.916
Expected by chance	3.50	10.50	10.50	3.50		
Total (*N* = 58)	12 (20.7)	12 (20.7)	18 (31.0)	16 (27.6)	1.66	1.101
Expected by chance	7.25	21.75	21.75	7.25		

Note. Coding: For each trial, the preschoolers were given a score of one if they chose the internally-similar object and zero if they chose the non-internally- (externally or behavioral/action) similar object.

Across Phase Analyses: External vs. Non-external Causal Conditions (Phase 1 and Phase 2)

I combined the data of Phase 1 (inside vs. outside) and Phase 2 (outside vs. behavioral/action) because the two alternatives for both phases are external vs. non-

external quality. Specifically, for each trial, the participants were given a score of 1 if they chose the external similar object and 0 if they chose the non-external (internal or behavioral/action) similar object. Summaries of preschoolers making external causal responses are presented in Table 8 (based on age). Three-year-olds chose the externally-similar objects on approximately 55.0% of the trials (M = 1.65, SD = .935), whereas 5-year-olds chose the externally-similar objects on approximately 50.0% of the trials in the external vs. non-external domain (M = 1.50, SD =1.157).

The combined data of Phase 1 and Phase 2 were compared against chance responding. I collapsed the data into two choice patterns: external responses (selected the externally-similar object on 2–3 of 3 trials), and non-external responses (selected the externally-similar object on 0–1 of 3 trials). Three-year-olds were external responders 54.4% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .597, ns. Five-year-olds were external responders 53.3% of the time, no more often than would be expected by chance responding (50%), binomial tests, p = .699, ns.

Table 8

Summary of Number of Participants Making External Causal Responses Based on Age

Condition	*Number of External Reponses Out of 3 Trials (% of N)*				*Mean*	*SD*
	0	*1*	*2*	*3*		
3-year-olds						
Phase 1 (*N* = 26)	5 (19.2)	9 (34.6)	6 (23.1)	6 (23.1)	1.50	1.068
Expected by chance	3.25	9.75	9.75	3.25		
Phase 2 (*N* = 31)	1 (3.2)	11 (35.5)	13 (41.9)	6 (19.4)	1.77	.805
Expected by chance	3.88	11.63	11.63	3.88		
Total (*N* = 57)	6 (10.5)	20 (35.1)	19 (33.3)	12 (21.1)	1.65	.935
Expected by chance	7.13	21.38	21.38	7.13		
5-year-olds						
Phase 1 (*N* = 30)	11 (36.7)	8 (26.7)	2 (6.7)	9 (30.0)	1.30	1.264
Expected by chance	3.75	11.25	11.25	3.75		
Phase 2 (*N* = 30)	6 (20.0)	3 (10.0)	15 (50.0)	6 (20.0)	1.70	1.022
Expected by chance	3.75	11.25	11.25	3.75		
Total (*N* = 60)	17 (28.3)	11 (18.3)	17 (28.3)	15 (25.0)	1.50	1.157
Expected by chance	7.13	21.38	21.38	7.13		

Note. Coding: For each trial, the preschoolers were given a score of one if they chose the externally-similar object and zero if they chose the non-externally- (internally or behavioral/action) similar object.

Across Phase Analyses: Behavioral/action vs. Non-Behavioral/action Causal Conditions (Phase 2 and Phase 3)

I combined the data of Phase 2 (outside vs. behavioral/action) and Phase 3 (inside vs. behavioral/action) because the two alternatives for both phases are behavioral/action vs. non-behavioral/action quality. Specifically, for each trial, the participants were given

a score of 1 if they chose the behavioral/action-similar object and 0 if they chose the non-behavioral/action (inside or outside) similar object. Summaries of preschoolers making behavioral/action causal responses are presented in Table 8 (based on age). Three-year-olds chose the behavioral/action-similar objects on approximately 33.3% of the trials (M = 1.23, SD = .851), whereas 5-year-olds chose the behavioral/action-similar objects on approximately 44.8% of the trials in the behavioral/action vs. non-behavioral/action domain (M = 1.34, SD =.965).

The combined data of Phase 2 and Phase 3 were compared against chance responding. I collapsed the data into two choice patterns: behavioral/action responses (selected the behavioral/action-similar object on 2–3 of 3 trials), and non-behavioral/action responses (selected the behavioral/action-similar object on 0–1 of 3 trials). Three-year-olds were behavioral/action responders 36.7% of the time, a trend toward significantly less often than would be expected by chance responding (50%), binomial tests, p = .052. Five-year-olds were behavioral/action responders 37.9% of the time, a marginally trend toward significant responding less often than would be expected by chance (50%), binomial tests, p = .087.

Table 9

Summary of Number of Participants Making Behavior/Action Causal Responses Based on Age

Condition	*Number of Behavioral/action Reponses Out of 3 Trials (% of N)*				*Mean*	*SD*
	0	*1*	*2*	*3*		
3-year-olds						
Phase 2 (*N* = 31)	6 (19.4)	13 (41.9)	11 (35.5)	1 (3.2)	1.23	.805
Expected by chance	3.88	11.63	11.63	3.88		
Phase 3 (*N* = 29)	6 (20.7)	13 (44.8)	7 (24.1)	3 (10.3)	1.24	.912
Expected by chance	3.63	10.88	10.88	3.63		
Total (*N* = 60)	12 (20.0)	26 (43.3)	18 (30.0)	4 (6.7)	1.23	.851
Expected by chance	7.50	22.50	22.50	7.50		
5-year-olds						
Phase 2 (*N* = 30)	6 (20.0)	15 (50.0)	3 (10.0)	6 (20.0)	1.30	1.022
Expected by chance	3.75	11.25	11.25	3.75		
Phase 3 (*N* = 28)	5 (17.9)	10 (35.7)	10 (35.7)	3 (10.7)	1.39	.916
Expected by chance	3.50	10.50	10.50	3.50		
Total (*N* = 58)	11 (19.0)	25 (43.1)	13 (22.4)	9 (15.5)	1.34	.965
Expected by chance	7.25	21.75	21.75	7.25		

Note. Coding: For each trial, the preschoolers were given a score of one if they chose the behavioral/action-similar object and zero if they chose the non-behavioral/action-(internally or externally) similar object.

Discussion

The main aim of this study ventured to enrich previous work, investigating the extent to which young preschoolers (e.g., 3-year-olds) understand identity in terms of what an object does rather than in terms of either what the object looks like or what its

inside properties are. To investigate this issue I have taken Sobel et al.'s (2007) paradigm and modified it to include diverse pairs (e.g., insides, outsides, behavior/action) in order to explore different levels/qualities of organization that characterize preschoolers' judgments of identity constancy. I suggested that a transition may occur between the ages of 3- and 5-years-old: a shift from a focus on behavior/action to a focus on insides as foundational to identity judgments.

Results of this study revealed that: First, there was no evidence in 5-year-olds of a consistent tendency toward aligning identity with insides or outsides, the same occurred in 3-year-olds, and it appeared that their responses did not significantly differ from chance; Second, with respect to behavior/action, as opposed to my prediction, preschoolers (both 3- and 5-year-olds) preferred either insides or outsides over behavior/action. Also, significantly more 5-year-olds chose outsides over behavior/action when the two were compared; and across the phases, when behavior/action was compared with non-behavior/action, non-behavior/action was overwhelmingly preferred by both 3- and 5-year-olds. In other words, preschoolers did not seem to consider behavior/action as central to identity in the context of this causal paradigm.

More specifically, with respect to my first prediction in Phase 1, I predicted that significantly more preschoolers would fall into the internal response category (selecting the internally-similar objects on the majority of trials) than would be expected by chance in the 5-year-old group but not in the 3-year-old group. For the 3-year-olds, significantly more preschoolers would fall into the external response category (selecting the externally-similar object on the majority of trials) than would be expected by chance. However, I found no support for this prediction and the result of this phase was not

consistent with the findings reported in Sobel et al (2007). Why does this study not replicate Sobel et al.? Does the failure to replicate reflected on the fact that Sobel's study is not replicable, or are there other possibilities than were indicated by Sobel's illustration of what takes place at 3 and 4 years of age? Or does the failure to replicate reflect a function of that my attempt to replicate differed from his study? The following paragraphs explain how this study differed from Sobel et al.

First, it differed in terms of sampling trials. In the current study, I used 3 instead of 4 trials. This minor dissimilarity is not significant or meaningful enough to make a real difference. This study offered enough trials to measure consistency in a child's responding. Additionally, it captured the tendency of 3-and 5-year-olds showing significant bias against behavior/action. Future study should investigate on these two different approaches by directly comparing and contrasting them (3 trials vs. 4 trials) in order to determine whether one fewer trial is of consequence. If a study does not replicate using the approach in Sobel et al.(2007) with one fewer trial, it is possible that the phenomenon Sobel et al. found is unstable.

Second, it differed in terms of research stimuli. This study deployed testing with animation instead of real life presentation. It is possible that this differentiation makes this study even more standardized. It enabled the researcher to limit uncontrollable factors and mistakes to the lowest level during testing phases. With video clip presentations, preschoolers have a direct visual experience of learning various qualities that represent objects to help with their identity judgments. This study seems to demonstrate a unique and positive approach. However, there is a possibility that the presence of animation could have a negative impact on younger preschoolers' ability to

concentrate on the information provided by the experimenter. To that effect, this second difference would play a role. It is possible that the preschoolers' visual experience of animation in this study versus Sobel et al. (2007) participants' visual experience of 3-dimensional objects may be a contributor to the incongruence in findings. Future research will be required to examine which patterns (i.e., the assertion of Sobel et al. that 3-year-olds are externalists, and 4-year-olds are essentialists; vs. no distinct essentialist tendency emerging in the 5-year -olds and no distinct externalist tendency emerging in the 3-year-olds) are more legitimate as a representation of preschoolers' identity judgments. As a suggestion, one direct way is to compare and contrast these two different approaches (real life presentation vs. animation). For instance, researchers could apply the real life presentation approach to half of the participants, and apply the animation approach to the other half of the participants with an equal number of trials in order to see whether the method make any difference.

Third, it differed in terms of ethnicity, socioeconomic status (SES), and parent education level diversity. In terms of ethnicity, the distribution in this study is diversely distributed (54% are Caucasian), whereas a greater proportion of the distribution in Sobel et al (2007) is Caucasian (75%). In order to examine whether ethnicity plays a role, I re-examined the data of this study by reducing the sample size to only include Caucasian children, and compared their responses against chance. The result revealed that, after the sample size reduction, the proportion of the 5-year-olds who fall into internal responder category remained the same as before. Thus, ethnicity diversity is not a factor. Next I examined whether SES plays a role by reducing the sample size to include only preschoolers parent education levels are college and above. The result revealed that 71%

(17 out of 24) of the 5-year-olds fall into the internal responder category, more than would be expected by chance (p=.064). Hence, it is possible that SES diversity is a factor. I then conducted similar sample size reductions to include only preschoolers from an upper-middle level income family (equal to or more than $50,000 annually). The results revealed that 74% (14 out of 19) of the 5-year-olds fall into the internal responder category, more than would be expected by chance (p=.064). So it is possible that the diversity of parent education level is a factor. Future research on diversity of SES and parent education level in relation to preschoolers identity judgments is needed, as Sobel et al. did not include any information in related to these two factors.

Disparity between 5-year-olds' response pattern in the narrow sample versus the sample as a whole raises a question: why would preschoolers from higher SES backgrounds and whose parents have higher education show a greater tendency to exhibit essentialist thought compared to my sample as a whole? It is possible that this disparity has something to do with language differences between the narrow sample and the sample as a whole. Preschoolers at the lower end of the SES spectrum and lower parental education levels may not experience the same kind of enriched language environment as preschoolers from higher SES and parental education levels. Gelman (2003) has acknowledged that language might have an influence on essentialist thoughts but argues that the emergence of essentialist thought is more likely to precede language development than to follow from it.

However, in the Theory of Mind (ToM) literature, language environment seems to be critical to the acquisition of a theory of mind (Dunn, Brown, Slomkowski, Tesla & Youngblade, 1991; Mar, Tackett & Moore, 2010; Milligan, Astington, & Dack, 2007).

Parents, for example, who spend more time talking with their children about psychological states (e.g., emotions, feelings, and thoughts) have children who demonstrate more advanced ToM skills. Additionally, maternal psychological talk predicts children's ToM understanding (Ruffman, Slade, & Crowe, 2002). Thus, how parents talk with their children about internal states matters to their children's cognitive development. Given this, it makes sense that increased exposure to talk about internal states may also help children to develop more of an essentialist frame of mind. It is possible that this is, in fact, what accounts for my findings. Future research needs to examine the contribution of language to preschoolers' causal identity judgments.

For Phase 1, even though 5-year-olds did not show any inclination to choose either insides or outsides, they showed a statistical trend of falling into the consistent responder category. In other words, a majority of the 5-year-olds were consistent responders when contrasting insides vs. outsides. When I examined these consistent responders, their responding did not favor one direction. Eleven out of 20 chose insides, and 9 out of 20 chose outsides. Because 5-year-olds were more consistent in their responding, they seem to have achieved more stability when compared to 3-year-olds.

With respect to my first prediction in Phase 2, I predicted that significantly more preschoolers would fall into the behavior/action response category (selecting the behavioral/action-similar object on the majority of trials) than would be expected by chance in the 3-year-old group. For the 5-year-olds, preschoolers would not differ from chance in their choice of a behavioral/action-similar object vs. an externally-similar object. For Phase 3, I predicted that significantly more preschoolers would fall into the behavioral/action response category (selecting the behavioral/action-similar object on the

majority of trials) than would be expected by chance in the 3-year-old group. For the 5-year-olds, significantly more preschoolers would fall into the internal response category (selecting the internally-similar objects on the majority of trials) than would be expected by chance. Distinguished from my prediction for Phases 2 and 3, preschoolers showed bias against behavior/action in their identity judgments. To both 3-and 5-year-olds, behavior/action does not seem to matter when making identity judgments. The findings in Phases 2 and 3 raised a question: why does this study not show preschoolers favoring behavior/action as some previous studies have shown (e.g., Mohr, 1978; Nicolopoulou & Richner, 2007; Shipley, 2000)?

One possible explanation is that even though this study is about identity, it is about a specific function of identity: how identity relates to causality (e.g., what is it about this object that activates the machine?). More specifically, I examined how the property of identity relates to causal aspects of the world, or, how it might cause changes in other things. By this account, the current study is a causal paradigm, whereas the other studies were not causal paradigms, instead, they focus on the nature of identity, which does not equate to the causal aspect of identity. Additionally, the other studies suggested that children think behavior/action is important for identifying what something is, and they think that what something is depends on what it does (behavior/action). But in this current paradigm, I asked what about this object (i.e., the property of the object) causes the machine to light up and play music. That is a little different than asking what is the nature of the object, even though we may expect that behavior/action would be of relevance. Hence, this paradigm is about a very specific consequence of identity, whereas

the other studies were about the nature of identity itself. But still, they are all identity paradigms that map onto the general understanding of identity.

Moreover, when children start to become essentialist, they think our insides make us who we are, and thus controls our behavior/action (Gelman, 2000, 2003; Gelman & Wellman, 1991; Gottfried & Gelman, 2005; Keil, 1989; Newman & Keil, 2008; Simons & Keil, 1995). Simply understanding that our insides make us who we are is different than understanding our insides have a causal impact on what we do and to what degree we understand the consequence of our behavior/action. Those are two different realms of identity paradigm. These potential differences might explain the apparent inconsistency between the finding of this study and previous ones, even though they are studies in relation to identity. Overall, there is solid evidence in this study supporting the idea that behavior does not constitute an important critical factor for preschoolers in a causal paradigm.

Results of this study shed new light on our understanding of developmental patterns between ages 3 and 5. I found alternative developmental pathways with regards to consistency in preschoolers responding. At age 5, preschoolers showed consistency in their responding, however, their responding did not favor one direction. In other words, neither did they all consistently hold essentialist thoughts or consistently hold externalist thoughts. Nearly half of them showed essentialist bias, and half of them showed externalist bias, whereas Sobel et al. (2007) suggested consistency at ages of 4 and 5 (i.e., preschoolers were consistently essentialists at ages 4 and5). The 5-year-olds showed more individual variability in their consistence (e.g., there seems to be stability within participants in their responses, but more variability between participants). Age 3,

preschoolers did not show consistency in their responding, and their responses were inconclusive. Given my results, it is possible that younger preschoolers are still in a transition period, and their organizational structure in identity judgments is potentially fragile, unlike what Sobel et al (2007) suggested, consistency at age 3 (i.e., preschoolers were consistently externalists at age 3).

Overall, there was more variability within participants at 3 years; and at 5 years, there seems to be more stability within participants in their responding, but more variability between participants when contrasting insides with outsides. Additionally, there was more variability within participants at 3- and 5-years when contrasting behavioral/action with insides or outsides. These findings suggest that younger (e.g., 3-year-olds) preschoolers' thoughts are in flux, suggesting the possibility that younger preschoolers are in a developmentally transitional period.

Limitations and Future Directions

It is important to recognize that a number of limitations of this study could be addressed in future research. First, although this study involved the investigation and examination of ideas/findings reported in Sobel et al. (2007), I must emphasize that I used different research stimuli, different numbers of sampling trials and sample sizes, and my statistical analyses differed from those implemented in previous research. Therefore, any comparison of the current results with previous findings should be treated with caution. Additional research is still required to examine which developmental patterns are more legitimate as a representation of preschooler identity judgments. Researchers are encouraged to directly compare and contrast the two different approaches (real life presentation vs. animation; 3 trials vs. 4 trials).

The second limitation is the diversity of the samples. This study included nearly 180 preschoolers in over 10 preschools from Albuquerque, NM from a variety of educational backgrounds and socioeconomic statuses. This is not a homogenous sample when compared to Sobel et al.(2007) , which introduced more variability in the sample and complicated results. As the findings of this study suggested, parent education level and SES seem play a role. A suitable larger sample size is required for future research in order to wash out the variability in the sample. Or researcher should implement systematical control to that variability by having an equal number of participants in different parent education or SES groups. Sobel et al's study, in its original methodology, needs to be replicated with more economically and educationally diverse samples in order to gain a deeper understanding of how these two factors influences the development of identity judgments in preschoolers.

Lastly, this study involved many experimenters in order to complete three phases which involved a great number of preschoolers throughout a period of over one and a half academic years. All of the experimenters were pre-tested, well trained and each participant's testing session utilized prescribed, standardized transcripts for the purpose of continuity and consistency. However, the more experimenters we involved, the more uncontrollable the factors, which naturally introduced more variability into the study, which may have affected outcome.

Future work need to examine how systematically this study (i.e., a causal paradigm) is related to other identity judgment studies (i.e., adoption paradigm, transformation/transplant paradigm) by studying the same child's responses to these

different paradigms to see if there is consistency in his/her responding across these paradigms.

Conclusion

Decades of research have revealed a great deal about young preschoolers' understanding of identity in terms of *either* what the object looks like (external quality) *or* what its inside properties are (internal quality), but not much in terms of what an object does (behavioral/action quality). In the paradigm introduced in this study, I explored how three organizational qualities (internal, external, and behavioral/action features) contribute to preschoolers' identity judgments. Findings suggest that preschoolers do not seem to grant behavior/action any causal power when determining object identity. Failing to replicate Sobel et al. (2007), it is possible that the phenomenon they found in their study was legitimate but highly fragile, or perhaps I did not replicate Sobel et al. because younger preschoolers' thoughts are in flux. Five-year-olds show consistency in their responding, but this consistency is not in one direction (e.g., essentialist thoughts) as Sobel et al. suggests. Further research is needed to investigate which developmental patterns are more legitimate as a representation of preschoolers' identity judgments. Sobel et al's study, in its original methodology, is encouraged to be replicated with more economically and educationally diverse samples in order to gain a deeper understanding of how these two factors influences the development of identity judgments in preschoolers.

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