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Children's emerging beliefs about the causal structure of social roles

Alexander Noyes, Frank C. Keil, and Yarrow Dunham

Corresponding author: Alexander Noyes

Alexander.Noyes@yale.edu

Department of Psychology

Yale University

Box 208205 [Courier: 2 Hillhouse Ave]

New Haven, CT 06520-8205

Abstract

Institutions make new forms of acting possible: Signing executive orders, scoring goals, and officiating weddings are only possible because of the U.S. government, the rules of soccer, and the institution of marriage. Thus, when an individual occupies a particular social role (President, soccer player, and officiator) they acquire new ways of acting on the world. The present studies investigated children's beliefs about institutional actions, and in particular whether children understand that individuals can only perform institutional actions when their community recognizes them as occupying the appropriate social role. Two studies (Study 1, $N = 120$ children, 4-11; Study 2, $N = 90$ children, 4-9) compared institutional actions to standard actions that do not depend on institutional recognition. In both studies, 4- to 5-year-old children believed all actions were possible regardless of whether an individual was recognized as occupying the social role. In contrast, 8- to 9-year-old children robustly distinguished between institutional and standard actions; they understood that institutional actions depend on collective recognition by a community.

Keywords: Concepts, causal reasoning, cognitive development, categorization, social categories.

Children's emerging beliefs about the causal structure of social roles

The social world is founded on institutions: Stable and coordinated patterns of behavior that provide the bedrock of complex human societies. Institutions shape how individuals can act in the world. In many cases they shape actions by regulating who is allowed to act and in what ways. For example, regulations on agriculture can limit who is allowed to farm. Institutions also make novel actions possible. Signing executive orders, scoring goals, and officiating weddings, are possible because of human institutions like the U.S. government, the rules of soccer, and the institution of marriage, respectively. Outside of the relevant institutions, signing an executive order is nothing more than putting ink on a piece of paper. But when embedded in the procedures of the U.S. government, the combination of ink and paper has the force of changing laws. Therefore, the power of institutions is their ability to make new forms of acting in the world possible. We take a developmental approach to this topic by investigating how children come to understand that certain actions are made possible by institutions.

We will call the actions that institutions are not relevant to, or that they merely regulate, *standard actions* and the actions that institutions directly make possible *institutional actions* (Figure 1). This distinction is reflected in the relationship between social roles (e.g., farmers, wedding officiator) and their characteristic actions (e.g., growing crops, pronouncing marriage). Social roles are sets of responsibilities that people possess within a group: Farmers take care of growing the crops, and officiators perform the wedding ceremonies. Standard actions can be performed by individuals regardless of their social role: Non-farmers and ex-farmers can plant seeds, water crops, and harvest produce so long as they have the appropriate skills and knowledge. Although institutions regulate who is allowed to farm and in what ways (for example, what sorts of pesticides can be used or where crops can be sold), these regulations

merely constrain pre-existing actions – actions that are intelligible outside of the institution. On the other hand, non-officiators and ex-officiators cannot change single people into a married couple. This is not because they are unable to perform the underlying standard action (i.e., reading out loud and asserting “I now pronounce you married”). Rather, these standard actions only count as marrying two individuals when performed by an officiator during a wedding ceremony. Thus, individuals can only perform institutional actions when they possess the appropriate social roles (e.g., officiator). We were interested in children's understanding of the relationship between social roles and acting in the world: How do children come to understand that to perform an institutional action, an individual must be recognized by their community as occupying the appropriate social role?

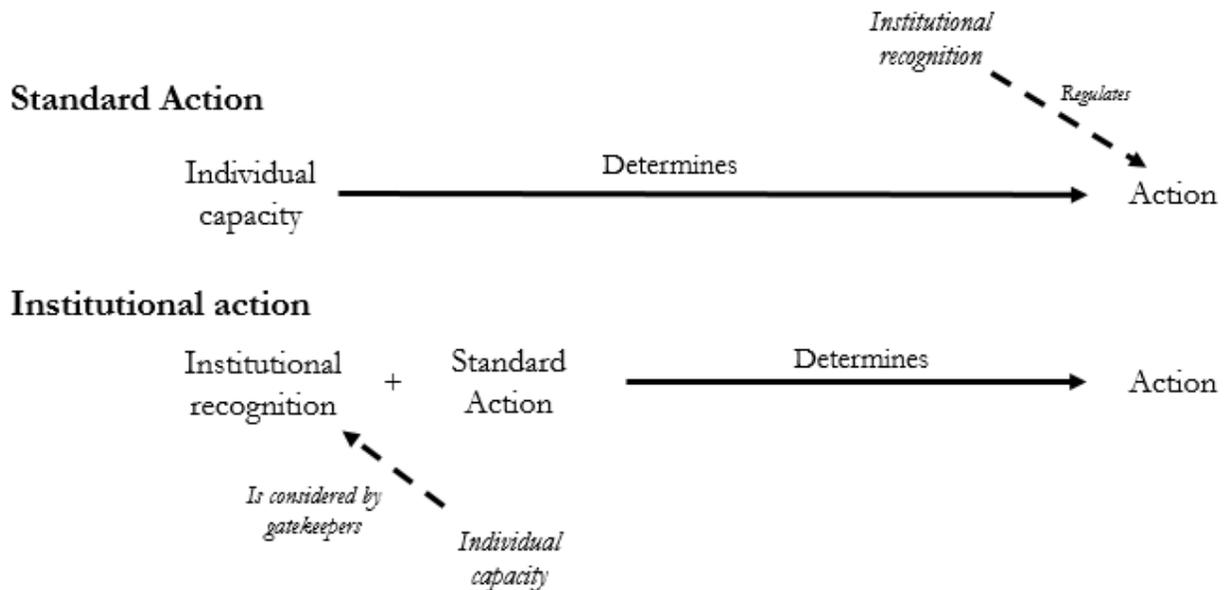


Figure 1. The distinction between standard actions and institution actions. Here, an action is a behavior with an intended outcome. *Standard actions* (e.g., performing surgery) depend on individual capacity. Institutional recognition regulates these actions; a standard action may be viewed as illicit or unauthorized if not performed in the appropriate institutional context. *Institutional actions* (e.g., scoring a goal) depend on institutional recognition. A standard action (e.g., kicking a ball across a line) only realizes an institutional action when recognized within the institution (e.g., when performed by a soccer player during a game). Individual capacity (basic physical and intellectual abilities) is necessary to perform the embedded standard action; individual capacity is also considered by gatekeepers (e.g., a coach decides whether an individual can be a soccer player and play during the game).

Causal reasoning and representations of kinds

Understanding the relationship between institutional actions and social roles is a form of causal reasoning. Why does kicking a ball over a line causes people to cheer, tally an additional point, and reward the player? To make sense of such event sequences, children must understand the causal role of *collective recognition* (also called *collective intentions* or *general acceptance*; Searle, 1995; 2010). In a certain institutional context, individuals collectively recognize that a ball moving over a line “counts as” a goal; this collective understanding leads individuals to respond with cheering, tallying points, and rewarding the player. Therefore, only when an individual has the right social role (e.g., is a player in the game) will her behavior realize the intended action (e.g., scoring a goal). For example, were an overzealous fan to run onto the field and kick the ball over the same line, this action is not a goal because the fan lacks the right social role (instead, this event will set in motion a different set of responses). Therefore, we can approach the question of how acting relates to institutions (and social roles in particular) through the framework of causal reasoning.

Our approach is informed by theories of categorization and kind representation (Keil, 1989; Gelman, 2003). Causal reasoning (also called explanatory reasoning or “intuitive theories”) is integral to how ordinary people represent categories (Ahn, Kim, Lassaline, & Dennis, 2000; Keil, 1989; Gelman, 2003; Murphy & Medin, 1985; Wellman & Gelman, 1992). For example, children and adults make different category judgments about artifact kinds and natural kinds because they possess contrasting intuitive theories of how artifact kinds and natural kinds come into existence – i.e., that people create artifact kinds to realize their goals, whereas natural kinds derive from natural processes independent of people's intentions (Ahn, 1998;

Bloom, 1996; Keil, 1989; Gelman, 2003). Therefore, children's conceptualization of social roles (and other institutional entities) as distinct from other domains, like natural kinds and artifacts, depends on whether they recognize and employ distinct causal theories for making sense of social roles and their properties.

Conventions

Children's understanding of conventions also bears on our topic (see Kalish & Sabbagh, 2007 for review). A large focus of that research is regulatory rules: Do children understand that people conform to social norms voluntarily (Kalish, 1998; Lockhart, Abrahams, Osherson, 1977), and do children understand that conventional rules apply in context-specific ways (Turiel, 1983; Rakoczy & Schmidt, 2013). Generally, even young children (approximately preschool) understand that regulatory rules are followed for social and psychological reasons, and that they apply locally to groups and particular social situations. Yet, we know far less about children's understanding of the way conventions not only regulate behavior but also make new social forms possible: Conventions bring novel categories into being and generate genuinely new ways of acting. Children's protests when conventions are violated during games and pretense suggest they understand that conventions shape what is appropriate behavior in a context, and so children understand that conventions generate new obligations (Schmidt & Tomasello, 2012; Schmidt, Rakoczy, & Tomasello, 2012; Rakoczy, 2008). However, they might not understand that conventions can make more substantial alterations to the world. For example, not until mid-elementary school do children seem to understand that conventions transform arbitrary pieces of paper into money (Noyes, Keil, & Dunham, 2018), and change the truth value of propositions about the world (e.g., "This is mine," Kalish, Weissman, & Bernstein, 2000). Therefore, the current study advances a novel question about children's understanding of how the social world

is constructed. In particular, a focus on the causal processes underlying institutional actions provides new insights as to the developmental process through which children recognize how collective recognition shapes social reality.

Institutional kinds

There has been some research into the causal processes underlying institutional kinds. Early in development, children reason that individuals become group members when they are recognized as a member (by themselves and by the group; Noyes & Dunham, 2017). This belief is likely inter-related with their belief that groups are coalitions (Rhodes, 2013; Shutts, Roben, & Spelke, 2013). Therefore, at least one context exists where children appear to believe that collective recognition can make substantial alterations to the world – changing a person's group membership. In contrast to social groups, children take several more years to understand institutional objects. Among human-made objects, there is a distinction between standard objects (e.g. hammers) and institutional objects (e.g., money), which parallels that distinction we draw between standard actions and institutional actions. Hammers can drive nails into wood because of their physical structure. In contrast, dollar bills can purchase goods because of their role in institutions of economic exchange. Pieces of paper only count as money when embedded in these institutions. Strikingly, young children believe novel currency can be used for economic exchange regardless of a community's intentions (Noyes et al., 2018). That is, young children seem to conflate institutional objects with standard objects, possibly by inferring that they must have physical affordances that preserve their roles regardless of community actions. Children only robustly distinguish between the causal structures of objects such as hammers and objects such as dollar bills around 8- or 9-years-old. Based on these findings, we expected a similar trajectory in children's causal reasoning about the relationship between social roles and action.

We expected children to initially reason that institutional actions are independent of social roles, reflecting a disregard for the causal importance of collective recognition.

Current study

We used a version of the transformation paradigm (Rips, 1989; Keil, 1989). If a change in property leads to a change in category membership, this method assumes the property must be causally central to category membership. The greater the difference the change makes, the more central the property is to the underlying causal structure of the category. We adapted this method to see whether changes in collective recognition (i.e., the collective recognition that an individual occupies a social role) would lead to changes in the possibility of acting. In the context of a novel island, we presented occupations that varied in whether their characteristic actions were standard or institutional. We then told children vignettes where the community alters who it recognizes as occupying a role and asked whether an action was still possible; specifically, we asked whether the former occupiers of the social role could still perform the same action (Study 1), and if they attempted the action, would their behavior still realize the same intended outcome (Study 2). If children say “no,” then they must believe that collective recognition is causally central to an individual's ability to realize the action.

As mentioned above, we predicted that 4- to 5-year-old children would believe collective recognition is irrelevant to both standard and institutional actions. Also following Noyes et al., (2018), we expected 8- to 9-year-old children to robustly distinguish between these two domains. Specifically, we expected them to understand the causal importance of collective recognition to institutional actions, revealing an appreciation for the domain of institutional kinds as distinct from other domains in the world.

Study 1

We tested children's beliefs about causal centrality of collective recognition for standard and institutional actions. Children learned about novel social roles that were characterized either by standard actions or institutional actions. Children then heard vignettes where the community decided a new set of individuals occupied the role (and the old set no longer did), and decided to use the new set of individuals to achieve some task (rather than the old set). We then asked children whether an individual from the old set could still perform the same action.

We asked children specifically whether an individual can still perform the action. This question has potential ambiguity. For example, "can" has normative interpretations ("can I go to the bathroom without a bathroom pass?"). Nonetheless, we were not overly worried about this potential ambiguity because this was the same question used in prior work (Noyes et al., 2018), where children showed no tendency to treat the question as normative – they robustly said standard artifacts could still be used by an individual even if the community decided to stop using them. Of course, it is possible that collective recognition is considered more central to social roles because of the greater regulatory control of social roles (Figure 1), and thus that normative considerations are more heavily evoked by social roles (Kalish, 2012; Kalish & Lawson, 2008); given that, Study 2 addresses this concern more directly.

Method

Participants

We recruited 120 children: We recruited a sample of 30 children from four age groups: 4- to 5-year-old children (range: 4y2m: 5y10m), 6- to 7-year-old children (range: 6y0m: 7y9m), 8- to 9-year-old children (range: 8y0m: 9y11m), and 10- to 11-year-old children (range: 10y2m: 12y0m). We recruited 30 subjects per age to allow us to detect a within-subject condition difference of an effect size $d = .70$ (medium-large) at 95% power. Ninety subjects total would

allow us to detect a continuous age effect in a linear regression of $f^2 = .15$ (medium effect) at 95% power. The effect size was estimated based on prior work (Noyes et al. 2018), based on older children and adults who distinguished between conditions in related studies. Fifty-eight girls and 62 boys participated. The sample was majority White (77%), 9% were Black, 4% Asian, 6% Hispanic, and 3% other or multiracial. Study 1 and 2 were approved by Yale University's Institutional Review Board, HSC protocol 1305012100 (Development of Social Category Knowledge). The data was collected at a Massachusetts elementary school.

Design and Procedure

The methods closely modeled Noyes, et al. (2018). Children received standard and institutional actions, and judged whether an individual had to be recognized as occupying the relevant social role to successfully complete the action. The experimental comparison between standard actions and institutional actions was within-subject. A within-subject design was chosen to ensure that children interpreted the test question similarly across conditions, which was critical for concluding whether they failed to distinguish between the two types of actions or not.

Children were first introduced to an island community:

This is Vawnsie Island. This is an island far away where Vawnsie people live. The only place that Vawnsie people live is here, and the only people that live here are Vawnsies. In this activity, I am going to tell you about the jobs that Vawnsies do. Then I will ask you some questions about them.

The novel island community provided the bedrock for the remainder of the experiment.

Specifically, the social roles were described in the context of the island community, and it was this community's collective intentions and practices that we varied across the test trials.

Across six experimental trials, children were introduced to one of six novel occupations (A-F, Figure 2). All occupations were depicted by three individuals wearing a novel uniform. Each occupation also had a unique novel label. Individuals in the sets were diverse in race and

gender. For each occupation, there were two distinct sets of individuals, so that there would be a “before” and “after” set. The “before” set visualized the individuals the community originally used as members of the role, and the “after” set visualized the individuals the community used as members after they changed their mind. Which set played the role of “before” and “after” was randomized across participants.

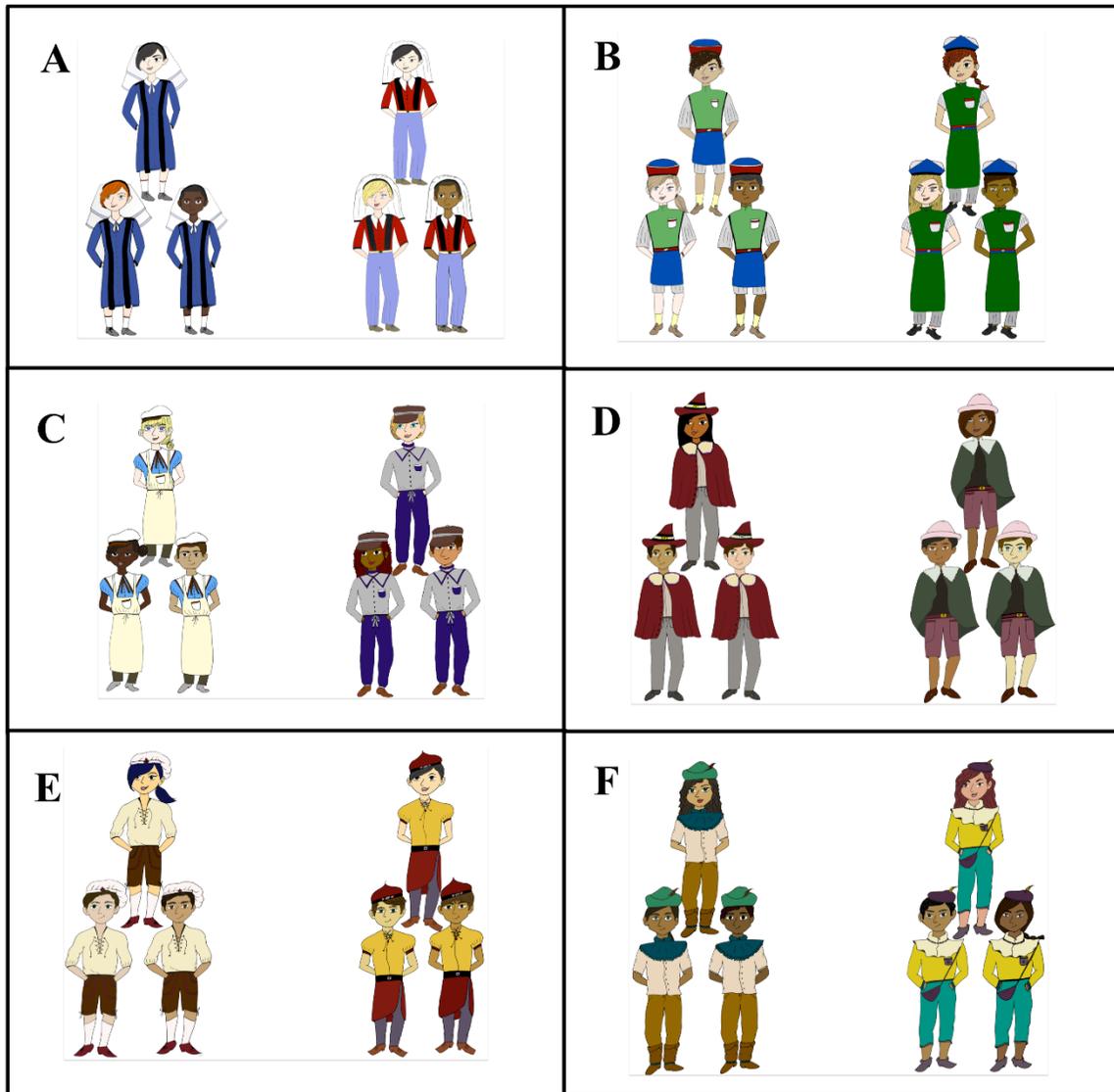


Figure 2. Novel occupation stimuli used in Study 1 and 2.

As they were introduced to the occupation, children heard a general functional description of what members of the occupation did within the island community. For example:

On Vawnsie Island, sometimes people break the rules. Some of the Vawnsies on the island are Cauters. As Cauters, they punish rule-breakers. When someone breaks a rule, the Cauters make up the punishment that person has to do [children are shown “before” set].

There were six occupation descriptions (Table 1; see Appendix for full descriptions). There were three descriptions based on standard actions and three descriptions based on institutional actions. To select for standard actions, we choose actions that are common and consequential to human life: Building, healing, and farming. To select for institutional actions, we choose actions whose intended outcome was as clearly institutional as possible: Starting meetings, making rules, and deciding punishment. Every picture set (A-F) was paired with one of the standard action descriptions and one the institutional action descriptions; the pairing children saw was then randomized between-subject. This ensured that details of the pictures and the verbal labels were not confounded with experimental condition. The order of all six actions was completely randomized.

Table 1.

Actions presented to children in Study 1.

<u>Stimulus Set</u>	<u>Standard Actions</u>	<u>Institutional Actions</u>
A and B.	Heal people.	Punish rule-breakers.
C and D.	Build things.	Make rules.
E and F.	Grow things.	Start meetings.

Note. Children also heard elaborations of all of the two-word descriptions: e.g., “*When people need tables for their houses the Wingles make them.*” and “*When people think there should be a new rule, the Wingles decide to add the rule or not.*”

Children were then told about the community changing who they recognized and used as members of the role (for example):

So remember, all the Cauters punish rule breakers. One day though, all the Vawnsies decide that only these ones are Cauters now [experimenter indicates “after” set], and all the Vawnsies only use these ones as Cauters now.

Children were asked to indicate which ones the Vawnsies used now, and which ones the Vawnsies used to use. This ensured that all children understood the critical manipulation, which was the change in collective recognition. After children correctly indicated the “before” and “after” sets, they were asked the test question:

Now let me ask you a different question. One day, one of these ones wants to make up a punishment someone has to do: if she [gender matched to child] wants to, can she still make up the punishment someone has to do?

After children indicated yes or no, the experimenter moved on to the next trial. Therefore, the dependent variable was always whether an individual could still perform the same action after no longer being recognized as occupying the same social role.

Data Collection.

Data collection was conducted live with individual children. The materials were presented to children on a laptop via Qualtrics. An experimenter read the materials out loud and navigated through Qualtrics for the child. Children either pointed to the screen (for comprehension checks) or provided “yes” or “no” answers (for test questions). The experimenter entered children's responses into the Qualtrics question. A single experimenter conducted the study. Consistency was maintained by a verbal script. The experimenter was not blind to hypotheses. The protocol was maintained by having randomization and survey flow conducted by the Qualtrics software itself.

Results and Discussion

To analyze results, we used a multi-level model, nesting trial types (standard or institutional) within participants. In the model, we used age as a continuous variable since we had children across the entire age spectrum of 4 to 11, but we report the results by age group since this most clearly visualized the condition differences and comparisons to chance; however, all reported results are robust to treating age categorically. The outcome variable was the average number of trials children reported that the person's action was impossible (after the community changed its intentions). This is a measure of how causally central children believed causal recognition was for the possibility of acting. There was a significant effect of domain, $b = .24$, $SE = .04$, $p < .001$, such that collective recognition was seen as more causally central for institutional actions, $M = .64$ [0.56:0.71], than standard actions, $M = .40$, 95% CI: [0.32:0.48], Cohens $d = .61$ [0.35:0.87]. (NB: All square brackets are 95% confidence intervals around the preceding statistic.) Notably, the means for different items were similar within-domain; institutional: punishing (0.65), making rules (0.60), and starting meetings (0.66); standard: healing (.42), farming (.38), and carpentry (.40).

There was also a significant effect of age, $b = .15$, $SE = .03$, $p < .001$, such that belief in the causal centrality of collective recognition increased with age. These age and domain effects were further qualified by a significant two-way interaction between age and domain, $b = .10$, $SE = .03$, $p = .002$. The causal centrality of collective recognition increased more dramatically over age for institutional actions, $b = .20$, $SE = .03$, $p < .001$, than standard actions, $b = .10$, $SE = .03$, $p = .003$ (Figure 3), reflecting an increasing distinction between the two types of actions.

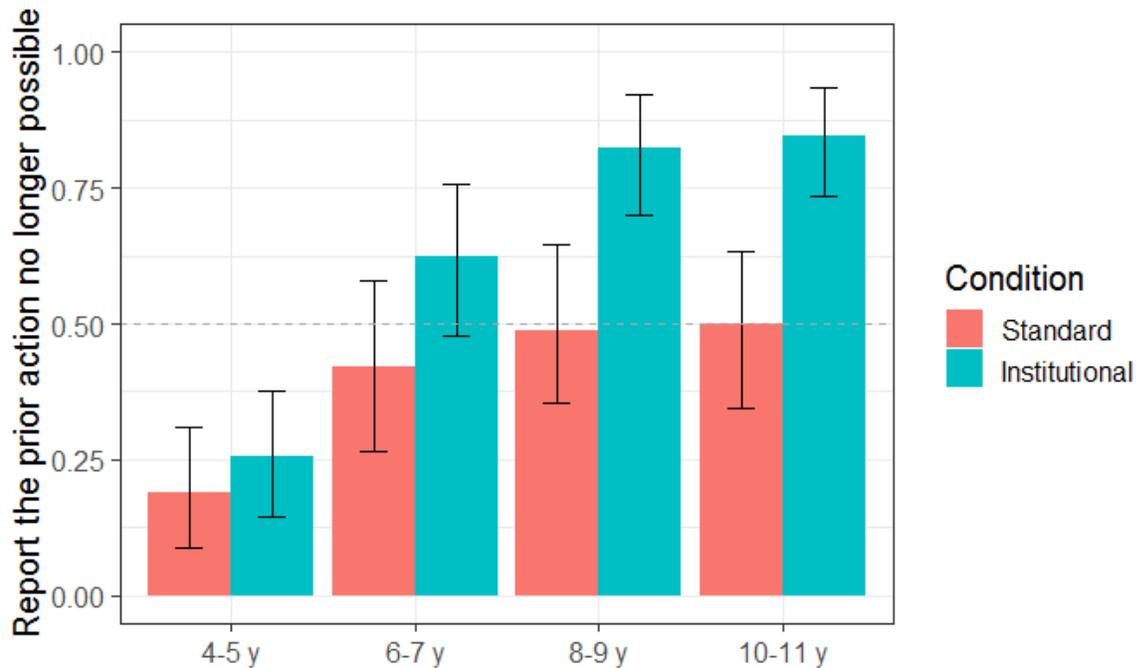


Figure 3. Children's beliefs about whether an action would be impossible after an actor was no longer recognized as a member of a social role. Error bars are 95% bootstrapped confidence intervals.

Follow-up tests confirmed that the 4- to 5-year-old children did not significantly distinguish between condition, $t(29) = 1.99, p = .056$, Cohen's $d = .36 [-0.16: .88]$. They were below chance for both institutional actions, $p < .001, M = .26 [0.13:0.38]$ and standard actions, $p < .001, M = .19 [0.07:.31]$, demonstrating that they believed collective recognition was causally irrelevant to both forms of action. The 6- to 7-year-old children moderately distinguished between condition, $t(29) = 2.98, p = .006, d = .54 [.02:1.07]$, but were at chance for both institutional actions, $p = .09, M = .62 [0.48:0.76]$, and standard actions, $p = .35, M = .42 [0.26:.59]$. Thus, they seemed to be a transitional age range. In contrast, the 8- to 9-year-old children robustly distinguished between conditions, $t(29) = 4.66, p < .001, d = .85 [0.31: 1.39]$. They thought collective recognition was causally central to institutional actions, $p < .001, M = .82 [.70:.94]$, but only partially relevant to standard actions, $p = .895, M = .49 [0.33:.0.64]$. The 10 to 11-year-old children demonstrated the same pattern of results, robustly distinguishing

between condition, $t(29) = 3.90, p < .001, d = .71 [.18:1.25]$. And they were above chance for institutional actions, $p < .001, M = .84 [0.74:0.95]$, and at chance for standard actions, $p = 1, M = .50 [.034:0.66]$.

Individual response patterns are broadly consistent with the developmental shift from treating all actions as remaining possible after the community changes its intentions, towards distinguishing between institutional actions and standard actions (Table 2). Though, we also see many mixed response patterns, such that children were unsure about standard actions even at the individual level.

Table 2. Individual Response Patterns, Study 1.

<u>Age Group</u>	<u>All Mature</u>	<u>Most Mature</u>	<u>All Immature</u>	<u>Most Immature</u>	<u>Other</u>
4-5 y	0	3	16	22	5
6-7 y	3	6	5	11	13
8-9 y	4	10	2	5	15
10-11 y	7	14	1	2	14

Note. The mature response is that after a community changes its intentions, institutional actions become impossible and standard actions remain possible. The immature response is that all actions remain possible. *All* means 100% of trials conformed to pattern. *Most* means 67% or more of trials conformed.

Overall then, we find a developmental shift from believing that collective recognition is causally irrelevant to all forms of acting, to believing that collective recognition is causally relevant, and especially relevant to institutional actions. The mixed pattern, such that standard actions were at chance even among the oldest age group, was unexpected. This deviates from the pattern found with similar measures for institutional objects (Noyes et al., 2018). One possible explanation for this pattern turns on the ambiguity in the “can” question alluded to above. “Can” questions are semantically ambiguous between causal possibility (“is he/she still able to X”) and normative possibility (“is he/she still allowed to X.”) Likewise, children may have reasoned about practical feasibility rather than whether the action was possible or impossible. Therefore, it is unclear exactly what the developmental change between the 4- to 5-year-old children and the

6- to 7-year-old children demonstrated. It could demonstrate a change in causal reasoning or a change in normative reasoning. But, the condition difference itself, cannot be reduced to normative reasoning since all of the actions would be “not allowed” if the community stopped recognizing the individual as occupying the relevant social role. To better understand the development of causal reasoning *per se*, we pursued in new test question in Study 2. We also asked about a new and more heterogeneous set of actions to replicate and extend our findings.

Study 2

Study 2 was conducted to address two major limitations of Study 1. First, Study 1 involved some potential confounds: The institutional actions were uniformly authority/leadership-based and relational, while the standard actions were not. To address this, we created new social actions that avoided these issues (see Table 2). If we find large condition differences with similar responding within-domain (standard vs. institutional), it would demonstrate that the developmental trajectory reflects changes in reasoning about institutional actions.

Second, in Study 1 older children expressed chance responding for standard actions. This might reflect ambiguity in the question: “*Can someone still X?*” The word *can* is semantically ambiguous between “it is possible” and “it is allowed.” It might also reflect ambiguity about whether an action is regulated severely enough to make the action practically impossible. Similarly, children may have been unsure how to respond because the same behaviors could occur even when the institutional role has been dissolved. For example, someone lacking institutional authority could still decide on a rule and attempt to stipulate the rule by speaking it out loud. But this behavior would no longer realize the same intended outcome (it would not create new obligations or duties among group members). To address the ambiguity, we asked a

new test question that focused on the intended outcome of the action. For example, “*if she tells a really funny joke, will it still make other Vawnsies laugh*” and “*if she gives a really long speech at a best-friend ceremony, will it still make two Vawnsies count as best friends?*” Therefore, we could see whether children understand that in the case of institutional actions, a behavior only achieves its intended outcome when the individual is recognized as occupying the appropriate social role.

Method

Participants

We recruited 90 children. Because 10- to 11-year-old children were similar to 8- to 9-year-old children in Study 1, and because of recruitment limitations, we only recruited children between the ages of 4 and 9. We recruited 30 children per 2-year bracket: 4- to 5-year-old children (4y1m to 5y11m), 6- to 7-year-old children (6y0m to 7y11m) and 8- to 9-year-old children (8y0m to 9y10m). 46 children were male and 44 were female. 75 children had race reported on their consent forms. Of those children, 49% indicates their race as White, 29% Hispanic, 12% multiracial or other, 5% Asian, 4% Black. The data was collected at a Connecticut elementary school.

Design and Procedure

We employed the same design and visual stimuli as Study 1. The major changes were a new set of social roles (Table 2 and Appendix) and a new test question. If someone attempted an action, would it still have the same outcome? For example, “*if she kicks a ball into a tree during a game, will it still count as a point for one of the teams?*”

Table 3.

Actions presented to children in Study 2.

Stimulus Set	Standard	Institutional
A and B.	...use a microscope to see if the special paper is real or not.	...write their name on the special paper so that it can be accepted for money.
C and D.	...tell really funny jokes that makes other Vawnsies laugh.	...give long speeches at best friend ceremonies to make the two Vawnsies count as best friends.
E and F.	...knock fruit out of trees by kicking balls really hard.	...get points by kicking the ball into the tree during the game.

Note. The action descriptions all contained a behavior and an intended outcome.

We selected institutional actions that were less related to authority or leadership than Study 1. Therefore, we selected institutional actions clearly outside of government settings. The social roles with institutional actions roughly resembled a bank teller, wedding officiant, and field goal kicker. To select for standard actions, we attempted to match features of the institutional action. For A&B, we selected a standard action that also involved using a tool (microscope vs. quill) on the special paper. For C&D, we selected a standard action that also involved verbally performing in front of people, and which involved eliciting a social response. C&D was our attempt to most clearly control for institutional actions being more social-relational than standard actions. For E&F, we selected a standard action that also involved kicking a ball into a tree to acquire something for others.

Results and Discussion

To analyze results, we used a multi-level model, nesting trial types (standard or institutional) within participants. As with Study 1, we used age as a continuous variable, but for ease of presentation we report the results by age group. The outcome variable was the causal centrality of collective recognition, as measured by how often children said a former occupier of the social role could no longer realize the same outcome if they engaged in the same behavior.

There was a significant effect of domain, $b = .33$, $SE = .05$, $p < .001$, such that collective recognition was seen as more causally central for institutional actions, $M = .50$ [0.42:0.57], than standard actions, $M = .17$, 95% CI: [0.11:0.23], Cohens $d = .74$ [0.44:1.05]. There was no significant effect of age, $b = .02$, $SE = .02$, $p = .277$, but there was a significant interaction between age and condition, $b = .14$, $SE = .02$, $p < .001$ (Figure 4), reflecting an increasing distinction between the two types of actions.

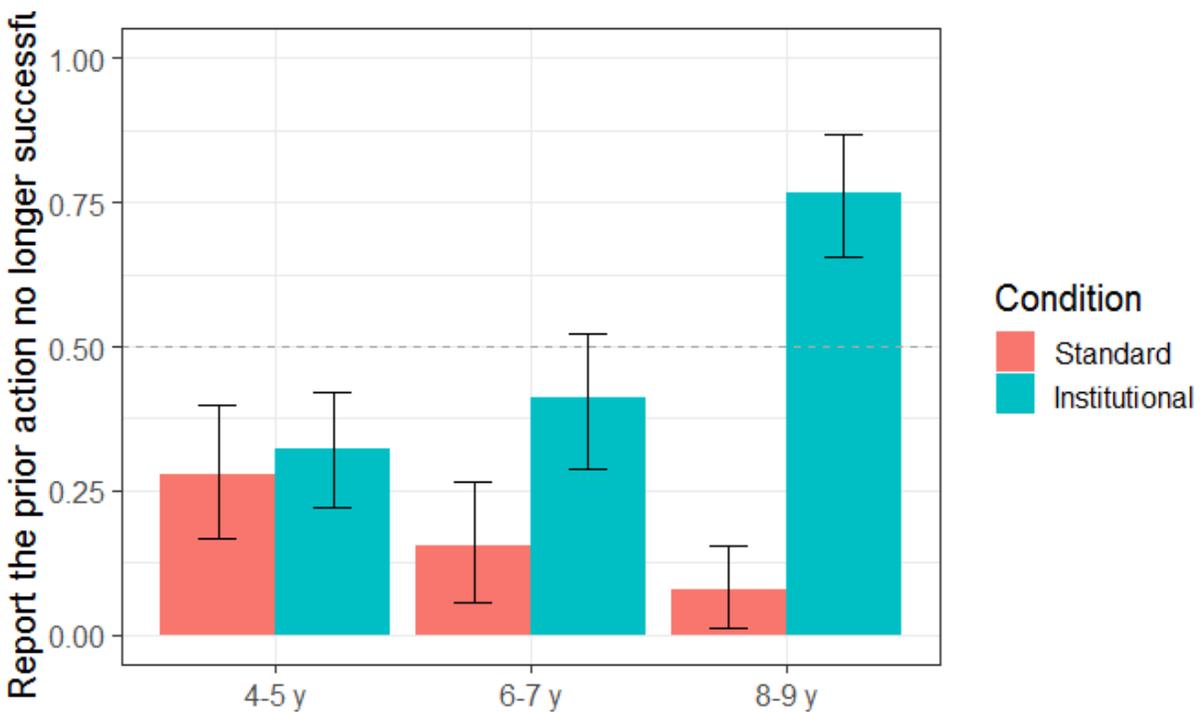


Figure 4. Children's beliefs about whether an action would still succeed in causing its intended outcome after an actor was no longer recognized as a member of a social role. Error bars are 95% bootstrapped confidence intervals.

Follow-up tests confirmed that the 4- to 5-year-old children did not significantly distinguish between condition, $t(29) = .75$, $p = .46$, Cohen's $d = .14$ [-0.38: .65]. They were below chance for both institutional actions, $p = .004$, $M = .32$ [0.21:0.44] and standard actions, $p < .001$, $M = .28$ [0.16:0.40], demonstrating that they believed collective recognition was causally irrelevant to both forms of action. The 6- to 7-year-old children distinguished between condition,

$t(29) = 3.91, p < .001, d = .54 [0.18:1.25]$. They were at chance for institutional actions, $p = .157, M = .41 [0.29:0.54]$, and below chance for standard actions, $p < .001, M = .16 [0.04:0.27]$, again suggesting they were a transitional age range – they distinguished, but did not robustly recognize the causal centrality of collective recognition to institutional action. In contrast, the 8- to 9-year-old children robustly distinguished between condition, $t(29) = 9.91, p < .001, d = 1.81 [1.20:2.42]$. They thought collective recognition was causally central to institutional actions, $p < .001, M = .77 [0.65:0.88]$, but irrelevant to standard actions, $p < .001, M = .08 [0.00:0.16]$.

Individual response patterns were consistent with the developmental shift from treating all actions as remaining possible after the community changes its intentions, towards distinguishing between institutional actions and standard actions (Table 4). Unlike Study 1, and suggesting that our revised wording was easier to understand, far fewer children expressed a mixed pattern of responding. Older children were far more likely to conform to the mature pattern of saying all or most institutional actions stopped being possible, and all or most standard actions remained possible.

Table 4. Individual Response Patterns, Study 2.

Age Group	All Mature	Most Mature	All Immature	Most Immature	Other
4-5 y	0	3	8	19	8
6-7 y	5	10	12	16	4
8-9 y	17	20	3	8	2

Note. The mature response is that after a community changes its intentions, institutional actions become impossible and standard actions remain possible. The immature response is that all actions remain possible. *All* means 100% of trials conformed to pattern. *Most* means 67% or more of trials conformed.

Critically, the developmental trajectory was highly similar for all items (Table 3) across all age ranges. No items were significantly different from each other within domain even without accounting for multiple comparisons. For example, the 8- to 9-year-old children were above chance for the “name-signer,” “friend-officiator,” and “point-kicker” (.83, .70, .70), and below

chance for the “microscope-user,” “joke-teller,” and “fruit-kicker” (.10, .07, .07). Because the items differed within domain in how much they evoked leadership, status, or relationality, and because the items were closely matched across domain, this pattern of results provides strong support for the conclusion that the observed developmental trajectory reflects changes in children's beliefs about the causal centrality of collective recognition. We also found that all children treated collective recognition as reliably irrelevant to standard actions, revealing that disambiguating our question did succeed in eliciting a clearer response pattern.

Table 5

Responses to individual items by age.

	Standard			Institutional		
	<u>Microscope</u> <u>-user</u>	<u>Joke-</u> <u>teller</u>	<u>Fruit-</u> <u>kicker</u>	<u>Name-</u> <u>signer</u>	<u>Friend-</u> <u>officiator</u>	<u>Point-</u> <u>kicker</u>
4-5y	0.27 ^b	0.27 ^b	0.30 ^b	0.40 ^c	0.27 ^b	0.27 ^b
6-7y	0.20 ^b	0.13 ^b	0.13 ^b	0.36 ^c	0.43 ^c	0.43 ^c
8-9y	0.10 ^b	0.07 ^b	0.07 ^b	0.83 ^a	0.70 ^a	0.70 ^a

Note. Comparisons to chance: a = above chance, b = below chance, c = at chance.

Overall then, we replicated the developmental trajectory of Study 1, but detected a clearer pattern of responses. Like Study 1, we found that 4- to 5-year-old children showed no sensitivity to the causal role of collective intentions, 6- to 7-year-old children showed some sensitivity, and the 8- to 9-year-old children showed robust sensitivity. Unlike Study 1, we found a clearer condition difference between standard actions and institutional actions. Therefore, the mixed responding we detected in Study 1 for standard actions was likely a consequence of the ambiguity in the test question. Here, we saw that older children only believed collective intentions were causally central to institutional actions.

General Discussion

The children we recruited started to distinguish between institutional actions and standard actions by the 6th or 7th year but not earlier, and robustly distinguished between them by the 8th and 9th year. The 4- to 5-year-old children tested believed that all actions were possible regardless of whether the individual was recognized as a member of the social role or not. For the 4- to 5-year-old children tested, collective recognition was causally irrelevant to the possibility of acting. Thus, an individual could continue to make rules, score goals, and start meetings even if they were not recognized as occupying the relevant social roles. Starting in the elementary school years, children in our samples increasingly believed that collective recognition was causally central to institutional actions.

Notably, we found little difference between the actions we described. This finding helps substantiate the claim that children were relying on an intuitive theory of institutions, one that cuts across many entities, rather than relying on highly local knowledge bound up in experiences with particular social roles. Even in Study 2, when we introduced more heterogeneity into the institutional actions, there was still a high degree of similarity across the items. Indeed, we found a qualitatively similar developmental trajectory as Noyes et al. (2018) found for institutional objects. The similarity across items and studies supports the conclusion that the documented developmental trajectory reflects changes in children's underlying intuitive theories.

Therefore, we speculate that the observed changes reflect conceptual change. Children may shift in how they reason about the causal structure of institutional kinds, leading to changes in the properties they consider central to these entities. The limiting factor does not seem to be children's knowledge *per se*. For example, considerably younger children understand that rules are embedded in communities and depend on context (Rakoczy & Schmidt, 2013; Schmidt & Tomasello, 2012). Thus, children seem to have the requisite pieces in place, but have difficulty

putting them together. Still, more securely establishing this as genuine conceptual change will require further work. To dissociate between mere knowledge accumulation and conceptual change, future research could leverage the methods of the conceptual change literature (Carey, 1999). For example, some forms of conceptual change are driven by executive function (which aids in holding multiple premises in mind and inhibiting intuitive responding), whereas knowledge accumulation is more often driven by verbal IQ (see Carey, Zaitchik, & Bascandziev, 2015; Zaitchik, Iqbal, & Carey, 2014). Therefore, future work could measure which individual differences predict the mature response pattern, particularly among 6- to 7-year-old children, who represented a transitional age range in the populations tested.

One limitation of the present task was that it was relatively demanding. Standard actions and institutional actions can only be distinguished by verbal descriptions, which means the task intrinsically placed high demands on attention, working memory, and verbal facility. Young children may need more training with the descriptions in order to successfully identify which actions are institutional and connect that information with their causal intuitions. That being said, the important cues were repeated multiple times, and the critical cues that signaled whether an action was standard or institutional were embedded in the test question itself. And even for highly familiar actions like making rules, young children showed no sensitivity to the causal importance of collective recognition. But future work could examine whether more extensive familiarization with the social roles would lead to earlier emergence of institutional reasoning. Another limitation was that our items were not entirely novel. Even if the social roles involved unfamiliar names, costumes, and settings, all of the social roles have some analogue to our participants' social environments. Nonetheless, given the many ways in which our examples deviated from those familiar settings, as well as the lack of between-item differences, we believe

it is unlikely that the patterns we observe could emerge absent a more general understanding of institutional actions.

Future work could also consider a few methodological changes that may provide more insight into the developmental changes we observed. In Study 2, we asked whether an action would still achieve its intended outcome, as this question reveals whether children distinguish standard actions from institutional actions. It may also be worth considering children's reasoning about the permissibility of the action, and whether the person can still undertake the action steps (e.g., write their name on the paper). Theoretically, these two questions should manifest the same pattern of responses across standard actions and institutional actions. However, children's reasoning about these facets of actions may also change across development, which could inform their reasoning about the outcomes of the actions. Another method that could be helpful is pairing two actions with every social role, such that one action is institutional and one is standard. Children should say the individual can still achieve the intended outcome of the standard actions but not the institutional action. This would help clarify whether children's responses reflected reasoning specifically about the actions.

If we are right that children were not merely relying on background knowledge, a critical question becomes what abstract cues children rely on to determine that an action is institutional. We believe the most important cue is that the intended outcome reflects a change in social facts. For example, we described an officiator whose actions made two people "*count as best friends*," or someone whose signature changed paper's normative properties, so that an individual was "*allowed*" to use the paper in a new way after it was signed. And we described someone who kicked a ball into a tree, which "*count[ed] as a point*" and could make their team "*count as the winning team*." Social facts can only change if individuals collectively recognize the act as

changing those facts; all social facts depend on the collective intentions of the community. Once children have this insight, then they will be able to flexibly decode whether or not any novel action is institutional.

We believe the combination of the current findings and findings from related work (Noyes et al., 2018) suggest that children are building a framework theory of institutions; one that emerges by the end of the 7th year in the populations tested. They construct a novel explanatory framework that allows them to readily detect new instances of institutions, even ones that are relatively unfamiliar: For example, children readily reasoned about novel instantiations for roles like chairpersons and bank tellers, recognizing that collective recognition was central to their institutional actions. Like other domains of biology and artifacts, children's emerging institutional domain is unified by causal-explanatory principles (Wellman & Gelman, 1992): Collective recognition causes new forms of acting in the world, like money's use in exchange and a juror's ability to decide guilt. This domain has an ontology, i.e. a set of entities that it picks out and explains, which includes entities like money and judges.

This is not to say that children cannot reason about certain aspects of social reality earlier in development. Indeed, 3-year-old children in prior research could reason about joint commitments (Kachel, Svetlova, & Tomasello, 2018; Kachel & Tomasello, 2019; Kachel, Svetlova, & Tomasello, 2019) and ownership (Kalish & Anderson, 2011). Joint commitment and ownership are both social facts, and so these may provide the entry point to reasoning about institutions. But studies on the early-emerging aspects of social reality focus on single and isolated social facts: "this truck is yours," and "we are playing together." They also often measure normative responses rather than causal reasoning *per se*. Instead, we were interested in when children can reason about institutional kinds like teams, money, and senators; in particular,

when children understand the causal processes that underlie their properties. We believe a more generic and kind-like representation of institutions emerges later in development. Our results suggest that by the 8th and 9th year, children understand the nature of collective recognition and its relationship to social facts in a sufficiently abstract way that they can reason flexibly about diverse social entities. Nevertheless, more research will be necessary to fully substantiate the breadth of children's insight into social entities, and to assess the developmental trajectory in other populations. We hope the present data at least shows that this claim is worth pursuing, and that institutional entities comprise a domain distinct from standard artifacts and natural kinds.

A new focus is emerging on children's concepts of political systems, including concepts of nationality (Hussak & Cimpian, 2019), the social function of punishment (Bregant, Shaw, & Kinzler, 2016), and leadership (Gülgöz & Gelman, 2017). Our theoretical and methodological approach connects with this new direction. Political systems are institutions. In reasoning about what it means to be a citizen or a leader, children will need to understand the way these roles are constructed, and the relationship between these roles and political acting. Children's insight into political actions, such as signing executive orders, making rules, and assigning punishment (Study 1) seems to follow a more general trajectory shared by other institutional actions, such as scoring points in a game (Study 2). Indeed, insight into the causal architecture of institutions – that they are grounded in the collective recognition of people – may provide the foundation for important conceptual developments in the political domain. For example, young children's error in linking nationality to biology (Hussak & Cimpian, 2019) may involve their failure to understand that collective recognition undergirds national groups and their functional affordances.

In the current studies we focused on the distinction between standard and institutional actions, and the way actions relate to social roles. This may imply that some social roles are institutional and others not, i.e., Senators versus farmers, respectively. But all social roles are necessarily embedded in institutions. A social role refers to the duties, obligations, and rights individuals possess in virtue of having some position within a collective. Being a farmer is more than being someone that farms; being a farmer is someone who has the duty (and right) to farm within a community. Therefore, an individual can only occupy a role within a collective and its division of labor. But there are many open empirical questions about concepts of social roles. For example, social roles like artist and scientist exhibit dual-character representations (Knobe, Prasada, Newman, 2013). That is, people entertain two distinct senses of a social role. People consider the following two individuals to be scientists in one of those senses, but not the other: (1) An uncurious and dogmatic employee of a scientific organization; (2) a curious and objective layperson (Knobe et al., 2013). This distinction is often characterized as being between the (1) superficial, concrete, descriptive sense, and the (2) deeper, essential, normative sense (Newman & Knobe, 2018). However, (1) does not merely possess the superficial trappings of a scientist: They are collectively recognized as a scientist (a non-obvious causal mechanism), and they possess all of the duties, rights, and obligations of a scientist. The distinction instead seems to be between the underlying justification for why our society has scientists (to advance empirical understandings of the world), and the institutions we have in place to regulate scientists (see also Leslie, 2015).

Institutions go beyond regulating our actions; they make new forms of action possible. Understanding the way collective intentions relate to action is an important part of making sense of social roles; particularly, how social roles like senators, judges, field goal kickers, and notaries

achieve their intended outcomes. We find that by the 8th or 9th year, children in our sample were able to reason about this relationship. This understanding will be important for them as they navigate complex societies, and participate in diverse institutional activities.

Works Cited

- Ahn, W. K. (1998). Why are different features central for natural kinds and artifacts? The role of causal status in determining feature centrality. *Cognition*, 69, 135-178.
[https://doi.org/10.1016/S0010-0277\(98\)00063-8](https://doi.org/10.1016/S0010-0277(98)00063-8)
- Ahn, W. K., Kim, N. S., Lassaline, M. E., & Dennis, M. J. (2000). Causal status as a determinant of feature centrality. *Cognitive Psychology*, 41, 361-416.
<https://doi.org/10.1006/cogp.2000.0741>
- Bloom, P. (1996). Intention, history, and artifact concepts. *Cognition*, 60, 1-29.
- Bregant, J., Shaw, A., & Kinzler, K. D. (2016). Intuitive jurisprudence: Early reasoning about the functions of punishment. *Journal of Empirical Legal Studies*, 13, 693-717.
- Gelman, S. A. (2003). *The essential child: Origins of essentialism in everyday thought*. Oxford Series in Cognitive Dev.
- Guala, F. (2016). *Understanding institutions: The science and philosophy of living together*. Princeton University Press.
- Gülgöz, S., & Gelman, S. A. (2017). Who's the boss? Concepts of social power across development. *Child Development*, 88, 946-963.
- Hussak, L. J., & Cimpian, A. (2019). "It feels like it's in your body": How children in the United States think about nationality. *Journal of Experimental Psychology: General*.
- Kachel, U., Svetlova, M., & Tomasello, M. (2018). Three-year-olds' reactions to a partner's failure to perform her role in a joint commitment. *Child Development*, 89, 1691-1703.
- Kachel, U., & Tomasello, M. (2019). 3-and 5-year-old children's adherence to explicit and implicit joint commitments. *Developmental Psychology*, 55, 80.

- Kachel, U., Svetlova, M., & Tomasello, M. (2019). Three-and 5-year-old children's understanding of how to dissolve a joint commitment. *Journal of Experimental Child Psychology, 184*, 34-47.
- Kalish, C. W., & Anderson, C. D. (2011). Ownership as a social status. *New directions for child and adolescent development, 2011(132)*, 65-77.
- Kalish, C. W., & Lawson, C. A. (2008). Development of social category representations: Early appreciation of roles and deontic relations. *Child Development, 79*, 577-593.
<https://doi.org/10.1111/j.1467-8624.2008.01144.x>
- Kalish, C. W. (2012). Generalizing norms and preferences within social categories and individuals. *Developmental Psychology, 48*, 1133.
- Keil, F. C. (1989). *Concepts, kinds, and cognitive development*. MIT Press: Cambridge, MA.
- Newman, G. E., & Knobe, J. (2018). The essence of essentialism. *Mind & Language*.
- Murphy, G. L., & Medin, D. L. (1985). The role of theories in conceptual coherence. *Psychological Review, 92*, 289.
- Noyes, A., Keil, F. C., & Dunham, Y. (2018). The emerging causal understanding of institutional objects. *Cognition, 170*, 83-87. <https://doi.org/10.1016/j.cognition.2017.09.008>
- Rips, L. J. (1989) *Similarity, typicality, and categorization*. In: *Similarity and analogical reasoning*, ed. S. Vosniadou & A. Ortony. Cambridge University Press
- Searle, J. (2010). *Making the social world: The structure of human civilization*. Oxford University Press. <https://doi.org/10.1177/0963721412448659>
- Searle, J. R. (1995). *The Construction of Social Reality*. New York: Free Press.
- Wellman, H. M., & Gelman, S. A. (1992). Cognitive development: Foundational theories of core domains. *Annual Review of Psychology, 43*, 337-375.

Appendix.

Table A1. Full descriptions for Study 1.

Set	<u>Standard Action Description</u>	<u>Institutional Action Description</u>
A and B.	On Vawnsie Island, sometimes people fall and get hurt, and sometimes they feel sick. Some of the Vawnsies on the island are [Russers / Cauters]. As [Russers / Cauters], they heal people. When people are sick or hurt, the [Russers / Cauters] make them better.	On Vawnsie Island, sometimes people break the rules. Some of the Vawnsies on the island are [Russers / Cauters]. As [Russers / Cauters], they punish rule-breakers. When someone breaks a rule, the [Russers / Cauters] make up the punishment that person has to do.
C and D.	On Vawnsie Island there are lots of houses filled with furniture like chairs and tables. Some Vawnsies on the island are [Wingles / Trugles]. As [Wingles / Trugles], they build things. When people need tables for their houses the [Wingles / Trugles] make them.	On Vawnsie Island, there are lots of rules that help people know what to do. Some of the Vawnsies on the island are [Wingles / Trugles]. As [Wingles / Trugles], they make rules. When people think there should be a new rule, the [Wingles / Trugles] decide to add the rule.
E and F.	On Vawnsie Island there are lots of fruit and vegetables that people eat. Some of the Vawnsies on the island are [Numbras/Lophals]. As [Numbras / Lophals], they grow things. When the vegetables get big and round, the [Numbras / Lophals] pick them.	On Vawnsie Island, everyone gets together for town meetings where they all talk about what they should do. Some of the Vawnsies on the island are [Numbras / Lophals]. As [Numbras / Lophals], they start meetings. When there are lots of things to talk about, the [Numbras / Lophals] choose what everyone talks about.

Table A2. Full descriptions for Study 2.

Set	<u>Standard Action Description</u>	<u>Institutional Action Description</u>
A and B.	<p>On Vawnsie Island, there are special pieces of paper that can be traded for money. These Vawnsies are [lonkers / toapers]. They [lonk / toap]. [Lonkers / toapers] are smart and know how to use a microscope. They can use the microscope to see if the special paper is real or not. All the other Vawnsies can trust the special paper knowing it is real. That's right! [lonking / toaping] is using a microscope to see if the special paper is real or not.</p>	<p>On Vawnsie Island, there are special pieces of paper that can be traded for money. These Vawnsies are [lonkers / toapers]. They [lonk / toap]. [lonkers / toapers] have to write their name on the special paper. The paper can only be accepted if they write their name on it. One is only allowed to trade the paper for money if it has their name on it. That's right! [lonking / toaping] is when they write their name on the special paper so that it can be accepted for money.</p>
C and D.	<p>On Vawnsie Island, there is a ceremony when Vawnsies want to be best friends. These Vawnsies are [geepers / slunkers]. They [geep / slunk]. [Geepers / slunkers] can tell really funny jokes. They know how to make the ceremony a fun time. Everyone laughs and feels happy when they tell their jokes. That's right! [geeping / slunking] is when they tell a funny joke that makes other Vawnsies laugh.</p>	<p>On Vawnsie Island, there is a ceremony when Vawnsies want to be best friends. These Vawnsies are [geepers / slunkers]. They [geep / slunk]. [Geepers / slunkers] have to give a long speech at the ceremony. Two Vawnsies count as best friends after the speech. The Vawnsies are accepted as best friends by everyone else when this happens. That's right! [geeping / slunking] is when they give a long speech at a best friend ceremony to make the Vawnsies count as best friends.</p>
E and F.	<p>On Vawnsie Island, there is fruit that grows in tall trees. These Vawnsies are [moopers / zibbers]. They [moop / zibb]. [Moopers / zibbers] can kick a ball into the tree really hard. They can kick the ball hard enough to knock fruit out of the tree. Their friends depend on them to get fruit to eat. That's right! [mooping / zibbing] is when they knock fruit out of trees by kicking the ball hard enough.</p>	<p>On Vawnsies Island, there is a game everyone plays. These Vawnsies are [moopers / zibbers]. They [moop / zibb]. [Moopers / zibbers] have to kick a ball into the tree. Their team can only get points if they kick the ball into the tree. Their team counts as the winning team when they kick the ball into the tree the most times. That's right! [mooping / zibbing] is when they get a point for their team by kicking the ball into the tree.</p>