

**Preschoolers' Reasoning about the "How", "What" and "When" of
Ownership.**

by

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A thesis

presented to the University of Waterloo

in fulfillment of

the thesis requirement for the degree of

Doctor of Philosophy

in

Psychology

Waterloo, Ontario, Canada

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Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Statement of Contributions

I am either the majority contributor or sole contributor to all of the work presented in this thesis. This includes chapters of my thesis which are publications co-authored with my supervisor Dr. Ori Friedman. Citations and information regarding these publications can be found in relevant chapters.

Abstract

My dissertation includes three papers. Paper one investigates preschoolers' appreciation of *how* people become owners. In two experiments, 70 3-to-5-year-olds were asked to explain why a character owns, likes, or uses certain objects. Four- and five-year-olds, but not three-year-olds, used past events of buying, giving and finding to explain ownership demonstrating an appreciation of how property is typically acquired. Four- and five-year-olds generated such explanations even though they never saw these past events happen. Thus, these findings also have implications for children's ability to infer history in their explanations. Paper two examines children's understanding of *what* ownership entitles owners to do with their property. In this study, 128 children aged 4 to 6 were asked what a person was allowed to do with an object that belonged to the person, belonged to no-one, or belonged to someone else. Children were allowed to provide as many responses as they wished. Their responses reflected an appreciation that ownership affects a wide range of object uses including harmless object use. The pattern of children's responses also suggested that they view ownership as restricting non-owners from using property, rather than affecting use by entitling owners. Paper three investigates the influence of ownership on young children's reasoning by examining *when* preschoolers use ownership to explain acceptability. In this study, 323 3- to 5-year-olds were asked to explain acceptable and unacceptable actions. In Experiments 1 and 2, ownership was not mentioned to children before they generated their explanations. In these experiments, older preschoolers but not

younger preschoolers spontaneously referenced ownership more than alternative considerations in their explanations. In Experiment 3, ownership was mentioned to children before they generated their explanations. In this experiment, younger preschoolers frequently referenced ownership when explaining unacceptability, but not when explaining acceptability. Together these findings suggest that ownership is influential in preschoolers' reasoning about the acceptability of using objects, but that the scope of its influence increases with age. My dissertation concludes with a discussion of the broader implications of my findings for children's reasoning about ownership.

Acknowledgements

Many people have played an important role in me completing my thesis. First I would like to acknowledge my lab. I have been lucky to be part of an amazing lab and meet some incredibly talented people throughout my time at Waterloo. Without the amazing people who spent hours transcribing, and coding my data I would not have a thesis. Thanks to Julia for teaching me how to test kids and cleaning up my mistakes in my first year. Thanks to Cory and Madison for recruiting all of my participants. You two are machines! A special thanks to Madison who has supported me through some tough times and has always been around to help me solve my problems large and small. I would also like to thank my amazing friends. You made graduate school some of the best years of my life so far. Drew gets a special thank you for listening to me complain for four years. Without her encouragement I doubt I would have finished.

I would also like to thank my family and in particular my mom for encouraging me to get my PhD. She taught me that the pursuit of knowledge was a good enough reason to pursue my degree. My husband Dan deserves this PhD as much as I do. I am very lucky to have him to go home to everyday. His undying patience and love made my PhD possible.

Finally, I would like to thank Ori. I was lucky he saw something in me that I didn't. He has been unimaginably supportive both academically and personally. He is one of the smartest people I will ever meet and I feel honored to have had the chance to learn from him.

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Chapter One: General Introduction

Consider the objects people come into contact with each day: the rows of cars in parking lots, the stacks of books in libraries, and the abundance of flowers in gardens. Whether and how objects are interacted with often depends on ownership. For instance, although people may freely pick their own flowers, they may not pick others' flowers without consent. In this way, ownership has a significant impact on our daily lives.

However, ownership has not been a prominent topic of study in developmental psychology. Beyond its importance to daily life, there are two reasons why developmental psychologists should care about ownership.

First, ownership greatly influences young children's thoughts, feelings, and behaviors. The presence of personal property predicts toddlers' willingness to explore new environments (Passman, 1977). Discussing who owns an object, rather than other facts like its name, makes preschoolers more likely to track it through space (Gelman, Noles & Stilwell, 2014). Knowing who owns an object affects how much preschoolers like it, how much they think it is worth, and how likely they are to remember it (even if the ownership is very new) (Cunningham, Vergunst, Macrae & Turk, 2013; Gelman, Manczak, & Noles, 2012; Grisdale, Lind, Eacott, & Williams, 2014; Irwin, & Gebhard, 1946). Ownership even predicts *the emergence* of important behaviors: Infants' recognition of who owns familiar objects is correlated with how quickly and how often they engage in prosocial behaviors like sharing (Brownell, Iesue, Nichols, & Svetlova, 2012; Hay, 2006), and their success on object permanence

tasks (Rodgon, & Rashman, 1976). As such, the study of ownership is important for understanding these factors.

Second, the study of ownership offers insight into how children reason about and represent abstract concepts—a topic of major interest to developmental psychologists (e.g., Carey, 2009; Gelman, 2003; Gopnik & Wellman, 1994). Ownership is an abstract concept because it is not perceivable or directly observable (i.e., there are no identifiable or physical properties of an object that make it belong to someone). The thought processes implicated in children’s reasoning about ownership likely also underlie their reasoning about other abstract concepts. For example, recent evidence suggests that making inferences about the past or history is important for children’s reasoning about a host of abstract concepts (i.e., language, authenticity, contamination, mental states) including ownership (Cimpian & Cadena, 2010; Cimpian & Markman, 2009; Frazier & Gelman, 2009; Gelman, 1988; Gelman & Kremer, 1991; Russell, 1990; Schulz, Bonawitz & Griffiths, 2007; Weatherhead, White & Friedman, in press; for ownership see Friedman, Van de Vondervoort, Defeyeter, & Neary, 2013; Gelman, Manczak, Was, & Noles, in press). Examining children’s reasoning about ownership is particularly useful for understanding such processes because it is a domain about which young children readily and successfully reason (for a review see Nancekivell, Van de Vondervoort, & Friedman, 2013).

What do young children know about ownership?

Most previous studies examining children’s understanding of ownership have relied on similar methodology. They typically presented children with a vignette about characters or real people who interacted with objects in some way, and then asked children questions about the ownership of the object, such as “who does it belong to?” and “whose is it?”. These studies often also included control conditions where children were shown the same vignettes but asked instead about preferences (e.g., “who likes it?”). These control conditions typically ruled out lower-level explanations for findings. Instead of asking children direct questions, a subset of studies recorded children’s reactions to the vignette (e.g., comments or protests). Previous work has chiefly considered two questions about children’s understanding of ownership.

Assigning Ownership

The first question is how children assign ownership to other people. Previous studies show that children use a variety of strategies to assign ownership and the number strategies they use increases with age. Two-year-olds assign ownership to the first person who uses the object (Friedman & Neary, 2008), and to the person who they are told owns it (e.g., “It’s Sally’s ball”) (Blake, Ganea, & Harris, 2012). Three-year-olds use gender and age stereotypes when assigning ownership; they judge that a doll belongs to a girl and that a car belongs to an adult (Malcom, Defeyter, & Friedman, 2014). They consider creative labour and assign ownership to whoever creatively modifies an object (Kangnesser, Gjersoe, & Hood, 2010; Kanngiesser & Hood, 2014; Kanngiesser, Itakura, & Hood, 2014). They use spatio-temporal history to

determine who owns perceptually identical objects (Gelman, Manczak, & Noles, 2012). For example, they consider the previous location of an object when deciding who owns it. Older 3-year-olds recognize that whoever controls access to an object is likely its owner (Neary, Friedman, & Burnstein, 2009). Four-year-olds use changes in emotional state to assign ownership. For instance, they judge that a sad child likely owns a broken toy (Pesowski, & Friedman, under review). They also recognize that artifacts typically have owners and natural kinds do not (Neary, Van de Vondervoort, & Friedman, 2012; Van de Vandervoort, & Friedman, 2015). Older 5-year-olds recognize that purchasing an object from a store, or receiving it as a gift entitles someone to own it (Blake & Harris, 2009; Cram & Ng, 1989; Furby, 1978) and that stealing does not entitle ownership (Blake & Harris, 2009). Finally, 6-year-old children use almost all of the aforementioned strategies to determine who owns an idea (Li, Shaw & Olson, 2013; Shaw, & Olson, 2012; Yang, Shaw, Garduno, & Olson, 2014) and 9-year-olds use many of these strategies to judge who owns land (e.g., an island) (Verkuyten, Sierksma, & Tijs, 2015).

Ownership and Normative Reasoning

The second question research has examined is how children represent and uphold the norms of ownership. Ownership governs how and whether objects may be used. For example, although I can drive my own car, I would most likely get arrested if I drove someone else's car without consent. From a young age, children appreciate this normative dimension of ownership. Four-year-olds recognize that an owner's permission affects whether property may be

used (Van de Vondervoort, & Friedman, 2015), and that owners are entitled to control the use of even newly acquired property (Kim & Kalish, 2009). Three to five-year-olds are more likely to share toys belonging to the entire class than their own toys, suggesting that they know that classmates are entitled to play with the classroom's toys but not their toys (Eisenberg-Berg, Haake, & Bartlett, 1981; Eisenberg-Berg, Haake, Hand & Sadalla, 1979). Five-year-olds recognize that ownership also governs normative behavior surrounding the use of ideas and express dislike for those who copy others' ideas (Olson & Shaw, 2011).

Children also enforce these ownership norms. Toddlers claim their property by verbally declaring "mine" and acknowledge others' property by labelling things as "yours" (Hay, 2006; Ross, 1996; Ross, 2013; Ross, Friedman & Field, 2015). Two-year-olds protest when their property is used without consent, and three-year-olds protest when others' property is used without consent (Eisenberg-Berg, Haake, & Bartlett, 1981; Kanngiesser, & Hood, 2014; Rossano, Rakoczy, & Tomasello, 2011). Three-year-olds also protest when someone interferes with an owner's wishes (Schmidt, Rakoczy, & Tomasello, 2013). For example, three-year-olds protested a puppet who tried to prevent an owner from sharing her toy.

Preschoolers' reasoning about what owners should be allowed to do with their property differs from adults' reasoning in a few ways. Four- and five-year-olds may not think that owners are entitled to modify their property, or use it atypically (Kim & Kalish, 2009). They are also more likely than adults to side with owners in conflicts over property (Neary & Friedman, 2014). For example,

4-year-olds, but not adults, judge that owners should get to use their property even if someone else needs it to accomplish a goal (e.g., finish making a birthday card). Together, existing research demonstrates that very young children know a lot about ownership and that what they know continues to develop into adulthood.

My Dissertation

My dissertation examines young children's ownership reasoning and is divided into three papers. All three of my papers utilize open-ended measures. In my first and third paper I examine children's explanations, and in my second paper I examine children's lists of object uses or affordances. The importance of such measures has not always been recognized in developmental psychology. Research using open-ended measures was often criticized as being too linguistically demanding and as a result underestimating children's true abilities (Wellman, 2011). Because of these criticisms open-ended measures decreased in popularity (Wellman, 2011). However, recently there has been a resurgence in the use of open-ended measures to study developmental psychology. This is in part because open-ended measures can offer important insights into young children's conceptual representations that other measure may not (Carey, 1985; Wellman, 2011). Studies analyzing children's explanations have revealed that preschoolers have causal knowledge of outcomes which was previously unknown (Bartsch, & Wellman, 1989; Legare, Wellman, & Gelman, 2009). For example, explanations, unlike predictions, revealed that young preschoolers understand that contamination causes illness (Legare, Wellman, & Gelman,

2009). Likewise, open-ended investigations involving children's listing of questions has offered insight into how the structure of children's knowledge differs by domain (Greif, Nelson, Keil, & Gutierrez, 2006; Kemler Nelson, Holt, & Egan, 2004). For instance, one study examining 3- to 5-year-olds' lists of questions about artifacts and animals revealed that children view function as central to artifacts, but biological processes as central to animals (Greif et al., 2006). Similarly, I employ open-ended measures in my studies because of their benefits for the study of conceptual development.

My procedures also include minimal information. The procedure used in my papers is always as follows: Children are shown a picture, told one fact about it, and then asked an open-ended question. They thus must generate their responses solely based upon this fact. For example, in my first study, children are shown a picture of a boy and object, told it was his, and then simply asked to explain "why." By designing my experiments in this way, I am able to study children's ability to reason about ownership *naturally* without much support.

In my papers, I examine children aged 3 to 6 because these are the first ages at which children reliably produce explanations and thus are likely to produce interpretable responses to open-ended measures (Wellman, 2011). It is also the age at which they begin to show respect of others' ownership (for a review see Nancekivell, Van de Vondervoort, & Friedman, 2013).

Major Questions

Each paper composes one chapter of my dissertation and explores a separate question about young children's reasoning about ownership.

Paper one investigates the “how” of ownership—it investigates whether preschoolers recognize how people become owners. Specific causal mechanisms underlie the legal acquisition of objects. Property is normally bought, given, made, or found. Particular kinds of objects are typically acquired in particular ways (e.g., manufactured objects are usually bought, natural objects are usually found, and art is usually made). Without an appreciation for how property is acquired, people would not know how to acquire it for themselves. For example, someone could believe it is equally possible to acquire a new couch by purchasing it or doing a dance in front of it. In two experiments, I explore whether preschoolers recognize how objects are acquired. I do this by asking 3- to 5-year-olds to explain why a character owns an object and then examining their explanations. To successfully answer this question children must infer what event might lead the character to own the object (i.e., make inferences about unseen past events). Such inferences reflect a powerful process that allows individuals to infer previous events that they did not witness themselves. This same process might allow a detective to reconstruct a crime scene and an archeologist to infer how people in an ancient culture lived. This study is also one of the first to investigate preschoolers’ ability to make inferences about the unseen past or history in their explanations and is framed as such.

Paper two investigates the “what” of ownership—it investigates preschoolers’ reasoning about what ownership entitles owners to do with their property. People may use their own objects as well as unowned objects in a

multitude of ways, but they cannot use others' objects in these ways, even harmlessly. For example, someone may decorate their own trees and wild trees, but may not decorate their neighbors' trees, even though doing so is harmless and likely would not affect the neighbors or the trees. In two experiments, I explore whether children recognize how ownership affects object use. I do this by asking 4- to 6-year-olds to list what a character is allowed to do with *either* an object they own or an object they do not own. Children's lists are examined to determine how the ownership of an object affects the permissibility of different kinds of actions. Ownership might affect permissibility of actions in two ways. It might entitle owners with special rights, or act mainly on non-owners and restrict them from using others' property. Children's lists are also examined to determine which of these accounts better explains their reasoning.

Paper three investigates the "when" of ownership—it investigates when and how ownership influences preschoolers' reasoning about acceptability. Suppose while playing outside a child notices their neighbor has a new bike, and despite really liking it, the child decides not to ride it. This child may make this decision for several reasons besides ownership: the bike could be too large to ride, the child might fear her parents' punishment, or she may not want to make her neighbor sad. However, adults consider these other factors *secondary* to ownership (i.e., they view ownership as a better reason for not riding the bike). It is unknown if young children reason in this way. Considering ownership in such cases may be very difficult for young children. Ownership is far less obvious than other factors such as the bike's size. Although previous

research has demonstrated that young children are capable of considering ownership when reasoning about the acceptability of using objects (for a review see Nancekivell, Van de Vondervoort, & Friedman, 2013), they have not demonstrated that preschoolers spontaneously consider ownership when reasoning about acceptability, or that they might view it as more important than other factors. In three experiments I explore the influence of ownership on preschoolers' reasoning about the acceptability of using objects.

Chapter Two: Preschoolers' reasoning about how ownership is acquired (Paper One)

This paper was previously published:

Nancekivell, S. E., & Friedman, O. (2014). Preschoolers selectively infer history when explaining outcomes: Evidence from explanations of ownership, liking, and use. *Child Development*, 85, 1236-1247. doi: 10.1111/cdev.12170

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Introduction

Why are seashells sometimes found on top of mountains? Why do Americans drive on the right side of the road? Why does Stonehenge exist? These questions cannot be answered by only considering present facts. For instance, knowing that Stonehenge is a popular tourist destination, or that it is close to the town of Amesbury, will not help you explain why it exists. To answer this question, you must make inferences about the past. For example, you might try to infer what Stonehenge was originally used for.

The ability to infer history when producing explanations may be particularly important in childhood. Producing explanations allows children to understand unexpected outcomes, learn about nonobvious causal properties, and test their hypotheses about the world by guiding their exploration (Keil, 2006; Legare, 2012; Wellman & Lagattuta, 2004). Inferring *history* in explanations may broaden the scenarios where children can learn—it may allow children to produce explanations for an outcome, even when they did not witness the prior circumstances that caused it.

Children's Explanations

Children begin producing explanations at age two (Hickling & Wellman, 2001) and by age four produce causal explanations about a wide variety of topics, including contamination, illness, supernatural phenomena, motion, and theory of mind (Bartsch & Wellman, 1989; Gelman & Gottfried, 1996; Legare, Wellman, & Gelman, 2009; Rosengren & Hickling, 1994). These explanations often refer to nonobvious causal properties and entities. For example, 3-year-olds use unobservable mental states (e.g., beliefs, desires) to explain people's actions, and 4-year-olds use magic to explain why an object suddenly changed color (Bartsch & Wellman, 1989; Rosengren & Hickling, 1994).

Little is known about children's ability to infer history in their explanations. Most studies examining children's explanations include a vignette or story, which provides any information about the past that children may need in their responses (Legare et al., 2009; Rosengren & Hickling, 1994; Schulz, Bonawitz, & Griffiths, 2007). For example, in one experiment, children were told a story about a boy who became sick after he ate a candy licked by a dog (Legare et al., 2009). When asked to explain why the boy got sick, children provided explanations such as, "Dog took a lick, they spread germs on each other and the boy gets sick" (Legare et al., 2009). In providing such explanations, children inferred the transfer of germs, an event that was not explicitly mentioned. However, because this germ transfer happened when the

dog licked the candy, the children did not have to *infer* a past event, only an event that occurred during the story (Legare et al., 2009).

In other studies, children chose between two explanations that used past events to explain an outcome (Schulz et al., 2007; Woolley, Cornelius, & Lacy, 2011). For instance, children were told that Bambi had itchy spots and were then asked whether this was “because of running through the garden or because of running through the cattail?” (Schulz et al., 2007). Because children in these studies were *told* the relevant history, these findings do not demonstrate that they *infer* history in their explanations.

To our knowledge only four previous studies provide evidence that children may infer history in their explanations. In two of these studies, preschoolers were asked to explain the origins of natural kinds and artifacts, as well as their features (Gelman, 1988; Gelman & Kremer, 1991). For example, preschoolers were asked, “Why do rabbits hop and have long ears?” Although some preschoolers inferred history in their explanations (e.g., “The egg made the ears so that it had them when it hatched”), such responses often followed prompts that encouraged discussion of the past (e.g., “Did a person make the long ears?”). In addition, because children's ability to infer history was not a variable of interest, its frequency was not reported. In the other two studies, children were told the features of animals and artifacts, and were then asked to explain why they have these features (Cimpian & Cadena, 2010; Cimpian & Markman, 2009). Children often inferred history in their explanations when explaining the existence of these features, though again such responses were not

the variable of interest. For example, when asked to explain why a particular tree has tubes inside it, one child said “maybe because there's a hole under it, and someone stucked a tube inside” (Cimpian & Markman, 2009). These findings suggest that children *try* to infer history in their explanations; however, the reported explanations were varied and often appeared implausible. Hence, it remains unclear whether children's historical inferences are constrained by their causal knowledge and whether these inferences allow children to infer historical events that are plausible.

Explanations and Ownership

If children have the ability to infer history in their explanations, they may be most likely to use this ability when explaining outcomes that causally depend on historical events. One area where children might be especially likely to infer history is in their explanations of why a person owns an object. This is plausible because current ownership depends on past events. For example, a person's current ownership of a bicycle depends on the person having previously purchased it. Hence, to explain why a person currently owns an object, children might refer to the past event that caused (or plausibly caused) the person to own it, even if they did not witness this event. Furthermore, children's explanations about ownership are likely to be accurate because there are only a few kinds of events that can cause ownership of an object—objects become owned when they are found, made, purchased, or received as gifts. Hence, children may not need much causal knowledge to accurately infer history when explaining ownership.

Children demonstrate significant knowledge about ownership at young ages. From early on, preschoolers appreciate ownership rights (Eisenberg-Berg, Haake, & Bartlett, 1981; Eisenberg-Berg, Haake, Hand, & Sadalla, 1979; Rossano, Rakoczy, & Tomasello, 2011). At age two, preschoolers protest when their own property is thrown away, and at age three they object when other's rights are infringed upon (Rossano et al., 2011). Moreover, 4- and 5-year-olds understand that owners can use their property in ways that others cannot; however, unlike adults, 4- and 5-year-olds believe that there are some restrictions on how owners can use their property (Kim & Kalish, 2009). In addition, preschoolers can judge who owns an object in a variety of circumstances. Two-year-olds can identify who owns familiar objects (e.g., their toothbrush or their mother's shoes), and sometimes view the first person seen with an object as the owner (Fasig, 2000; Friedman, 2008; Friedman & Neary, 2008). By age three, preschoolers understand that ownership of an object endures regardless of the spatiotemporal location of an object (Gelman, Manczak, & Noles, 2012). Furthermore at this age, preschoolers can use a character's control over the use an object to help decide who owns it (Neary, Friedman, & Burnstein, 2009). It is also at the age of three that preschoolers understand some of the ways in which ownership can be transferred (Blake & Harris, 2009; Friedman & Neary, 2008; Kanngiesser, Gjersoe, & Hood, 2010). Preschoolers understand that ownership of an object can be transferred to the person who creatively modifies it (Kanngiesser et al., 2010). They also view the transfer of a wrapped gift between two characters as gift giving but do not

consider the transfer of an unwrapped gift this way (Blake & Harris, 2009; Friedman & Neary, 2008).

Two previous findings suggest that preschoolers may consider object history when reasoning about ownership. First, 3-year-olds use spatiotemporal history to judge who owns a toy (Gelman et al., 2012). Gelman et al. (2012) showed children three identical objects and told them that one object belongs to them and another to the experimenter. Even after the toys were moved around the table, the preschoolers were able to identify their toy and that of the experimenter. However, these findings do not reveal whether preschoolers *infer* past events when making ownership judgments. Second, preschoolers may use object origins to judge whether objects are owned (Neary, Van de Vondervoort, & Friedman, 2012). Neary et al. (2012) asked preschoolers to judge whether or not artifacts and natural kinds were owned. Preschoolers viewed the natural kinds as less likely to be owned than artifacts. This difference may have occurred because preschoolers appreciate that artifacts are made by people and are therefore likely to be owned, while natural kinds are not made by people and are therefore unlikely to be owned (Neary et al., 2012). However, non-historical reasoning might instead underlie their judgments. Instead, preschoolers might have based their ownership judgments on non-historical rules, such as “toys are owned” and “plants are not owned” (Neary et al., 2012). Previous findings do not provide conclusive evidence that children infer history when reasoning about ownership.

The Present Studies

The present studies investigate children's historical inferences by examining their explanations of ownership. We expect that children will infer history when explaining why a person owns an object, because this depends on past events. In particular, children should discuss how the object came to be owned (e.g., being found, made, or bought). However, children should not infer history, or refer to specific events of acquisition, to explain outcomes for which these are not causally relevant. For example, to explain why a woman likes a bicycle, children should not refer to her having bought it, because this is not causally relevant to her liking it. Instead, children might refer to its characteristics (e.g., the bike is fast) or the woman's taste in bicycles (she likes red bicycles). Similarly, to explain why she is riding a bicycle, children might refer to her current goals or aims (e.g., she wants to go to a friend's house). Again, past events should not be relevant.

We also examine whether children's history-based explanations are sensitive to likelihood. For example, a number of events could explain why the woman owns the bike—she might have made it herself, she might have found it abandoned in a forest, or she could have bought it. Even so, it is most likely that the woman's ownership depends on having bought the bicycle. Conversely, if the woman owns a rock, it would be more plausible that she found it. If preschoolers consider likelihood, their explanations of ownership should change depending on which object is being discussed, and they should be more likely to infer past events that actually occurred.

These predictions were examined in two experiments. Experiment 1 compared children's explanations of ownership with their explanations of liking; Experiment 2 compared children's explanations of ownership with their explanations of object use.

Experiment 1

Methods

Participants. Sixty-seven children were tested. These included thirty-three 3-year-olds ($M = 3$ years 5 months; range = 3,0–3,11; 12 girls) and thirty-six 4-year-olds ($M = 4,5$; range = 4,0–4,11; 17 girls). An additional sixteen 3-year-olds and six 4-year-olds were also tested but excluded from analysis because they failed a screening task (described below). Although demographics were not formally collected, the majority of these children were from White middle-class families.

Materials and Procedures. Testing began with a screening task. Children were shown a picture of children playing in a park, and were asked six questions about the scene, as follows: “What is this boy doing?” “Can you find a girl on a bike?” “What color is her bike?” “Why is this girl holding balloons?” “Why are all the children playing?” and “What color is this girl's shirt?” This task was included to ensure that participants could produce explanations in response to the experimenter's questions. Children passed the screening task if they produced explanations for both *why* questions. The quality of their explanations was not evaluated. When children did not produce an explanation, or said, “I don't know,” they were prompted twice. First, they were requested to

“just guess,” and then if they still did not produce an explanation, the original “why” question was repeated. If an explanation was still not produced, the experimenter moved on to the next trial. This prompting procedure was also used in the main task.

Once the screening task was complete, children in each age group were randomly assigned to either of two conditions, “ownership” or “liking.” The ownership condition consisted of three test trials. In each trial, children were shown a picture displayed on a laptop using PowerPoint. Each picture depicted a character and an object (boy with a rock, girl with a picture, girl with a hat; see Figure 1 for a sample picture). The character was shown beside the object, but not holding or touching it. In each trial, the experimenter briefly introduced the picture (e.g., “Here is a boy, and here is a rock”), and then told children that the character owns the object (e.g., “It is the boy's rock”). They were then asked a comprehension question to ensure that they understood who owned the object (e.g., “Whose rock is it?”). After correctly answering the comprehension question, children were asked to explain *why* the character owns the object (e.g., “Why is it the boy's rock?”).

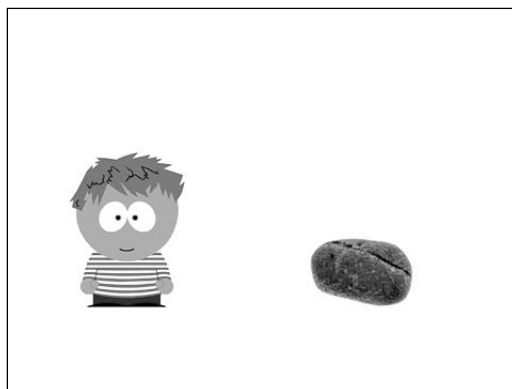


Figure 1. Experiment 1: Example of stimuli used during test trials.

Each child was assigned to receive the three test trials in one of six different orders. To prevent children from repeating their answers across trials, distractor tasks were given between the test trials. In the first distractor task, children looked at an image of penguins and were asked, “What are the penguins doing?” and “Are they having fun?” In the second distractor task, children were shown an image of three cars and were asked, “Which car will win?” and “Is it the fastest?”

The liking condition followed the same procedure, but with three exceptions. First, rather than being told that the character in each trial owns the object, children were told that the character *likes* the object (e.g., “The boy likes the rock”). Second, the comprehension question asked who *likes* the object (e.g., “Who likes the rock?”). And third, children were asked to explain why the character *likes* the object (e.g., “Why does the boy like the rock?”).

Occasionally, children had difficulty producing the correct answer to the comprehension question. If the children indicated someone other than the character in the picture (e.g., “Me!”) their answer was carried forward into the main test question (e.g., “Why do you like the rock?” or “Why is it your rock?”). However, such alternative responses occurred very infrequently.

Transcription and Coding. All testing sessions were audio recorded onto a laptop and then transcribed by a research assistant. Before coding began, children's answers to the *why* questions were separated from the rest of the transcript. The answers were then randomly sorted, so that they could no longer

be associated with their condition. Next, children's answers were coded. First, each response was coded as informative or uninformative. Responses were considered uninformative if the child produced an answer that was completely unrelated to the task (e.g., “Cats” or “I really like red hats”) or if the child indicated they did not know the answer (e.g., “I don't know” or “I can't think of anything”). All other responses were considered informative. Informative responses were then coded into one or more of the following categories: Characteristics, use/desire, proximity, history, and acquisition. Responses in the *characteristics* category described features of the object (e.g., “It is red” or “It's fun”). Explanations in the *use/desire* category described how the character might use the object (“She wears it”), the character's preference for the object (e.g., “He likes it”), or the character's desire for the object (e.g., “He wants it”). Use, preferences, and desires were grouped as one category because children often used or mentioned them concurrently, making them difficult to isolate (e.g., “He likes to play with the ball”). Explanations in the *proximity* category referenced the distance between the character and the object (e.g., “It is near him” or “It is beside him”). Explanations in the *history* category referenced the past (e.g., “He had it” or “He was playing with it”). Explanations in the *acquisition* category described how the character became the owner of the object (e.g., “He bought the hat”). Explanations in the acquisition category were further coded by the type of acquisition: *made*, *found*, *bought*, *gave*, and *other*. Explanations found in *other* referred to nonspecific ways of acquiring objects (e.g., “He got it”).

Two coders coded all explanations independently. The intercoder reliability reached near perfect levels with Cohen's Kappas ranging from 0.83 to 1.0. All disagreements were resolved by discussion.

Results and Discussion

Each child had the opportunity to produce three explanations (i.e., one explanation in each of the three trials). However, children sometimes gave non-informative responses (e.g., they remained silent, or said, “I don't know”). These responses were included in the analysis but were coded as 0 for all categories.

Preliminary analyses were conducted to examine whether children's inferences of history, and their references to acquisition principles, differed by age. A first analysis of variance (ANOVA) examined the effects of age (3 vs. 4) and condition (ownership vs. liking) on children's inferences about history. It revealed a main effect of age, $F(1, 65) = 14.40, p < .001, \eta^2_p = .19$; a main effect of condition, $F(1, 65) = 9.88, p < .001, \eta^2_p = .18$; and an Age \times Condition interaction, $F(1, 65) = 17.61, p < .001, \eta^2_p = .21$. A second ANOVA examined whether children's references to acquisition were influenced by age (3 vs. 4) and condition (ownership vs. liking). It also revealed a main effect of age, $F(1, 65) = 20.91, p < .001, \eta^2_p = .29$; a main effect of condition, $F(1, 65) = 22.25, p < .001, \eta^2_p = .26$; and a significant Age \times Condition interaction $F(1, 65) = 13.32, p = .001, \eta^2_p = .17$. Because of these effects of age, findings from 3- and 4-year-olds were examined separately in all subsequent analyses.

The main analysis examined whether explanation scores in each category differed between the ownership and liking conditions. If children understand that past events are more causally relevant for ownership, then they should refer to *history* more when explaining ownership than when explaining liking. Specifically, they should refer to *acquisition* more in their explanations of ownership than in their explanations of liking, because how an object can come to be owned is only causally relevant for liking.

Figure 2 compares 3- and 4-year-olds' mean scores for each scored category, in the ownership and liking conditions. For each scored category, independent samples *t* tests were conducted to compare scores between the ownership and liking conditions. Three-year-olds' explanations did not vary by condition for any of the coded categories, $t(31)_{\text{history}} = 0.44, p = .662$; $t(31)_{\text{acquisition}} = -1.11, p = .277$; $t(31)_{\text{use/desire}} = 0.60, p = .554$; $t(31)_{\text{characteristics}} = 0.94, p = .356$, $t(31)_{\text{proximity}} = -1.03, p = .310$. Four-year-olds' explanations were markedly different and varied greatly across conditions. Four-year-olds used history and acquisition of the object more to explain ownership than liking, $t(34)_{\text{history}} = -4.81, p < .001, \eta^2 = .40$; $t(34)_{\text{acquisition}} = -4.93, p < .001, \eta^2 = .42$. Characteristics of the object were mentioned more often in explanations of liking than ownership, $t(34) = 2.80, p = .008, \eta^2 = .19$. The use/desire category, however, did not vary by condition, $t(34) = 1.67, p = .104$, and 4-year-olds' use of proximity was not analyzed as it was not used in either condition. Four-year-olds' greater use of history and acquisition in the ownership condition demonstrates that they are more likely to infer history

when explaining outcomes that depend on past events. This conclusion does not apply to 3-year-olds as their responses did not differ across the conditions.

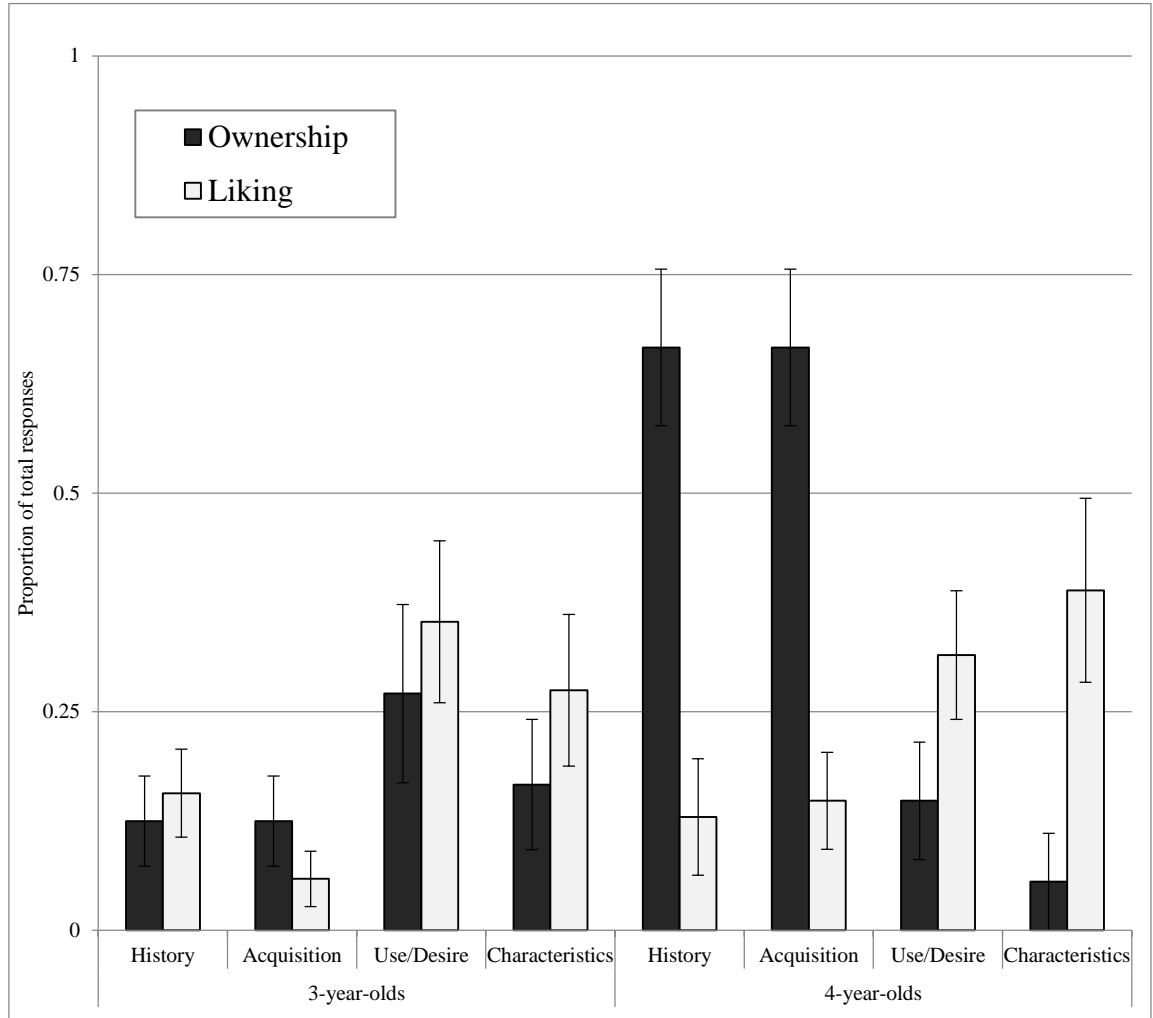


Figure 2. Experiment 1: The proportion of 3- and 4-year-olds' responses falling into each coded category in the liking and ownership conditions.

We then examined whether 4-year-olds' explanations were sensitive to likelihood. Each object in the tasks had a different kind-typical way of becoming owned: Simple pictures are typically made, rocks are typically found, and hats are typically bought. Hence, this analysis examined 4-year-olds' use

of *made*, *found*, and *bought* to explain ownership. We initially expected that children might also use the principle *given*, particularly to explain ownership of the hat. However, this principle was only used by one participant, so its use was not analyzed.

Made was used more to explain ownership of the picture than ownership of the rock or hat, Fisher's exact test, $p < .001$, and in the picture trial, *made* was used more to explain ownership than liking, Fisher's exact tests, $p = .007$. *Found* was used more to explain ownership of the rock than of the picture or hat, Fisher's exact test, $p < .001$, and in the rock trial, *found* was used more to explain ownership than liking, Fisher's exact tests, $p = .027$. *Bought* was used more to explain ownership of the hat than of the rock or picture, Fisher's exact test, $p = .002$, and in the hat trial, *bought* was used more to explain ownership than liking, Fisher's exact test, $p = .019$. Figure 3 illustrates this pattern and shows preschoolers responses by object. These findings show that 4-year-olds' explanations reflect an appreciation of the likelihood of events that can cause ownership.

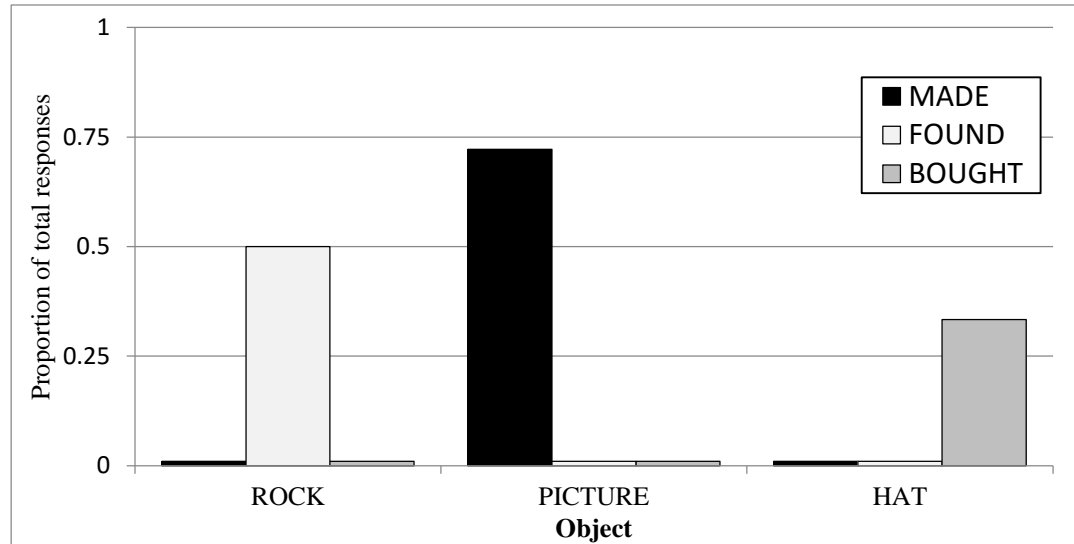


Figure 3. Experiment 1: The proportion of 4-year-olds' responses in which ownership of each object was explained as resulting from making, finding, or buying.

In sum, these findings show that 4-year-olds understand that current ownership of an object depends on past events, particularly acquisition events, whereas preference for an object does not. Furthermore, their explanations are sensitive to likelihood. Taken together, the findings reveal that children's explanations are constrained by their causal knowledge (i.e., knowledge of how ownership is acquired) and that 4-year-olds are able to infer events that plausibly happened.

We suggest that children's explanations of ownership and liking differed because children understand that past events are causally relevant for ownership, but not liking. However, ownership and liking differ in many ways, and so other factors may account for the differences found. For example, whereas owners typically interact physically with their property, this may be

less characteristic of liking (e.g., you can like a painting without ever coming close to it). Thus, children may have referred to making, finding, and buying because they are common physical interactions with the objects presented, and not because they cause ownership.

To rule out this possibility, preschoolers in a second experiment were asked to explain why a character is *using* an object. Even more than ownership, object use requires physical interaction with an object. Hence, if non-causal reasoning were responsible for the findings in Experiment 1, then children should give similar explanations for ownership and use. However, if their explanations depend on causal knowledge, children should refer to past acquisition events more when explaining ownership than object use. Because 3-year-olds did not infer history in their explanations, they were not included in this experiment. To further explore developmental differences, 5-year-olds were tested in addition to 4-year-olds.

Experiment 2

Method

Participants. Seventy children were tested, including thirty-four 4-year-olds ($M = 4,7$; range = 4,0–4,11; 15 girls) and thirty-six 5-year-olds ($M = 5,4$; range = 5,0–5,11; 16 girls). An additional six 4-year-olds and two 5-year-olds were also tested but were not included in analysis because they failed a screening task.

Materials and Procedures. Children first engaged in the same screening task used in Experiment 1. Children in each age group were randomly

assigned to either of two conditions, “ownership” or “use.” The ownership condition consisted of two test trials. In each trial, children were shown a picture displayed on a laptop using PowerPoint. In one trial, the picture showed a boy holding a rock; in the other, it showed a girl holding a drawing (presentation order of the trials was counterbalanced across children). In each trial, the experimenter briefly introduced the picture (e.g., “Here is a boy, and here is a rock”) and then told children that the character owns the object (e.g., “It is the boy's rock”). They were then asked a comprehension question to ensure they understood who owned the object (e.g., “Whose rock is it?”); children occasionally had difficulty with this question, and these instances were treated the same as in Experiment 1. After children correctly answered the comprehension question, they were asked to explain *why* the character owns the object (e.g., “Why is it the boy's rock?”). To prevent the repetition of answers, the penguin distracter task from Experiment 1 was used between the two trials.

The procedure in the *use* condition was identical except children were told that the character is using the object. In the picture trial they were told, “The girl is looking at the picture,” and in the rock trial were told, “The boy is playing with the rock.” The main test question was also modified to ask to children to explain *why* the character is using the object (e.g., “Why is the girl looking at the picture?”).

Similar to Experiment 1, children occasionally had difficulty producing the correct answer to the comprehension question. This was dealt with in the same manner as in Experiment 1.

Transcription and Coding. Transcription and coding procedures were identical to those in Experiment 1, with one exception. Because the characters were depicted holding the objects, the proximity category was expanded to include this fact. For example, if a child said, “Because he's holding it,” this was coded as a proximity response. As in Experiment 1, all explanations were coded independently by two coders. The inter-coder reliability was at near-perfect levels with Cohen's Kappas ranged from 0.82 to 1.0. All disagreements were resolved by discussion.

Results and Discussion

Each child had the opportunity to produce two explanations (i.e., one explanation in each of the two trials). Although children sometimes gave non-informative responses (e.g., they remained silent, or said, “I don't know”), these responses were included in the analysis but were coded as 0 for all categories.

Preliminary analyses revealed no effects of age on children's inferences of history or on their references to acquisition principles. Because there were no effects of age, findings from 4- and 5-year-olds were examined together in all subsequent analyses. The main analysis examined whether explanation scores in each category differed between the ownership and use conditions. If children understand that ownership depends on past events then they should refer to history more when explaining ownership than object use. Furthermore, children should use acquisition less often when explaining object use because how an object was acquired is not causally relevant.

Figure 4 shows 4- and 5-year-olds' mean scores for each scored category in the ownership and use conditions. For each category, independent samples *t* tests were conducted to compare scores between the ownership and use conditions. Children used history of the object to explain ownership but rarely to explain object use, $t(68) = -1.10, p < .001, \eta^2 = .02$. Children always referred to acquisition when referring to history, and so analysis of acquisition yielded the same values, $t(68) = -1.10, p < .001, \eta^2 = .02$. This was not true in Experiment 1 because the 4-year-olds, in that experiment occasionally spoke about history without discussing object acquisition. References to object use/desire occurred more in explanations of use than ownership, $t(68) = 5.22, p < .001, \eta^2 = .29$. References to proximity and characteristics did not vary by condition, $t(68)_{\text{proximity}} = -1.19, p = .240; t(68)_{\text{characteristics}} = .431, p = .668$.

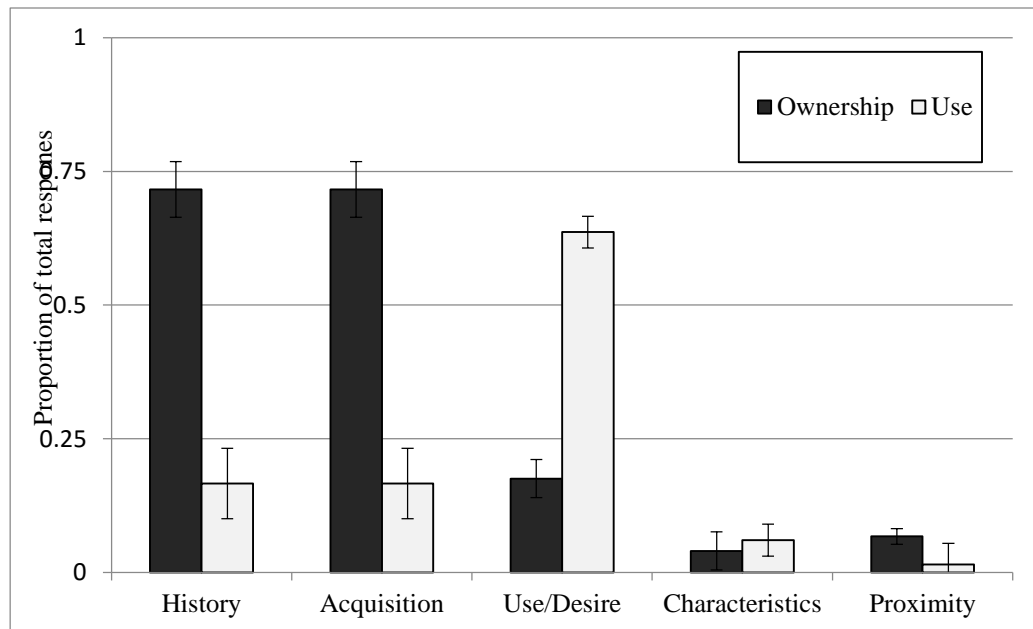


Figure 4. Experiment 2: The proportion of 4- and 5-year-olds' responses falling into each coded category in the using and ownership conditions.

Further analyses examined whether 4- and 5-year-olds' causal inferences varied for the rock and the picture (i.e., simple pictures are typically made and rocks are typically found). This analysis examined 4-year-olds' use of *made* and *found*. *Made* was used more to explain ownership of the picture than ownership of the rock, Fisher's exact test, $p < .001$, and in the picture trial, *made* was used more to explain ownership than *liking*, Fisher's exact test, $p < .001$. *Found* was used more to explain ownership of the rock than of the picture, Fisher's exact test, $p < .001$, and in the rock trial, *found* was used more to explain ownership than *liking*, $p < .001$. Figure 5 illustrates the pattern of their responses by object.

In sum, these findings show that 4- and 5-year-olds understand that current ownership of an object depends on past acquisition events, whereas object use does not. Furthermore, their explanations of ownership are sensitive to likelihood. The findings also rule out the concern that findings from Experiment 1 only resulted because physical interaction is more typical of ownership than liking. This factor does not differentiate ownership from current use, and yet the current experiment shows that children's explanations of these outcomes differed nonetheless.

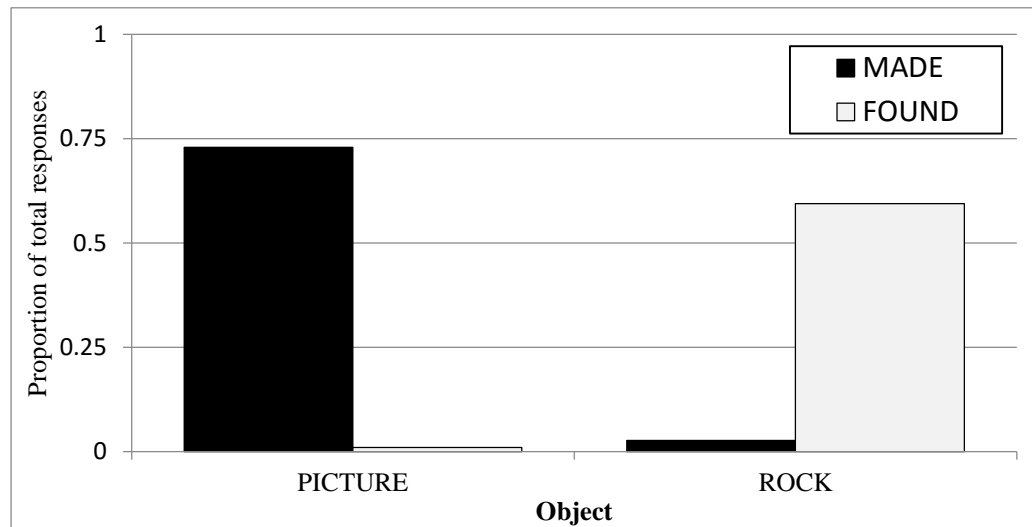


Figure 5. Experiment 2: The proportion of 4- and 5-year-olds' responses in which ownership of each object was explained as resulting from making or finding.

General Discussion

In two experiments, we examined preschoolers' ability to infer history when explaining an outcome. In our tasks, preschoolers were given minimal information to base their explanations upon. They were only told the outcomes they were to explain (e.g., “This is the boy's rock”) and nothing else. This is less information than in previous experiments examining children's explanations (Legare et al., 2009; Rosengren & Hickling, 1994; Schulz et al., 2007; Woolley et al., 2011). Because children were not told about prior events or circumstances that led to the outcomes, their explanations depended entirely upon their prior knowledge. These findings demonstrate that young

children can explain known outcomes and events by reasoning backward in time to uncover unknown but plausible *prior* causes.

We found that preschoolers as young as 4 years of age are sophisticated in their ability to infer history when explaining everyday outcomes. Children aged 4 and 5 readily inferred history when explaining outcomes that depended on past events, but not when explaining outcomes for which past events were not relevant. They regularly inferred history when explaining why a person owns an object, but rarely when explaining why a person likes an object (Experiment 1) or is using it (Experiment 2). Moreover, 4- and 5-year-olds used causal reasoning to produce their history-based explanations. They understood that acquiring an object can cause it to become owned, but does not explain why a person prefers it (Experiment 1) or uses it (Experiment 2). For example, they often said the boy owns the rock “because he found it,” but never gave this response when explaining why the boy likes the rock, or is playing with it.

Furthermore, 4- and 5-year-olds produced inferences that reflected their knowledge that different outcomes have typical ways of being caused. In the current experiments, each object could have been acquired in a few ways (e.g., pictures can become owned by being *made*, *given as gifts*, or *bought*). However, each object has a likely way of becoming owned (e.g., simple pictures are typically *made*). Children provided the most typical cause of ownership for each object (both experiments), and thus inferred past events that *plausibly* happened. How did children know which causes were typical for each object? One possibility is that children are sensitive to the distributional input of the

way that people come to own different kinds of things. For example, they may know that although people *can* buy rocks, finding rocks is more common. If children's responses were driven by sensitivity to distributional input, these findings would lend additional evidence that children use statistical evidence when producing explanations (Lombrozo, 2007; Schulz et al., 2007). An alternative possibility is that children believe there is only one way to acquire each object. For example, they may believe that pictures can *only* become owned by being made. As such, investigating between these possibilities is an area for future research.

Developmental Differences

In contrast to the 4- and 5-year-olds, 3-year-olds did not use historical inferences to explain ownership (Experiment 1). Furthermore, their explanations for ownership and liking did not differ in any way. They inferred history and referred to acquisition principles equally often in the ownership and liking conditions, but at low rates (< 15% of explanations in both conditions). Why did 3-year-olds' responses differ from those of older children? We consider four accounts of their difficulty.

First, 3-year-olds may be generally bad at producing explanations. If this were true, it would be expected that they would do poorly when explaining *all* outcomes. This account is ruled out by our finding that 3-year-olds produced plenty of explanations in both conditions (75% of 3-year-olds produced informative explanations), and is also ruled out by previous studies that found that 3-year-olds can produce explanations (e.g., Legare et al., 2009).

Second, 3-year-olds may not be aware of which particular actions cause ownership. For example, 3-year-olds may not know that making a picture causes the artist to own it, whereas older children may appreciate this. Because older children know that making a picture causes ownership, they had a reason to infer history (i.e., “The girl made the picture”), whereas 3-year-olds may not. However, we can rule out this account, at least for children's explanations of the picture. Three-year-olds appreciate that by investing creative labor in an object, a person can become the owner of it (Kanngiesser et al., 2010). This suggests that for the picture trial, 3-year-olds had the necessary causal knowledge to guide their inferences about the past.

Third, 3-year-olds might have difficulty with certain forms of causal reasoning. Although they might be able to reason from cause to outcome, they could have difficulty reasoning *backward* from outcome to cause. For example, they might be able to predict that an artist who draws a picture will own it (cause → outcome), but have difficulty reasoning that the artist owns a drawing because the artist drew it (outcome → cause). Such difficulty would make it impossible for children to generate historical inferences and also to infer other kinds of causes. This is unlikely to explain 3-year-olds' difficulty, though, because previous findings suggest children show the *opposite* asymmetry; they are more successful at explaining that sickness is caused by contamination (outcome → cause) than they are at predicting that contamination causes sickness (cause → outcome; Legare et al., 2009).

Fourth, and most likely in our view, 3-year-olds may have found our task difficult because they had such little information to base their explanations on. They were only told the outcome to be explained and nothing else. Although 3-year-olds produced informative explanations, many of these explanations *were* based on the little information they were given. For example, by observing that the rock is gray, 3-year-olds could generate explanations such as “the boy likes it because it's gray.” Such explanations are less generative than those that make reference to entities and events not provided to children (e.g., the event of finding). Producing generative explanations might be especially taxing for 3-year-olds because doing so likely requires executive control of memory (i.e., to actively search semantic memory for relevant information about the kinds of events that can cause an outcome; e.g., Tomita, Ohbayashi, Nakahara, Hasegawa, & Miyashita, 1999) and because executive functioning is quite immature at this age (e.g., Garon, Bryson, & Smith, 2008). Three-year-olds' performance might improve if the stimuli provided more information. For instance, if shown a forest scene with rocks on the ground, they might find it easier to generate the explanation that the boy found the rock on the ground.

Inferring History in Explanations

The current findings suggest that children infer history for outcomes that depend on past events, but not for outcomes that do not—children inferred history when explaining ownership, but not when explaining liking or object use. These findings have implications for children's explanations in other domains. For example, consider the domain of theory of mind. Current beliefs

often depend on prior observations. For example, a man may believe a ball is in a drawer (even though it is not currently there) because he previously saw it there. Hence, when explaining why the man believes the ball is there, children might infer that he previously saw it in the drawer, even if they were not provided with this information. In contrast, children might not infer history when explaining people's desires, because current desires often depend on present facts rather than on past events. For example, a woman might desire ice cream because she currently wants something sweet. Previous studies have only required children to explain characters' current actions (e.g., Bartsch & Wellman, 1989; Wellman & Lagattuta, 2004) and have not contrasted explanations of beliefs and desires.

In addition, although history is typically more relevant for ownership than liking, there are instances where history *is* relevant for liking. “Authentic” objects are often valued because of their distinctive history—for example, original creations, such as the *first* bicycle ever made, are valued because they occupy an important place in history. By the time they are in kindergarten, children appreciate that original creations belong in museums (Frazier & Gelman, 2009), and so perhaps they might refer to history when explaining why original creations (and other objects valued for their histories) are liked by people. Consistent with this, in the few cases where children inferred history in the liking condition (Experiment 1, 13% of responses in the liking condition), they predominantly referred to the picture (an original creation) and said that the girl liked it because she made it.

Another question for future research concerns whether inferring history in explanation may help children in categorization and related judgments. Historical inferences have been claimed to influence people's judgments in a variety of domains, including judgments about whether an object is an artifact or a natural kind (Gelman & Kremer, 1991), judgments regarding the functions of artifacts (e.g., Kelemen, Seston, & St. Georges, 2012; Matan & Carey, 2001), and judgments regarding how both artifacts (e.g., Bloom, 1996; Preissler & Bloom, 2008) and biological kinds (Lombrozo & Rehder, 2012) should be categorized. Moreover, producing explanations aids adult's ability to categorize by helping them discover subtle similarities underlying category membership (Williams & Lombrozo, 2013). Hence, having children produce explanations, which might contain historical inferences, could influence their judgments in domains for which history is important.

Understanding Ownership

Our findings are also informative about children's reasoning about ownership in three important ways. First, they support the proposal that children use historical reasoning to understand ownership (Friedman, Neary, Defeyter, & Malcolm, 2011; Friedman, Van de Vondervoort, Defeyter, & Neary, 2013; Gelman et al., 2012; Neary et al., 2012).

Overwhelmingly, preschoolers used past acquisition of an object to explain ownership and rarely to explain other outcomes such as preference or object use. Their discussion of past acquisition indicates that they understand that ownership results from past investment upon an object, and other person–

object relations (e.g., liking, use) do not. For example, preschoolers said that the boy found the rock when explaining why he owns it. These findings conflict with claims that preschoolers' reasoning about ownership is primarily based on simple cues, such as physical associations between an object and a person, and verbal testimony (Blake & Harris, 2011; also see Blake, Ganea, & Harris, 2012). In contrast to these claims, we found that 4- and 5-year-olds explained ownership by inferring past events, which they neither witnessed nor were told.

Second, this is one of the first studies to examine children's understanding of the specific ways objects become owned. Most previous studies only investigated children's understanding of object acquisition using scenarios where ownership was transferred (e.g., Blake & Harris, 2009; Friedman & Neary, 2008; Kanngiesser et al., 2010). In our tasks, preschoolers demonstrated an appreciation of ownership acquisition by referencing making, buying, and finding in their explanations. Specifically, preschoolers' use of *making* to explain why the girl owns the picture demonstrates an appreciation that creative labor can cause ownership. This finding builds upon previous work suggesting that children appreciate that ownership of an object can be transferred to a person who creatively modifies it (Kanngiesser et al., 2010). Preschoolers' use of *buying* to explain ownership indicates an understanding that monetary investment can cause ownership. These are the first findings to demonstrate that 4-year-olds possess this knowledge; the only previous study to examine this only showed that 5- to 6-year-olds understand that buying an

object can cause ownership (Cram & Ng, 1989). Furthermore, this study is the first to explore whether children understand that *finding* an object can cause ownership and shows that 4-year-olds appreciate this. Natural kinds are typically not owned, and preschoolers know this (Neary et al., 2012). Hence, preschoolers' explanations may indicate that they realize that finding an unowned object can cause it to become owned. As a whole, this study demonstrates children's profound appreciation of how objects become owned.

Third, although previous research has suggested that preschoolers distinguish between ownership and liking (Friedman, 2008; Friedman & Neary, 2008; Malcolm, Defeyter, & Friedman, 2012), our findings go further by indicating that children understand that events that are causally relevant for ownership are not relevant for liking or using an object. For example, when children were asked “Why is the girl looking at the picture?” they often referred to her mental states (e.g., “Because she wants to”). The preference to discuss mental states rather than past events suggests that children distinguished between what causes use and ownership.

It may be surprising that young children have such a detailed understanding of how objects become owned. However, knowing both who owns an object and how they are typically acquired is important. Young children may use this detailed knowledge of what causes ownership to help them avoid conflict. For example, if children did not appreciate that only particular events cause ownership, then after simply playing with a toy, they could believe they own it. This could lead to conflicts between owners and mere users of objects. In

addition, young children may use their causal knowledge to help them acquire objects they desire. For instance, if a girl wants a toy she sees on TV, knowing the toy must be bought in a store will help her obtain it.

Conclusion

Taken together our findings demonstrate that 4- and 5-year-olds have a robust ability to infer history in their explanations; in contrast, 3-year-olds do not appear to show this ability. Although further research is needed, we speculate that this developmental improvement results from increases in children's executive control of memory, which is likely needed to generate explanations. The findings also show that 4- and 5-year-olds appreciate a variety of ways in which an object can become owned, and know which events are most likely to cause ownership depending on the type of object.

Chapter Three: Preschoolers' reasoning about what ownership entitles owners to do with their property (Paper Two)

This paper was previously published:

Nancekivell, S. E., & Friedman, O. (2014). Mine, yours, no one's: Children's understanding of how ownership affects object use. *Developmental Psychology*, *50*, 1845-1853. doi:10.1037/a0036971

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Introduction

People have cared about ownership of property for a very long time. Ancient legal systems, such as the Laws of Manu, the Code of Hammurabi, the Hittite Code, and Ancient Roman Law, included rules governing property use, and some punished certain property violations with death (Bühler 1886; Good, 1967; Robinson, 2007). Today ownership still governs how objects may be used. For example, if a smart phone belongs to you it is acceptable to use it to make phone calls, to play Angry Birds, or to send emails; however, if it belongs to a colleague, then it is unacceptable to use it in any of these ways without permission. In everyday life, understanding ownership rights is an important part of understanding object use.

Awareness of ownership begins early in development, and considerations of ownership are important in very young children's reasoning about objects. For example, 2-years-olds can identify familiar objects belonging to themselves and family members (Fasig, 2000). They also defend their own ownership rights (Rossano, Rakoczy, & Tomasello, 2011) and appeal to ownership in disputes over their property (Ross, 1996).

Young children also have some appreciation of *others'* ownership rights (for a recent review see Nancekivell, Van de Vondervoort, & Friedman, 2013). Three-year-olds sometimes protest if someone acts adversely towards another's property (Rossano et al., 2011; also see Vaish, Missana, & Tomasello, 2011). For example, 3-year-olds may tell a puppet to "stop" if he tries to steal or damage someone else's hat. Also, young children side with owners when an owner and non-owner have conflicting wishes about how an object should be used. Children aged 3 to 7 judge that a girl should be able to use her own crayon immediately, even if someone else needs the crayon to finish a project (Neary & Friedman, 2014). Similarly, 4- to 8-year-olds believe objects should only be lent or discarded if the owner approves (Kim & Kalish, 2009). Children have similar beliefs about intellectual property. For instance, 5- and 6-year olds negatively evaluate someone who copies another person's idea (Shaw & Olson, 2011).

Although these previous studies show that children respect ownership, they leave important issues unaddressed about how young children represent ownership rights. Theories of ownership typically posit that a few broad principles underlie peoples' reasoning about ownership rights (Jackendoff, 1992; Miller & Johnson-Laird, 1976; Snare, 1972); these principles distinguish reasoning about ownership from reasoning about other social norms (e.g., norms of politeness, norms of gender roles). However, it is unknown if young children reason about ownership rights using broad principles. Instead, children could heed narrower, context-specific, rules. Hence, the study of young

children's reasoning about ownership is relevant to wider questions in cognitive development regarding whether young children reason in terms of broad abstract principles, or more specific, context-dependent rules (Gopnik, 2003; Gopnik & Wellman, 1994; Smith & Colunga, 2012). We discuss three unresolved issues related to this question.

Harmless Violations

The first issue concerns children's views of the *range* of object uses influenced by ownership rights. Adults typically refrain from using another's property, even when using it would be harmless and would not affect the owner in any way. However, previous studies only presented children with situations where someone deprived or tried to deprive the owner of property. Rossano et al. (2011) confronted children with a puppet who stole or threw away another's hat. Kim and Kalish (2009) asked children about situations where someone wanted to throw away or lend another's object without approval. Neary and Friedman (2014) used scenarios where the owner could not use her own crayon because someone else was using it. Because these studies only required children to consider scenarios where owners were deprived of their property, it is possible that children consider more harmless ownership violations to be acceptable.

Such ownership judgments could arise if children's judgments about ownership rights are solely based on a heuristic that owners should not be prevented from using their property. Previous findings are consistent with this possibility (Kim & Kalish, 2009; Neary & Friedman, 2014; Rossano et al.,

2011). Children's use of such a heuristic could result from parental input. Observational studies show that parents are inconsistent in their treatment of ownership violation, but are most likely to intervene when ownership violations are severe and could deprive the owner of property (Ross, 1996; Ross, Filyer, Lollis, Perlman, & Martin, 1994). Moreover, children tattle most often about these same transgressions (Ross & den Bak-Lammers, 1998). As such, it is possible that young children only consider it *unacceptable* to use another's property when using it deprives or interferes with the owner. Alternatively, children may be similar to adults and appreciate that ownership rights influence a broad range of object uses, including harmless ways of using another's property.

Presence of Owner

The second issue concerns children's views of the *contexts* in which ownership rights influence object use. In all previous studies examining ownership violations, the owner, property and non-owner were always present together (Kim & Kalish, 2009; Neary & Friedman, 2014; Rossano et al., 2011). However, on many occasions, people encounter property and respect that it is impermissible to use it, even though the owner's identity is unknown and the owner is not nearby. For example, adults do not typically try on others' coats at a coat-check, even if the owners are not around, and even if the owners' identities are unknown. Children may not share these intuitions and may believe that it is acceptable to use property when the owner is not present. Blake and Harris (2011) propose that children's understanding of ownership is largely

based on visual associations between an object and its owner. In this account, children may find violations of owner's rights to be more salient when the owner is known and visible.

Entitlement, Restriction, or Both

The third issue concerns the *principles* that underlie children's judgment of ownership rights. Accounts of ownership often distinguish between two ways that ownership affects property use. First, ownership may confer the *privilege* of using property to only the owner. Some theorists refer to this privilege as the Right of Use (Jackendoff, 1992; Miller & Johnson-Laird, 1976; Snare, 1972). If children view owners as having this privilege then they should view people as more entitled to use their own objects, than other's or ownerless objects. Second, ownership may act to *restrict* people from using others' property. Some theorists refer to this as the Right of Exclusion (Cohen, 1954; Merrill, 1998). If children view ownership as having this consequence, they should view people as restricted from using others' objects, but equally entitled to use their own and ownerless objects. It is unknown whether children view ownership as conferring privileges to owners, restrictions to non-owners, or both.

The Current Experiments

The current experiments address these three core issues. Experiment 1 explores whether children view harmless object use as influenced by ownership rights, and whether children respect ownership rights when the owner is neither known nor visible. Experiment 2 explores these issues as well as the principles

that underlie children's judgment of ownership rights. To explore these issues, Experiment 1 examined 4- to 6-year-old's views regarding the use of human-made property, and Experiment 2 examined 4- and 5-year-old's views regarding owned and ownerless natural objects; we also tried testing 3-year-olds in Experiment 2, but they were unable to perform the experimental task. Across the two experiments, we tried testing children ranging from 3- to 6-years because we were interested in tracking early development in children's reasoning about ownership rights, and, as reviewed above, recent research suggests that children's awareness of others' ownership rights first emerges at ages three and four.

Experiment 1

Method

Participants. Eighty-four children were tested, including 29 4-year-olds ($M=4;6$ years, range=4;0-4;11, 12 girls), 27 5-year-olds ($M=5;4$ years, range=5;0-5;11, 13 girls) and 28 6-year-olds ($M=6;4$, range=6;0-6;11, 13 girls). Although demographics were not formally collected, most children were from white middle class homes.

Materials and Procedures. Children in each age group were randomly assigned to either an *Agent owns* or an *Other owns* condition. The *Agent owns* condition consisted of three test trials. In each trial, children were shown a picture of a person beside an object (boy and teddy bear; boy and hat; girl and ball; see Figure 6 for all pictures shown. First, the experimenter briefly introduced the picture (e.g., "Here is a boy, and here is a ball"), and explained

that the person owns the object (e.g., “It is the boy’s ball. It belongs to him”). Next, children were asked to list what the person is allowed to do with the object (e.g., “What is the boy allowed to do with the ball?”). Children received the three test trials in one of six different orders.

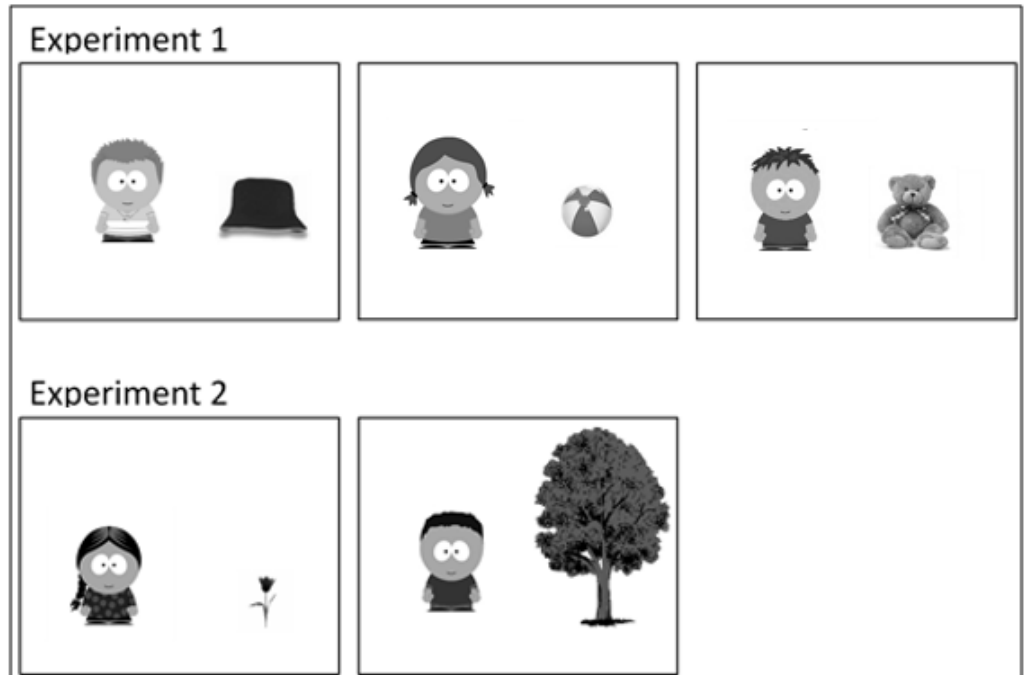


Figure 6. Pictures shown in Experiment 1 and 2.

The same procedure was used in the *Other owns* condition with one exception. Rather than being told that the person in each trial owns the object, children were told that the person does *not* own the object (e.g., “It is not the boy’s ball. It does not belong to him”).

Children in both conditions could produce as many responses as they wished. To encourage them, children were told that each response was a “Good idea” or Great idea,” regardless of the quality of the answer. Trials ended in two

ways. Children either told the experimenter that they had no more answers (e.g., “no more ideas”), or were silent for longer than three seconds. To confirm that children’s silence meant they were done, the experimenter asked the child if they had “Any more ideas?” or “Anything else?” If children responded *yes*, then the trial continued.

Occasionally children offered responses *completely unrelated* to the task (e.g., one child generated a list animals). In these cases, children were reminded to stay on topic (e.g., “But what about the boy and the ball?”). If they continued giving irrelevant answers (e.g., listed more animals), the experimenter moved onto the next trial.

Transcription and Coding. Testing sessions were audio recorded onto a laptop and then transcribed by a research assistant. Before coding began, children’s responses were separated from the rest of the transcript and randomly sorted. Because of this, responses could not be associated with their condition during coding. Each response was initially coded as informative or uninformative. Most responses were deemed informative. The only responses considered uninformative were those completely unrelated to the task (e.g., “I know a magic trick”), or those indicating that the child did not know an answer (e.g., “I don’t know”).¹

Two coders then independently coded all informative responses into one of 6 categories: modification, sharing-giving, contact-without-modification,

¹ Children gave irrelevant or unintelligible responses in 29 of the 288 trials in Experiment 1, and in 22 of the 88 trials in Experiment 2. These responses were not included in the analyses, but the few children who only gave such responses were included (i.e, they contributed scores of 0).

return-to-owner/appeals-to-authority, limitations, or use-without-contact.

Responses in the *modification* category described the actor purposely modifying the object. Responses in the *sharing-giving* category described either the actor sharing the object with others (“play with friends”) or giving the object away (“give it to his little sister”). These two were combined because often it was difficult to distinguish between giving away permanently and sharing. Responses in the *contact-without-modification* category included responses which described the person coming in contact with the object but not modifying it (e.g., “He’s wearing it”). The *return-to-owner/appeals-to-authority* category included responses which suggested that the actor should return the object to its owner (e.g., “Find who owns it”) or ask an adult what to do (e.g., “Tell the teacher”). These were grouped as one category because children often mentioned them concurrently, making them difficult to isolate (e.g., “He should ask his mom to give it back”). Responses in the *limitations* category referenced actions the person could not do (e.g., “He can’t touch it” or “He can’t hurt it”). This category also included object use that was conditional on the owner’s involvement (e.g., “Her and the owner could play catch”). Finally, explanations in the *no-contact* category described the person interacting with the object without touching it or the person’s thoughts about the objects (e.g., “look at it” or “want it”).

The inter-coder-reliability was excellent (Cohen's Kappa = 0.89). All disagreements were resolved by discussion. (During discussion coders noticed four notable responses which did not fit into our coding scheme. These

responses occurred in the *Agent owns* condition and claimed that the person should be allowed to “have” the object or “keep it forever”. Because these occurred very infrequently, they were not analyzed.)

Results and Discussion

First, we wanted to examine whether children viewed people in the *Agent owns* condition as more entitled to use objects than people in the *Other owns* condition. To do this, children were assigned a maximum entitlement score which indicated how freely an object could be used. To derive this score, all responses were first individually given one of three entitlement scores: 2 for responses in the *modification* category and for responses in the *sharing-giving* category, 1 for responses in the *contact-without-modification* category, and 0 for responses in all other categories. Next, the highest score was identified and used as that child’s maximum entitlement score.

We assigned a greater entitlement score for modification and sharing-giving because these actions, unlike use-without-modification, are almost exclusively reserved for owners. People often can use objects they do not own—they eat with silverware in restaurants and cafés, they read books borrowed from the library, and they wear clothing borrowed from friends. However, modifying these objects, or transferring ownership of them, is typically unacceptable (at least without special permission).

An ANOVA analyzed whether maximum entitlement scores differed by age (four, five, six) and condition (*Agent owns*, *Other owns*); Figure 7 shows the means scores in each condition. Although Levene’s test of equality of error

of variances was violated, $F(5,78) = 5.56, p < .001$, an ANOVA was still deemed appropriate as the two samples were of identical sizes, and the largest standard deviation was less than four times greater than the smallest (Howell, 2010, p. 334). Children's entitlement scores were higher in the *Agent owns* condition than in the *Other owns* condition, $F(1,78) = 50.07, MSE = 0.37, p < .001, \eta^2_p = 0.39$. Age was not a predictor of children's scores, $F(2,78) = 0.59, MSE = 0.37, p = .555, \eta^2_p = 0.02$, nor did it enter into an age by condition interaction, $F(2,78) = 2.04, MSE = 0.37, p = .138, \eta^2_p = 0.05$.

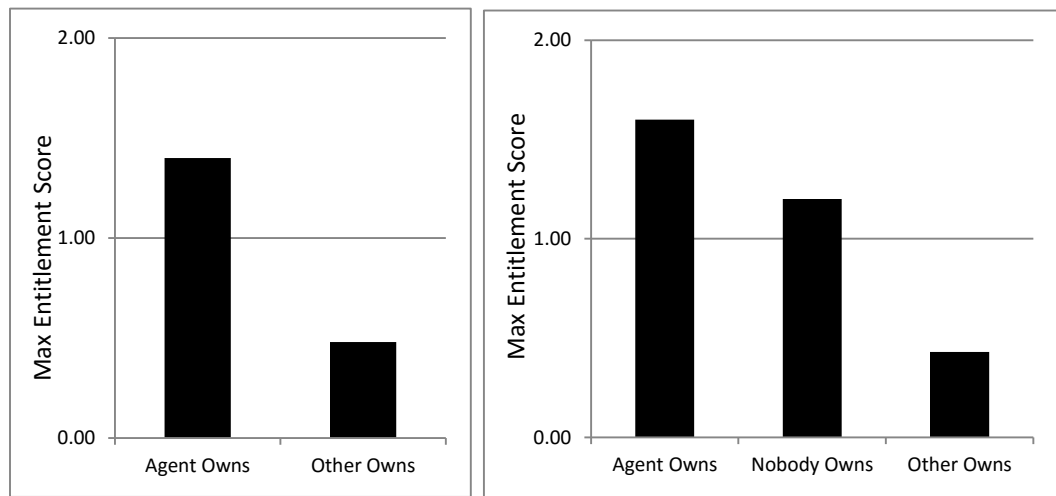


Figure 7. All Ages, Average Maximum Entitlement Score in Experiments 1 (Left) and 2 (Right).

We then examined whether this difference between conditions was also reflected in the frequency of responses given in each of the three entitlement categories (see Table 1). These analyses were conducted using Mann-Whitney U tests. (The same pattern of results was found when examining whether children were more likely to give responses in each category at least once.)

	Age	Condition	N	Modification (SD)	Contact-without-modification (SD)	Sharing-giving (SD)	Return-to-owner/appeals-to-authority (SD)	Limitations (SD)	No-contact (SD)
Exp. 1	4	Agent owns	14	0.21 (0.58)	6.36 (2.79)	0.14 (0.53)	0.00 (0.00)	0.21 (0.58)	0.00 (0.00)
		Other owns	15	0.07 (0.26)	1.87 (5.40)	0.67 (1.45)	1.27 (1.98)	1.20 (2.4)	0.13 (0.35)
	5	Agent owns	14	0.07 (0.27)	10.64 (5.92)	1.00 (1.52)	0.07 (0.27)	0.14 (0.53)	0.29 (0.61)
		Other owns	13	0.00 (0.00)	0.85 (1.82)	0.00 (0.00)	1.62 (1.89)	1.23 (1.64)	0.00 (0.00)
	6	Agent owns	14	0.00 (0.00)	8.64 (3.32)	0.93 (1.27)	0.07 (0.27)	0.14 (0.53)	0.00 (0.00)
		Other owns	14	0.07 (0.27)	1.07 (2.09)	0.29 (0.73)	3.00 (2.57)	1.43 (1.65)	0.00 (0.00)
Exp. 2	4-5	Agent owns	15	1.73 (2.79)	2.47 (2.36)	0.00 (0.00)	0.00 (0.00)	0.07 (0.26)	1.07 (1.79)
		Nobody owns	15	0.36 (1.08)	0.36 (0.74)	0.00 (0.00)	0.50 (1.16)	0.57 (0.85)	0.64 (1.74)
		Other owns	14	1.67 (2.44)	1.33 (2.19)	0.00 (0.00)	0.07 (0.26)	0.40 (0.63)	1.13 (1.25)

Table 1. Experiments 1 and 2. Mean Use of Entitlement Categories Per Trial with Standard Deviations in Brackets.

Modification Category. The number of responses in the *modification* category did not differ by condition, Mann-Whitney $U = 860.00$, $p = .631$. Notably, responses in this category were given very infrequently, making up less than 2% of all responses.

Sharing-giving Category. Children discussed *sharing-giving* more frequently in the *Agent owns* condition than in the *Other owns* condition, Mann-Whitney $U = 707.00$, $p = .032$.

Contact-without-modification Category. Children discussed the *contact-without-modification* more often in the *Agent owns* condition than in the *Other owns* condition, Mann-Whitney $U = 83.50$, $p < 0.001$.

We also examined the frequency responses in the *no-contact* category. We did not expect frequency to differ by condition because this category

includes actions such as thinking about an object, or smelling it, which should be unaffected by ownership. As expected they did not, Mann-Whitney $U = 681$, $p = .647$.

Lastly, we examined whether children viewed people as more restricted from using objects in the *Other owns* condition than in the *Agent owns* condition. To examine this, children were assigned a restriction score. This score is similar to the maximum entitlement score assigned earlier. However, because no categories indicated restriction more than the others, we did not give children a weighted score. Instead children were scored 1 if they gave responses in either the *return-to-own/appeal-to-authority* category or *limitations* category; children who never gave a response in either category were scored 0. A Fisher's exact test revealed that more children spoke about restriction in the *Other owns* condition than in the *Agent owns* condition, $p < .001$. See Figure 8 for mean restriction scores by condition.

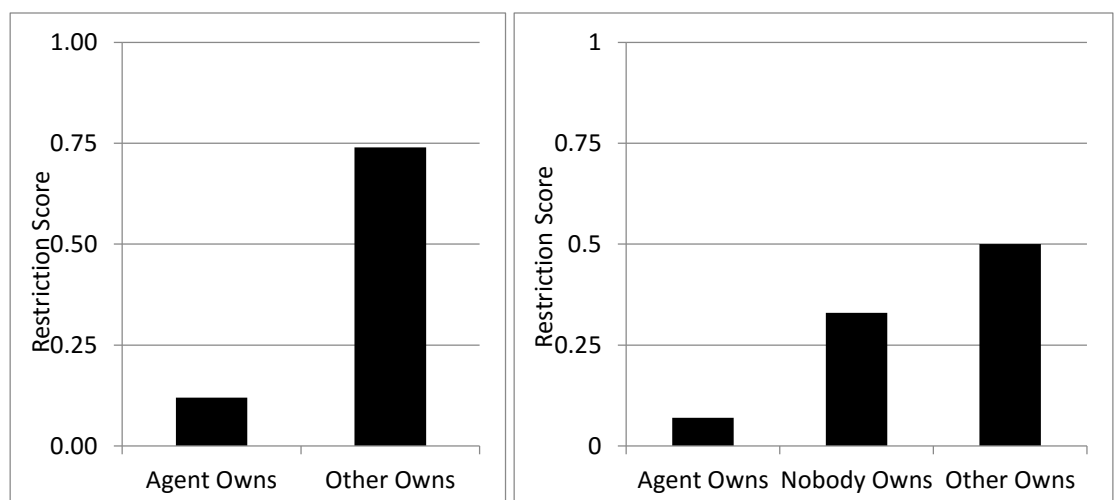


Figure 8. All Ages, Proportion of Children Discussing Restrictions At Least Once, in Experiments 1 (Left) and 2 (Right).

These findings suggest that children view people as more entitled to use their own property than others' property. These findings also suggest that children view people as restricted in how they can use others' property. These findings arose even though the owner was not present (or even known) in the *Other owns* condition, and differences even arose for harmless actions (i.e., actions in the use-without-modification category). This suggests that by age 4, children reason about ownership using a very broad principle (or broad principles), not specific to context or type of object use.

However, this experiment leaves the nature of this principle unclear. Children could either view ownership as influencing object use by entitling owners or by restricting non-owners (or both). Because these two accounts (entitlement, restriction) make different predictions about how people may use ownerless objects, Experiment 2 uses such objects to explore this issue. According to the entitlement account, ownership confers the privilege of using property to the owner. In this account, entitlement to use an object only applies to its owner. Hence, this account predicts that children would view people as less entitled to use ownerless and other owned objects, than personally owned objects. Alternatively, the restriction account views ownership as restricting non-owners from using property. Because restriction only applies to objects owned by someone else, this account predicts that children would view people

as less entitled to use other owned objects than ownerless and personally owned objects. Because we were mainly interested in children's entitlement reasoning, and no age differences were found between ages four to six in any entitlement analyses, we did not include children aged six.

Also, in Experiment 1, children rarely discussed modification. Although it could be that children believe owners are restricted from modifying property altogether (see Kim & Kalish, 2009), it is also possible that children think it is undesirable to modify manufactured goods (e.g., clothing, toys). If this is the case, then children may think it is acceptable to modify natural objects; Experiment 2 explores this possibility.

Experiment 2

Method

Participants. Forty-four children were tested, including 25 4-year-olds ($M = 4;5$, range = 4;0-4;11, 10 girls) and 19 5-year-olds ($M = 5;5$, range= 5;0-5;11, 8 girls). An additional 5 children were tested, but excluded from our analyses for failing the comprehension question.²

Materials and Procedures. The method differed from Experiment 1 in a few ways. First, Experiment 2 had only *two test trials* and used only natural objects (trial one tree, trial two flower). Second, children participated in an additional *Nobody owns* condition, where they were told that the object is ownerless (e.g., "It is no-one's tree. It doesn't belong to anyone"). Hence, each

² The task was also run on 15 3-year-olds. However, testing was discontinued because they found the task too difficult. Most 3-year-olds were silent, or failed the comprehension questions.

child was randomly assigned to one of the three conditions. Third, in the *Other owns* condition, we specified who owns the object, always referring to a person of the opposite gender from the person shown in the picture (e.g., “It belongs to a girl. It is a girl’s tree”). As before, this owner was not shown. Lastly, a comprehension question was asked at the end of each trial to confirm children’s understanding of the ownership information. Children were asked “Does the [object] belong to anyone?”, if they responded “yes” they were then asked “who does it belong to?” Children who answered this incorrectly were excluded from the analysis. After the first 17 children were tested, we made a slight addition to the procedure and also asked children to repeat the ownership information immediately after it was given. Of the 5 children excluded for failing a comprehension question all failed the question after this addition.

Transcription and Coding. The same coding and transcription methods were used as Experiment 1. Inter-coder-reliability was excellent (Cohen's Kappa = 0.84). All disagreements were resolved by discussion.

Results and Discussion

The scoring methods remained the same as Experiment 1. First, we examined whether children viewed people’s entitlement to use objects as differing for personally owned objects, other owned objects, and ownerless objects. To do this, children’s maximum entitlement scores were calculated and an ANOVA analyzed whether maximum entitlement scores differed by condition (*Agent owns*, *Other owns*, *Nobody owns*); Figure 2 shows the mean scores in each condition. Although Levene’s test of equality of error of

variances was again violated, $F(2,41) = 3.41, p = .043$, an ANOVA was still deemed appropriate as the three samples were of almost identical sizes, and the largest standard deviation was less than four times greater than the smallest (Howell, 2010, p. 334). Condition had a main effect on children's maximum entitlement scores, $F(2,41) = 5.10, MSE = 0.62, p = .001, \eta^2_p = 0.29$.³ Children's entitlement scores were higher in the *Agent owns* condition than the *Other owns* condition, Tukey HSD $p = .001$. Children similarly had higher entitlement scores in the *Nobody owns* condition than the *Other owns* condition, Tukey HSD $p = .031$. People in the *Agent owns* condition and the *Nobody owns* were considered to be similarly entitled, Tukey HSD $p = .355$.

We then examined using Mann-Whitney U tests, whether these differences were reflected in the frequency of responses in the three entitlement categories (see Table 1). (The same pattern of results was found when examining whether children were more likely to give responses in each category at least once).

Modification Category. Children discussed *modification* more often in the *Agent owns* condition than in the *Other owns* condition, Mann-Whitney $U = 51.00, p = .001$. They also discussed *modification* more often in the *Nobody owns* condition than in the *Other owns* condition, Mann-Whitney $U = 63.50, p = .032$. Children discussed *modification* as often in the *Agent owns* condition and the *Nobody owns* condition, Mann-Whitney $U = 109.00, p = .880$.

³ A preliminary ANOVA included age as a factor, and confirmed that it was not a significant predictor of children's scores, and that there was no age by condition interaction, both $ps > .21$.

Sharing-giving Category. Children never discussed sharing or giving so it could not be analyzed.

Contact-without-modification Category. Children discussed *contact-without-modification* more in the *Agent owns* condition than in the *Other owns* condition, Mann-Whitney $U = 36.50$, $p = .008$. Discussion of *contact-without-modification* did not differ between the *Nobody owns* and *Agent owns* conditions, Mann-Whitney $U = 70.00$, $p = .066$, and also did not differ between the *Nobody owns* condition and the *Other owns* condition, Mann-Whitney $U = 81.50$, $p = .211$.

As in Experiment 1, we also examined whether the frequency of *no-contact* responses differed by condition and found, as expected, they did not differ, *all p's* $> .308$.

Lastly, as in Experiment 1, we examined whether children viewed people's restriction from using an objects as differing for personally owned objects, other owned objects, and ownerless objects. To do this, we examined how children's restriction scores differed by age and condition; Figure 8 shows the mean restriction scores by condition. An initial Fisher's exact test revealed that restriction score varied across the three conditions, $p = .033$. More children spoke about restriction in the *Other owns* condition than in the *Agent owns* condition, Fisher's Exact Test, $p = .014$. No other differences between conditions were found, *all p's* $> .169$.

These results suggest that children appreciate that people are more entitled to use personally owned objects and ownerless objects, than others'

objects. These results also replicate those in Experiment 1 suggesting that children appreciate that people's use of others' property is more restricted than use of personally owned property. These findings support the restriction account of ownership; this is discussed further. Unlike Experiment 1, children appreciated that personally owned and ownerless natural objects may be modified, but others' objects cannot.

General Discussion

Two experiments examined how ownership influences 4- to 6-year-olds reasoning about what a person is allowed to do with an object. We found that children offered sophisticated responses. Children appreciated that people can use their own property and ownerless property *more* freely than others' property. For example, many children in Experiment 2 said a person could modify personally owned and ownerless objects, but not objects owned by someone else. Children also offered *more* restrictions (e.g., "Don't touch it") when objects were owned by someone else than when they were personally owned. Children also discussed harmless uses (contact-without-modification category) *less often* when objects were owned by someone else than when they were personally owned. In contrast, children appreciated that as long as someone is not touching an object (no-contact category), ownership does not influence what they may do. For example, children understood that people may smell another's flower, but not touch it. Children also appreciated that owners could modify natural objects, but not manufactured objects. We discuss how our findings relate to important issues concerning children's reasoning about

ownership rights, and their broader implications for the representation of ownership and morality.

Harmless Violations

We investigated children's views of the *range* of object uses that ownership rights affect. In everyday life, it is impermissible to use another's property, even harmlessly. However, previous studies of ownership rights (Kim & Kalish, 2009; Neary & Friedman., 2014; Rossano et al., 2011) left open the possibility that children think it is acceptable to use others' property harmlessly or in ways that cannot deprive the owner.

If children thought it was acceptable to harmlessly use another's property, they should have mentioned *contact-without-modification* actions when discussing how non-owners can use another's property. Such actions would not affect the owner's use of property or damage the property in anyway. However, few children mentioned these actions when specifying how another's property could be used. In Experiment 1, only 29% of children thought that people could use others' property harmlessly; conversely, 100% of children thought that people could use their own property harmlessly; in Experiment 2, 21% and 80%.

These findings show that children understand it is typically unacceptable to use others' property, even harmlessly. As such, the findings rule out the possibility that children reason about ownership rights using a narrow heuristic that owners should not be prevented from using their property.

Like adults, children appreciate that ownership rights affect a broad range of object uses.

Presence of Owner

We also investigated the effect of *context* on children's respect of owner's rights. In daily life, people uphold owners' rights over property even when the owners are not near their property, and their identity is unknown. However, previous studies left open the possibility that children view it acceptable to use others' property when they are not nearby (Kim & Kalish, 2009; Neary & Friedman, 2014; Rossano et al., 2011). Children might also view this as acceptable if their reasoning about ownership depends on visual associations between owner's and property, because these associations are not provided when the owner is absent (Blake & Harris, 2011). In our experiments children respected owners' rights even though they were absent (*Other owns* conditions). Moreover, in the *Other owns* condition of Experiment 1, children were never told that the objects were owned. Instead, our findings demonstrate that the owner does not need to be present nor does their identity need to be known for children to uphold the owner's rights. These findings are consistent with the proposal that when the owner of an object is unknown, children assign a place-holder attribute of "owned" to reason about ownership of that object (Blake & Harris, 2011).

Entitlement, Restrictions, or Both

Finally, we investigated the principles children use to reason about ownership rights. Ownership can be viewed as entitling owners to use property, or as restricting non-owners from using it, or both. To determine which account better captures children's reasoning, we examined children's beliefs about ownerless objects. Under the restriction account, ownership confers the Right of Exclusion and restricts people from using others' property, but allows people to use their own and ownerless objects freely (Cohen, 1954; Merrill, 1998). However, under the entitlement account, ownership confers the Right of Use and entitles *only owners* to use objects (Jackendoff, 1992; Miller & Johnson-Laird, 1976; Snare, 1972). Because the Right of Use is unique to owners, under this view, people's use of ownerless objects is restricted (i.e., because as non-owners, they are not entitled to use them). In Experiment 2 we found that children did not view ownerless objects in this way. They granted similar levels of entitlement to those using ownerless objects and personally owned objects, but lower levels to those using other owned objects. These findings suggest that children do not view entitlement to use objects as *unique* to ownership. As such, our findings are more consistent with a restriction account.

However, this conclusion may not apply to both natural kinds and artifacts. In Experiment 2, we only examined children's judgments about only ownerless natural kinds. Children might reason differently about ownership rights for natural kinds and artifacts. This could be viewed as plausible because children often reason differently about artifacts and natural kinds (Brandone & Gelman, 2009; Rhodes & Gelman, 2009; Rhodes, Gelman, & Karuza, 2014),

and they have differing expectations about whether artifacts and natural kinds are owned (Neary, Van de Vondervoort, & Friedman, 2012). To directly test whether the restrictions account extends to artifacts, future research could examine children's responses for unowned artifacts (e.g., abandoned or discarded artifacts).

However, the present findings provide some evidence that the restrictions account is *not* limited to natural kinds. Restriction-based reasoning would explain why children in *both* experiments discussed restrictions more often when objects belonged to someone else than when they were personally owned (i.e., this was found for both artifacts and natural kinds). Most of these instances included direct discussion of limitations or what the person was *not* allowed to do. It is striking that children discussed any such limitations, because they were only asked what the person was *allowed* to do. In Experiment 1, 43% of children listed limitations when discussing the use of another's property, whereas only 7% of children listed any limitations when discussing the use of personally owned objects (Experiment 2: 36% and 7%). Children's spontaneous listing of limitations may reflect the strength of their normative belief that others' property should not be used.

Broad Principles

In three different ways, our findings suggest that children reason about ownership rights using broad principles (or a broad principle). First, children appreciate that ownership affects a broad range of object uses. Second, they appreciate that ownership influences object use in a variety of contexts (e.g.,

owner known and present and not known and not present). Third, children's reasoning appears to adhere to the Right of Exclusion, which is itself a broad principle. This suggests that by age four children do not reason about ownership rights using narrow or piecemeal rules. As such, our findings are consistent with claims that young children reason in terms of broad abstract principles (e.g., Gopnik, 2003; Gopnik & Wellman, 1994).

How do children come to this broad understanding of ownership rights?

One possibility is through *inductive reasoning*. Children have a bias to generalize information (Gelman, Collman & Maccoby, 1986; Gelman & Markman, 1986; Rhodes, Brickman & Gelman, 2008). For example, when learning a novel trait about three golden retrievers, children generalize that trait to the entire category of dogs, even in cases where adults do not (Rhodes et al., 2008). Similarly, after viewing a few situations where ownership prevents a non-owner's use of an object, children may infer a general rule that using another's property is impermissible. Another related possibility is that children generate such a rule from their own experience with successfully excluding others from using property. For example, 20-month-olds exercise control over their belongings by preventing others from using them (Ross, 2013). This first-person experience with exclusion may lead young children develop a broad rule that owners are entitled to exclude, which would also apply to third-person interactions.

A final possibility is that children's reasoning about ownership rights may be an extension of their ability to reason about *bodily rights* (Humphrey

1992; Neary & Friedman, 2014). For example, children's appreciation that it is wrong to control another's property (e.g., by holding another's ball), may stem from their appreciation that it is wrong to control another's body (e.g., by holding another's arm). Hence, the broad reasoning which likely underlies children's reasoning about bodily rights may carry over to their understanding of ownership rights. Future research might help answer this question by examining younger children, but using a method suitable for younger children.

Further Directions

Our findings suggest possible areas for further research. First, some children's responses were not consistent with the restrictions account. If children thought ownerless objects could be used freely, they should *not* have listed any restrictions in the *Nobody owns* condition. We found they sometimes did, though the number of children giving such restrictions did not significantly differ from either the *Agent owns* condition or the *Other owns* condition. These responses may have resulted from some children thinking that the objects were not truly ownerless. For example, when asked what could be done with a tree, some children may have thought of a tree in a park owned by the city. To further explore this possibility, future research could highlight the ownerless nature of the objects by specifying where the objects are located (e.g., an uninhabited island).

Second, our analysis assumed that children omitted actions because they viewed them to be *unacceptable*. Alternatively, children may also have omitted *uncommon* actions. For example, in the *Other owns* condition children may

have omitted harmless actions because people rarely use others' property. However, this concern is largely ruled out because children often listed direct limitations on use (e.g., "she can't touch it"). To explore children's judgments using a method less likely to be impacted by the frequency of actions, future research could ask children more direct follow-up questions about the acceptability of different kinds of object uses. Alternatively, in future research, children could be asked about restrictions more directly (e.g., "What can't the owner/non-owner do?").

Third, although we could have imagined finding a developmental shift in children's reasoning about ownership rights (e.g., perhaps a shift from reasoning in terms of specific rules to reasoning using broader principles), we did not. However, we did not succeed in testing 3-year-olds. Many of the 3-year-olds remained silent, perhaps because they found the open-ended nature of our task difficult. Future research should use easier tasks to investigate whether 3-year-olds have a similarly broad respect of ownership.

Fourth, the present experiments appeared to differ in the frequency with which children discussed particular uses. In discussing artifacts (Experiment 1), children sometimes discussed sharing and giving, but rarely discussed modification (Kim & Kalish, 2009, likewise found that young children may view owners as generally restricted from modifying artifacts); conversely in discussing natural kinds (Experiment 2), they rarely discussed sharing and giving, but sometimes discussed modification. We could not directly compare findings across these two experiments because they differed in the number of

trials given, but future research could further investigate these differences. Some differences might reflect broad differences in reasoning about object kinds (i.e., artifacts vs. natural kinds)—for example, children might only appreciate that owners can modify natural but not artificial property. Other differences might have completely different explanations. For example, children might have no differing expectations about the sharing of artifacts and natural kinds; the low levels of sharing in Experiment 2 might have resulted because the tree and flower were rooted into the ground, and are non-portable.

Finally, our findings may also have broader implications for moral development. Recent research suggests that children can judge victimless offenses to be wrong (Rottman & Keleman, 2012). Rottman & Keleman (2012) found that if a harmless act is described as unnatural or disgusting, 7-year-olds will judge it to be wrong. Our findings suggest that ownership violations may be another case where children view victimless acts as unacceptable. Future research should more directly investigate whether children view ownership violations as being victimless offences.

Chapter Four: Preschoolers' reasoning about when ownership is relevant (Paper Three)

A version of this paper has been accepted at *Cognitive Science*:

Nancekivell, S. E., & Friedman, O. (accepted). Preschoolers explain acceptability with ownership. *Cognitive Science*.

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Introduction

Suppose while on a walk, you notice your neighbor has a new garden gnome. You really like it, and think it would perfectly match the other gnomes in your garden. Hopefully, you immediately recognize that you should not take the gnome because it is not yours. This reaction indicates that ownership is influential in your reasoning about the acceptability of using objects. You thought about ownership without anyone pointing out its relevance to you, or even mentioning it. Also, you privileged ownership over other considerations that might have prevented you from taking the gnome, such as the difficulty of carrying back to your garden.

Is ownership similarly influential in young children? Young children are capable of considering ownership when reasoning about the acceptability of using objects. For instance, 3- and 4-year-olds side with owners in conflicts about who should use property (Neary & Friedman, 2014), and recognize that property should not be used without consent (Kanngiesser & Hood, 2014; Nancekivell & Friedman, 2014a; Rossano, Rakoczy, & Tomasello, 2011). However, as we detail below, existing research has not examined whether young children's reasoning has the properties that characterized the influence of

ownership on your reasoning about the garden gnome. As such, the influence of ownership in young children's reasoning is unknown.

Recognizing that Ownership is Relevant Even When No One Mentions It

In all previous experimental studies on ownership, the relevance of ownership for reasoning about acceptability was highlighted. Experimenters either highlighted ownership by telling children about the owner (e.g., "It is the girl's ball") or by asking them directly about ownership (e.g., "Does this ball belong to someone?"). This is true of studies examining children's recognition of ownership rights (e.g., Kim & Kalish, 2009; Neary & Friedman, 2014; Rossano et al., 2011) and studies investigating how children's judge and track whether objects are owned and who they are owned by (Blake, Ganea, & Harris, 2012; Gelman, Manczak, & Noles, 2012; Gelman, Noles, & Stilwell, 2014; Kanngiesser & Hood, 2014; Kanngiesser, Itakura, & Hood, 2014; Neary, Van de Vondervoort, & Friedman, 2012). Hence, these studies do not show whether children consider ownership when it is not mentioned to them. Observational studies suggest that children consider ownership without its explicit mention (i.e., they spontaneously refer to it in their disputes); however this mainly occurs for their own property and rarely for others' (Dunn & Munn, 1987; Hay & Ross, 1982; Ross, 1996, Ross, 2013). So while previous studies suggest that children are capable ownership reasoners, they leave open the possibility that ownership does not influence their reasoning unless its relevance is highlighted for them. Put differently, it is possible that a young child who wants to take your neighbor's garden gnome might not consider its

owner unless someone mentions or asks about her.

Privileging Ownership Over Other Factors Affecting Object Use

Many factors influence whether it is acceptable for someone to use an object. These include personal beliefs, object properties, welfare, authority, and gender stereotypes (e.g., Killen, Pisacane, Lee-Kim, & Ardila-Rey, 2001; Killen & Smetana, 1999; Laupa, 1994; Nucci & Weber, 1995; Smetana, 1989; Stoddart & Turiel, 1985). It is unknown whether children privilege ownership over these other factors when reasoning about whether it is acceptable to use an object. In fact, young children might be more likely to use observable properties of objects to reason about acceptability. This might occur because young children often rely on external or readily available properties of objects when reasoning about the world (Hickling & Wellman, 2001; Sobel, Yoachim, Gopnik, Meltzoff, & Blumenthal, 2007; Walker, Lombrozo, Legare & Gopnik, 2014). For example, a young child might decide it is unacceptable to take the garden gnome because it is too heavy, and not because it belongs to the neighbor. Only one existing study has examined ownership's influence relative to another factor (Neary & Friedman, 2014). This study found that 3- to 7-year-olds believed an owner should be able to take back her property, even though someone else needed it to complete a goal. However, because of the limited scope of this study, it is unclear whether ownership is more influential than the many other factors that might arise in children's reasoning about object use.

The Current Approach

In this paper, we use children's explanations to investigate the influence of ownership in their reasoning about the acceptability of using objects. We use children's explanations because they are a window into the theories and principles children use to reason about the world (Carey, 1985; Legare, Wellman, & Gelman, 2009; Rhodes, 2014; Wellman, 2011; Wellman & Lagattuta, 2004). We focus on children aged three to five because these are the first ages at which children reliably produce explanations (Wellman, 2011), and respect others' ownership (for a review see Nancekivell, Van de Vondervoort, & Friedman, 2013).

We conducted three experiments. In Experiments 1 and 2 we examined whether children refer to ownership in their explanations even when it is not mentioned to them, and whether children reference ownership in their explanations more than alternative considerations. Experiment 3 only examines the latter issue. If children offer ownership as an explanation more often than other types of explanations, and when it has not been mentioned, it would suggest that ownership is influential in their reasoning about acceptability, and more influential than other factors. However, if they rarely offer ownership as an explanation it would suggest that ownership is not influential in their reasoning about acceptability.

One concern is that we might underestimate children's abilities because of the language demands explanations. However, as young as 17 months children can generate possessive utterances such as "mommy's sock" (Brown,

1973; Tomasello, 1998) necessary for using ownership as an explanation. As such, preschoolers have the sufficient linguistic skills to succeed on our task. Any developmental differences in young children's use of ownership to explain acceptability would suggest a change in their conceptual development not linguistic development.

Experiment 1

In Experiment 1, we asked preschoolers to explain either why it was acceptable for a character to use one of two objects, or why a character knew how to use one of two objects. Knowledge was chosen because, similar to acceptability, it affects how and if objects are used. Although we expected that children might refer to ownership when explaining acceptability, we thought children might refer to ownership less when explaining knowledge states because these might depend more on other factors, such the character's previous use of the object. Because we wanted to assess whether children recognize that ownership is relevant even when it is not highlighted, we did not mention ownership to them.

Method

Participants. One-hundred and seven children were tested. These included 36 three-year-olds ($M = 3;6$, range = 3;0-3;11, 22 girls), 35 four-year-olds ($M = 4;5$, range = 4;0-4;11, 18 girls) and 36 five-year-olds ($M = 5;5$, range = 5;0-5;11, 12 girls). Although demographics were not formally collected, the majority of these children were from white middle class families. This demographic information is true for all subsequent experiments.

Materials and Procedure. Children in each age group were randomly assigned to either of two conditions, “acceptability” or “knowledge”. All children completed two test trials. In each trial, children were shown a picture depicting a character and two objects (a character with two backpacks in trial one, and a different character with two robot toys in trial two; see Figure 9 for a sample picture). Children in the acceptability condition were told that it was acceptable for the character to use one of the objects but not the other, and were then asked to explain why it was acceptable for the character to use the object (e.g., “Why is it okay for the girl to open just this backpack?”). Children in the knowledge condition were told instead that the character knew how to use one of the objects but not the other, and were asked to explain this (e.g., “Why does the girl know how to open just this backpack?”) (See Figure 9 for script and sample materials).

When children did not produce an explanation, or said “I don’t know” they were prompted up to three times. First, they were asked to “just guess,” and then they were asked “what do you think?”, and finally, if they still did not produce an explanation, the original “why” question was repeated. If an explanation was still not produced after three prompts, the experimenter moved on to the next trial. Children were also prompted if they just repeated the information in the test question (e.g., “She can open this one but not this one” or “She can open this one”). When this happened children were told “that’s right” and then were asked “but, why?”. Children repeating the test question information were only prompted once in this way; if they persisted, this answer

was accepted. This prompting procedure was used for all subsequent experiments.

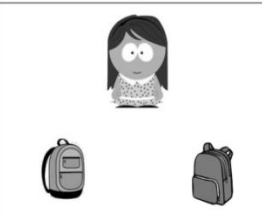
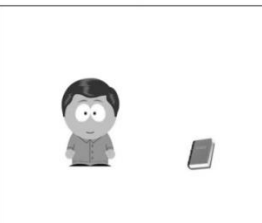
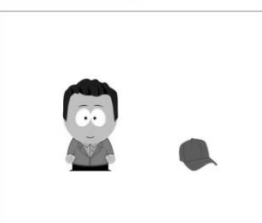
<p>Experiment 1</p> 	<p>Acceptability condition. Look here is a girl and two backpacks. It's okay for the girl to open this backpack but not this backpack. Why is it okay for the girl to open just this backpack?</p> <p>Knowledge condition. Look here is a girl and two backpacks. The girl knows how to open this backpack but not this backpack. Why does the girl know how to open just this backpack?</p>
<p>Experiment 2</p> 	<p>Acceptability condition. Look here is a man and a book. It's okay for the man to take the book home. It's okay for the man to take the book home. Why is it okay for him to take it home?</p> <p>Unacceptability condition. Look here is a man and a book. It's not okay for the man to take the book home. It's not okay for him to take the book home. Why is it not okay for him to take it home?</p>
<p>Experiment 3</p> 	<p>Acceptability condition. Look here is a man and a hat. It's the man's hat and it's the right size for him. It's okay for him to wear it. Why is it okay for him to wear it?</p> <p>Unacceptability condition. Look here is a man and a hat. It's someone else's hat and it's too big for him. It's not okay for him to wear it. Why is it not okay for him to wear it?</p>

Figure 9. Sample scripts and materials used for all experiments.

Transcription and Coding. All testing sessions were audio recorded onto a laptop and then transcribed by a research assistant. Children's answers to the *why* questions were then separated from the rest of the transcript, and randomly sorted, so that they could no longer be associated with their condition. Next, children's answers were coded. Each response was coded first as informative or uninformative. Responses were only considered uninformative if

the child produced an answer that was unrelated to the task (e.g., “I have lots of backpacks at home”) or if the child indicated they did not know the answer (e.g., “I don’t know” or “I can’t think of anything”). Informative explanations were then coded as *one of four* mutually exclusive explanation types: ownership, object property, normative⁴, and other. See Table 2 for a description of each category. Children’s explanations never fell into more than one category and their entire responses was always coded.

Category	Criteria	Examples
Uninformative	Any utterance which was not comprehensible. This category also includes silences and “I don’t know.”	“Dog.” “I don’t know.” “I only have one backpack.”
Ownership	Explanations referencing someone’s ownership or the absence of their ownership. This also includes referencing ownership-based rules about purchasing objects or permission.	“It is the girl’s.” “It’s someone else’s.” “He paid for it.”
Object Properties	Explanations referencing features or properties of the object such as its shape, size, or function. This includes non-obvious properties such as safety and remote operation.	“It’s blue.” “It’s for wearing.” “It has a remote.”
Normative	Explanations referencing non-ownership rules or conventions in some way. This includes references to authority, stereotypes, and location-based rules.	“It’s a school rule.” “It’s a boy one.” “It’s always like that.”
Other	All other explanations.	“He wanted to.” “It is sunny outside.” “It’s nice.”

Table 2. Criteria for all coded categories.

⁴ This category refers to normative considerations *other than ownership*.

Two coders coded all explanations independently. The inter-coder-reliability reached near perfect levels ($\kappa = 0.91$). All disagreements were resolved by discussion.

Results and Discussion

We first examined whether the type of explanations children used was affected by condition and age (see Table 3 for children's mean use of each explanation types). To do this, we ran a mixed ANOVA. We treated explanation type as a within subjects factor with five levels (each level corresponding to an explanation type; see Table 3). Condition and age were inputted as between subject factors. This analysis allowed us to explore possible effects of condition and age on children's *average use* of each explanation type. The maximum number of times each explanation type could occur was two. (For recent examples of similar analyses see Legare & Lombrozo, 2014; Lombrozo & Gwynne, 2014; Rhodes, 2014). Mauchley's Test of Sphericity was significant, so a Greenhouse-Geisser correction was used.

Explanation type interacted with condition, $F(4,320.94) = 6.89$, $MSE = 201.67$, $p < .001$, $\eta_p^2 = 0.064$, and age, $F(8, 320.94) = 7.74$, $p < .001$, $\eta_p^2 = 0.086$. Explanation type, age and condition also marginally interacted, $F(8, 320.94) = 1.83$, $p = .088$, $\eta_p^2 = 0.035$. Given our interest in ownership, we then used a Univariate ANOVA to examine how *average use* of ownership differed by condition and age. There was a main effect of condition, acceptability > knowledge, $F(1,101) = 17.05$, $p < .001$, $\eta_p^2 = 0.14$, and age, older > younger, $F(2,101) = 4.45$, $p = .014$, $\eta_p^2 = 0.08$. Condition and age did not interact,

$F(2,101) = 1.21, p = .303, \eta_p^2 = 0.023$. Together, these findings show that children used different explanation types to explain acceptability and knowledge, and that as children age they are more likely to use ownership to explain acceptability.

Age	Explanation type	Acceptability	Knowledge
3	ownership	0.28 (0.67)	0.00 (0.00)
	object properties	0.67 (0.84)	0.67 (0.84)
	norms	0.28 (0.57)	0.22 (0.55)
	other	0.06 (0.24)	0.28 (0.57)
4	ownership	0.78 (0.94)	0.18 (0.53)
	object properties	0.67 (0.84)	0.76 (0.90)
	norms	0.06 (0.24)	0.00 (0.00)
	other	0.22 (0.55)	0.76 (0.83)
5	ownership	1.00 (0.97)	0.22 (0.55)
	object properties	0.50 (0.62)	1.44 (0.70)
	norms	0.22 (0.43)	0.00 (0.00)
	other	0.22 (0.43)	0.28 (0.46)

Table 3. Experiment 1: Children's average use of each explanation type shown by condition and age (standard deviation in brackets).

Because we were particularly interested in children's ability to explain acceptability, our next set of analyses focused on the acceptability condition. These analyses used a series of 2 by 2 Chi-Square tests to determine which *informative* explanation type was most *frequently* used at each age. To decrease the number of comparisons and reduce the chances of a Type 1 error, we focused our comparisons on the two (or three when most frequent tied) most frequently used explanation types at each age. For 3-year-olds the most frequently used explanation types were object properties (33%), norms (14%), and ownership (14%); this comparison included three categories because of the

exact tie between norms and ownership. Object properties occurred marginally more often than norms and ownership, both χ^2 s = 3.77, $ps = .052$. For 4-year-olds the most frequently used types were ownership (39%), and object properties (33%). Object properties and ownership occurred equally often, $\chi^2 = 0.24$, $p = .62$. For 5-year-olds, the most frequently used types were ownership (50%) and object properties (25%). Ownership occurred significantly more often than object properties, $\chi^2 = 4.80$, $p = .028$. These findings show that as children aged, they were more likely to provide ownership explanations more often than other types of explanations.

Experiment 2

In our first experiment, children became increasingly likely to use ownership to explain acceptability with age. Some research suggests that young children are very sensitive to how ownership governs what should *not* be done (see Hay & Ross, 1982; Nancekivell & Friedman, 2014a). As such, it is possible that young children might be more likely to use ownership to explain why it is unacceptable for someone to use an object, than why it might be acceptable to use an object. To test this possibility, the present experiment compared children's explanations of acceptability and unacceptability. We also asked children to explain a wider range of object uses, and added a screening task.

Method

Participants. One-hundred and eight children were tested. These included 36 three-year-olds ($M = 3;6$, range = 3;0-3;11, 23 girls), 36 four-year-

olds ($M = 4;6$, range = 4;0-4;11, 18 girls) and 36 five-year-olds ($M = 5;5$, range = 5;0-5;11, 18 girls). An additional 8 children were tested but were replaced because they failed the screening task.

Materials and Procedure. Before the main experiment all children participated in a screening task. In this task, they were shown a picture of a girl using an umbrella in the pouring rain, and were asked to explain why the girl was using the umbrella. Children were given two opportunities to answer the question. Children only failed if they did not provide a relevant answer (e.g., “a dog”). A screening task was added to this experiment to eliminate children who could not generate explanations and who were likely not to speak during the main task.

After the screening task, children in each age group were randomly assigned to either of two conditions: “acceptability” or “unacceptability”. Each condition included two trials—a “hat” trial and a “book” trial. These trials were always administered in this order but in either of two versions.

In the acceptability condition, children were told that it was okay for one character to wear a particular hat and for another character to take a particular book home (version 1), or that it was okay for the first character to take a hat home and for the second character to read a particular book (version 2). The trials in the unacceptability condition were identical, except children were told that it was not okay for each character to perform the actions. After each trial, children were asked why it was okay (acceptability condition) or not

okay (unacceptability condition) for the character to engage in the actions (e.g., “Why is it okay for him to wear the hat?”; see Figure 9 for a sample script).

Transcription and Coding. The same transcription and coding procedures were used as Experiment 1. Two coders coded all explanations independently into the categories described in Experiment 1. The inter-coder-reliability reached near perfect levels ($\kappa = 0.84$). All disagreements were resolved by discussion. Identical to Experiment 1, Children’s explanations never fell into more than one category and their entire responses was always coded.

Results and Discussion

The same set of analyses was used as Experiment 1. First, a mixed ANOVA was used to determine if the number of explanations from each type varied by condition and age (see Table 4 for children’s mean use of each explanation types). Again, Mauchly’s Test of Sphericity was significant so a Greenhouse-Geisser correction was used. Explanation type interacted with age, $F(8, 307.68) = 3.81, p = .001, \eta_p^2 = .070$. Explanation type did *not* interact with condition, $F(4, 307.68) = 2.31, p = .875$. Explanation type, age and condition also did not interact, $F(8, 307.68) = .68, p = .663$. Because of our interest in ownership, we then used a Univariate ANOVA to examine children’s average use of ownership. There was a main effect of age on children’s use of ownership, older > younger, $F(2, 102) = 5.34, p = .006, \eta_p^2 = .095$. There was no main effect of condition on children’s use of ownership, $F(1, 102) = .064, p = .801$, and no age by condition interaction, $F(2, 102) = .50, p = .610$. These

findings replicate major findings from Experiment 1, and show that as children age they are more likely to use ownership to explain both unacceptability and acceptability.

Age	Explanation type	Acceptability	Unacceptability
3	ownership	0.39 (0.70)	0.22 (0.55)
	object properties	0.33 (0.59)	0.06 (0.24)
	norms	0.11 (0.32)	0.22 (0.55)
	other	0.78 (0.73)	0.94 (0.94)
4	ownership	0.56 (0.70)	0.72 (0.75)
	object properties	0.33 (0.49)	0.39 (0.61)
	norms	0.28 (0.46)	0.39 (0.61)
	other	0.78 (0.55)	0.50 (0.62)
5	ownership	0.83 (0.86)	0.94 (0.94)
	object properties	0.11 (0.32)	0.06 (0.24)
	norms	0.39 (0.61)	0.28 (0.46)
	other	0.67 (0.84)	0.67 (0.77)

Table 4. Experiment 2: Children's average use of each explanation type shown by condition and age (standard deviation in brackets).

As in Experiment 1, our second set of analyses examined *frequency* of each explanation type. We collapsed these analyses by condition, because of its null effect. For 3-year-olds, the most frequently used explanation types were other (43%) and ownership (15%). We found that 3-year-olds used other more often than ownership, $\chi^2 = 13.45, p < .001$. For 4-year-olds, the most frequently used ownership (32%), other (32%) and object properties (13%); this comparison included three categories because of the exact tie between other and ownership. Ownership and other were used marginally more often than object properties, $\chi^2 = 3.70, p = .054$. For 5-year-olds, the most frequently used types were ownership (44%) and other (33%). Ownership and other occurred equally

often, $\chi^2 = 1.87$, $p = .17$. Although the other category tied with ownership for 4- and 5-year-olds, this category is heterogeneous and does not reflect a single or dominant type of explanation. So for the older children, ownership was the dominant principle used to explain acceptability. The general pattern again emerged that as children aged, they were more likely to provide ownership explanations.

Experiment 3

In the previous experiments, children's use of ownership as an explanation increased with age. One possible reason is that younger children may find it difficult to infer that ownership is relevant. Therefore in Experiment 3 we provided children with information about ownership so they did not have to infer that it was relevant. We also provided information about object properties, so that children could choose whether this factor or ownership was more relevant. Object properties were chosen because 3-year-olds and 4-year-olds frequently referred to these in Experiment 1 and 2. Although "other" sometimes occurred more often, it could not be used in our comparison because of its heterogeneous nature. We again included acceptability and unacceptability conditions, because we expected younger children's references to ownership to increase and thus a possible condition differences to emerge.

Method

Participants. We tested 108 children. These included 36 3-year-olds ($M = 3;5$, range = 3;0–3;11, girls = 15), 36 4-year-olds ($M = 4;5$, range = 4;0–4;11, girls = 15) and 36 5-year-olds ($M = 5;7$, range = 5;1–5;11, girls = 15). One

additional child was tested; however they were not included in our analysis because they failed a screening task. This screening task was the same as Experiment 2.

Materials and Procedure. Children in each age group were randomly assigned to either an acceptability or unacceptability condition, each of which consisted of two test trials. In each trial in the acceptability condition, children were shown a picture of a character next to an object (hat in trial 1, book in trial 2). They were then told two pieces of information, one about a property of the object (e.g., “It’s the right size for him” or “It’s easy to read”) and the other about ownership (e.g., “It’s the man’s hat”); order counterbalanced across participants. Children were then told that it was acceptable for the character to use the object, and were then asked the test question (e.g., “Why is it okay for him to wear it?”); see Figure 9 for sample script and pictures.

The unacceptability condition was identical except for the information provided to the children before the test question was adjusted for the action being “not okay”. In this condition, children were told a negative object property (e.g., “It’s too big for him” or “It’s hard to read”) and that the object did not belong to the character (e.g., “It’s someone else’s”).

Transcription and Coding. Because children in this experiment were given information about ownership and object properties, their informative explanations were coded based on whether they referred to ownership, object properties, or neither of these factors. Uninformative responses (e.g., “I don’t know”) were coded into an uninformative category. Six of the 108 children

tested provided both explanation types, and were given credit in each category. The coders had substantial agreement ($\kappa = 0.72$ to 0.94). (Because categories were not mutually exclusive, Cohen's Kappa for each category was calculated). All disagreements were resolved by discussion.

Results and Discussion

Similar to the Experiment 1 and 2 a mixed ANOVA was used to determine if explanation type varied by condition and age (see Figure 10 for children's mean use of each explanation types). For these analyses we only examined the informative explanation types of ownership, object properties, and neither. Explanation type interacted with condition, $F(2, 204) = 3.37, p = .036, \eta_p^2 = .032$, and marginally interacted with age, $F(4, 204) = 2.37, p = 0.054, \eta_p^2 = .044$. However, condition, age, and explanation type did not interact $F(4, 204) = 1.16, p = .332$. Given our specific interest in ownership, we then ran a Univariate ANOVA to confirm the effects of condition on *average use* of ownership as an explanation. There was a main effect of condition on children's use of ownership, unacceptability > acceptability, $F(1, 102) = 5.45, p = .022, \eta_p^2 = 0.051$, and age, older > younger, $F(2, 102) = 5.57, p = .005, \eta_p^2 = 0.098$. Condition and age did not interact, $F(2, 102) = .83, p = .439$. These findings replicate major findings from Experiment 1 and 2. Overall, as children age they were more likely to use ownership as an explanation. In contrast to Experiment 2, children offered more ownership explanations when explaining unacceptability than when explaining acceptability. Overall, this suggests that

when prompted, young children view ownership as more relevant for explaining unacceptability.

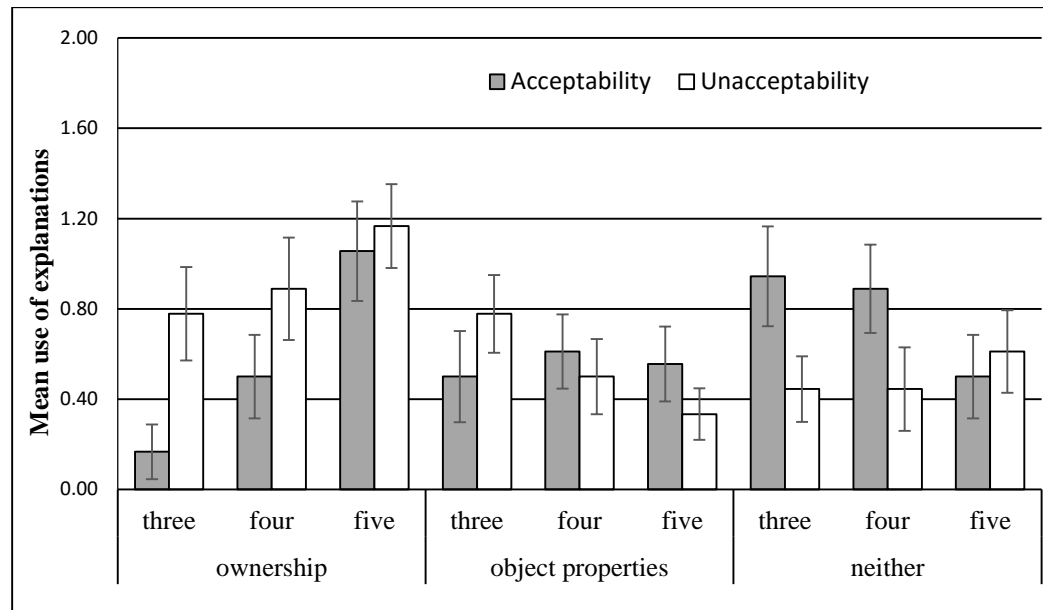


Figure 10. Experiment 3: Children's average use of each explanation type shown by condition and age; error bars show ± standard error.

Similar to Experiment 1 and 2 we then examined frequency of each type of explanation at each age. We conducted separate *frequency* analyses for each condition, because of its significant main effect on the types of explanations children offered. We first examined the acceptability condition. For 3-year-olds the most frequently used type of explanations were neither (47%) and object properties (25%). Neither was used significantly more often than object properties, $\chi^2 = 3.89, p = .050$. For 4-year-olds, the most frequently used types of explanations were also neither (44%) and object properties (31%). These did not significantly differ from each other, $\chi^2 = 1.45, p = .22$. For 5-year-olds, the most frequently used types of explanations were ownership (53%) and object

properties (28%). Ownership was used significantly more often than object properties, $\chi^2 = 4.68$, $p = .031$. These findings show that when explaining acceptability older children, but not younger children, provide ownership as an explanation more often than other types of explanations.

We next examined the unacceptability condition. For 3-year-olds the most frequently used types of explanations were ownership (39%) and object properties (39%) and they were used equally often. For 4-year-olds the most frequent types were ownership (44%) and again object properties (25%). Ownership occurred marginally more often than object properties, $\chi^2 = 3.00$, $p = .083$. For 5-year-olds, ownership (58%) and neither (31%) were most common. Ownership occurred significantly more often than neither, $\chi^2 = 5.63$, $p = .018$. Overall, we found that when explaining unacceptability, ownership was a prominent explanation type at all ages (i.e., either tied for most frequent or most frequent).

General Discussion

We used 3- to 5-year-olds' explanations to investigate the influence of ownership in their reasoning about the acceptability of using objects. Together our findings suggest that ownership is influential in young children's reasoning about the acceptability of using objects and its influence increases with age. Ownership only influenced younger preschoolers reasoning about acceptability in limited cases (i.e., when they reasoned about unacceptability after ownership had been mentioned).

These age-related changes reflect development in children’s conceptual reasoning not linguistic ability. Three-year-olds were able to meet the linguistic demands of our task and provided many coherent explanations—they were just not about ownership. Out of the 90 3-year-olds asked to explain acceptability, 73 (81%) provided informative explanations. Moreover, in Experiment 3, linguistic demands cannot explain the difference in 3-year-olds’ use of ownership between conditions (unacceptability > acceptability) as both conditions had the same linguistic demands. Below we relate our findings to our two major questions, and also discuss the broader implications of our findings for the study of children’s explanations.

The Relevance of Ownership

In daily life, children encounter many situations where ownership is not mentioned to them, but they must infer its relevance. However, this is the first study to examine whether children can infer ownership’s relevance in cases where it has not been mentioned in any way. In Experiment 1 and 2, children were not told who owned the object, thus any mention of ownership in their explanations was spontaneous. As preschoolers aged they were more likely to infer that ownership was relevant. Five-year-olds provided the most ownership explanations (44% to 50%), and 3-year-olds the least (14% to 15%). These findings suggest that younger preschoolers struggle to recognize ownership’s relevance for reasoning about acceptability. Findings from Experiment 3 confirmed this. In Experiment 3, children were provided with information about ownership (e.g., “It’s someone else’s hat”), and so they did not need to infer its

relevance. On average this manipulation doubled ownership references in 3- and 4-year-olds.

One reason why this inference might have been difficult for young preschoolers is that such inferences make executive demands. Generating explanations which depend on non-obvious property likely requires executive control of memory (i.e., to actively search semantic memory for relevant information about the kinds of events that can cause an outcome; e.g., Tomita, Ohbayashi, Nakahara, Hasegawa, & Miyashita, 1999). Immature executive functioning and thus executive control of memory might explain why younger preschoolers provided explanations which depended on more obvious and available properties (i.e., because these explanations are less generative and depend less on executive functioning).

Privileging Ownership

Many considerations beyond ownership influence the acceptability of using an object such as its properties, testimony from authority, and stereotypes. We investigated whether children privilege ownership over other considerations by examining whether they reference ownership more often than other considerations in their explanations. In 3-year-olds, ownership explanations typically occurred less than often other types of explanations, such as object properties, and in 4-year-olds ownership explanations typically tied as the most commonly used category with other types of explanations. Not until 5-years-old was ownership typically the most dominant explanation type. These findings

show that with age children are more likely to privilege ownership over other considerations when reasoning about acceptability.

Some of our findings suggest an asymmetry in the influence of ownership on 3- and 4-year-olds' reasoning about acceptability and unacceptability. In Experiment 3, ownership shifted from being a non-dominant explanation type in the Acceptability condition to a highly dominant one in the Unacceptability condition for younger preschoolers. (We did not find this difference in Experiment 2, most likely because ownership explanations occurred too infrequently in younger children to capture it.) This difference in younger preschoolers might reflect an increased sensitivity to the ways non-owners are excluded from using property (i.e., the Right of Exclusion) (see Hay & Ross, 1982; Nancekivell & Friedman, 2014a).

One limitation of our measure of privilege should be acknowledged. Specifically, we only used scenarios where characters used common objects in harmless or benign ways. We chose these scenarios (e.g., a man wearing a hat or taking it home) because they are characteristic of everyday situations. However, these scenarios may have lent themselves more to ownership than other types of normative explanations (e.g., gender stereotypes). For example, children might have referred to gender norms more if we had used gendered objects (e.g., dresses and trucks). Moreover, it is unknown if same pattern of findings would emerge if children were asked about other actions (e.g., modifying or sharing objects). Future research should investigate these possibilities.

Broader Implications for Children's Explanations

Our findings also have two important implications for the study of explanations. First, we extend existing knowledge regarding the kinds of non-obvious properties children use to explain events. Previous research has shown that young children generate explanations using non-obvious properties such as illness, bodily functions, mental states, and social norms (e.g., Bartsch & Wellman, 1989; Legare, Wellman, & Gelman, 2009; Miller & Bartsch, 1997; Rhodes, 2014; Wellman & Lagattuta, 2004). Our findings are the first to demonstrate that ownership is also part of young children's explanatory framework. Second, our findings show that mentioning non-obvious properties directly affects the degree to which 3-year-olds, but not 4-year-olds, refer to such properties in their explanations. In many studies showing that 3-year-olds reference non-obvious properties in their explanations, the non-obvious property that researchers intended 3-year-olds to mention was alluded to in the preceding vignette or question (see Bartsch & Wellman, 1989; Lagattuta & Wellman, 2001). Our findings suggest that these studies may have found different results if they had not first provided children with this kind of information. Our findings highlight the importance of distinguishing between the kinds of explanations young children naturally produce or produce with little supporting information, and the kinds of explanations young children might produce with more supporting information.

Chapter Five: General Conclusions

Major Findings

Paper one investigated preschoolers' understanding of how people become owners. In two experiments, children were asked to explain why a character owns an object. Four- and five-year-olds frequently used past acquisition of an object to explain ownership but rarely to explain preference or use. Their discussion of past acquisition indicates that they understand that ownership results from past investment upon an object, and other person-object relations (e.g., liking, use) do not. Four- and five-year-olds also showed an appreciation that different kinds of objects are typically acquired in particular ways. For example, 4- and 5-year-olds said that the rock was found, the picture was made, and the hat was bought. Because 4- and 5-year-olds were never told how these objects were acquired, they had to infer this information for themselves. These findings are also the first to show that by four years of age children have a robust ability to infer *unseen past events* or history in their explanations.

Paper two investigated preschoolers' understanding of what ownership affords. Four- to six-year-olds were asked to generate lists of what a character was allowed to do with an object she either owned or did not own. In Experiment 1, 4- and 6-year-olds provided longer lists with more extreme uses when discussing possible uses of personally-owned property than when discussing possible uses of others' property. They were also more likely to spontaneously list restrictions when discussing the use of others' property than

when discussing the use of personal owned property. These findings show that by age four, children appreciate that people can use their own property freely but are restricted in using others' property. Experiment 2 replicated these findings and also investigated children's reasoning about ownerless objects. In this experiment, children granted similar levels of entitlement to those using ownerless objects and personally-owned objects, and lower levels of entitlement to those using other-owned objects. These findings suggest that children do not view entitlement to use objects as *unique* to ownership. Together the findings from both experiments suggest that children may possibly be reasoning about ownership using a restriction-based principle.

Paper Three investigated when ownership influences preschoolers' reasoning about the acceptability of using objects. In three experiments, young children were asked to explain either why it was acceptable or unacceptable to use an object. In Experiment 1 and 2 ownership was never mentioned and preschoolers had to infer its relevance for themselves. In these two experiments, 5-year-olds provided the most ownership explanations and 3-year-olds the fewest. In Experiment 3, ownership was highlighted to children as a possible explanation. Although 5-year-olds still produced the most ownership explanations, younger preschoolers' references to ownership increased. A difference between conditions also emerged: Younger preschoolers referenced ownership more when explaining *unacceptability* than when explaining acceptability. Together, these findings suggest that the influence of ownership increases with age. Ownership only influenced younger preschoolers reasoning

about acceptability in limited cases (i.e., when they reasoned about unacceptability after ownership had been mentioned).

Intersections Between Papers

The findings of my three papers intersect in a few ways. These intersections suggest some general conclusions about children's understanding of ownership and about the early production of explanations.

Intersection 1: Development in Explanation. The first intersection lies between the developmental trends found in Paper one and three. In Paper one, 3-year-olds, but not 4- and 5-year-olds, rarely used history to explain ownership. In Paper three, 3-year-olds, unlike older children, rarely used ownership to explain acceptability. In both cases, 3-year-olds relied on readily available and obvious properties of objects in their explanations (e.g., colour or size) instead of the non-obvious factor older children relied on (i.e., history and ownership). In these papers, I suggest that 3-year-olds' difficulty likely stems from immature executive control of memory: 3-year-olds offered obvious properties instead of non-obvious ones because they could not effectively search their semantic memory for a better answer (Garon, Bryson, & Smith, 2008; Tomita, Ohbayashi, Nakahara, Hasegawa, & Miyashita, 1999).

Alternatively, 3-year-olds' difficulty could be specific to ownership. My first study (Paper one, liking condition) demonstrated that 3-year-olds can generate explanations by referencing at least one non-obvious property: desires. Such explanations suggest that 3-year-olds might not have difficulty referring to other non-obvious properties in their explanations. However, desire-based

explanations may be easier to generate than other kinds of non-obvious explanations. There is a large literature suggesting that preferences and desires are particularly salient to young children (e.g., Bartsch, & Wellman, 1989; Kushnir, Gopnik, Chernyak, Seiver, & Wellman, 2015; Wellman, & Woolley, 1990). For example, it is not until 6-years-old that children will say that people can choose to act against their desires (Kushnir et al., 2015). The salience of desires might make generating desire-based explanations less demanding. This might make explanations referring to desires the exception (i.e., and not explanations referring to ownership). Future research should have children generate explanations using other kinds of non-obvious properties to see how far their difficulty extends.

Intersection 2: Children View Restriction as Important. A second intersection exists between my findings in Paper two and three. In these papers, I found that children appear to be particularly sensitive to the restrictive or exclusionary nature of ownership. In Paper two, I found that children often spontaneously discussed how ownership restricts the use of others' property, and proposed that a broad restriction-based principle likely underlies their understanding of ownership rights. Likewise in Paper three, Experiment 3, I found that 3-year-olds used ownership more often to explain *unacceptability* (i.e., which restricts the use of property) than *acceptability* (i.e., which permits the use of property). Together, these findings suggest that ownership's restrictive or exclusionary nature is very salient to young children.

There are two possibilities regarding why ownership's restrictive nature may be especially salient. One possibility is that it is especially salient because restriction is an integral part of ownership. Many theorists have suggested that exclusion or the Right of Exclusion is necessary for ownership (Cohen, 1954; Merrill, 1998). Under this account, young children are sensitive to ownership's exclusionary and restrictive nature because they recognize its importance. Notably, children's recognition of the importance of exclusion is also suggested by their ability to use exclusion to infer who owns an object (Neary, Friedman, & Burnstein, 2009).

An alternative possibility is that children's sensitivity is a by-product of a more general and early developing sensitivity to the inference of goals (Hamlin, 2013; Hamlin, Wynn & Bloom, 2010; Kuhlmeier, 2013; Woodward, 2009). Previous research has shown that 3-month-old infants can detect when one agent interferes with another's goals (Hamlin, Wynn & Bloom, 2010). Under this account, ownership's restrictive nature is especially salient to young children because it often manifests as goal interference. For example, imagine Bart wants to play basketball, but Sally owns the only basketball nearby and will not let him use it. Sally's act of exclusion is actively preventing or interfering with Bart's goal to play basketball.

Intersection 3: A Theory of Ownership? The final intersection among my findings spans all three of my papers. Developmental psychologists have long been interested in whether children's knowledge is theory-like or contains abstract coherent systems of causal entities and rules (Carey, 1985; Gelman &

Noles, 2011; Gopnik, 2003; Gopnik & Wellman, 1992). One important feature of theories is that they have ontological commitments (Gelman, & Noles, 2011; Gopnik, 2003). Ontological commitments are typically unobservable entities that participate in a theory (Gelman & Noles, 2011). For example, the ontological commitments of folk psychology are thoughts and desires (Gelman, & Noles, 2011). Similarly, the ontological commitments of ownership are property and owners. Previous research has shown that young children can infer which objects are owned and who owns them, and thus that they can identify ownership's ontological commitments (e.g., Friedman & Neary, 2008; Neary, Friedman, & Burnstein, 2009; Neary, Van de Vondervoort, & Friedman, 2012; Van de Vandervoort, & Friedman, 2015).

However, another important feature of theories is that they support causal-explanatory reasoning (Gelman, & Noles, 2011; Gopnik, 2003). This means that theories must be able to explain and predict outcomes. For example, children's theories of physics are causal-explanatory because principles of physics like gravity can be used to explain events like a ball falling off a shelf (Gelman, & Noles, 2011). My findings are the first to show that children's reasoning about ownership is causal-explanatory. My third paper shows that children use ownership to explain the acceptability of using objects. For example, it shows that older preschoolers use ownership to explain why it is okay to open a backpack or wear a hat. My second paper shows that children also use information about who owns an object to judge or predict what is acceptable. Together, these findings suggest that children understand the causal

relations between acceptability and ownership. My first paper also shows that young children understand what kinds of events cause a person to own an object.

My findings combined with previous work suggest that children's understanding of ownership may be theory-like. However, one limitation of my research is that it focused on the causal relations between acceptability and ownership. It would be important for future research to show that ownership also supports young children's causal-explanatory reasoning of *behaviour*. For example, it could investigate whether preschoolers use ownership to explain events like why someone is sitting on a particular chair, or is driving a particular car. If children use ownership as an explanation it would suggest that ownership broadly influences their causal-explanatory reasoning.

Universality of Ownership Reasoning

My dissertation is informative about the reasoning about ownership of children in Canada. However, whether my findings are culturally universal is unclear.

Some aspects of how children reason about ownership differ cross-culturally. Three-year-olds in America and China are more likely than three-year-olds in Brazil and Vanuatu to use information about creation and familiarity to judge who owns property (Rochat, Robbins, Passos-Ferreira, Dias, & Guo, 2014). British and Japanese 4-year-olds are more likely than Chinese 4-year-olds to consider creative labour when attributing ownership to social agents (i.e., robots) (Kanngiesser, Itakuram, Zhou, Kanda, Ishiguro, &

Hood, 2015). Finally, unlike Western children, Kenyan children from small scale groups do not use first possession of an object to decide who owns an object until 8-years-old (Kanngiesser, Rossano, & Tomasello, 2015).

Whether children's reasoning about the role of investment (Paper one) and exclusion (Paper two and three) for ownership is also affected by their culture is an important consideration for future research. It seems likely that children's reasoning about investment (Paper one) and exclusion (Paper two and three) are not affected by culture. These principles appear to be fundamental to ownership. For example, it is unclear what would cause ownership in another culture if investment did not, and how ownership would operate if it did not, in some way, exclude others. Although previous findings show that cultural differences exist in the heuristics children use to assign ownership, children still cross-culturally recognize ownership and at very young ages. This suggests that some fundamental aspects of ownership are likely universal. Nonetheless, these are open questions, and future research will be needed to provide definitive answers. Even if these factors are universal, they might show some cultural variation. For instance, even if all cultures view non-owners as typically excluded from others' property, cultures might differ in who is typically excluded. For example, although universally strangers may be excluded from using each others' property, relatives and family may not be universally excluded. It is well-known that there are many cross-cultural differences in how kinship is conceptualized (Sahlins, 2011), and it is possible that these differences could influence ownership relations.

Conclusion

Together, my papers show that by around 4-years-old preschoolers begin to effectively reason about the “how”, “what” and “when” of ownership. These papers also raise questions for future research, and demonstrate the significance of open-ended measures for the study of developmental psychology.

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