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The Role of Sharing and Information Type in Children's Categorization of Privileged and Conventional Information

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The Role of Sharing and Information Type in Children's Categorization of Privileged and Conventional Information

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Abstract

Categorization is an essential part of our daily lives and an integral part of humans' ability to function and interact within society. There are large bodies of research that document children's categorization in domains such as natural kinds, artifacts and human kinds. One domain that has not been investigated is children's ability to categorize different types of information; specifically conventional information, shareable to others with no restrictions, and privileged information, shareable to only a few. Study 1 investigated 4- and 5-year-olds and adults' ability to categorize conventional and privileged information. All participants correctly categorized both types of information equally well at above chance levels, though each older age group performed significantly better than the younger age group. Study 2 investigated whether 4- and 6-year-old and adults categorize information by its category membership or whether the information is shared or not shared. Four-year-olds and adults categorized conventional information by its category membership and did so significantly more than 6-year-olds. There was no pattern of responses to the categorization for privileged information by participants in any age group. Though this ability develops with age, by the age of 4 children are able to distinguish between and identify conventional and privileged information. There appears to be a U-shaped curve of development for categorizing conventional information by its category membership, which is not apparent in the categorization of privileged information.

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Dedication

This dissertation is dedicated to my parents. This would not have been possible without their continuous and unconditional support.

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The role of sharing and information type in children's categorization of privileged and conventional information

Categorization is a ubiquitous and essential part of our daily lives (Carey, 1985; Diesendruck, 2003; Gelman, 2003; Hirschfeld, 1996; Murphy, 2002; Rhodes & Gelman, 2009). It is an integral part of a human's ability to function and interact within society and the world at large. Importantly, when categorizing any entity, people make inferences about its properties and based on these properties, know how to act around it and what to predict from it (Diesendruck & Weiss, 2014; Gelman, 2003; Murhpy, 2002; Rhodes & Gelman, 2009). People also use their previous knowledge of categorized items to infer the label and properties of novel items, thereby reducing unpredictability. People can efficiently maneuver throughout their world, applying past knowledge to categorize future people, objects, food; indeed almost anything that is liable to be encountered. This is a necessary part of conceptual development in building cohesive, integrative and structured mental representations of the world (Murphy, 2002). It would not be much of an exaggeration to say that without the ability to categorize, the time and effort to identify one's surroundings and to avoid danger would stop life as it is now (Murphy, 2002). A key goal of research in cognitive development is to understand how children learn and integrate knowledge into categories and concepts.

There are large bodies of research on children's categorization in domains such as natural kinds, artifacts and human kinds, which have culminated in theoretical perspectives of conceptual development in these areas (for examples see Gelman, 2003; German & Johnson, 2002; Hirschfeld, 1996). One domain of which there is little knowledge is in children's categorization of information. This is a crucially important domain and one that our daily lives revolve around. In today's global society with its technological advances, there is constant

exposure to information. People are being told information, overhearing it, observing it and actively researching it. Much of our ability to successfully interact with our world is based on the acquisition and appropriate dissemination of information. Not all such external information is the same nor is one always informed if it can be shared with others or not. Some information is conventional in nature, which is available to everyone without any restrictions on its dissemination, and hence can be told to anyone; for example, general knowledge and game rules. Other types of information are privileged in nature, which is not available to everyone and is intentionally concealed and restricted in its dissemination, and hence are only shared with few, if any, people; for example, personal information and secrets. To my knowledge, this dissertation will be the first to examine children's categorization abilities for these types of information.

This dissertation seeks to answer two questions: 1) can preschool children categorize information as privileged and conventional and 2) do children categorize privileged and conventional information by the type of information it is or by how it is used, specifically whether a person decides to share it or not. For example, passwords are considered privileged information. If a person decides to share his/her password with the general public, does this change the type of information or does it stay the same type regardless of whether the person shares it or not? The second study, which will answer the second research question, will determine if children categorize information similarly to artifacts or to natural kinds. Children utilize different criteria when categorizing members within each of these particular domains (i.e., natural kinds and artifacts), but for both domains I will examine this question within the essentialist perspective of categorization that will be described in a subsequent section.

The first study is a standard object sorting task (for examples see, Goldberg, Perlmutter & Myers 1974; Gopnik & Meltzoff, 1992; Markman, Cox, & Machida, 1981; Waxman & Gelman,

1986) in which pictures of the category labels depict conventional and privileged information, i.e., a face with a hand cupped to its mouth indicating talking and one with its finger to its lips indicating silence, respectively. Test pictures conveying particular instances of conventional and privileged information are presented to the participants individually. They will then be asked to place it in the box with the category label of the information type.

The second study examines if children categorize information based on its category membership (i.e., its label) or by its use (i.e., whether it is shared or not). This study will use methods similar to those used to test whether natural kinds and artifacts are categorized by non-obvious properties (e.g., internal characteristics or function) or their appearance. Throughout this dissertation, I am considering the use of information (i.e., whether it is shared or not) to be analogous to artifacts' function (e.g., how it is used). While I realize that the term 'use' is more closely associated with whether information is disseminated to others or not, I have specifically used the term 'function' throughout the dissertation for ease of understanding whether the information is categorized similarly to natural kinds or artifacts. For experimental trials, two target pictures will be presented and labeled by its type of information and function. For example, participants will be shown a picture of privileged information and told it is private and not shared with other people. Participants will then be shown a test picture, labeled with its correct information type but the incorrect function (e.g., this is private but it has been shared with other people). Participants will then be asked which of the target pictures is most like the test picture; thereby determining if children use category membership (information type) or function (shared or not) when categorizing information.

Since there is no research to date examining these specific research questions, my dissertation will focus solely on those types of information that are prototypically conventional

or privileged. It is necessary to understand how children are categorizing the most typical examples of these information types before using more ambiguous examples. While my dissertation will examine children's categorization abilities within conventional and privileged information alone, a full discussion of information types would not be complete without reference to idiosyncratic information. Doing so will also provide strong evidence regarding young children's knowledge of different types of information. Therefore, I will review the existing literature on children's knowledge of conventional, privileged and idiosyncratic information. I will then discuss the different criteria children use to categorize natural kinds and artifacts and whether either may be similar to how children categorize different types of information.

Information Types

Most of the information children acquire at a young age is considered conventional (Csibra & Gergely, 2009). Conventional information encompasses a culture's shared social norms, values, language, communication styles and general conceptual knowledge of the world (e.g., names of natural kinds and numbers, cultural artifacts, game rules, etc.; Csibra & Gergely, 2009; Diesendruck, 2012). This information is expected to be known by other members of the culture and is free to be shared under any circumstances and to the general public as a whole. It would appear that a majority of our communications as adults is conventional. This is certainly true when it comes to communication with young children (Csibra & Gergeley, 2009; Diesendruck, 2012; Mesoudi & Whiten, 2008; Tomasello, 2008). Properties that are common to all conventional information are that it is a) generic, or generalizable to other similar kinds; b) specific to one's culture, e.g., the label of 'cow' to a domestic bovine animal is specific to English speakers; c) prescriptive, or normative in nature; d) expected to be understood by others

in one's culture and e) can be shared with anyone under any circumstances (Diesendruck, 2012; Lewis, 1969). While conventional information may seem arbitrary in its origin (e.g., the label 'cow' for a domestic bovine animal instead of 'woc'), it is the agreed standard within a culture and is culturally transmitted by each previous generation to the following generation (Kalish & Sabbagh, 2007; Mesoudi, Whiten, & Dunbar, 2006).

Recent research supports the contention that young children attend to the use of ostensive cues in direct communication and treat the subsequently conveyed information as conventional in a process known as natural pedagogy (Csibra & Gergely, 2009). Children do appear to be cognitively predisposed to interpret new information as generic, therefore shareable, and known by all others (Csibra & Gergely, 2009; Diesendruck, 2012; Kalish & Sabbagh, 2007). For example, children as young as 3-years-old will assume a stranger knows the name of novel objects even if the stranger was absent when the novel object was first labeled (Diesendruck & Markson, 2001). Diesendruck and Markson (2001) presented two novel objects to participants in this age group. In one condition, a researcher labeled one of the novel objects with a novel name in front of a second researcher. In the second condition, the second researcher was absent during the initial labeling of the novel object. In both conditions, the second researcher asked for an object using a different novel name than given by the first researcher. Both groups of participants gave the previously unnamed object to the researcher, demonstrating an expectation that the second researcher should know the name of the first labeled object even when not present at the initial labeling. Young children also have an expectation that conventional information indicates normative communication or knowledge that represents accurate cultural information. Children as young as 2-years-old will frequently correct those who label an object with an incorrect name (Kalish & Sabbagh, 2007) and will correct others who make a mistake

when playing a game (Rakoczy, Warneken & Tomasello, 2008). Rakoczy et al. (2008) taught 2- and 3-years-olds the rules to a new game. After some minutes of playtime, a puppet joined the game and performed an action that was either considered a mistake or not a mistake in the game. Participants verbally corrected the puppet more often when its actions were considered to break the game rules than when the action was not considered to break the game rules. Therefore, even when someone was not privy to the demonstration of the rules of a new game, this information was expected to be known and was the basis for normative interaction.

A second type of information I will discuss is idiosyncratic information (Diesendruck, 2012). Idiosyncratic information is particular to an individual, such as a proper name or personal preferences. It is learned from the environment or originates from the person him/herself. Though it is often specific to one's culture, it is not generic, e.g., your dog's name is most likely not your neighbor's dog's name. Examples of idiosyncratic information include one's preference for a type of music, nicknames, and family or friendship traditions. It is generally considered to be prescriptive for those who are privy to it. For example, people should not be called by a name different from their own and family members may follow traditions for family vacations or birthday parties. This is not information that is known or expected to be known by the general public, though it is intuitive that the information *type* is known by others. People expect others to have a name, even though they may not know what it is. While there are no real limitations on sharing this information with others, there are normative practices for when and what type of idiosyncratic information should be shared (Diesendruck, 2012). A person would not share his/her name with random people at a grocery store, but would share the name when applying for a job. Sharing family traditions or personal preferences may not be shared with bosses, strangers or casual acquaintances, but one may share the name of a pet with them.

The third type of information is privileged (Behrend & Girgis, under review). For the purposes of this dissertation, the definition of privileged information adopts Watson and Valtin's (1997) definition of a secret as "knowledge that is intentionally concealed but which may be shared with a restricted audience" (p. 432). This definition thus encompasses taboos (e.g., sexual/physical abuse, substance abuse), rule violations (e.g., 'partying', cheating) and breaking social conventions or normative behavior (e.g., physical/mental health problems, poor academic achievement; Vangelisti, 1994; Vangelisti & Caughlin, 1997). Privileged information is person-specific and not considered generic. This is not information that is known or expected to be known by the general public, though it is intuitive that the information *type* is known by others. While it pertains to an individual or to the individual with whom it is shared, the specific content of privileged information (specific examples of taboos, rule violations and social conventions) is based on cultural, societal and even community-based conventions and rules. For example, the types of information considered to be privileged may differ in a rural, poor community as compared to a high SES urban or suburban area. There are also social norms for when and with whom one shares privileged information. Sharing privileged information under inappropriate circumstance or to inappropriate people (e.g., sharing personal information with a stranger in a grocery store line) is considered socially awkward, at the least, and can serve to decrease potential interpersonal interactions (Rubin, 1975). Indeed, over-disclosure of personal information in inappropriate (i.e., non-normative) contexts is at times considered a symptom of a mental disorder (e.g., bipolar disorder, American Psychiatric Association, 2013)

The bulk of research on children's knowledge of privileged information examines their secret sharing. Examining 5-, 6-, 8-, 10- and 12-year-olds in Germany and Australia when sharing secrets with their mothers, Watson and Valtin (1997) found that 5- and 6-year-olds and

about half of the 8-year-olds consistently said they would reveal guilty (i.e., stealing money from mother's purse) and dangerous secrets (i.e., setting a fire), while very few of the 10- and 12-year-olds said they would reveal them. Children in all age groups said they would not share the innocent secret (i.e., surprise present), but most said they would share an embarrassing secret (i.e., wetting pants at school). The overall decline in sharing secrets with their mother for the older age groups came from an increased awareness of social consequences from peers, e.g., being ostracized by their social group. This pattern of younger children being more likely to share secrets than older children has been replicated in other studies as well (Bottoms, Goodman, Shwartz-Kenney, & Thomas, 2002; Pipe & Wilson, 1994). In a particularly clever study, Peskin and Ardino (2003) examined secret sharing in a context commonly encountered by young children: a hide and seek game. In two experiments, 3-, 4- and 5-year-olds were asked to explain the game of hide and seek and then to actually play the game with a researcher, while a second researcher videotaped it. Children in all three age groups were able to correctly describe how to play hide and seek, but only 4- (78%) and 5-year-olds (94%) could correctly play it (e.g., not peeking when counting or being visible when 'hidden') as compared to 3-year-olds (17%). It appears from the literature on young children's secret sharing that children younger than 5 or 6 have limited abilities in being able to keep a secret. Analogous to Peskin and Ardino's (2003) findings, even though younger children do not have the mechanisms to inhibit the sharing of privileged information, this may not mean that younger children do not recognize or are not able to accurately identify types of privileged information.

In summary, conventional information is known and expected to be known by all members of one's culture and can be shared without restriction among the population. While both idiosyncratic and privileged information are specific to an individual and not expected to be

known by members of one's culture, these types of information differ in how they are shared with the larger public. The former can be shared freely under the appropriate circumstances, while the latter is intentionally concealed from others while only being shared with a few people, if any. Though it seems intuitive that every society has these three types of information, the specific information that will fit into each type may vary by culture. Additionally, these types of information are prescriptive in nature. There are normative rules in both knowledge of and dissemination of these different types of information. The question now is to determine how and when children differentiate between these types of information.

Children's Differentiation of Information Types

Recall that the focus of this dissertation will be on children's identification of privileged and conventional information and determining what criteria are used to categorize them. While idiosyncratic information will not be included in the two experiments, it is a necessary component to understanding how and when young children are aware of different types of information and use this knowledge to modify their interactions with others.

It seems young children do recognize and treat conventional and idiosyncratic information differently. Diesendruck (2005) examined 3- and 4-year-olds' understanding of others' knowledge of referents of proper names (idiosyncratic) as opposed to common names (conventional). Using the same methodology as Diesendruck and Markson (2001), 3- and 4-year-olds were presented with two novel objects, one of which was labeled by a proper name. A second researcher, who was either present or not present during the initial labeling, asked the participants for the object with the previously labeled proper name. When the second researcher had been present, participants handed them the previously named object. When the second researcher had not been present, participants randomly selected one of the two objects, indicating

they did not expect the second researcher to know the proper name of the object labeled by the first researcher. These findings stand in contrast to Diesendruck and Markson (2001), in which preschoolers believed that even when absent, a person is familiar with the common (or conventional) names of objects. This is true even when the label and objects are novel to the children. In addition, young children treat personal preferences similarly to proper names. Graham, Stock, and Henderson (2006) examined whether 19-month-olds understood the referent of a speaker who asked for a common object versus a preferred object. In this study, an experimenter looked in different boxes for a target toy, either one that was given a novel label (i.e., 'where's the mido?) or one that represented a desire (i.e., 'where's the one I want?'). A second experimenter came in after the first left and asked the participant for either the 'mido' or the 'one that I want'. Overall, participants picked the target toy in the novel label condition, but not in the desire condition. This expectation that others know conventional names, but not preferences (i.e., idiosyncratic information) has been extended to 9- and 12-month-olds (Henderson & Woodard, 2012; Novack, Henderson, & Woodard, 2014).

The research examining children's use and knowledge of conventional information and how it differs from idiosyncratic information has not been extended to privileged information. There is some recent research, though, that does indicate preschoolers have an emerging understanding about the differences between conventional and privileged information. Behrend and Girgis (under review) examined whether 3-, 4- and 5-year-olds and adults shared conventional and privileged information differently. Vignettes were presented to participants involving a character exposed to one of these types of information; then the experimenter asked the participant if this character should share it. There were no differences in judgments of sharing conventional information among all age groups, but there were for privileged

information. While only 5% of the adults judged that a character should share privileged information, at least 40% of the younger age groups judged that privileged information should be shared. Though not similar to adult patterns, 5-year-olds did judge that privileged information should be shared significantly less frequently than conventional information, indicating they were making some distinction between the types of information.

Anagnostaki, Wright and Bourchier-Sutton (2010) examined whether 4-, 5- and 6-year-olds could identify secrets and non-secrets from a list of sentences that were previously determined to be secrets and non-secrets by adults. Child participants were read aloud a short statement using a puppet as the protagonist and asked to determine if it was a secret (e.g., Zinc hit a child at school/nursery) or non-secret (e.g., Zinc's home is close to the school). The younger age groups did not differentiate between the secret and non-secrets, but the older age groups (ages 5.5 to 6.5) were similar to adults in their selection of secrets and non-secrets. It appears from both the literature on secret sharing and on children's distinction of conventional and privileged information that it is not until around the age of 6 that the ability to differentially identify and share this information emerges.

In sum, preschoolers discriminate between conventional and idiosyncratic types of information and use this distinction to inform their actions around others (Birch & Bloom, 2002; Diesendruck, 2005; Graham et al., 2006). Children's recognition of the differences between conventional and privileged information, both in identification and appropriate sharing, appear to take longer to develop, emerging around the age of 6.

As stated earlier, the goal of the first study is to examine if children can categorize information types as conventional and privileged. The previous section defined these information types and presented evidence supporting that young children are aware of and treat

these types of information differently. It has also shown a gap in the literature on children's ability to differentiate between conventional and privileged information, which this study will help to fill.

Categorization of Natural Kinds and Artifacts

Recall that the second goal is to examine if children categorize privileged and conventional information using similar criteria to how natural kinds or artifacts are categorized. Natural kinds and artifacts represent two of the three domains which comprise most of the entities in our world. The third is human kinds or social categories, e.g., race, gender, occupation. These three, natural kinds, artifacts, and human kinds, have distinct sets of properties which we use to categorize its members, though the criteria used to categorize human kinds combines components of both natural kinds and artifacts. It could be that information is categorized similarly to human kinds, but it must first be determined that it is not categorized similarly to natural kinds or artifacts. Therefore, in this section, I will only review the criteria children use to categorize natural kinds and artifacts from the naïve theory and essentialist perspectives.

A common approach to early conceptual development argues that children develop early competencies understanding the world around them by developing naïve theories of domains, such as physics and biology (Diesendruck, 2003; Noles & Gelman, 2012; Wellman, Hickling & Schult, 1997). Other theories of children's conceptual development have focused on the detection of similarities among category members, such as the attentional account which posits that children are using 'dumb attentional mechanisms' to make associations about the properties of category members and nonmembers (Smith, Jones, & Landau, 1996). Yet the myriad of ways children could identify or select properties of category members or non-members by association

seems to be at odds with the young age and relative ease with which children are able to accurately categorize both known and novel entities. Thus it seems likely that there are cognitive mechanisms which constrain children's choices when categorizing or developing conceptual models (Murphy & Medin, 1985). The naïve theory perspective posits that concepts are developed and constrained by naïve theories held concerning how the natural and social world operates (Murphy & Medin, 1985; Murphy, 2002). Children are actively building naïve theories of natural kinds, human kinds and artifacts based on the evidence of how these entities interact with each other and their environment. For example, water can change states (e.g., liquid to solid to gas), but it is not animate. In order to produce a cohesive concept of water, we must integrate our theories (or knowledge) of chemistry and animate kinds (Murphy & Medin, 1985).

Essentialism is considered to be a critical aspect of the naïve theory perspective specific to categorization. In essentialist reasoning, the criterion used to categorize entities is based not on perceptual cues or similarities, but on the *kind* of entity it is (Gelman, 2003; Jaswal, 2004; Medin & Ortony, 1989; Noles & Gelman, 2012; Wellman et al., 1997). Therefore, naming a novel object with the same name that was used for a previously known object (with a similar shape) is because the *kind* of object is similar, not because the shapes are similar (Markson, Diesendruck, & Bloom, 2008). A typical example is even though a penguin is not perceptually similar to a typical bird (e.g., a robin), children understand that a penguin is a bird *kind*, which makes it a member of the category 'bird.' Gelman (2003) defines essentialism as "An underlying reality or true nature, shared by members of a category, that one cannot observe directly but that gives an object its identity and is responsible for other similarities that category members share" (p.6). Rather than relying on statistical tracking of perceptual similarities among category members, the more reliable criterion is the entity's category membership,

substance and function. Please note while there are other conflicting perspectives of conceptual development, it is the beyond the scope of this dissertation to defend this theory of categorization over others (see Gelman, 2003 for full discussion).

Natural kinds. Although there is an agreement that natural kinds and artifacts are to some degree essentialized by children, the most essentialized domain is natural kinds (Gelman, 2003). Natural kinds are considered natural, real, and objective categories. These are entities that are discovered but not created and encompass domains such as biology, physiology and chemistry (e.g., animals, minerals, plants; Diesundruck, 2003; Gelman & Markman, 1986; Wellman, et al. 1997). More importantly, natural kinds have clear, firm category boundaries that are not flexible (Gelman, 2003; Gelman & Markman, 1986). The criteria used when categorizing natural kinds is not perceptual similarity, but category membership. For example, a dog is a dog, regardless of the differences in outward appearances of subordinate categories (e.g., Great Dane or Pekinese), whether it barked or even had teeth. To be a dog is more than the sum of its external features or behaviors. A classic example of the properties of essentialism is if one changes the appearance of a gold bar, e.g., paints it black, and uses it as a doorstop, it does not change the gold bar into a black door stop (Gelman, 2003).

In a landmark study, Gelman and Markman (1986) examined whether children would base their categorization of natural kinds on category membership or perceptual similarities. Four-year-olds were presented with triads of pictures. For example, they were shown a picture of a dolphin and told “The dolphin pops above the water to breathe.” The next picture was of a tropical fish, perceptually dissimilar to the dolphin, and the children were told “This fish stays underwater to breathe.” Lastly, the researcher pointed to a picture of a shark, similar in appearance to the dolphin but labeled as a fish, and said, “See this fish? Does it breathe

underwater, like this fish, or does it pop above the water to breathe, like this dolphin?" The results found that children adhered to category labels when inferring the animal's category membership, disregarding how similar it looked to the animal in the different category.

Gelman and Wellman (1991) further examined children's use of an entity's 'insides', or its nonobvious characteristics, as opposed to its appearance in a series of categorization tasks across five studies. These studies provide strong evidence that children are indeed using internal properties rather than external properties to categorize items. The authors found 3- and 4-year-olds were able to identify novel category members based on their similarity to the target's internal properties rather than on their perceptual similarity to a non-category member. Therefore, children could distinguish between the insides and outsides, even in the presence of conflicting information, and were able to successfully verbalize how the stimuli's insides and outsides differed. Four-and 5-year-olds believed that an animal's internal properties, as opposed to its external ones, were necessary to an animal's survival, its physical actions and behaviors. The last studies used an adoption task, in which a baby is raised by parents belonging to a different category. In this study, the baby is presented with minimal features of what it would look like as an adult and though it is initially labeled for the child (e.g., cow), it is called a proper name in the actual task (e.g., Edith). In the conflict trials, children were shown a picture of the immature animal (e.g., baby cow), the environment in which it was raised and the animals (e.g., adult pigs) who raised it. Children were asked two questions: when the immature animal grew up would it have a physical feature from its own category or from the animals who raised it (e.g., for a baby cow raised by pigs: "When Edith got to be grown up, what did her tail look like, was it straight or curly?") and would it have a behavior from its own category or from the animal who raised it (e.g., "When Edith got to be grown up, what sound did she make, did she say 'moo' or

did she say ‘oink’?”). Older 4-year-olds used the immature animal’s category membership to determine its physical properties and its behavior when it was an adult. The authors extended these findings to the domain of food (i.e., fruit) and plants (i.e., flower seeds). Results such as these have been replicated numerous times with a variety of different stimuli and children from a variety of cultures (for example, Bailenson, Shum, Atran, Medin & Coley, 2002; Diesundruck, 2001).

Additionally, natural kinds are constrained by the very nature of their internal structure from becoming anything else. Keil (1992) examined whether children understood that an animal’s insides was what defined an animal. Keil (1992) tested this by presenting participants with the insides (e.g., blood, bone, organs) of one animal, but the outsides (e.g., color, fur) of another animal. An example used in this study was a picture of an animal that had the insides of a raccoon, but a strip of fur was shaved down the middle of its back, painted white and a stink sac attached to its tail. When asked whether the animal was a raccoon or a skunk, Keil (1992) found that most of the 5-year-olds and half of the 7-year-olds had problems recognizing the animal as a raccoon, suggesting that essentialist reasoning is still developing in the early school years.

Artifacts. Artifacts, on the other hand, are not considered natural kinds. Artifacts are human-made creations with flexible category membership (Bloom, 1996; German & Johnson, 2002; Jaswal, 2006). Artifacts are mostly categorized by function rather than by an underlying essence that links all members of the category to that particular category (German & Johnson, 2002; Jaswal, 2006; Kemler Nelson, Holt, & Egan, 2004). As Bloom (1996) succinctly addresses it, “We infer that the novel entity has been successfully created with the intention to be a member of artifact kind X – and thus is a member of artifact kind X – if its appearance and

potential use are best explained as resulting from the intention to create a member of artifact kind X" (p.12). Artifacts are subjective and flexible with fuzzy category boundaries. If two physically identical objects were created, one meant for a teapot and the other meant as a watering can, these would be categorized respectively by their function. Thus, the criteria used to categorize artifacts are its function or the creator's intended use. Yet there are some essentialist aspects to this domain, such as discovering that young children categorize novel artifacts not based on perceptual similarity, but based on function similarity with function being a nonobvious, internal property (Diesendruck & Peretz, 2013; Gopnik & Sobel, 2000; Jaswal, 2006; Kemler Nelson, Russell, Duke and Jones 2000a).

This privileged status of human intention on artifacts has been the subject of extensive research (Bloom, 1996; German & Johnson, 2002; Gopnik & Sobel, 2000; Hammer & Diesendruck, 2005; Jaswal, 2004, 2006; Kemler Nelson, Frankenfield, Morris & Blair, 2000b). Children are cognizant of the fact that objects have purpose and use this knowledge to categorize them (Gelman & Bloom, 2000). Gelman and Bloom (2000) presented children with an array of items that were either created purposefully or accidentally; for example, a knife was purposefully blown from glass or it was dropped and broke into a shape of a knife. Children labeled the intentionally made object a knife, but the accidentally made object by its substance, a piece of glass.

Children also use the creator's intention to categorize an artifact by using its label over its appearance (Jaswal, 2006; Jaswal & Markman, 2007). Jaswal (2006) presented artifacts that were similar in appearance to one artifact, but labeled it as something different. For example, a 'key-spoon' that was a hybrid of both a key and a spoon: an artifact that looked similar to a key but was slightly rounded to model the function of the spoon. Researchers demonstrated the

function of a prototypical key and spoon and then presented the hybrid with the label it least appeared like, e.g., key-spoon was labeled as spoon, and as something the researcher either found or had made. Participants were asked to model how the hybrid should be used. Both age groups used it based on the label given and not its appearance when the artifact was intentionally made, though they did not do this when the artifact had been found. Therefore even in the artifact domain, preschoolers use the intended function as opposed to its appearance to determine category membership. Furthermore, when 3- and 4-year-olds, and to a lesser extent 2-year-olds, are presented with novel artifacts, they are more likely to ask about the novel artifact's function than they are to ask about its name (e.g., category membership; Kemler Nelson et al., 2004).

Kemler Nelson et al. (2000a) devised an elegant study to determine if 4-year-olds categorized artifacts by appearance or by function. In this study, a novel target toy was first introduced to participants with a novel name (e.g., a gidget). Following a short period of play time with the target toy, participants were shown 4 test toys. The test toys were either: similar in both appearance and function; similar in appearance but not in function; dissimilar in appearance but similar in function; and dissimilar in both appearance and function to the target toy. A set of two test toys was presented to the participants without being labeled and he/she was asked to hand a puppet the 'gidget', the label of the target toy. Since multiple instances of the same test toys were presented across trials, participants were initially told that they would see the same toys more than once but that would be okay. Four-year-olds more often selected the test toy similar in function to the target toy than those similar in appearance, thereby providing strong evidence that children categorize artifacts based on function rather than perceptual similarity to non-category members.

In sum, natural kinds are objective, real categories. Changing the appearance or the properties associated with natural kinds cannot change category membership; therefore categorization is based on the entity kind or its category membership. Artifacts are human-made, subjective and flexible and are categorized based on its function rather than appearance. The studies proposed here will be the first to apply the methods of the naïve theory/essentialist perspective to the domain of information. The second experiment will be the first study, to my knowledge, to determine if information is categorized by its category membership or by its function (whether it is shared or not). Recall, the function of the information is analogous to the function of an artifact. If children categorize information by its category membership regardless of whether it shared or not, then children are treating it similarly to natural kinds. If children categorize information by whether it is shared or not, regardless of its category membership, then children are treating it similarly to artifacts.

As described earlier in this section, the methods used to test children's categorization of natural kinds are most often a conflict task pitting appearance against category membership (for example, Gelman & Markman, 1986). The methods used to test children's categorization of artifacts are most often a task pitting appearance against intended function (for example, Kemler Nelson et al., 2000a). Since my second study will examine children's categorization of information, I will use a conflict triad task pitting category membership against function. This will be based upon the methods used in the Kemler Nelson et al. (2000a) and the Gelman and Markman (1986) studies.

Current Research

This dissertation will attempt to answer two questions: 1) Can preschool age children categorize information as privileged and conventional and 2) Do children categorize privileged

and conventional information by the type of information it is or by its function, e.g., whether a person decides to share it or not.

To answer the first question, an examination of previous research revealed that by age 4 children are differentiating between conventional and idiosyncratic types of information. There is a gap, though, in both the information and categorization literatures on children's distinction between conventional and privileged information types. The available research on children's identification of privileged and conventional information indicates that such a distinction does not begin to emerge until age 5 (Behrend & Girgis, under review), though 5-year-olds still do not perform as well as adults. It may be that the methodologies used in these studies are too demanding for the general cognitive limitations of 4-year-olds. Therefore in Study 1, I will use a simple sorting task to determine if children can recognize and categorize these information types. I will present colorful pictures that represent either conventional or privileged information and ask participants to sort them according to the depicted information type. Based on the research cited earlier, I hypothesize that 4-year-olds will be able to accurately categorize conventional and privileged information. I included 5-year-olds in my sample to examine any developmental trends in this ability. Based on the previous research on children's secret sharing and identification of secrets and non-secrets, I predict that participants in each older age group will more accurately categorize the depicted information than the younger group(s). Lastly based on the natural pedagogy perspective, I hypothesize that 4-year-olds will be more accurate categorizing conventional information than privileged information.

In addition to the main goal of determining when children categorize information, I will also investigate if the following variables influence the ability to correctly categorize pictures of the different types of information: theory of mind, number of siblings, being the oldest sibling,

number of hours spent in preschool, and number of hours of playtime outside of preschool and sibling playtime. With the exception of the theory of mind tasks, parents of participants will provide the responses to the questions about these variables.

The second goal of my dissertation is to examine if children categorize information based on its category membership (the kind of information it is) or by its function (how a person uses it, specifically by whether the person decides to share it or not). For example, a secret is privileged information. Does the category membership of a secret change from privileged to conventional information if a person decides to share the secret with the general public? If children believe it does, then the human intention for its use is the criterion used to categorize information, which is similar to how artifacts are categorized. If children believe it does not, then the category membership of the information is the criterion used to categorize information, which is similar to how natural kinds are categorized. In this second study, I present two target pictures: one each of privileged and conventional information, and identify the information type and whether it is shared or not. A test picture will then be presented and participants are asked which of the target pictures is most similar to the test picture. In the conflict trials, the test picture's information type and function are mismatched, e.g., a secret is private information but is told to everyone. In the consistent trials, the test picture's information type and function match, e.g., a secret is private information and is not told to everyone.

Past research (Diesendruck, 2001; Gelman & Markman, 1986; Rhodes & Gelman, 2009; Rhodes, Leslie, & Tworek, 2012; Gelman & Wellman, 1991) has found that essentialist reasoning emerges at age 4, but information is a unique domain in that it is invisible and abstract and has not been previously investigated. It is important, though, to compare 4-year-olds' categorization of information types to existing findings in the other domains (i.e., natural kinds

and artifacts). For this second study, I will test 4-year-olds and compare their responses to 6-year-olds and to adults. I am testing 6-year-olds for comparison purposes since previous research has revealed it is not until closer to age 6 that children begin to differentially share and identify secrets from non-secrets. Since this particular research question has not been asked before, adults will be tested to determine what criteria is used to categorize information. Responses from all three age groups should reveal any developmental change in the criteria used to categorize different types of information.

If information is thought to be a natural kind, an objective, natural category, then I hypothesize that it will be categorized by its category membership. If information is thought to be an artifact, a human social creation, then I hypothesize that it will be categorized by its function, i.e., how it is shared. Based on the natural pedagogy perspective's claim, that young children are predisposed to attend to conventional information and the different properties associated with the information types, I predict conventional information will be more often categorized by its membership than privileged information by participants in all three age groups.

While compiling the specific instances of conventional and privileged information to use in these studies, special care was taken to ensure that the results would be specific to the information type and not confounded by valence or personal preference. The list of conventional and privileged information is similar to the stimuli used in Behrend and Girgis (under review). All information is neutral in valence and comprises situations with which young children should be familiar. Specifically, instances of rule violations were excluded, since these are negatively valenced and both children and adults believe they should be reported to the proper authority (Girgis & Behrend, 2012; Kim, Harris, & Warneken, 2014).

Study 1

Methods

Participants. There were a total of 70 participants: 23 four-year-olds (M_{age} = 4.4, 11 females, age range = 3.8 to 4.9), 23 five-year-olds (M_{age} = 5.4, 9 females, age range = 5.00 to 5.9) and 24 undergraduate students (M_{age} = 20.0, 16 females, age range = 18.4 to 25.1). The undergraduate students were tested as a comparison group. Sample sizes of between 20 to 24 children per condition in categorization tasks are standard in the child development literature (see among others, Behrend & Girgis, under review; experiments in Gelman, 2003; experiments in Keil, 1992; Kemler Nelson et al., 2000a, 2000b). Child participants were recruited from area preschools in a predominately middle class, European-American community located in the south central area of the United States. The adults were undergraduate students in the same community who participated for course credit.

Materials. A total of 12 pictures comprised the stimuli for Study 1. These pictures were comprised of 10 test pictures and 2 category label pictures. Pictures were colored clip art images taken from public domain online sources, such as Google Images, and were modified as needed in Microsoft Paint. Five test pictures depicted conventional information: numbers, (1, 2, 3, 4, 5, 6); alphabet (alphabet letters written individually on blocks); an animal (dog); a color (circle of the color green); and an object (cup). Five test pictures depicted privileged information: a secret (a girl whispering in the ear of another girl); a wrapped present; children playing hide and seek; surprise party (balloons, streamers and confetti); and a password for a clubhouse (child climbing

into a tree house). These laminated pictures were approximately 3 in. by 3 in. in size. Two category label pictures represented the two information categories. The category label picture depicting conventional information was a round yellow face with a hand cupping its open mouth indicating talking. The category label picture depicting privileged information was a round yellow face with its finger to its lips indicating not talking. Each category label picture was approximately 4.5 in. by 4.5 in. and laminated. Each category label picture was taped to a wooden stick and affixed to the back of a shallow box. See Appendix A for stimuli pictures. For the two false belief tasks: a laptop was used to administer the location change task and an empty box of M&M candy and crayons were used for the unexpected contents task. Parents of child participants answered the following questions on the consent form: weekly number of preschool hours, number of siblings, whether he/she is the oldest sibling and weekly number of playtime hours excluding preschool and sibling playtime.

Procedure. Child participants were tested in an empty classroom or a quiet area in their preschool. Adults were tested in an empty classroom on the university campus. All participants were tested individually. The procedure took approximately 5 to 10 minutes to complete.

Familiarization Task. A familiarization task was first administered to participants. The purpose of this familiarization task was to define conventional and privileged information for participants. To start, the term 'public' was substituted for conventional and 'private' was substituted for privileged as these terms are ones with which young children are more familiar. The researcher began by telling child participants they will learn two new words for the game. The researcher then defined public information and provided an example (e.g., "The first new word is public. There are some things that you know and you can tell anyone you want to tell. These things are called public. You can tell anyone about it. For example if I learned that 1 + 1

is 2, I could tell anyone about it."). The researcher then defined private information and provided an example (e.g., "The second new word is private. There are some things that you know that you cannot tell anyone. These things are called private. You cannot tell anyone about it. For example, if I were playing a matching game, I could not tell the other person where the matching card was."). These definitions are similar to ones used in previous research for secrets and conventional information (see Anagnostaki, Wright, & Papathanasiou, 2013; Behrend & Girgis, under review; Watson & Valtin, 1997). The researcher asked two follow up questions to ensure participant understanding (e.g., "So, if you knew some things you could tell anyone about, is that public or private?"). If answered incorrectly, the researcher repeated the definition of both words and asked the questions again. Participants who could not answer the questions properly the second time were excluded from the study. As some of the younger participants were reticent to speak, acceptable answers included pointing to the appropriate category label picture to answer the follow up questions.

For adult participants, researchers explained that the study was being conducted by a cognitive development lab examining children's knowledge of different types of information. Public and private information were defined using the same definitions and examples that were given to child participants.

Test Trials. Testing began immediately after the familiarization task. The two category picture boxes were placed in front of the participant and the researcher sat next to the participant. The researcher instructed child participants on the procedure, e.g., "So, for this game I'm going to show you some pictures. If you think the picture is private, something you could not tell anyone, then you would be put it in this box (*researcher pointing to corresponding category picture box)* and if you think the picture is public, something you could tell anyone, then you

would put it in this box (*researcher pointing to corresponding category picture box).* Now, can you show me where you would put pictures that are private? Can you show me where you would put pictures that are public?". Similar to the questions in the familiarization task, this procedure was used to ensure children knew the correct category label picture. If participants answered incorrectly, then the researcher repeated the instructions and asked the follow up questions again. Participants who could not answer the questions correctly the second time were excluded from the study. The researcher then presented each picture to participants, described the content of the picture and asked if it belonged in the public or private box (e.g., "These are numbers to 6. Should it go in the private, can't tell, box or the public, can tell, box? Put it in the box where you think it should go."). Answers were recorded by the experimenter.

After the categorization task, two false belief tasks were administered. On a laptop computer, the researcher presented a location change task to child participants. There were five pictures depicting the Sally-Anne task and the researcher narrated each picture, e.g., "This is Sally. This is Anne. Sally puts her ball in the basket. Sally goes away. Anne moves the ball to her box. Where will Sally look for her ball?" (Wimmer & Perner, 1983). If participants answered "basket," they passed the false belief task. If participants answered "box", they did not pass the false belief task. The unexpected contents task was the second false belief task (Hogrefe, Wimmer & Perner, 1986). The researcher presented a box of M&M candy to the participant and asked what he/she thought was in the box. All participants except for 2 answered candy or M&Ms. The researcher then opened up the box to show the participant that there were crayons in it and asked, "So if your friend walked in here, what would they think is in the box?" If participants answered candy/M&Ms or what was originally thought to be in the candy box,

they passed the false belief task. If the participant answered crayons, they did not pass the false belief task.

Adult participants were tested similarly, though they were not asked the follow up questions for the category label pictures. The researcher reiterated that the study was designed for preschoolers and we need to know in general if these types of information are ones you could tell anyone as opposed to ones you could not tell anyone. Researchers also did not administer false belief tasks to adult participants nor did they ask the questions regarding number of siblings or hours of preschool and playtime.

To ensure there were no confounding variables that influenced participants' responses, the following was done: 1) The category label boxes were randomly placed in front of the participants, so that some participants had the public category label box on the left while others had the private category label box on the left; 2) The order of the category labels in the test questions (public and private) was counterbalanced within and between participants; and 3) Two orders of the 10 items were created. Half of the participants in each age group received each order. In addition, a research assistant with minimal exposure to the hypotheses of the study tested a subset of the participants.

Results

In the familiarization task, all child participants had to answer the follow up questions to the definitions of the terms 'public' and 'private' in order to participate in the study. Researchers repeated the definition and questions once for nine 4-year-olds and three 5-year-olds. All participants correctly answered the questions the second time.

The number of times each participant responded correctly in categorizing the information the pictures depicted as public or private was summed and served as the dependent variable.

Two summary variables were created for information type: percent of correctly answered questions on the public information trials and percent of correctly answered questions on the private information trials.

In order to ensure there was no experimenter bias, an independent samples t-test was conducted to compare total number of correct responses to both public and private information as a function of the researcher who tested the participants. This analysis revealed no significant differences between responses when tested by the author of this dissertation (M = 74%) and an undergraduate research assistant (M = 66%), $t(44) = 1.36$, $p = .18$. Thus, this variable was dropped from further analyses.

In order to compare participants' performance to chance a series of one sample t-tests was conducted for each age group, which revealed 4-year-olds were at above chance levels for correctly categorizing both public (M = 65%), $t(22) = 3.46$, $p = .002$, and private information (M = 67%), $t(22) = 4.35$, $p < .001$, 5-year-olds were at above chance levels for correctly categorizing both public (M = 80%), $t(22) = 5.78$, $p < .001$, and private information (M = 75%), $t(22) = 6.46$, $p < .001$ and adults correctly categorized the items at above chance levels for both public (M = 100%) and private information (M = 99%), $t(23) = 59$, $p < .00$.

In order to determine if there were differences in correct responses to the categorization task between the adults and child participants, a one way ANOVA with Age (4- and 5-year-olds and adults) as a between subjects factor revealed that adults were significantly better at correctly categorizing public and private information than 4- and 5-year-olds, $F(2,69) = 20.56$, $p < .001$, $F(2, 69) = 27.39$, $p < .001$, respectively. Since the adults correctly categorized both information types at ceiling levels, I excluded them from the following analysis. A 2 x 2 (Information Type [public, private] x Age (4-year-olds, 5-year-olds]) mixed ANOVA revealed a main effect of age,

such that 5-year-olds had more correct responses across both information types (M = 77%) than 4-year-olds (M = 66%), $F(1,44) = 5.15$, $p = .02$. No other significant results were revealed. See Table 1 for percent of correct responses to the categorization task by age group.

Parents were asked a number of questions to determine if there was a correlation between the following variables and the ability to categorize the depicted information: number of weekly hours spent in preschool, number of siblings and being the oldest sibling, and number of playtime hours excluding preschool and sibling play time. The average number of hours participants spent in preschool was 26.8, ranging from 6 to 45 hours. For both 4- and 5-year-olds, 12% had no siblings. The number of siblings ranged from 1 to 4 with 22% of participants reporting they had one sibling and 16% of participants were the oldest sibling. The mean number of hours participants spent playing with friends excluding preschool and sibling play time was 4.3, ranging from 0 to 10. Fifty-six percent of 4-year-olds correctly answered at least one of the false belief tasks, while 78% of 5-year-olds correctly answered at least one of the false belief tasks. Few of the child participants answered both false belief tasks correctly; therefore a 0 was assigned to participants who did not answer correctly either of the false belief tasks and a 1 if participants answered at least one correctly.

A series of chi square tests and Pearson correlations were calculated to examine the relationship between responses on the categorization task and the responses on the false belief task, r = -.05, number of siblings, r = -.05, weekly hours in preschool, r = .18, and playtime (excluding preschool and sibling playtime), r = .02, and being the oldest sibling, r = -.05. There was no systematic relation between any of those variables and the dependent variable, p's > .23.

Discussion

Participants in each age group correctly categorized the information the pictures depicted as public and private at above chance levels. Five-year-olds had significantly more correct responses than 4-year-olds, while adults had significantly more correct responses than both 4- and 5-year-olds. Participants in each age group categorized public and private information equally well. A number of variables were measured to determine if these were correlated with correctly categorizing the depicted public and private information. The number of hours spent in preschool or playtime, number of siblings, being the oldest sibling and passing false belief tasks were not significantly correlated with the dependent variable:

Study 2

The results from Study 1 demonstrated that children as young as 4 are able to identify and distinguish between conventional and privileged information. The goal of Study 2 was to determine *how* young children and adults categorize types of information. For experimental trials, two target pictures were presented and labeled by their type of information and function. For example, participants are shown a picture of privileged information and told it is private and cannot be told to anyone and a picture of public information and told it is public and can be told to anyone. Participants are then shown a test picture, labeled with its information type but its contrasting function (e.g., this is private but it has been told to everyone). Participants are then asked which of the target pictures is most like the test picture. If participants answered by matching the test picture with the target picture's category membership, then they are using the same criteria used to categorize information as natural kinds. If the participants answered by matching the test picture with the target's picture function (whether it is shared or not), then they are using the same criteria used to categorize information as artifacts.

Methods

Participants. There were a total of 68 participants: 22 four-year-olds (M_{age} = 4.66, 12 females, age range = 3.99 to 5.2), 24 six-year-olds (M_{age} = 6.41, 13 females, age range = 6.06 to 7.05) and 22 undergraduate students (M_{age} = 19.3, 14 females, age range = 18.3 to 20.17). The undergraduate students were tested as a comparison group. Most child participants were recruited from area preschools who were tested at their school, though seven 4-year-olds were recruited from the lab's database of prior research participants and were tested in an on-campus laboratory. All were from a predominately middle class, European-American community located in the south central area of the United States. The adults were undergraduate students in the same community who participated for course credit.

Materials. A total of 30 pictures comprised the stimuli for Study 2. Pictures were colored clip art images taken from public domain online sources such as Google Images and were modified as needed in Microsoft Paint. The same types of information used in Study 1 were used in Study 2. For conventional information, 3 pictures *each* depicted the following: numbers (1, 2, 3, 4, 5, 6); alphabet (alphabet letters); an animal (dog); a color (color green); and an object (cup). For privileged information, 3 pictures *each* depicted the following: a secret (someone whispering in the ear of another person); a wrapped present; children playing hide and seek; a surprise party; and a password for a clubhouse (a child climbing into a tree house). These laminated pictures were approximately 3 in. by 3 in. in size. See Appendix B for stimuli pictures. Similar to Kemler Nelson et al.'s (2000a) use of the same toys over multiple trials, the same specific types of information (e.g., secret, name of animal) were used multiple times across trials for Study 2. Though the specific information types will be the same, the pictures themselves are different and were not similar in detail to other pictures of the same specific type. Each picture, however, was easily identified as the type of information it was intended to depict.

Procedure. Child participants were tested in an empty classroom or a quiet area in their preschool or in a campus laboratory. Adults were tested in an empty classroom on the university campus. The procedure took approximately 15 minutes to complete.

Familiarization Task. Similar to Study 1, a familiarization task was first administered to participants. The purpose of this familiarization task was to allow the researcher to define public and private information for the participant. To start, the researcher defined public and private information using the same definitions and examples used in Study 1. The same follow up questions were asked of the definitions that were used in Study 1. If the participant answered incorrectly, the researcher repeated the definition of both words and asked the questions again. Participants who could not answer the questions properly the second time were excluded from the study.

For adult participants, researchers explained that the study was being conducted by a cognitive development lab examining children's knowledge of different types of information. Public and private information were defined using the same definitions and examples that were given to the child participants.

Test Trials. Immediately after the familiarization task, testing began. The researcher first instructed the participant on the how the game would be played and that the participant would see the specific information types multiple times during the game, e.g., "Okay, I'm going to show you some different pictures of public and private things and I'm going to ask you which ones are more alike. You will hear about the same kinds of things more than once during the game but that will be okay. You just need to listen very carefully about what I have to say about each of them. Okay? I'm going to tell you some stories about my friend named Jane.". Jane was introduced to the participant in order for there to be a reason that the information in the test

picture was shared or not shared appropriately. The instructions about seeing the pictures depicting the same types of information more than once are similar to Kemler Nelson's (2000a) study regarding seeing the same toys across multiple trials.

Consistent trials. In these trials the test pictures' category membership and function are consistent (e.g., private information that is not shared and public information that is shared). After presenting the two target pictures, the test picture (e.g., alphabet letters) is identified by its information type (e.g., public) and its correct function (e.g., telling everyone). The trials served as control trials as well as to assess if children understood the procedure of the task.

Conflict public trials. In these trials the test picture is public and participants are told the correct category membership but the incorrect function (e.g., public information that is not shared). After presenting the two target pictures, the test picture (e.g., alphabet letters) is identified by its information type (e.g., public) and the incorrect function (e.g., did not tell everyone). These trials serve as experimental trials.

Conflict private trials. In these trials the test picture is private and participants are told the correct category membership but the incorrect function (e.g., private information that is shared). After presenting the two target pictures, the test picture (e.g., birthday present) is identified by its information type (e.g., private) and the incorrect function (e.g., did tell everyone). These trials also serve as experimental trials. See Table 2 for list of stimuli by trial type.

For both consistent and conflict trials, the researcher placed two target pictures, one at a time, in front of the participant. One target picture depicted public information and one depicted private information. The researcher identified the information type of each target picture and its function, (e.g., "See this, this is a birthday present which is private and cannot be told to anyone.

See this, these are numbers up to 6 which is public and can be told to anyone."). The researcher then presented the test picture, placing it underneath and in between the two target pictures. For the consistent trials, the researcher identified the information in the picture and its correct function (e.g., "See this, this is a secret which is private and Jane does not tell this to everyone."). For conflict public and private trials, the researcher identified the information in the picture and its incorrect function (e.g., "See this, this is the color green which is public but Jane does not tell this to everyone." Or, "See this, this is a secret which is private but Jane tells this to everyone."). In the consistent trials and both types of conflict trials, the conjunction (either 'and' or 'but') joining the information type and its function was emphasized by the researcher. There were 4 conflict public and 4 conflict private trials for a total of 8 experimental trials and 2 consistent or control trials for a total of 10 trials. For the test question the participant was asked if the test picture was similar to either of the target pictures (e.g., "So, is it like this which is public and told or like this which is private and not told."). Children's responses were coded as either matching or not matching the category membership of the target picture.

The control trials were presented to ensure participants understood the procedure and were attending to the information given in each trial. Memory check questions were included for the test pictures' category membership and function after 4 of the 8 conflict trials to further ensure that participants accurately recalled the presented information, e.g., "So, did I say this was public or private? Did Jane tell this to everyone or not tell everyone?"

The procedure was exactly the same for the adults. For instructions, though, the researcher reiterated the study was designed for preschoolers and we need to know in general which types of information are similar to each other.

To ensure there were no confounding variables that influenced participants' responses the following was done: 1) The presentation of the target pictures were counterbalanced across participants, such that some participants were presented with the public information picture first and others were presented with the private information first; 2) The wording of the category membership and function of the test picture was counterbalanced (e.g., private but Jane told everyone/Jane told everyone but it is private); 3) The order of the function and category membership terms in the test question was counterbalanced (e.g., is it like this which is public and told/is it like this which is told and public); and 4) Two orders of the 10 items were created. Half of the participants in each age group received each order. In addition, a research assistant with minimal exposure to the hypotheses of the study tested a subset of the participants.

Results

In the familiarization task, all child participants had to answer the follow up questions to the definitions of the terms 'public' and 'private' in order to participate in the study. Researchers had to repeat the definition and questions for ten 4-year-olds, but not for any of the 6-year-olds. All participants correctly answered the questions the second time.

In order to ensure there was no experimenter bias, an independent samples t-test was conducted to compare the category membership responses in the conflict trials. This analysis revealed no significant differences between responses when tested by the author of this dissertation (M = 42%) and an undergraduate research assistant (M = 39%), $t(22) = .20$, $p = .83$. Thus, this variable was dropped from further analyses.

Two memory check questions were asked after 4 of the 8 experimental trials. The questions asked for the test picture was what type of information it was and if it were told or not told to everyone. The proportion of the participants who responded correctly to the 8 memory

check questions served as the dependent variable. A one-sample t-test, using a test value of .5, compared the proportion of correct responses from participants in each age group to chance. This analysis revealed that 4-year-olds answered the memory check questions correctly at above chance levels, (M = 67%), $t(21) = 3.13$, $p = .005$, as did 6-year-olds (M = 78%), $t(23) = 6.39$, $p < .001$ and adults (M = 94%) $t(21) = 20.45$, $p < .001$. A one-way ANOVA revealed there was a significant difference in the accuracy of participant responses to the memory check questions between the age groups, $F(2,60) = 8.69$, $p < .001$. Tukey's HSD follow up analysis revealed that adults were more accurate than both 4- and 6-year-olds (p's < .03), but there were no differences between the accuracy of 4- and 6-year-old responses ($p = .16$). This provides evidence that participants were attending to the labeling of both the information type and how the information was shared in regards to the test picture; also the answers to the test question were not due to the misinformation about the test picture.

Answers to the test question revealed whether participants categorized information by its category membership or by its function. The number of times each participant selected the target picture's category membership to categorize the information depicted in the test pictures was summed, converted to percentages and served as the dependent variable. A 3 x 3 (Age [4-, 6-year-olds, adults] x Trial Type [consistent, conflict public, conflict private]) mixed ANOVA revealed a main effect for trial type, $F(2, 130) = 26.93$, $p < .001$. Follow up analyses were conducted for the main effect of Trial Type with a series of paired samples t-tests which revealed that participants, as a whole, categorized the depicted information significantly more often by its category membership in the consistent trials (M = 86%) than in the conflict public trials (M = 55%) $t(65) = 5.2$, $p < .001$, and the conflict private trials (M = 50%), $t(65) = 6.19$, $p < .001$. There were no differences between the conflict public and conflict private trials. In addition, an

Age x Trial Type interaction was found, $F(4, 130) = 7.13$, $p < .001$. Follow up analyses were conducted for the Age x Trial Type interaction. A series of one-way ANOVAs were conducted for each trial type. For the conflict public trials, participant category membership responses differed among age groups, $F(2,65), = 4.53$, $p = .01$. Tukey's HSD follow up analysis revealed that 4-year-olds ($M = 67\%$) and adults ($M = 63\%$) were more likely to categorize public information by its category membership than 6-year-olds ($M = 36\%$), $p = .02$, $p = .04$, respectively, while 4-year-olds and adults did not differ from each other, $p = .95$. For the conflict private trials, category membership responses did not differ among adults ($M = 44\%$), 6-year-olds ($M = 46\%$) and 4- ($M = 60\%$), $F(2,65) = 1.23$, $p = .29$. Lastly, for the consistent trials, category membership responses did differ among the age groups, $F(2,65) = 16.64$, $p < .001$. Tukey HSD follow up analysis revealed that adults ($M = 100\%$) and 6-year-olds ($M = 93\%$) produced more category membership responses than 4-year-olds ($M = 65\%$), *p's* < .001. See Table 3 for the percent of category membership responses as a function of age and trial type.

In order to determine if participants were categorizing the conventional information more often by its category membership than the privileged information, paired samples t-tests were conducted comparing participants' category membership responses of conflict public trials to conflict private trials. Four-year-olds' category membership responses to conflict public ($M = 67\%$) and private trials ($M = 60\%$) did not differ, $t(21) = .54$ $p = .59$ and neither did 6-year-olds' category membership responses between the conflict public ($M = 36\%$) and conflict private trials ($M = 46\%$), $t(23) = 1.68$, $p = .10$. For adults, the percentage of category membership responses in the conflict public trials ($M = 63\%$) was significantly greater than the percentage of such responses on conflict private trials ($M = 44\%$), $t(21) = 2.01$, $p = .05$.

I also compared the proportion of category membership responses for each trial type by age group to chance using one sample t-tests. These analyses revealed that 4-year-olds responded with category membership responses on consistent trials (M = 65%), $t(21) = 2.30$, p = .03, and conflict public trials at above chance levels (M = 67%), $t(21) = 2.41$, p = .02, but not on conflict private trials, p = .20, 6-year-olds responded with category membership responses to consistent trials at above chance levels (M = 93%), $t(23) = 12.68$, $p < .001$, but not on conflict public, p = .10, or private trials, p = .68, and adults responded with category membership responses on consistent trials at above chance levels (M = 100%), but not on conflict public, p = .13, or private trials, p = .44.

The last analysis included an examination of the distribution of category membership responses for the conflict public and private trials. With the exception of the 4-year-olds' category membership responses to the conflict public trials, all other responses to the conflict public and private trials were at chance. I wanted to determine if this pattern of responses within each age group represented participants who were individually consistent, but in different ways, when categorizing the information or if most participants were truly responding randomly. If participants responded randomly then their pattern of responses should not differ from the expected binomial distribution. The patterns of responses were examined separately for conflict public and conflict private trials, each of which had 4 trials. These data are shown in Table 4. Four-year-olds' patterns of responses were not significantly different from the binomial distribution on conflict public trials, χ^2 (4) = 7.24, $p > .1$ nor the conflict private trials, χ^2 (4) = 8.39, $p > .05$. Six-year-olds' pattern of responses did not differ from the binomial distribution on the conflict private trials, χ^2 (4) = 6.58, $p > .1$, but did differ from the binomial distribution on the conflict public trials, χ^2 (4) = 14.04, $p < .01$. Adults' pattern of responses did not differ from the

binomial distribution on the conflict private trials, χ^2 (4) = 4.56, $p > .1$, but did differ from the binomial distribution on the conflict public trials, χ^2 (4) = 13.36, $p < .01$.

Discussion

As expected, participants across the age groups categorized the information types by its category membership more often for consistent trials than for the either of the conflict trials. Four-year-olds and adults both categorized the conventional information more often by its category membership than 6-year-olds. There were no differences in how participants categorized privileged information.

When comparing category membership responses between conflict public and conflict private trials, only adults categorized conventional information more often by its category membership than privileged information. Four- and 6-year-old category membership responses did not differ between public and private information. Four-year-olds did categorize public information by its category membership at above chance levels, but did not do so for private information. Both 6-year-olds and adults did not categorize public or private information by its category membership at above chance levels.

For private information, participant responses did not differ from the binomial distribution, therefore there was no pattern of responses across the conflict private trials. However, there was a pattern of participant responses for the 6-year-olds and adults when they categorized public information. Adults were more likely to categorize the depicted public information by its category membership across all trials, while 6-year-olds were more likely to categorize the depicted public information by its function across all trials. While the distribution of responses of the 4-year-olds when categorizing public information did not differ from chance, recall they did categorize public information by its category membership at above chance levels.

General Discussion

With the decades of research on what, when and how children categorize, one domain that has not been investigated is when and how children categorize information types, specifically conventional and privileged information. Imagine what it would be like to not be able to distinguish between these different types of information. What would happen if a person treated all information similarly, for example as if it were all conventional? One possibility would be this person would believe that all brown dogs are named Bob because their brown pet dog is named Bob. While this example is not particularly consequential, there are severe consequences for not appropriately identifying or disseminating information. What if a person treated all information as if it were privileged? It would be nearly impossible to both communicate and learn. Therefore, it is important to both understand how and when this ability develops and how it fits into the larger theoretical framework of how children in general learn about their world.

The specific goals of this research was to investigate, in two studies, the answers to the following questions: 1) can preschool children categorize information as privileged and conventional and 2) do children categorize privileged and conventional information by the type of information it is or by its function, specifically whether a person decides to share it or not.

In Study 1, 4- and 5-year-olds and adults sorted pictures of conventional and privileged information into boxes labeled pictorially as either conventional or privileged. The results supported two of the three hypotheses for this study. I hypothesized that by using pictures to depict the different types of information and a simple sorting task, 4-year-olds should be able to categorize and distinguish between conventional and privileged information and they did. Participants in all three age groups correctly categorized conventional and privileged

information. The second hypothesis, that participants in each older age group would more accurately categorize information than the younger group(s) was also supported. Adults were significantly more likely to correctly categorize both conventional and privileged information more often than 4- and 5-year-olds, while 5-year-olds were significantly more likely to correctly categorize both information types information than 4-year-olds. The results did not support the third hypothesis that 4-year-olds would be more accurate categorizing conventional information than privileged information.

I expected that 4-year-olds had the ability to identify and distinguish between conventional and privileged information, but the methods used previously were not sensitive enough to elicit their true abilities in this domain. Using a simple sorting task and pictures depicting types of conventional and privileged information which were familiar to preschool children, over two-thirds of the 4-year-olds correctly categorized the conventional and privileged information. Although this is the first study to find that children as young as 4 have the ability to categorize conventional and privileged information, it does fit with previous research on children's ability to distinguish between conventional and idiosyncratic information. Children as young as two years of age are able to differentiate between the properties of idiosyncratic information (e.g., personal preference) and conventional information (e.g., names of objects) when interacting with another person (Diesendruck, 2005; Diesendruck & Markman, 2003; Graham et al., 2006; Henderson & Woodard, 2012; Novack et al., 2014). In addition, 4-year-olds' can correctly categorize natural kinds, artifacts and human kinds (e.g., gender) and are able to categorize novel items in these domains using nonobvious properties (Diesendruck, 2001; Gelman & Kremer, 1991; Gelman & Markman, 1986; Heyman & Giles, 2006; Jaswal, 2004; Keleman et al., 2000a).

Thus, it appears that children can identify privileged information before they are able to properly use this type of information, e.g., not share it freely with others. A preponderance of the literature on children's sharing secrets has found that preschool children will share secrets and privileged information more indiscriminately compared to older children (Behrend & Girgis, under review; Bottoms et al., 2002; Peskin & Ardino, 2003; Pipe & Wilson, 1994; Watson & Valtin, 1997). In many cases, it is not until age 6 when children begin to withhold sharing secrets or privileged information from others. Young children's ability to identify a particular concept before being able to appropriately use it is not an uncommon phenomenon in development. Peskin & Ardino (2003) found that 3-year-olds could correctly explain the rules of hide and seek to a third party, but could not correctly play the game by those same rules. In addition, research on selective trust has found that 3-year-olds are able to identify accurate informants versus inaccurate informants even though they do not use this knowledge to selectively choose who they would like to learn from in subsequent interactions with the same informants (Koenig & Harris, 2005). It appears the same development trend holds true for how children learn about the differences between conventional and privileged information, as 4-year-olds are able to both identify and distinguish between conventional and privileged information but still share secrets in experiments in a first person format (Bottoms et al., 2002) and endorse characters' sharing secret or privileged information in experiments in a third person format (Behrend & Girgis, under review; Watson & Valtin, 1997). Where children as young as 2 are able to modify their social interactions based on the differential presentation of conventional and idiosyncratic information, it appears that experience plays a greater role in being able to appropriately use privileged information. These findings seem to fit into the naïve theory perspective of children's learning, which claims children are creating naïve theories of the world

around them in domains such as biology and physics and, in this case, information (Diesendruck, 2003; Murphy, 2002; Wellman et al., 1997). Children continue to modify their naïve theories as they continue to learn and interact with others.

The most important type of information for young children and one that most of their social interactions revolve is conventional information (Csibra & Gergeley, 2009; Diesendruck, 2012; Mesoudi & Whiten, 2008; Tomasello, 2008). The natural pedagogy perspective underscores the importance of young children being able to both recognize and to utilize the properties associated with conventional information with empirical evidence to support this perspective (Csibra & Gergely, 2009). Because of young children's predisposition to learning conventional information and their limited cognitive resources, understanding the function of privileged information may not as important or as central to their daily lives as being able to differentiate between the information types.

The results did not show, however, that 4-year-olds were better at categorizing conventional information than privileged information as was hypothesized. According to the natural pedagogy perspective, our communication system is designed for young children to be both sensitive and attentive to ostensive cues that indicate to children that the information about to be imparted is conventional in nature (Csibra & Gergely, 2009). The amount of information children learn about natural kinds, artifacts, human kinds, and cultural and social norms at such a young age reflects the fact that a majority of the information transmitted to them is conventional; therefore, most of their experience is with conventional information (Cisbra & Gergely, 2009; Mesoudi & Whiten, 2008; Tomasello, 2008). It seemed likely because of this exposure to conventional information that young children would be more accurate at categorizing conventional information than privileged information. This was not the case for 4-year-olds,

since they were able to categorize both types of information equally well. It could be that because of their adeptness at identifying conventional information, 4-year-olds identified information that was not conventional with the only other choice available; i.e., privileged information. While this possibility should be examined, it does not seem likely since the procedure did not differ for each of the information types, e.g., providing ostensive cues for conventional information but not for privileged information. Children received the same cues and questions for the conventional information items as for the privileged information items and were able to distinguish between them. Future research should further examine this issue by asking children to categorize information using properties other than being shareable, such as its generalizability or whether it is known by other people. A crucial next step will be to examine how children categorize novel items within each information type. This will provide evidence that children are not simply aping what has been told to them (e.g., 'don't tell mom what I got for her birthday'), but are recognizing the properties associated with these types of information.

In an attempt to examine why there may be individual differences in categorizing the different types of information, a variety of variables were measured that intuitively seemed related to the development of correctly categorizing of conventional and privileged information. These were the number of siblings, being the oldest sibling and the weekly number of hours spent in preschool and playtime (excluding preschool and sibling playtime). Two false belief tasks were also administered to child participants, as the knowledge that other people have different mental states from oneself should increase awareness of information that should not be shared with others. Interestingly, none of these variables were correlated with rates of correct responses on the categorization task. These null findings could be due to a small sample size and limited variability in child participant responses to both the categorization task and the measured

variables. In addition, current perspectives on the development of theory of mind has argued that using false belief tasks as the sole measure of theory of mind development may miss earlier achievements in this domain that might be related to the abilities of interest in these studies (Wellman & Liu, 2004).

The first study found that 4-year-olds are able to distinguish between conventional and privileged information. The second study investigated what criteria children were using to differentiate between these information types. Specifically, I wanted to determine if children categorize privileged and conventional information by its category membership or by its function, e.g., whether it is shared or not shared with other people. To my knowledge, this is the first study to investigate such a research question. While there are decades of research on how children categorize both known and novel category members in other domains, information categorization is unique because information is both abstract and invisible.

These results did not fully support a conclusion that information is treated similarly to either natural kinds or artifacts. While only 4-year-olds categorized conventional information by its category membership, a pattern of categorizing conventional information among the age groups emerged. The pattern of categorization of conventional information by its category membership is U-shaped, with 6-year-olds significantly less likely to categorize conventional information by its category membership than both 4-year-olds and adults. While this pattern was not predicted, it is a pattern found in other areas of cognitive development. The classic example is young children's overregulization of grammatical rules to irregular words, e.g., 'goed' or 'falled' (Marcus et al., 1992; Pinker, 1991). Young children are able to appropriately apply grammar rules to irregular words only to regress and inappropriately apply these grammar rules before being able to again appropriately apply grammatical rules to irregular words. One of the

explanations for this pattern is that there is a qualitative shift in children's reasoning from one based on associations and memory to one based on rigid rules, which blocks previous experience in the domain, and then the end stage that is based on increased experience with the rules culminating in an appropriate understanding of both the application of and exceptions to them (Marcus et al. 1992).

It may be that this same process applies to how children learn to categorize conventional information. It may be young children's predisposition to learn conventional information makes them highly attuned to its properties, specifically that conventional information is generic, known to others and shareable to all others. As children transition to kindergarten, types of information are being defined more often in terms of whether it is shared or not, rather than any of its other properties. By the time they are 6 years old, children also have more experience with different types of information. Their predisposition to treat novel information as conventional may have attenuated as they begin to experience the negative consequences of sharing privileged information. Additionally, as children get older and are more often away from the direct supervision of parents (or other caregivers), there may be more instruction on what types of information should be shared or not shared. Children in kindergarten are also now in a structured setting where explicit pedagogical teacher-student relationship is entrenched and students are expected to answer questions when asked, further reinforcing that conventional information should be shared with others. It may be that all of these circumstances focus 6-year-olds on identifying information as what can be shared or not shared rather than by its total set of properties. Similar to other domains with U-shaped developmental curves, application of this rule then blocks previous knowledge of the entire set of properties of different types of information and children only apply the rule of whether information is shared or not to identify

the information. As children get older and have learned the 'sharing rule' along with when exceptions can be made, they revert back to using category membership to identify conventional information. While the supposition put forth here for why a U-shaped curve for the development of categorization needs to be empirically investigated, some support for it is derived from research which has found that it is not until age 6 when children begin to understand that privileged information should not be shared with others (Angostaki et al., 2010; Behrend & Girgis, under review).

An alternate explanation to the U-shaped development curve of how conventional information is categorized is that 6-year-olds are employing multiple categorization strategies. According to the dynamic systems theory, development is constantly in motion and interconnected to all aspects of a child's life: biological, cognitive and social (Thelen & Smith, 2006). All of the forces that influence children's performance will sometimes appear as a pattern of responses, but it may only be for a fleeting time or may be indicative of multiple strategies rather than a single strategy. The utilization of multiple strategies can manifest as an inability to perform certain tasks that children had previously been able to perform. A classic example is children's performance on mathematical problems where it appears that children have increased difficulty answering questions they were once able to easily answer (Siegler, 1987). This explanation does not account for the pattern of responses across the age groups, though. Results revealed that 6-year-olds' and adults' categorization of conventional information did not result from random responses across trials, which might have indicated multiple strategies being engaged to categorize conventional information, but from individuals categorizing consistently by category membership or by function. In any case, future research must provide additional

empirical evidence in order to clarify the underlying mechanisms of developmental patterns of information categorization.

I hypothesized that participants would more often categorize conventional information by category membership than privileged information. While adults use category membership to categorize conventional information more so than privileged information, there were no differences between how these information types were categorized for the younger age groups. If members of one's culture knows the content of the information (e.g., the color green is green), then the decision to share or not share is not a central property in categorizing conventional information as conventional. On the other hand, a central property of privileged information is that should not be shared with others. Indeed this is how it is defined both in this dissertation and by previous research on secrets and privileged information (for examples see Anagnostaki et al. 2010, 2013; Behrend & Girgis, under review; Watson & Valtin, 1997; Vangelisti, 1994; Vangelisti & Caughlin, 1997). Furthermore, it is not expected to be known by others and is not generic. Therefore, sharing a specific piece of privileged information, e.g., sharing this particular secret, may change it from private to public. These differences in properties that define the information types appear to be of importance in determining how it is categorized and does need to be more thoroughly examined in future studies.

The lack of difference between how younger children categorize conventional and privileged information may be related to the finding that 4- and 6-year-olds and adults did not categorize privileged information solely by its category membership or function, but rather categorized privileged information using both of these dimensions. There was no consistent pattern of responses when categorizing privileged information and no differences among the age groups. It could be that participants were not reasoning about this type of information as part of

a larger domain (e.g., natural kinds/artifacts), but were categorizing it on a case-by-case basis. Yet Study 1 revealed that children as young as 4 are able to categorize privileged information, therefore it seems probable that there is some property of privileged information that identifies it as such rather than what appears to be a random utilization of either category membership or function when categorizing it. These ambiguous results underscores that this study is the first attempt to understand how privileged information is categorized. It seems that how we conceptualize privileged information lies at a point somewhere between natural kinds and artifacts. Other methods from the categorization literature could be used to have a better understanding of how this information is categorized. I will discuss this further in the limitations and the future research sections that follow.

It appears from the results from the second study, these information types are conceptualized differently. By categorizing conventional information by its category membership and not by its function, 4-year-olds treat conventional information as an objective category with inflexible boundaries. This is an important finding as being able to categorize conventional information by its category membership increases the ease with which children can process and reason about it; for those in these age groups, conventional information is both stable and predictable (Diesendruck, 2003; Gelman, 2003). The differences in how 6-year-olds categorize conventional information makes it apparent that conventional information may shift in how it is conceptualized depending upon age. Whether information is shared or not seems to become the defining property for conventional information for 6-year-olds. Therefore, even though conventional information is treated as a natural kind at times throughout development, it would not be considered a true natural kind since its conceptualization shifts across time (Gelman, 2003; Keil, 1992).

It appears from this initial study that different types of information are reasoned about differently and information as a whole is not treated exclusively as a natural kind or as an artifact. Though it was important in this initial examination to treat information as either a natural kinds or artifact, it appears that this domain is more complex than this simple dichotomy. This pattern in which some types of information are more essentialized than others is similar to how human kinds are categorized than to either natural kinds or artifacts (Diesendruck, Goldfein, Rhodes, Gelman & Neumark, 2013; Haslam, Rothschild, & Ernst, 2000; Rhodes & Gelman, 2009; Taylor, Rhodes & Gelman, 2009). Essentialist reasoning for all social categories does not develop simultaneously and is impacted by environmental and contextual factors. The differences between children's categorization of natural kinds and human kinds appear to be in the timing and origin of their essentialist beliefs (Haslam et al., 2000; Gelman, 2003; Rhodes & Gelman, 2009; Taylor et al., 2009). While naïve theories of natural kinds and artifacts revolve around a central theme, such as selecting category membership or human intention to categorize all members belonging to that domain, social categories are diverse and vary in to what degree they are essentialized vary by culture and even community (Halsam et al., 2000; Hirschfeld & Gelman, 1994; Rhodes & Gelman, 2009). Many social categories have properties that are conventional, socially constructed, subjective and flexible (Rhodes & Gelman, 2009; Heywood & Giles, 2006). Children essentialize natural kinds from infancy, providing significant evidence that there is a cognitive bias to conceptualize all natural kinds in this manner (Gelman, 2003). This bias to essentialize natural kinds from infancy has been found across many diverse cultures as well (Bailenson et al., 2002; Diesendruck, 2001). In the case of social categories, children will essentialize some categories, such as gender, from a very young age, but not others such as race (Rhodes & Gelman, 2009). The pattern of how different information types are categorized

may reveal a similar pattern to how we categorize human kinds, with some information types, such as conventional information, essentialized at an earlier age than other information types.

A common paradigm to test essentialism with social categories is with an adoption task. A typical example is an infant of one category (e.g., baby girl) is raised by members of another category (e.g., all males; Rhodes & Gelman, 2009; Taylor, 1996). Adoption tasks focused on gender have found that found young children believe gender is a highly essentialized category and the behavioral properties associated with gender cannot be changed by the environment (e.g., girl raised by all boys will want to sew when she grows up rather than build things or a girl raised only by her father will still play with dolls when she is older; Rhodes & Gelman, 2009; Taylor, 1996). Young children also gave essentialist explanations, such as using "brain, instinct or desires" to explain why girls have certain biological properties (e.g., girl blood) and why behavior is gender-stereotyped (e.g., girls play with a tea set versus a toy truck; Taylor & Gelman, 1993).

Interestingly, gender, as a social category, often becomes more flexible and less essentialized with age, while other social categories often become more essentialized, such as race (Rhodes & Gelman; 2009). At this point, environmental factors rather than category membership will more often influence how properties are assigned to different genders. While research supports that young children use essentialist reasoning as a domain general mechanism for understanding their world, many researchers believe that learning occurs through domain-specific mechanisms, e.g., learning language and grammar rules (Hirschfeld & Gelman, 1994; Chomsky, 1980). Depending upon the domain, experience and knowledge of one's culture can shift our reasoning, which is apparent in how the reasoning about gender develops over time. It is feasible that the differences found between how people categorize conventional and privileged

information is due to the inherent social nature of acquiring and disseminating information. From this first attempt to answer how and when we categorized information, it appears that conventional information is essentailzied at a young age but also shifts with age and exposure to environmental forces. The specifics of how culture impacts our reasoning of information types is still to be determined, but it is a necessary next step in understanding how we think, reason and process information.

Limitations

While Study 1 was a simple sorting task with pictures for the category labels to help identify conventional and privileged information, Study 2 was more complex. Though a developmental pattern did emerge for how conventional information is categorized, there were no difference among the age groups for how privileged information was categorized. Additionally, participants selected either category membership or function to categorize privileged information. Based on the apparent ease of which adults are able to identify privileged information from conventional information (Anagnostaki et al., 2010; Behrend & Girgis, under review) and the efficiency of human categorization and reasoning processes (for example, see Gioia & Poole, 1984), one would assume that adults categorize privileged by some defining set of properties, but this was not revealed by this study. Children also did not use any defining set of properties to categorize privileged information. Although pictures were used to represent the information types in Study 2, the stimulus pictures were defined verbally in terms of information type and function. The wording may have hampered young children's understanding of the task and have been too demanding on children's working memory, though the correct responses on the consistent trials and memory check questions does not fully support this conclusion.

It may be that defining these types of information by only one property - whether it is shared or not - is not sufficient to elicit how children categorize privileged information. The multiple properties that are key to how conventional information is defined may be needed to fully distinguish between conventional and privileged information. For example, sharing a specific secret with everyone may indeed make that information 'public' as I defined it in the studies. The seemingly random selection of criteria to categorize privileged information across trials may be due to only categorizing information by its sharing property. While this is of interest, the role the property of sharing plays in how information is categorized, it does not reveal a complete picture of how information is categorized.

Future Directions

Since these are the first studies to investigate when and how we categorize conventional and privileged information, there are many future directions for this research. One of the first should examine exactly when children are able to categorize conventional and privileged information and when this ability matches that of adults. The study should be extended to both younger and older children to understand the full developmental pattern of the categorization of prototypical conventional and privileged information. Future research should also investigate the categorization of information types beyond prototypical conventional and privileged information. There are certain types of information that may not be easily identified as conventional, privileged or idiosyncratic; these should be examined in both sorting tasks and using other methods, such as a reaction time task. To investigate whether children's categorization of privileged information reflects understanding at a conceptual level or mere identification of normative behaviors (e.g., not telling a surprise), an inductive inference task extending

information properties to novel instances is needed (for example, see Ahn, Kim, Lassaline & Dennis, 2000 and Heyman & Gelman, 2000).

Follow up studies examining how privileged information is categorized will be helpful to illuminate how we reason and identify these types of information. One simple way to do this is to use an uninformed character (such as an alien from a faraway place) who, highlighting different properties of the information types, directly asks children which information types can be grouped together and which do not go together (for example, see Rhodea & Gelman, 2009). Similar to many of the natural and social kinds categorization tasks, the adoption task paradigms could further clarify how privileged information is categorized as well (for example, see Gelman & Wellman, 1991). A type of information, e.g., public, which is surrounded only by a different type of information, e.g., private. Children would then be asked to identify the type of information or the properties associated with it. There are decades of research on how children categorize, and while information is a unique domain, it is important to modify the existing and valid methods to use in this domain. Additionally, past research on conventional information has provided a complete set of properties for it (Csibra & Gergeley, 2009; Diesendruck, 2012; Mesoudi & Whiten, 2008; Tomasello, 2008), and the same has to be provided for privileged information. There cannot be a full examination of how privileged information is conceptualized unless we understand what properties are central and peripheral to its definition.

Lastly, future research should further examine why there are differences in both the ability to categorize different types of information and how these are categorized. It seemed intuitive that theory of mind or social interactions either with siblings or at preschool would be correlated with ability to identify types of information, but this was not found in Study 1. The stark differences in responses to the conflict public trials in Study 2, as well, warrants an in-depth

investigation of why individuals categorize by function versus category membership and how this may relate to wider domain general differences in cognitions. While additional cognitive tests should be administered, asking children and adults why they answered as they did should be revealing as well.

Conclusions

Take a second moment to imagine what it would be like to not be able to differentiate among the different types of information. It is almost incomprehensible and would certainly greatly reduce our ability to interact with both our environment and other people. With the advent of technology and the easy access to both retrieve and disseminate information, understanding and recognizing different types of information becomes all the more important. These two studies have found that children as young as 4 are able to both identify and distinguish between conventional and privileged information and the criteria used to categorize these information types differ. It appears that there may be a U-shaped curve in the conceptual development of our knowledge of conventional information, but this pattern is not found for privileged information. These combined findings provide a valuable insight into children's categorization of information types and begins to lay the foundation to understand children's conceptual development in this domain.

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Table 1

Percent of correct responses to categorization task by information type

	Conventional Information		Privileged Information	
	M	*SD*	*M*	*SD*
4-year-olds	65	21	67	18
6-year-olds	80	24	75	19
Adults	100	0	99	4

Table 2

List of stimuli by trial type for Study 2

	Category Label	Shared or Not Shared
Consistent Trials		
Target 1	Birthday present	Not shared
Target 2	Numbers to 6	Shared
Test Picture	Secret	Not shared
Target 1	Cup	Shared
Target 2	Hide and Seek	Not shared
Test Picture	Dog	Shared
Conflict Public Trials		
Target 1	Alphabet Letters	Shared
Target 2	Surprise Party	Not shared
Test Picture	Color Green	Not shared
Target 1	Numbers to 6	Shared
Target 2	Birthday present	Not shared
Test Picture	Dog	Not shared
Target 1	Color green	Shared
Target 2	Password	Not shared
Test Picture	Cup	Not shared

Target 1	Dog	Shared
Target 2	Surprise party	Not shared
Test Picture	Alphabet Letters	Not shared

Conflict Private Trials

Target 1	Surprise party	Not shared
Target 2	Alphabet Letters	Shared
Test Picture	Birthday Present	Shared
Target 1	Cup	Shared
Target 2	Hide and Seek	Not shared
Test Picture	Password	Shared
Target 1	Secret	Not shared
Target 2	Numbers to 6	Shared
Test Picture	Numbers	Shared
Target 1	Color green	Shared
Target 2	Password	Not shared
Test Picture	Secret	Shared

Table 3

Percent of category membership responses by trial type

	Consistent		Conflict Public		Conflict Private	
	M	*SD*	*M*	*SD*	*M*	*SD*
4-year-olds	62	31	70	30	57	37
6-year-olds	93	16	36	39	46	37
Adults	100	0	63	40	44	34

Table 4

Number of category membership responses per trial by age and trial type

	Conflict Public					Conflict Private				
Trial No	0	1	2	3	4	0	1	2	3	4
4-year-olds	2	2	5	5	8	4	2	3	7	6
6-year-olds	10	4	4	1	5	6	4	6	3	5
Adults	4	3	2	3	10	6	3	5	6	2

Appendix A

Category label pictures

Public

Private

Public information

1. Numbers

1 2 3
4 5 6

2. Alphabets

3. Dog

4. Color

5. Cup

Privileged information

1. Secret

2. Birthday present

3. Hide and seek

4. Surprise party

5. Password to clubhouse

Appendix B

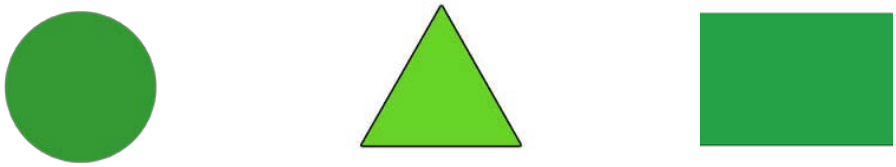
Public information

1. Numbers

2. Alphabets

3. Dog

4. Color



5. Cup

Privileged information

6. Secret



7. Birthday present



8. Hide and seek



9. Surprise party



10. Password to clubhouse



UNIVERSITY OF ARKANSAS

Office of Research Compliance
Institutional Review Board

May 26, 2015

MEMORANDUM

TO:	Helana Girgis Doug Behrend
FROM:	Ro Windwalker IRB Coordinator
RE:	PROJECT MODIFICATION
IRB Protocol #:	15-01-450
Protocol Title:	*Children's Information Categorization*
Review Type:	☐ EXEMPT ☒ EXPEDITED ☐ FULL IRB
Approved Project Period:	Start Date: 05/22/2015 Expiration Date: 02/01/2016

Your request to modify the referenced protocol has been approved by the IRB. **This protocol is currently approved for 140 total participants.** If you wish to make any further modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

Please note that this approval does not extend the Approved Project Period. Should you wish to extend your project beyond the current expiration date, you must submit a request for continuation using the UAF IRB form "Continuing Review for IRB Approved Projects." The request should be sent to the IRB Coordinator, 109 MLKG Building.

For protocols requiring FULL IRB review, please submit your request at least one month prior to the current expiration date. (High-risk protocols may require even more time for approval.) For protocols requiring an EXPEDITED or EXEMPT review, submit your request at least two weeks prior to the current expiration date. Failure to obtain approval for a continuation *on or prior to* the currently approved expiration date will result in termination of the protocol and you will be required to submit a new protocol to the IRB before continuing the project. Data collected past the protocol expiration date may need to be eliminated from the dataset should you wish to publish. Only data collected under a currently approved protocol can be certified by the IRB for any purpose.

If you have questions or need any assistance from the IRB, please contact me at 109 MLKG Building, 5-2208, or irb@uark.edu.