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The Development of Territory-Based Inferences of Ownership

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Abstract

Legal systems often rule that people own objects in their territory. We propose that an early-developing ability to make territory-based inferences of ownership helps children address informational demands presented by ownership. Across 6 experiments (N = 504), we show that these inferences develop between ages 3 and 5 and stem from two aspects of the psychology of ownership. First, we find that a basic ability to infer that people own objects in their territory is already present at age 3 (Experiment 1). Children even make these inferences when the territory owner unintentionally acquired the objects and was unaware of them (Experiments 2 and 3). Second, we find that between ages 3 and 5, children come to consider past events in these judgments. They move from solely considering the current location of an object in territory-based inferences, to also considering and possibly inferring where it originated (Experiments 4 to 6). Together, these findings suggest that territory-based inferences of ownership are unlikely to be constructions of the law. Instead, they may reflect basic intuitions about ownership that operate from early in development.

Keywords: ownership; territory; cognitive development; historical inference; law and psychology; cognitive offloading.

The Development of Territory-Based Inferences of Ownership

Before interacting with any object it is essential to have a sense of who owns it. This is a universal human concern (Brown, 1991), and one we address from a young age (Brownell, Iesue, Nichols, & Svetlova, 2013; Fasig, 2000; Ross, 1996; Ross, Tesla, Kenyon, & Lollis, 1990). However, knowing who owns the objects around us presents two informational demands. First, we encounter innumerable objects in our daily lives, so individually learning object-owner pairings would be time-consuming and cognitively taxing. Second, objects are often unattended, making it difficult to ascertain who owns them. Territory helps us solve both demands. Once we know who owns a territory, we can infer this person owns the objects within it. As such, territory allows us to address the informational demands posed by ownership, and allows owners to leave their possessions unattended while still clearly signaling their ownership.

We propose that territory-based inferences of ownership stem from two aspects of the psychology of ownership. First, they may stem from relatively direct judgments that people own objects on their territory. Such judgments could result from adherence to rules holding that the owner of a territory owns, or is entitled to own, objects in it. These judgments could also result from reasoning about part-whole relations, as we may view objects in a territory as its parts and infer the parts belong to the owner of the whole (Claeys, 2013; also see Merrill, 2009). Either way, such judgments could lead to the conclusion that people own objects in their territory, even when they did not intentionally acquire or know about them. Such inferences are reflected in ancient law. For example, the Laws of Manu and the Institutes of Justinian both hold that the owner of a field owns plants that grow in it, even if the seeds belonged to someone else (Du Plessis, 2015; Olivelle, 2005). Likewise, early Roman law held that when a person discovered

treasure on someone else's land, it belonged to the land-owner rather than the finder (Du Plessis, 2015; see Abramovitch for related discussion of ancient Jewish law).¹ When lay people consider cases where a person discovers valued objects in someone else's territory, they also typically side with the owner of the territory (DeScioli & Karpoff, 2015; DeScioli, Karpoff, & De Freitas, 2017). The chief exception is when the territory is a public space like a shop.

Second, territory-based inferences of ownership may also result from a tendency to understand ownership by considering and inferring history and past events. For example, when we see a shovel in someone's yard, we may assume the landowner placed it there, and acquired it at some earlier time. Such historical inferences are also evident in the law. A person can be arrested for having an illegal item in their home or car, because the item's location suggests past contact with it (Whitebread & Stevens, 1972). Importantly, historical inferences can also lead us to deny an object belongs to the owner of the territory in which it is found. We may change our mind about who owns the shovel if we hear that it was borrowed from a neighbor. It is plausible that historical inferences underlie lay people's territory-based judgments of ownership, as even young children consider object history when thinking about ownership (Friedman, Van de Vondervoort, Defeyter, & Neary, 2013; Gelman, Manczak, Was, & Noles, 2016; Gelman, Manczak, & Noles, 2012; Nancekivell & Friedman, 2014). For example, 3-year-olds look for historical traces left on their possessions to differentiate them from other identical objects (Gelman et al., 2016), and 4-year-olds explain ownership by inferring how an object came to be in the owner's possession (e.g., "He bought it"; Nancekivell & Friedman, 2014).

¹ Ancient law has also advocated other solutions to these disputes (e.g., Du Plessis, 2015; Ominsky, 2002). We suspect that disputes between land-owners and finders have been of recurring interest because they involve a conflict between competing principles for determining who owns what (Merrill, 2009), and given competing principles we should not expect legal systems to consistently come to the same solution.

In the present paper, we examine whether young children judge that people own the objects in their territory, and whether these two mechanisms contribute to these judgments. Previous studies show that young children base inferences of ownership on people's interactions with objects. For example, they infer a person owns an object if that person is the first individual known to have physically handled it (Blake & Harris, 2009; Friedman & Neary, 2008), the person has "control of permission" and decides whether others may use it (Neary, Friedman, & Burnstein, 2009; Shaw, Li, & Olson, 2012), or the person created or creatively labored on the object (Kanngiesser, Gjersoe, & Hood, 2010). However, such cues do not help children with the informational demands of ownership discussed above. For instance, inferring ownership from control of permission does not save children from having to learn and remember numerous object-owner pairings, and this cue is useless when children have no information about who previously interacted with an object. An object's location within a territory may therefore serve as a potent ownership cue in the absence of other information. Young children understand that land can be owned (Zebian & Rochat, 2012), but it is unknown whether they use this knowledge to make territory-based inferences of ownership and overcome the informational demands posed by ownership.

Experiment 1

We first examined whether children make territory-based inferences of ownership, and infer that people own objects in their territory, but not those in another person's territory.

Method

Participants. We initially tested 28 3-year-olds ($M = 3;4$ [years; months], range = 3;0-3;11, 11 girls). We then conducted a follow-up version of the task on a further sample of 28 3-year-olds ($M = 3;6$, range = 3;1-3;11, 15 girls). In all experiments, we tested 28 children per age

per between-subjects condition. Children were recruited and individually tested at childcare centers and elementary schools.

Materials and procedure. Children were told about a scenario, with accompanying slides displayed on a laptop computer. In the scenario, two houses were shown with a road running between their front lawns (see Figure 1). Each house had four objects on its lawn: two artifacts (chair, lawnmower) and two natural kinds (tree, flowers). A man was standing next to one of the houses, and children were told, “Look, this is Ben, and he’s standing in front of his house. And look, across the street is his neighbor’s house.” Children were asked comprehension questions asking which house belonged to Ben and which belonged to his neighbor. If children responded incorrectly, the information and question were repeated; if they failed a second time, the information was repeated once more, and testing continued. All subsequent experiments used similar materials, began with a similar introductory procedure, and followed the same procedure when children had difficulty with comprehension questions; see the Supplementary Materials for sample slides and testing scripts from all experiments.

Children then completed eight test trials. In each trial, the experimenter indicated a different object in the scene, and asked if it belonged to the man (e.g., “Look at this chair. Is it Ben’s chair?”). We used this yes/no question instead of the forced choice questions used in many previous studies (e.g., “Whose chair is it?”) for two reasons. First, this yes/no format allowed us to avoid having to introduce multiple agents. Second, and more importantly, this question format allowed us to avoid implying that each object is owned; this was especially important in the subsequent experiments. See the Supplementary Materials for sample slides and testing scripts, and information about counterbalancing for each experiment.



Figure 1. Sample slides from Experiments 1 (top left), 2 (top right), 3 (bottom left), & 4 (bottom right)

Results and Discussion

In all experiments, the main analyses used Generalized Estimating Equations models (binary logistic). Table 1 provides an overview of factors entered into each analysis, and lists all significant effects. We used pairwise comparisons to follow-up on interactions, and we conducted single-sample tests using intercept-only models. See the Supplementary Materials for means, standard deviations, and single-sample tests from individual conditions in all experiments. The complete data from all experiments is available online at <https://osf.io/7jvw4/>.

Children were more likely to judge the agent owned the objects in his territory than those in his neighbor's territory, $\chi^2(1) = 33.56, p < .001$. They mostly judged he owned objects in his territory (91% of responses), $p = .047$, and mostly denied he owned those in his neighbor's territory (65% of responses), $p = .037$.

Table 1
Factors and significant effects from each Generalized Estimating Equation model

Study & predictors	Significant effects	Wald χ^2	<i>p</i>
Experiment 1, main object-location: agent's or neighbor's territory object-type: artifact, natural-kind	location	33.56	< .001
Experiment 1, follow-up object-location: agent's or neighbor's territory object-type: artifact, natural-kind	location	9.74	.002
Experiment 2 judgment: ownership, preference object-location: agent's or neighbor's territory object-type: beautiful flower, ugly plant age: 3,4,5 years; continuous & transformed to 0, 1, 2	judgment location type age judgment*location type*judgment type*age type*judgment*age	9.69 14.26 30.57 9.60 8.40 16.00 18.58 5.83	.002 < .001 < .001 .002 .004 < .001 < .001 .016
Experiment 3 object-location: agent's or neighbor's territory awareness: known object, unknown object age: 4 or 5 years	Location awareness location*awareness	73.27 9.42 5.93	< .001 .002 .015
Experiment 4, between-territories original-location: agent's or neighbor's territory age: 3, 4 or 5 years	original-location age original-location*age	15.98 10.75 9.44	< .001 .005 .009
Experiment 4, within-territories original-location: agent's or neighbor's territory age: 3, 4 or 5 years	original-location	36.00	< .001
Experiment 5, between territories age: 3, 4 or 5 years	age	59.96	< .001
Experiment 5, within territories age 3, 4 or 5 years	age	12.14	.002
Experiment 6 original-location: agent's or neighbor's territory or far away age: 4 or 5 years	original-location original-location*age	57.72 13.34	< .001 .001

These findings suggest that at age 3, children already make territory-based ownership judgments and infer that people own objects in their territory. However, one potential concern with this conclusion is that instead of basing judgments on territory, children might have based responses on the proximity of each object to the agent—children might have said “yes” for objects that were closer to the agent, and “no” for those they deemed further from the agent.

To rule out this concern, we tested a further group of 3-year-olds (see Participants section). These children saw the same slides, but were told the agent owned the territory that he was *not* in (“Look, this is Ben. He lives in this house, but right now he's visiting his neighbor. So, this is Ben's house, and this is his neighbor's house.”). Hence, if children based their ownership judgments on proximity to the agent, they should now say he owns objects in his neighbor’s territory, and deny he owns the objects in his own territory. However, the results rule out this possibility. As with the original sample of children, children were more likely to judge the agent owned the objects in his territory than those in his neighbor’s territory, Wald $\chi^2(1) = 9.74, p = .002$. Children mostly judged the agent owned objects in his territory (92% of responses), $p < .001$, but claimed he owned objects in his neighbor’s territory at chance rates (55% of responses), $p = .565$.

These findings show that children *do* use territory to infer ownership, and do not simply base judgments on proximity of objects to the owner. In the subsequent experiments, we always showed each agent in the territory they owned. We did this to reduce memory demands, and to ensure that children could remember which territory belonged to the agent. This was especially important because some subsequent experiments featured more complicated scenarios.

Experiment 2

We next examined whether children’s territory-based inferences even apply to objects that enter territory without the owner’s knowledge or intent. This experiment also examined whether children’s responses might reflect an associative strategy that does not require thinking about ownership (e.g., simply saying “yes” for any objects in the agent’s territory, and “no” for other objects). To examine this, we compared children’s inferences about the agent’s ownership with inferences about his preferences.

Method

Participants. We tested 168 children: 56 3-year-olds ($M = 3;6$, range = 3;0-3;11, 23 girls), 56 4-year-olds ($M = 4;6$, range = 4;0-4;11, 28 girls), and 56 5-year-olds ($M = 5;5$, range = 5;0-5;11, 26 girls). One additional child did not respond to the questions and was therefore replaced.

Materials and procedure. Children again saw a scene with two houses, and a man in front of one. The lawns of both houses were initially bare, but while the man was away, some seeds blew onto the lawns and grew into flora. To convey this, in an animation, seeds faded onto the scene and bounced onto the lawns. Then in the next slide, four fully-grown flora appeared on each lawn, two beautiful flowers and two ugly plants (see Figure 1). The man returned, and across eight test trials, children were asked either whether he owned each flora (e.g., “Is it Ben’s plant?”) or whether he liked each (e.g., “Does Ben like this plant?”).

Results and Discussion

Children’s judgments of whether the agent owned the flora and their judgments of whether the owner liked them (see Figure 2) were differentially affected by where the flora were located, Wald $\chi^2(1) = 8.40$, $p = .004$. Children more often judged the agent owned flora in his territory than flora in his neighbor’s territory, $p = .001$. However, location did not influence children’s preference judgments, $p = .827$.

Children’s ownership and liking judgments were also differentially affected by age and by whether the flora were beautiful flowers or ugly plants, Wald $\chi^2(1) = 5.83$, $p = .016$. When inferring ownership, 3-year-olds were unaffected by the attractiveness of the flora, and judged the agent owned beautiful flowers and ugly plants at similar rates, $p = .36$; in contrast, 4- and 5-year-olds were more likely to judge the agent owned the beautiful flowers than the ugly plants,

$ps \leq .014$. When inferring preferences, children at all ages were affected by the attractiveness of the flora, and were more likely to judge that the agent liked beautiful flowers than to judge he liked the plants, all $ps < .001$.

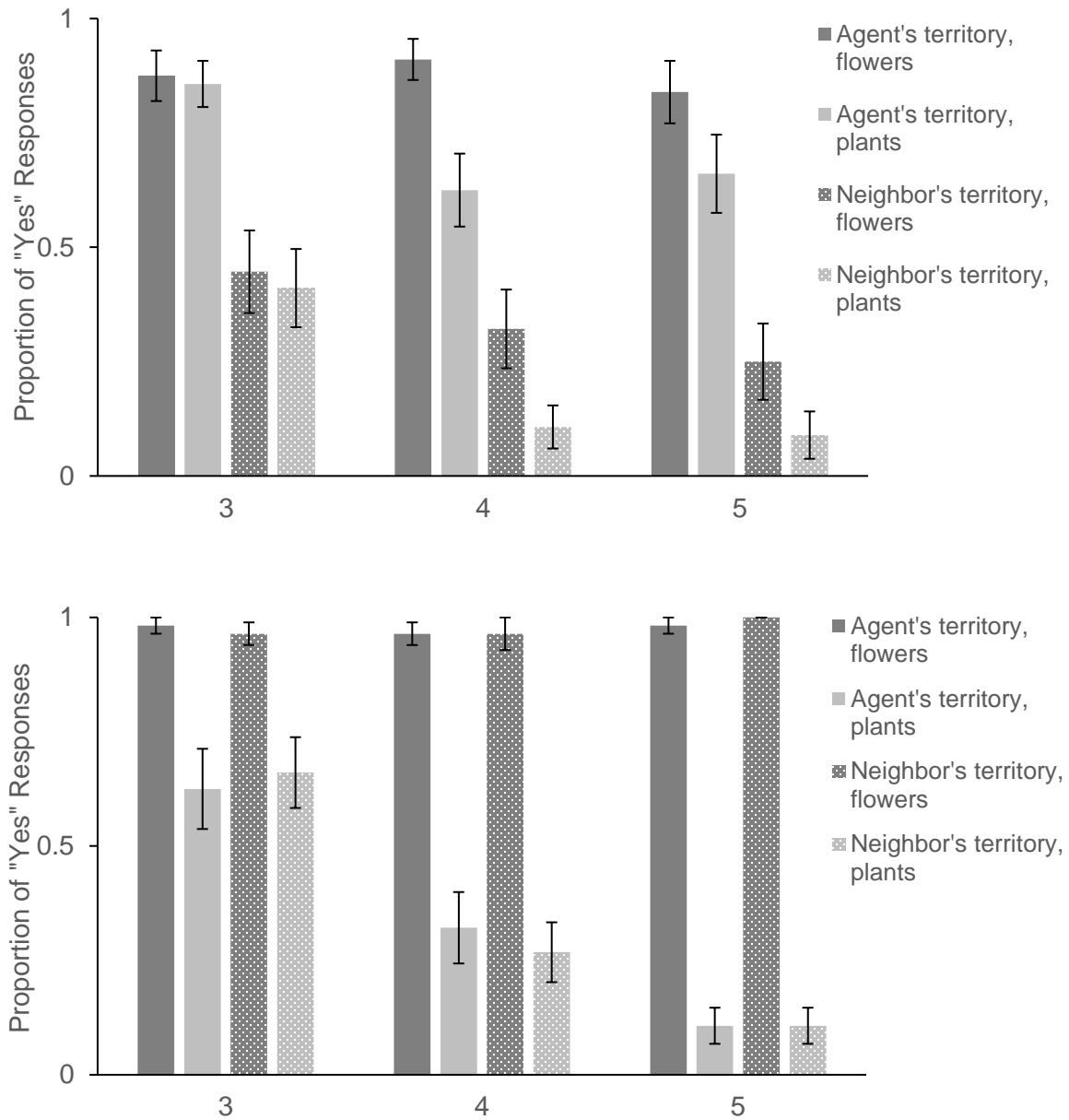


Figure 2. Experiment 2: Mean proportion of trials in which children judged the agent owned (top graph) or liked (bottom graph) the flora in each territory. Vertical lines show ± 1 standard errors of the means.

Single-sample tests found that 3-year-olds mostly judged that the agent owned all flora in his territory, $ps \leq .001$, but responded at chance when asked about flora in his neighbor's territory. Children aged 4 and 5 judged the agent owned beautiful flowers in his territory, $ps \leq .001$, but only affirmed he owned the ugly plants marginally or at chance rates. However, they mostly denied the agent owned flora in his neighbor's yard, $ps < .054$. For preference judgments, children generally affirmed that the agent liked beautiful flowers regardless of their location, and they either denied he liked the ugly plants or responded at chance rates.

Together, these findings suggest children believe that people own objects in their territory, even when the objects entered the territory without the owner's knowledge or intent. Even though the agent did nothing to acquire the flora in his territory, children were more likely to judge he owned them than flora in his neighbor's territory. With age, children also came to consider the attractiveness of the flora when inferring ownership, as 4- and 5-year-olds were less likely to judge the agent owned flora that were ugly, though they still claimed these objects were owned at chance rates (for a similar finding see Noles & Gelman, 2014, Experiment 2). This finding could result from some children believing that people do not own objects that are inherently undesirable, or a belief that the agent would soon dispose of the unattractive flora. Finally, the findings also suggest that ownership judgments are unlikely to reflect associative responding, as children responded differently when inferring ownership and preferences.

Experiment 3

In this experiment, we examined whether children's territory-based inferences of ownership also apply to objects that are unknown to the owner of the territory. We only tested 4-5-year-olds, as 3-year-olds often have difficulty understanding that others are unaware of objects (Birch & Bloom, 2003).

Method

Participants. We tested 56 children: 28 4 year-olds ($M = 4;5$, range = 4:0-4;11, 16 girls) and 28 5 year-olds ($M = 5;5$, range = 5:0-5;11, 16 girls).

Materials and procedure. Children again saw a scene showing two houses with a man standing in front of one. The picture used a cross-sectional view to reveal underground regions of each yard (see Figure 1). Each house had two artifacts on its lawn and two desirable natural kinds under its lawn (e.g., a diamond and gold nugget). Children were told the agent knew about the objects on the grass, but was unaware of those found underground, and were asked comprehension questions to ensure they understood this. Then, in eight test trials, children were asked whether each object belonged to the man.

Results and Discussion

Children were more likely to judge the agent owned objects in his territory than objects in his neighbor's territory regardless of whether he was aware of them, $ps < .001$ (see Figure 3). Children were also sensitive to whether the agent was aware of the objects (i.e., whether they were above-ground or underground), though this depended on whether the objects were in the agent's or neighbor's territory, Wald $\chi^2(1) = 5.93$, $p = .015$. Children were more likely to judge the agent owned objects in his territory if he was aware of them than if he was unaware of them, $p = .013$, but his awareness of the objects did not affect judgments for objects in his neighbor's territory, $p = .763$. Children's sensitivity to territory also varied with age, Wald $\chi^2(1) = 5.24$, $p = .022$. Although children at both ages were equally likely to affirm the agent owned objects in his territory, $p = .253$, 5-year-olds were more likely than 4-year-olds to deny he owned objects in his neighbor's territory, $p < .001$.

Single-sample tests found that children at all ages mostly agreed that the agent owned known and unknown objects on his territory, $ps \leq .001$, and mostly denied he owned objects in his neighbor's territory, $ps \leq .039$.

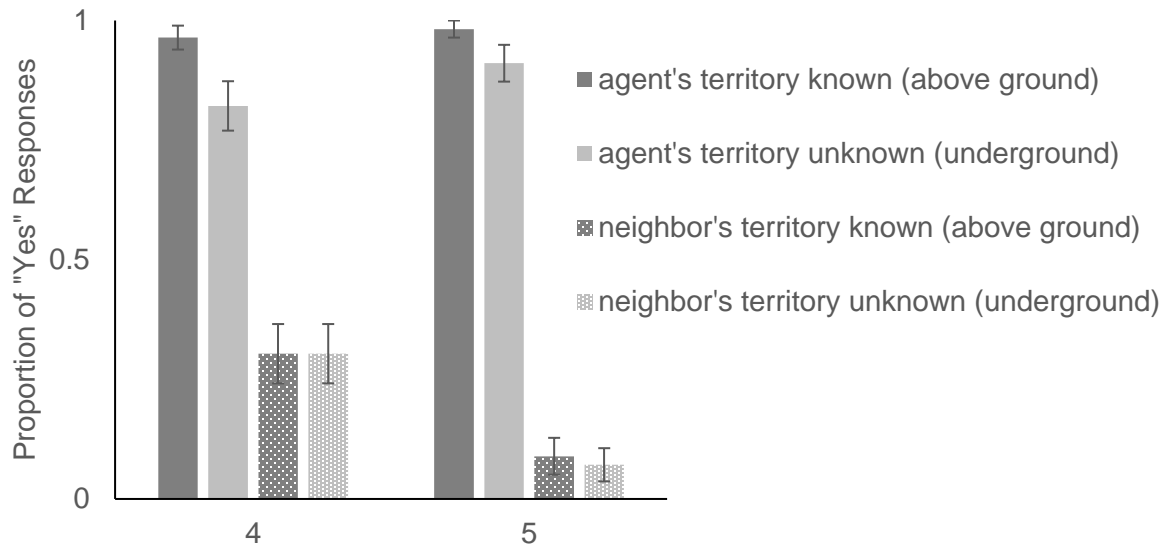


Figure 3. Experiment 3: Mean proportion of trials in which children judged the agent owned known and unknown objects in each territory. Vertical lines show ± 1 standard errors of the means.

These results suggest that children believe that people own objects in their territory, even when they are unaware of the objects. The findings are also generally consistent with the judgments of lay people and the law regarding cases where landowners are unaware of objects on their territory (Dukeminier, 2002; DeScioli & Karpoff, 2015; DeScioli et al., 2017).

Experiment 4

We next turned to the possibility that children make territory-based ownership judgments by considering object history. The importance of history is especially evident when it is inappropriate to conclude that a person owns an object in their territory. For example, if the wind blows a ball into a neighbor's yard, the neighbor does not come to own the ball. In such instances, we look to the object's previous location when judging whose it is.

Method

Participants. We tested 84 children: 28 3-year-olds ($M = 3;7$, range = 3:1-3;11, 11 girls), 28 4-year-olds ($M = 4;5$, range = 4:0-4;11, 13 girls), and 28 5-year-olds ($M = 5;5$, range = 5:0-5;11, 13 girls).

Materials and procedure. To examine whether children consider history in these judgments, we again showed children a scene with two houses and a man standing in front of one. There were four artifacts in each front yard, and after the experimenter mentioned them (“There are a bunch of things in each yard. See?”), a dog entered the scene, and children were told that it likes to play with, and move around, the objects in the yards. Then across a series of eight test trials, the dog moved each object to a new location (see Figure 1), and children were asked whether the man owned the object that was moved (e.g., “Look! He moved the ball! Is it Ben’s ball?”). In half of the trials, objects were moved between the territories (i.e., from one lawn to the other); in the other half, objects were moved within each lawn.

Results and Discussion

We separately analyzed children’s responses from trials where objects moved between the territories and trials where objects moved within each territory (see Figure 4). We separated these analyses as only the between-territory trials were informative about whether children consider history in their territory-based inferences (i.e., these trials pit each object’s current location against its past location).

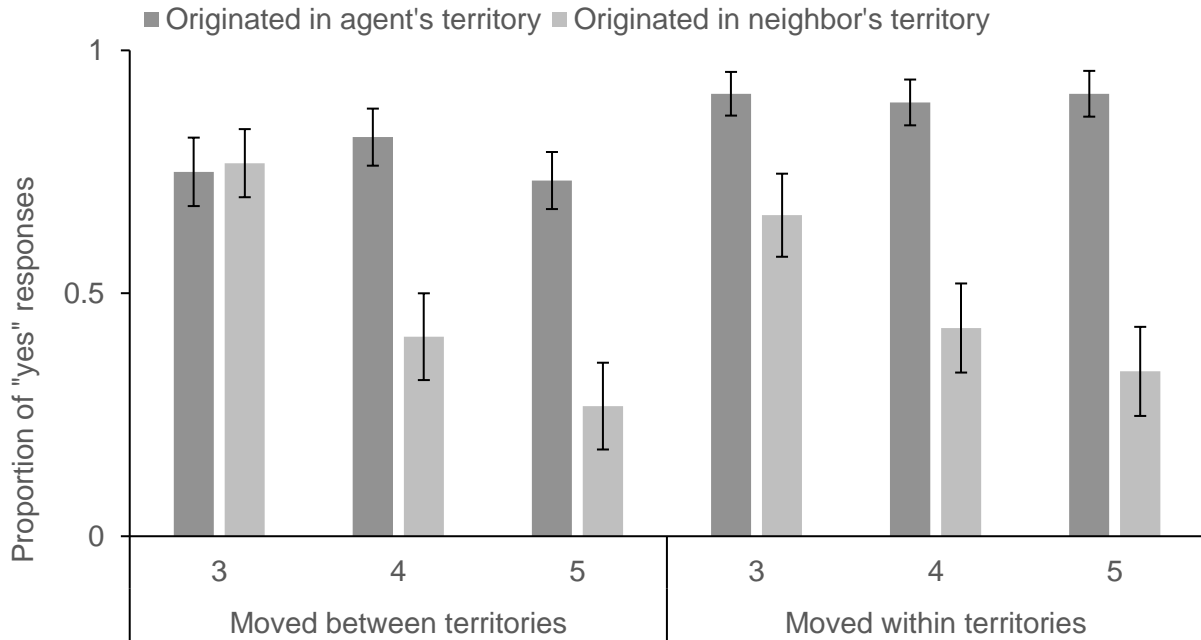


Figure 4. Experiment 4: Mean proportion of trials in which children judged the agent owned objects moved between territories and those moved within each territory. Vertical lines show ± 1 standard errors of the means.

For objects that moved between territories, children's sensitivity to the original-locations of the objects varied with age, Wald $\chi^2(1) = 9.44$, $p = .009$. Children aged 4 and 5 were more likely to judge the agent owned objects that originated in his territory (and ended up in his neighbor's territory) than those originating in his neighbor's territory (and ending up in the agent's territory), $ps < .001$. They mostly affirmed the agent owned objects that originated in his territory $ps \leq .007$, and either mostly denied he owned objects originating in his neighbor's territory or responded at chance for these objects. In contrast, children aged 3 responded similarly regardless of where objects originated, $p = .857$, and they mostly affirmed the agent owned objects, $ps \leq .002$.

For objects moved within each territory, children were more likely to judge the agent owned objects in his territory than those in his neighbor's territory, Wald $\chi^2(1) = 36.00$, $p < .001$. Single sample tests found that children at all ages affirmed the agent owned objects in his

territory, $ps < .001$. However, 3-year-olds showed a marginal effect to affirm the agent also owned objects in the neighbor's territory, $p = .075$, 4-year-olds responded at chance for these items, $p = .434$, and 5-year-olds only showed a marginal effect towards denying the agent owned these objects $p = .062$.

These findings show that 4- and 5-year-olds consider history in territory-based judgments of ownership, as they often judge that objects belong to the owner of the territory from which they originated (rather than the owner of the territory in which they are currently located). In contrast, 3-year-olds do not appear to consider history in their territory-based judgments of ownership.

Experiment 5

We wondered if 3-year-olds in the previous experiment struggled because we asked yes/no questions, and children this age are sometimes subject to a “yes” bias (Fritzley & Lee, 2003). Hence, in this experiment, we avoided such questions and instead asked children about *which* of two agents owned various objects.

Method

Participants. We tested 84 children: 28 3 year-olds ($M = 3;7$, range = 3:1-3:11, 11 girls), 28 4-year-olds ($M = 4;6$, range = 4:0-4:11, 12 girls), and 28 5 year-olds ($M = 5;5$, range = 5:0-5:11, 17 girls). An additional six children did not respond to the questions and were therefore replaced.

Materials and procedure. We showed children a scene similar to that from the previous experiment, except now each had a person in front of it (i.e., a man stood in front of one house, and a woman stood in front of the other). After the experimenter explained that each agent

owned the house they stood in front of, the dog moved the objects as in the previous experiment, and children were asked who each object belonged to (e.g., “Whose ball is it?”).

Results and Discussion

We again separately analyzed children’s responses from trials where objects moved between the territories and trials where they moved within each territory. As children grew older, they increasingly used history to infer who owned objects that moved between territories, Wald $\chi^2(2) = 59.96, p < .001$. Children aged 4 and 5 mostly indicated that objects belonged to the owner of the territory where they originated (76% and 91% of responses), $ps < .001$, while 3-year-olds mostly inferred they belonged to the territory where they ended up (60% of responses), $p = .039$. For objects moved within the territories, older children were more likely than younger ones to infer that objects belonged to the owner of the territory where they originated and remained, $\chi^2(2) = 12.14, p = .002$, though children at all ages mostly inferred objects belonged to this agent (between 79-94% of responses across ages), $ps < .001$. These findings again show that 4- and 5-year-olds consider history in territory-based judgments of ownership, but 3-year-olds do not.

Experiment 6

In this final experiment, we examined whether 4- and 5-year-olds also consider history when an object’s past location is not specified, and can only be inferred.

Method

Participants. We tested 56 children: 28 4 year-olds ($M = 4;6$, range = 4:0-4;11, 14 girls) and 28 5 year-olds ($M = 5;4$, range = 5:0-5;10, 12 girls). One additional child did not respond to the questions and was therefore replaced.

Materials and procedure. Children were introduced to a picture of two houses with artifacts on their lawns, and a man standing in front of one house. A dog appeared, and children were told it sometimes brings objects from far away. In each of nine trials, the dog moved an artifact and left it on the man's lawn, and children were asked whether he owned the object. In three trials, the object started on the man's lawn; in three trials, it started on his neighbor's lawn; and in three trials, the dog brought the object from an off-screen location described as "far away".

Results and Discussion

Children's ownership judgments depended on where the objects originated, but their sensitivity to this factor varied with age, Wald $\chi^2(2) = 13.34$, $p = .001$ (see Figure 5): 5-year-olds were more likely than 4-year-olds to judge the agent owned objects originating on his lawn, $p = .032$, but less likely than 4-year-olds to judge he owned objects that came from his neighbor's territory or from far away, both $ps = .004$. However, children at both ages were more likely to judge the agent owned objects originating on his lawn than those originating on his neighbor's lawn or far away, $ps < .001$; children at both ages were also more likely to judge the agent owned objects originating far away than those originating on his neighbor's lawn, both $ps \leq .045$. Finally, single-sample tests found that 4- and 5-year-olds both mostly judged the agent owned objects originating in his territory, $ps < .001$, and mostly denied he owned objects originating in his neighbor's territory, $ps \leq .037$. Children aged 5 also mostly denied the agent owned objects that came from far away, $p < .001$, but 4-year-olds' responses for these objects did not differ from chance.

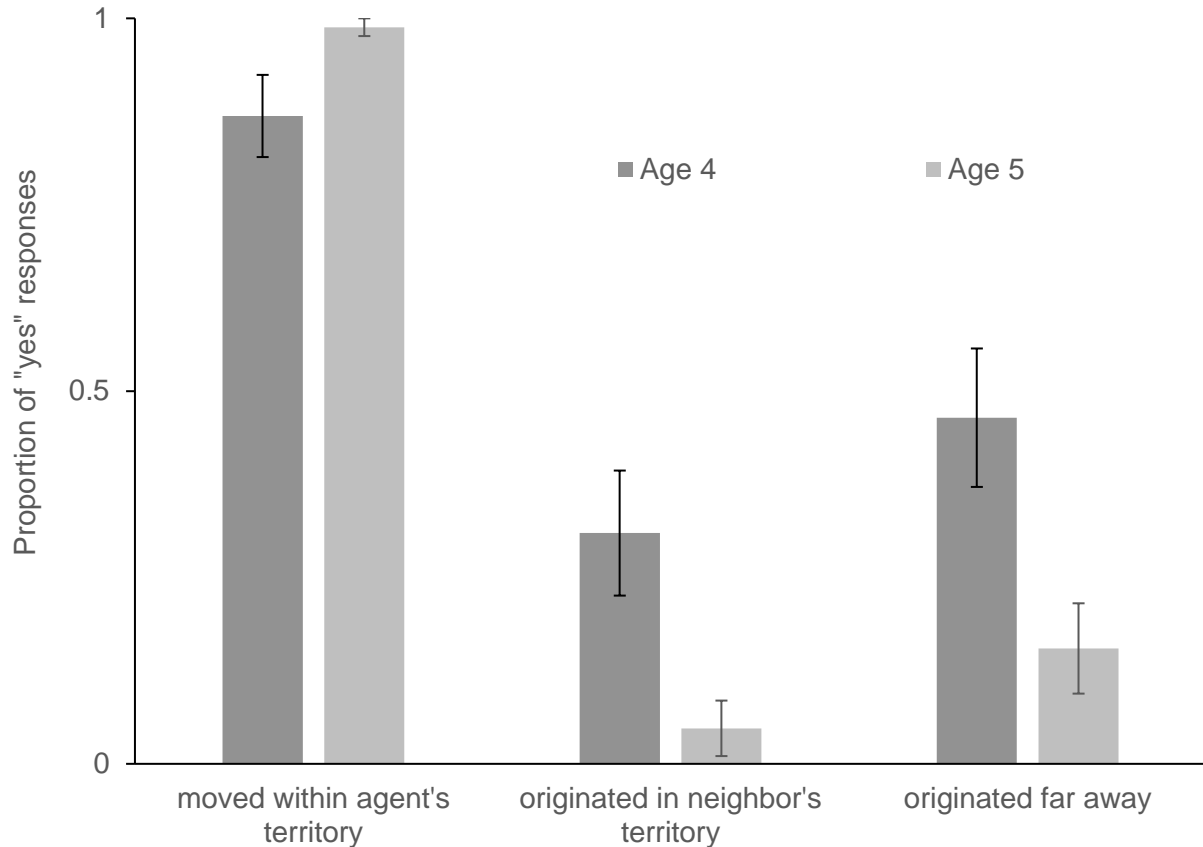


Figure 5. Experiment 6: Mean proportion of trials in which children judged the agent owned objects moved within his territory, and those originating in his neighbor's territory or from a distant unspecified location. Vertical lines show ± 1 standard errors of the means.

The results further suggest that children consider object history in territory-based ownership judgments. Moreover, 5-year-olds show signs of inferring history, as they denied the agent owned objects brought to his territory from far away (though like 4-year-olds they were even more likely to deny he owned objects brought from his neighbor's yard). This finding suggests that 5-year-olds may have inferred the objects had been wrongly taken from their legitimate owners.

General Discussion

Together our findings show that children use territory ownership to infer object ownership. This ability allows children to address informational demands posed by ownership

(Merrill & Smith, 2007; Smith, 2012). It prevents them from needing to learn numerous individual object-owner pairings, and it allows them to infer who owns objects they have never seen anyone interact with or physically possess. Although previous research has revealed many ways that children infer ownership, we believe the present findings are the first to reveal a method of identifying particular individuals as owners in the face of these informational demands.

Our findings reveal two ways that children make territory-based inferences of ownership. First, they make general judgments that people own the objects in their territory, including objects they did not intend to acquire and objects that are entirely unknown to them. These judgments develop early, and were observed at all ages tested. For example, 3-year-olds judged the agent owned flora in his territory, even though he had never interacted with them. Children's ability to make these judgments is striking because the agent never interacted with the objects, and children mainly base ownership judgments on information about such interactions (e.g., Blake & Harris, 2009; Blake, Ganea, & Harris, 2012; Friedman & Neary, 2008; Neary et al., 2009; Kanngiesser, Gjersoe, & Hood, 2010; Rochat et al., 2014; Shaw et al., 2012).

As noted in the Introduction, children could make these judgments by adhering to a rule that people own objects in their territory, or through part-whole reasoning. Other mechanisms are also possible. The legal scholar Thomas Merrill (2009) suggests that territory-based inferences often reflect a more general principle of *accession*, in which the owner of a property is also viewed as owning objects, resources, and benefits prominently connected to it. Territory-based inferences could also result from children viewing property as an extension of its owner and as akin to the owner's body (Belk, 1988; James, 1890). We often extend our thoughts and feelings about people to things they own (Diesendruck and Perez, 2015; Gjersoe, Newman, Chituc, &

Hood, 2014; Hood, Weltzien, Marsh, & Kanngiesser, 2016; Newman, Diesendruck, & Bloom, 2011), and we may even extend people's rights and responsibilities to their belongings (Bowman-Smith, Goulding, & Friedman, in press; Dan-Cohen, 1992; Humphrey, 1992; Van de Vondervoort & Friedman, 2015). Perhaps children view an object in someone's territory much as if it is in the person's hand—they may regard it as if it is in the person's physical possession and infer it belongs to the person.

Second, children also make territory-based inferences by considering history and past events. These inferences appear later, and appear to improve with age. Whereas 4- and 5-year-olds inferred ownership by considering the past location of objects moved by the dog, 3-year-olds did not consider this history. Likewise, 5-year-olds' responses suggest they inferred that artifacts brought from an unspecified far-off location were already owned, whereas 4-year-olds' responses were less clear about this. It is also worth noting that 4- and 5-year-olds' judgments that objects belonged to the owner of the territory where they originated resemble the first possession bias, in which children (and adults) assume objects belong to the first person known to physically possess them (Blake & Harris, 2009; Friedman & Neary, 2008; Friedman et al., 2013; Kanngiesser, Itakura, Zhou, Kanda, Ishiguro, & Hood, 2015; Verkuyten, Sierksma, & Martinovic, 2015; Verkuyten, Sierksma, & Thijs, 2015). Crucially, though, children did not see the territory-owners physically possess the objects (i.e., they never held or used them).

The contrasting developmental trajectories of children's "general" and history-based inferences highlights the distinctness of these methods of inferring ownership. Nonetheless, the two methods could be related, as history-based ownership beliefs may often depend on beliefs that people own objects in their territory. For example, when objects were moved from one territory to another, children may have initially judged the owner of the original location as the

owner by adhering to the general rule for inferring ownership from territory (while also rejecting the dog's actions as sufficient to transfer ownership).

We close by considering three broader implications of this work. First, our findings suggest the practice of keeping possessions in one's territory may be a novel form of cognitive offloading—using physical acts to reduce the processing requirements of a task (e.g., Risko & Gilbert, 2016; for relevant discussion to offloading and placements of objects see Sloman & Fernbach, 2017 p. 100 and Hutchins, 2005). Although owners may primarily arrange objects in their territory to ensure their possessions are readily available, these arrangements also convey information about ownership. As such, keeping objects in one's territory may help owners to differentiate their possessions from those belonging to others, and may likewise help other people keep track of who owns what (also see Rossano, Fiedler, & Tomasello, 2015). Indeed, our findings show that even 3-year-olds benefit from this information.

Second, although we explored children's ability to infer ownership from territory, they might make similar inferences at smaller scales. Children might infer that people own items in sub-territories, like bedrooms and seating areas at school. They might also use similar inferences to infer that a bookmark belongs to the owner of the book in which it is found, and to infer that people own things in their clothing pockets. Nonetheless, there may be unique aspects to judgments about territories. Objects typically have clear boundaries, but where territories begin and end is often ambiguous (Sprankling, 2007) and has been subject to discussion since ancient times (Abramovitch, 1961). Children dealt with this ambiguity in our experiments. They were informed only about who owned each house. Yet their responses suggested they assumed the territory also included the surrounding yard and its underground portions.

Finally, our findings may be informative about the law. As reviewed in the Introduction, diverse legal systems have endorsed territory-based ownership judgments. We might expect young children to be unaware of such legal conventions, yet their judgements were strikingly in line with the law. For instance, the law often regards landowners as owning natural resources on or beneath their land (Burke & Snoe, 2008), and our young participants shared this intuition. Likewise, the law often uses historical inferences to establish who owns, or is responsible for, an object (McMurray, 2007). Again, our participants inferred ownership in this way. As such, our findings suggest that such territorial-based legal rules may not depend on acquaintance with legal rules. Instead they could be rooted in basic intuitions about ownership that are in place at a very young age.

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