

Subjectivity and Social Constitution: Contrasting Conceptions of Institutions, Artifacts, and Animals

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We systematically compared beliefs about animal (e.g., *lion*), artifactual (e.g., *hammer*), and institutional (e.g., *police officer*) categories, aiming to identify whether people draw different inferences about which categories are subjective and which are socially constituted. We conducted two studies with 270 American children, ages 4 through 10: 140 girls, 129 boys, one not reported; 59% White, 3% Black, 10% Asian, one Native American, 17% multiracial or another race, 11% unreported. We also conducted two studies with 360 American adults recruited from Amazon mechanical Turk. In all four studies we found that children and adults judged institutional categories as more socially constituted than artifactual categories (in all studies) but as less subjective (in three of four studies). Whereas younger and older children's beliefs about subjectivity were similar, younger and older children expressed different beliefs about social constitution. Young children judged none of the category domains as socially constituted; older children differentiated between the three domains. These results support the conceptual independence of subjectivity and social constitution and suggest that concepts of institutions and artifacts differ.

Public Significance Statement

During childhood, children acquire concepts for a large number of categories, such as *cat*, *chair*, and *teacher*, which differ in important ways. In particular, categories like *teacher* depend on human societies more than categories like *cat*. As children come to grasp the nature of these categories and how they differ, they become better equipped to predict and explain their world.

Keywords: categories, concepts, conceptual development, social cognition

Natural kinds are traditionally distinguished from non-natural kinds (Schwartz, 1980; Putnam, 1975). Candidate natural kinds include the categories *gold*, *water*, and *tiger*. Candidate non-natural kinds include *money*, *ugly things*, and *hammers*. Members of a non-natural kind only form a class because they satisfy a human concept,

whereas members of natural kinds possess common structure. For example, the category *ugly thing* corresponds to the collection of objects people think of as unattractive, whereas the category *gold* corresponds to instances of matter comprising element Au. Put another way, categories can be distinguished by whether their existence depends on people's minds. Here, we elaborate on this traditional dichotomy and use that elaboration to guide a novel empirical investigation of children's concepts.

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The design, analysis plan, and hypotheses were pre-registered for all studies on OSF: <https://osf.io/jcn49/>. Data and analysis files are posted on OSF: <https://osf.io/jcn49/>. Part of the data and narrative interpretation contained here were previously disseminated at Society for Research in Child Development. 2021. The manuscript was posted on PsyArxiv: <https://psyarxiv.com/h7s2rl/>.

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Theoretical Premise

Categories like *money* complicate the distinction between natural and non-natural kinds. Members belong to the category *money* because of people's goals, desires, and beliefs, suggesting that *money* is a non-natural category like *ugly things*. But does an object belong to the category *money* because people think of it as belonging to the category *money*? Or does the category *money* refer to things in the world independent of people's concepts? Philosophical views differ on this issue. In one influential account, instances belong to the category *money* because of collectively-accepted rules, such as "pieces of paper created by the Bureau of Engraving and Printing count as money in the United States" (Searle, 1995, 2010). Taken literally, objects belong to the category

money because people think about them as belonging to the category *money*. In a different account, money is a solution to a reoccurring coordination problem with characteristic features: instances act as a medium of exchange, a unit of account, and a store of value (Guala, 2016). If economists wanted to know whether cigarettes in a prison community were money, they would examine if the social practices involving cigarettes had the right structure: Do individuals use cigarettes to buy goods? Do they measure the value of goods in terms of cigarettes? Do they expect that cigarettes will continue to be accepted for payment indefinitely? The economists would not consider whether the community thought of the cigarettes as belonging to the category *money*. Taking this example a step further, given affirmative answers to these three questions, if members of the community declared that the cigarettes and their social practices were not money, they would be wrong.

Paradigm cases of natural kinds involve reference to intrinsic features. For example, a penny belongs to the category *copper* because it is composed of the element Cu. As the category *money* illustrates, categories can also be defined via features of the world that are extrinsic to an object, such as people's social practices. This difference can be described in terms of the persistence conditions for category membership: What would need to happen for a penny to stop being copper? It would need to undergo a fundamental change in its chemical make-up. What would need to happen for a penny to stop being money? It would need to lose its current role in our economic practices; nothing about the penny itself would have to change.

Putting this together, imagine members of a different society observed our dollar bills and the role they have in our society but did not consider our dollar bills or our social practices an instance of the category *money*. Under one plausible view, their category judgment is objectively wrong. On the other hand, imagine that our dollar bills washed up on their shores and they used them as coasters instead of a medium of exchange, store of value, or unit of account. Regardless of how they or Americans conceptualize the objects, their relationship to social practices has changed. Insofar as the category *money* refers to a kind of social practice or a position an object occupies in social practices, we might conclude that the objects are no longer money even if nothing about their intrinsic features changed (i.e., their form, composition, and so on). Therefore, a category can be objective while also being socially constituted.

These considerations illustrate an important point: the antonym of "natural" in "natural kind" is ambiguous between (at least) two senses. First, we can say a category is non-natural when the category depends solely on people's concepts instead of features of the world, as exemplified by *ugly things*. Second, we can say a category is non-natural when the relevant features of the world that make an object a member of the category are social factors extrinsic to the object, as exemplified by *money*. We refer to the first of these senses of 'non-natural' as subjectivity: The extent to which objects belong to a category merely because people conceptualize them as belonging to a category. We refer to the second of these senses as social constitution: The extent to which a category and its properties depend on social factors (e.g., social practices) instead of intrinsic features of objects. In the present article, we ask whether people distinguish subjectivity from social constitution (as well as objectivity from intrinsic constitution).

People's Concepts of Natural and Social Kinds

The first major goal of this investigation is to examine beliefs about subjectivity and social constitution in the context of natural, artifactual, and institutional categories and use this comparison among domains to assess the relationship between them. In the psychological literature, natural categories like *gold* and *tiger* have often been contrasted with artifactual categories like *hammer* and *chair* (Gelman, 2003; Keil, 1989; Malt, 1990). People may represent natural categories as having essences and artifactual categories as lacking them (cf. Bloom, 1996; Kelemen & Carey, 2007; Medin & Ortony, 1989). For example, even children think there is *something* intrinsic to a tiger that makes it a tiger (Gelman, 2003; Rhodes & Mandalaywala, 2017). Consistent with several studies (e.g., Rhodes & Gelman, 2009), the claim is that people represent animal categories as both objective and constituted by intrinsic factors and artifactual categories as both subjective and constituted by social factors. Both of these beliefs may be outcomes of attributing essences to animal categories and not attributing them to artifactual categories. Therefore, one possibility is that people make qualitatively similar judgments about subjectivity and social constitution, as they have a common source (when people attribute essences to categories, they conclude the category is objective and constituted by intrinsic factors; when they suppose there is no essence, they conclude the category is subjective and constituted by social factors).

A complementary perspective argues that social structures and coordinated human behaviors can support coherent, inductively rich categories, such that socially-constituted categories can be objective too (Noyes, 2022; Noyes et al., 2018, 2020; Noyes & Keil, 2019, 2020; Vasilyeva et al., 2018; Vasilyeva & Lombrozo, 2020). Social structures can support several features of categories often associated with essences, such as generic claims like "lawyers defend clients" and formal explanations like "lawyers defend clients because they are lawyers." This perspective opens up the possibility that other features of category representations associated with essences might also be compatible with a belief in social constitution. In particular, insofar as objectivity is conceptually linked with the coherence or inductive potential of a category, objectivity may be compatible with social constitution. For example, a recent study found that occupational role categories (e.g., *police officer*) supported as much inductive inference as animal categories, even though people judged occupational-role categories as socially constituted (Noyes et al., 2021).

Social Institutions

A second major goal of the investigation is to better understand how people represent social institutions and their parts; we also exploit social institutions as a critical test case for interrogating the distinction between subjectivity and social constitution. As discussed above, institutional objects, such as *money*, are particularly useful for showing that objectivity may not always correspond to intrinsic structure. Prior psychological research on concepts has focused on natural and artifactual categories. While categories like *police officer* and *money* may seem akin to artifactual categories like *hammer* and *chair* because they both depend on people, they differ in their structure: Artifacts like hammers and chairs are kinds of physical objects that humans manufacture. They rely on

physical causal processes (e.g., the amplification of force afforded by the form and material composition of the object). Institutional categories are kinds of social practices or social structures as well as particular positions or roles in those structures. Money can be realized by any number of physical (e.g., bills, coins) or nonphysical (e.g., digital record) forms, because money is not a kind of physical object but a kind of social institution that objects play a role in.

Children and adults appear sensitive to the unique structure of institutional categories by middle childhood (Noyes, 2022; Noyes et al., 2018, 2020), as well as the existence of structural causes of human behavior (Vasilyeva et al., 2018; Vasilyeva & Lombrozo, 2020). Prior research suggests that children and adults distinguish the constitution of institutional and artifactual categories, judging institutional categories as more socially constituted than artifactual categories (Noyes et al., 2018). However, these studies focused on children's beliefs about affordances (e.g., why can a person buy things with dollar bills and not other physically similar objects?). They did not examine children's beliefs about kind membership per se. Moreover, these studies did not examine children's beliefs about the objectivity or subjectivity of institutional categories. This distinction matters because, if participants judge institutional categories as more socially constituted and subjective than artifact categories, their beliefs about subjectivity and social constitution should coincide. To test for such convergent beliefs, we need to systematically contrast institutional categories with other domains across both types of beliefs.

Conceptual Development

A third goal of these studies is to understand how concepts of subjectivity and social constitution develop; we therefore use a developmental approach to provide deeper insight into how inferences about subjectivity and social constitution relate to each other. The major differences between concepts of animals and artifacts emerge early in development and persist into adulthood (Brandone & Gelman, 2009; Gelman, 1988; Greif et al., 2006). Germane to the present investigation, prior research finds that children represent natural categories as more objective than artifactual categories from preschool onward (Kalish, 1998; Rhodes & Gelman, 2009) such that they judge alternative classifications (e.g., a single category for lions and wolves) as incorrect. Children's concepts change in both domains, though; for example, with age, children prioritize central over superficial features (Matan & Carey, 2001; Keil, 1989)—for example, when categorizing an animal, children, with age, prioritize the category membership of its genetic parents over its current appearance or surgical modifications. Prior research also found that the beliefs traditionally associated with psychological essentialism become more correlated with age, suggesting that the standard profile of psychological essentialism coheres during childhood (Gelman et al., 2007). If beliefs about subjectivity and social constitution correspond to beliefs about essences, then we would expect to see beliefs about subjectivity and social constitution converge with age. If these beliefs are conceptually independent, then we would expect these beliefs to remain distinct into adulthood.

Beliefs about subjectivity and social constitution may undergo distinct developmental trajectories. Based on prior research, objectivity beliefs should remain relatively stable during childhood (Rhodes & Gelman, 2009), whereas beliefs about social constitution

should undergo substantial change. Initially, children may not fully grasp the sense in which categories like *money* and *lawyer* are fully constituted by people's social practices (Noyes et al., 2018, 2020). Likewise, children may not initially grasp the possibility of social structures to fully account for group differences (Coley et al., 2019; Hussak & Cimpian, 2019; Peretz-Lange et al., 2021; Vasilyeva et al., 2018; Vasilyeva & Lombrozo, 2020). Therefore, we expected children to initially show little variation in their beliefs about social constitution; with age, we expected children to differentiate institutional categories (e.g., *police officer*) from physical artifactual categories (e.g., *hammer*) and artifactual categories from animal categories (e.g., *lion*). The dissociation between subjectivity and social constitution in adult cognition, combined with distinct, non-converging developmental trajectories, would support a distinction between subjectivity and social constitution in ordinary concepts.

Sequence of Studies

We undertook four studies to determine whether children and adults distinguish subjectivity and social constitution. Our approach was to examine children's and adults' responses to questions about social constitution and subjectivity in three domains: animals, artifacts, and social institutions. If children and adults distinguish social constitution and subjectivity, then we would expect to see qualitatively different patterns of reasoning. If children and adults express the same pattern of beliefs by domain for social constitution and subjectivity, then we would be unable to conclude that they distinguish them. Instead, it would suggest social constitution and subjectivity are combined in ordinary concepts; for example, they may be part of a combined intuition about which categories possess or lack essences.

To measure social constitution and subjectivity, we identified and adapted measures already present in the literature. To measure subjectivity, we adapted the task from Study 2 of Rhodes and Gelman (2009), which modified the original task from Kalish (1998); see Figure 1. In our version, children were introduced to a novel island community. Children were told that the community does many things differently than we do: Sometimes what they do differently is wrong and other times what they do is just different (such that there can be multiple, right ways of doing things). On each trial, children saw pictures from two categories labeled with conventional American labels (e.g., "turtle" and "frog"); they were told that Americans consider the exemplars members of different categories. Children then learned that the novel community considers them members of the same category. Children were asked "are they maybe right?" If children believe the category boundary is objective, such that it maps onto facts about the real world independent of people's beliefs or decisions about category membership, then people who categorize differently are wrong. But if category membership is determined by people's beliefs or decisions about category membership, then alternative classifications are merely different and so equally correct.

One of the best ways to understand the constitution of kind membership is to examine the persistence conditions of kind membership (Keil, 1989; Rips, 1989). Here we focused on changes in an object's relationship to social practices. Specifically, people and objects from the United States wash up on the shores of a foreign society. The objects and people acquire different roles in the foreign society; however, nothing about the intrinsic features of the objects or people change. If children believe that kind membership depends

Figure 1

Comparison of Test Questions Used to Assess Whether a Category Is Subjective (Top Panel) and Whether Category Membership Is Socially Constituted (Bottom Two Panels)

	
Study 1: Subjectivity The Vawnsies and everyone from their island says these are the same kind of animal. Are they maybe right?	
	
Study 1: Social Constitution One day this turtle washes up on Vawnsie Island. The Vawnsies say "Now that this is on our island, it should be a frog!" So now, it acts like this frog on Vawnsie Island. And now it has the same role on Vawnsie Island that this frog does. Does that make it a frog now?	
	
Study 3 – Social constitution Look at this on the left - it's a turtle! Imagine that everyone decides that it should change into a frog now! Could it really change into a frog? Does that make it a frog now?	
	

Note. Study 3 was conducted with a simplified question owing to concerns that Study 1's social constitution question was difficult for the youngest children to comprehend; we were worried that the phrase "acts like" may have implied that the intrinsic behavior of the animal changed, such as its vocalizations, rather than merely its extrinsic properties, such as how people interact with the animal. The pictures of animals are for illustrative purposes (Public Domain Vectors, 2016a, 2016b): Children saw different but comparable images of animals. See the online article for the color version of this figure.

on social factors, then kind membership changes when an object's relationship to a society's social practices changes. If children reject that kind membership has changed, then they must think there are other features that constitute kind membership, such as the intrinsic features of the object (e.g., genes, chemical make-up, physical form and composition). We predicted that children would judge institutional categories as more socially constituted than artifactual categories (consistent with Noyes et al., 2018) and artifactual categories as more socially constituted than animal categories.

In Study 1, children responded to questions assessing subjectivity and social constitution (between subjects). In each case, children responded to questions about the same categories and category pairs. In Study 2, we replicated the same experiment with adults. In Study 3, we conducted a modified version of the social-constitution condition in Study 1 to address concerns about young

children's comprehension. In Study 4, we examined adults' beliefs about a larger set of stimuli from each domain to clarify adults' beliefs about the three domains (animals, artifacts, institutions). We hypothesized that children and adults would demonstrate a different profile of judgments when evaluating the subjectivity and social constitution of categories, providing evidence that these are psychologically distinct types of beliefs, favoring a more multifaceted picture of ordinary concepts.

Study 1

Study 1 tested children's beliefs about the subjectivity and social constitution of ordinary categories from three domains: animals, artifacts, and social institutions. We tested children ages 5–10 because that age span generally captures the developmental

transitions for this family of conceptual questions (e.g., Noyes et al., 2018; Rhodes & Gelman, 2009). We preregistered our design and analysis at <https://osf.io/jcn49>. We predicted that children would distinguish between what is subjective and what is socially constituted. We did not predict large changes in children's responding to questions about subjectivity, consistent with prior studies (with respect to animals & artifacts, Kalish, 1998; Rhodes & Gelman, 2009). We did not preregister a prediction about age-related changes for responding to social constitution, but prior literature is consistent with a more protracted development with mature responding emerging after the 7th year (Kalish et al., 2000; Noyes et al., 2018, 2020). The type of measure was between subject (subjectivity, social constitution) but category domain was within subject.

Method

Sample Selection and Participants

We collected samples sequentially, such that the first sample of children responded to questions about subjectivity and the second sample responded to questions about social constitution (see Figure 1). We preregistered our analyses and predictions separately for each. Because we preregistered cross-study comparisons, and it is the comparison that is of primary theoretical interest, we present the data as conditions of a single study. We recruited 180 children with 30 five- to 6-year-old children per condition, 30 seven- to 8-year-old children per condition, and 30 nine- to 10-year-old children per condition. We recruited 30 participants per age range per condition to have 95% power to detect large within-subject effect size ($d = .70$) in any given age bracket per condition, and 95% power to detect small, within-subject effect sizes ($d = .40$) in the full sample per condition. The sample contained 97 girls and 82 boys; gender was not reported for one child. Fifty-seven percent of children identified as White, 4% as Black, 12% as Asian, 13% as multiracial or another race, one child as Native American; 13% did not report. The samples were recruited predominantly from two museums: One museum charged \$13 per adult and \$6 per child (with data collection also occurring on a free day); one museum charged \$25 per adult and \$17 per child. The study methods and sample were approved by Yale University's Institutional Review Board, HSC protocol 1305012100: "Development of Social Category Knowledge."

Stimuli

We selected three category pairs from each domain: For animals, we selected turtle/frog, goat/pig, and wolf/lion. For artifact pairs, we selected car/train, hammer/screwdriver, and table/bookcase. For institutional kinds, we selected license/badge, police officer/judge, and artist/teacher. These decisions were made as the result of a pretest. MTurk Adults ($n = 34$ after exclusions) rated a larger set of pairs on a 1 to 7 similarity scale. We selected pairs for inclusion in the main study based on three criteria: (a) We selected pairs that were rated as slightly more similar than the midpoint: average = 4.13; (b) We selected pairs that kept the within-pair similarity similar across domains: 4.09, 4.13, and 4.16 for animals, institutions, and artifacts; (c) We tried to maximize the dissimilarity between pair so that the pairs covered a greater area of the conceptual space. For example, we selected a pair of vehicles, tools, and furniture to maximize coverage of the space of possible artifacts. We considered institutional objects like drivers' licenses and

social roles like police officers to be part of the same domain (social-institutional categories). We test and confirm that this is empirically true of adults' intuitions in Study 4.

Design and Procedure

Children responded either to questions about subjectivity or to questions of social constitution (see Figure 1). All children responded to an identical set of nine category pairs taken from three domains of categories (animals, artifacts, and institutions).

Subjectivity

We adapted our task from Study 2 of Rhodes and Gelman (2009), which modified the original task from Kalish (1998; see Figure 1). In the beginning of the study, children were introduced to the task and a novel island community. They were told that members of that community do many things differently than us, and that sometimes what they do differently is wrong and other times just different. Subjectivity can be assessed at an individual or group level. One could ask about two Americans who disagree about whether a bowl of soup tastes good or bad; one could also ask about two cultures that differ in their sense of what is right or wrong. The group level was most pertinent for our interest because it matches the level of analysis appropriate for social constitution (i.e., the category money is constituted by social practices not by individual actions). Moreover, in prior work (Rhodes & Gelman, 2009), children and adults rejected idiosyncratic classifications of animals and artifacts. This probably reflects the intuition that the individual is wrong regardless of whether the category is objective or subjective: Either they made a mistake about the way the world is or they have failed to learn their community's norms. This suggests that people do not think of artifact categories as subjective in the strong sense that preferences are subjective.

Children were then given a brief training (used in Rhodes & Gelman, 2009): Children were asked whether it would be maybe right if the Vawnsies called the child by a different name (the correct answer for the purposes of the study was no) and whether it would be maybe right if the Vawnsies said they liked carrots more than cookies (the intended answer was yes). The intent of the warm-up phase was to familiarize children with the test question and provide an example of both an affirmative and negative response. After each question, children were provided with the correct answer. Then, the answer to both questions was reiterated at the end of the familiarization phase. Children produced the expected answer 74% of the time on the name question and 79% of the time on the preference question. Children who answered both questions correctly were the same age as children who answered one or more questions incorrectly: 7.92 and 7.89, respectively.

Children then received nine trials in randomized order. Children saw pictures of the two categories. The two pairs were labeled using their conventional categories, and children were told that Americans considered these two items to belong to different categories. Children then learned that the Vawnsies categorized the category pairs within the same category. Children were asked "are they maybe right?" and the experimenter inputted their answer (either "yes" or "no").

Social Constitution

This task combined features of the above task with the social transformation task used in Noyes et al. (2018; see Figure 1).

Children were presented with the same novel island. They were told that a boat from America crashed in the ocean, and that many things from the United States were transferred to Vawnsie island. Children then received the nine trials in randomized order. Each trial showed children one of the category exemplars in the pair arriving on the island (e.g., turtle from turtle/frog). When the object arrived, the community decided that the object should belong to the opposite category (e.g., they decided the turtle should be a frog). Thus, the object took on a different role within the community. Children were then asked the test question: *Does that make it a Y now?* The experimenter then inputted children's response (either "yes" or "no"). Children did not receive familiarization at the beginning of this condition. A familiarization was added in Study 3 which follows up on this condition.

Analysis Plan

We preregistered five sets of analyses.

Analysis 1. For both subjectivity and social constitution, we compared participants' responses to animal, artifactual, and institutional categories. Specifically, we used a binomial GEE model with children's response ("yes" or "no") as the outcome variable and domain as categorical variables as predictors. A generalized estimating equation (GEE) model extends generalized linear models when there are possible correlations between observations, as is the case for within-subject designs.

Analysis 2. We then examined whether children's responses are significantly different from chance in each domain by fitting a binomial GEE model to children's responses by domain and looking at whether the intercept significantly differs from chance.

Analysis 3. For each domain, we then fit a GEE model with children's age (continuous, 5–10) as a predictor to determine whether there are significant changes by age.

Analysis 4. Where there are age differences, we then repeat *analysis 1* by age group (5–6, 7–8, 9–10) to characterize how children's pattern of responses by domain differ with age.

Analysis 5. Finally, we examine whether children's response by domain vary by whether they are thinking about subjectivity or social constitution. To do so we fit a binomial GEE model that contains domain and question (subjectivity versus social constitution) as predictors. To communicate effects sizes appropriate for the dichotomous response measure we also report odds ratios.

Open Science

This study's design, analysis, and hypotheses were preregistered; see <https://osf.io/jcn49/> for preregistration files.

Results and Discussion

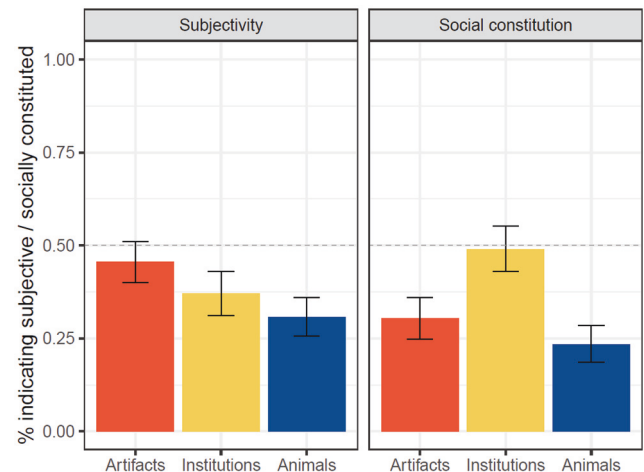
Subjectivity

Results are coded such that higher numbers indicate the category is more subjective, which corresponds to a 'yes' response ("are they maybe right?").

Analysis 1. Replicating prior literature (Rhodes & Gelman, 2009; cf. Kalish, 1998), and confirming our preregistered prediction, children judged artifact categories as more subjective than animal categories, $b = .63$, $SE = .16$, $p < .001$ (see Figure 2). The difference between children's judgments about animal and institutional categories was nonsignificant, $b = .28$, $SE = .17$, $p = .098$.

Figure 2

Children's Judgments About Whether Categories Were Subjective or Socially Constituted by Domain



Note. Chance (50%) is represented by dotted line. Error bars are bootstrapped; error bars are informative relative to chance and between study, but not within study as those comparisons are within subject. See the online article for the color version of this figure.

Children judged the artifactual categories as more subjective than institutional categories, $b = .35$, $SE = .17$, $p = .037$.

Analysis 2. Children judged the animal categories as objective: That is, they judged animal categories as subjective significantly less often than predicted by chance, $b = -.81$, $SE = .17$, $p < .001$. Children also judged the institutional categories as objective, $b = -.53$, $SE = .15$, $p = .001$. Children's judgments about artifact categories were not significantly different from chance, $b = -.18$, $SE = .15$, $p = .239$.

Analysis 3. Consistent with the flatter developmental trajectories of prior research (Kalish, 1998; Rhodes & Gelman, 2009), we found no indication of age effects in any domain ($bs < .129 \leq ps \leq .841$).

Exploratory

Children who answered both warm-up questions correctly indicated that artifactual, institutional, and animal categories were subjective 42%, 37%, and 24% of time, respectively. Children who answered one or more of the questions incorrectly reported that artifactual, institutional, and animal categories were subjective 50%, 38%, and 40% of the time. Therefore, we see a qualitatively similar pattern of results; most importantly, children judged artifactual categories as the most subjective and more subjective than animal categories (this condition difference was significant for both subsets of children; $p < .05$).

Social Constitution

We coded results such that higher numbers indicate the category is more socially constituted, corresponding to "yes" to "does that make it a Y now?"

Analysis 1. As predicted, children judged institutional categories as significantly more socially constituted than animal categories, $b = 1.15$, $SE = .18$, $p < .001$, $OR = 3.14$ (see Figure 2).

Children also judged institutional categories as significantly more socially constituted than artifact categories, $b = .79$, $SE = .17$, $p < .001$, $OR = 2.19$. Children judged artifact categories as significantly more socially constituted than animal categories, $b = .36$, $SE = .16$, $p = .022$, $OR = 1.43$.

Analysis 2. Children judged animal categories as socially constituted significantly less often than predicted by chance, $b = -1.19$, $SE = .21$, $p < .001$, $OR = 3.29$. Children also judged artifactual categories as socially constituted less often than predicted by chance, $b = -.83$, $SE = .18$, $p < .001$, $OR = 2.29$. Thus, children appeared to reason that both animal and artifactual categories were constituted primarily by nonsocial factors. Children's judgments about institutional categories were not significantly different from chance, $b = -.04$, $SE = .16$, $p = .764$.

Analysis 3. With age, children were significantly less likely to judge animal categories as socially constituted, $b = -.62$, $SE = .17$, $p < .001$, $OR = 1.86$. With age, children were also significantly less likely to judge artifactual categories as socially constituted, $b = -.31$, $SE = .12$, $p = .012$, $OR = 1.36$. Children's judgments about institutional categories did not significantly differ with age, $b = .024$, $SE = .10$, $p = .794$, $OR = 1.02$ (see Figure 3).

Analysis 4. We found domain differences only for 9–10-year-olds ($ps < .001$) and 7–8-year-olds ($ps < .001$), but not for 5–6-year-olds ($ps > .30$; see Figure 3). Therefore, we found a developmental trajectory consistent with prior literature, such that children's reasoning became more adult-like after the 7th year when reasoning about social constitution (Kalish et al., 2000; Noyes et al., 2018, 2020). However, the absolute values imply that children were initially unsure whether any of the categories were socially constituted, and then, with age, selectively determined that animal and artifactual categories were *not* socially constituted. We would have expected young children to judge at least animal categories as constituted by intrinsic features (e.g., Keil, 1989; Gelman & Wellman, 1991). Because the test question was somewhat complex, it raised the possibility that young children

did not comprehend the task. We address this with a modified question in Study 3.

Comparison Between Subjectivity and Social Constitution

We examined whether the pattern of cross-domain comparisons differed by measure (see Figure 2). As predicted, the difference between artifactual and institutional categories differed by measure, $b = 1.14$, $SE = .24$, $p < .001$, $OR = 3.12$. Children judged artifactual categories as more subjective than institutional categories, whereas children judged institutional categories as more socially constituted than artifactual categories. The difference between animal categories and social-institutional categories also varied by measure, $b = .86$, $SE = .25$, $p = .001$, $OR = 2.37$, such that children expressed a larger difference when reasoning about their social constitution than their subjectivity. The difference between artifact categories and animal categories was *not* measure-dependent, $b = -.27$, $SE = .22$, $p = .211$ —only comparing animal and artifact categories (to the exclusion of institutional categories) may lead to the false impression that beliefs like subjectivity and social constitution pattern the same across domains. In the context of all three domains, we see that the profile of children's reasoning differed by measure, demonstrating that children brought in different intuitions about subjectivity and social constitution; indeed, we see no indication that children conflated subjectivity and social constitution at any point in development.

Study 2

We replicated Study 1 exactly with an adult population.

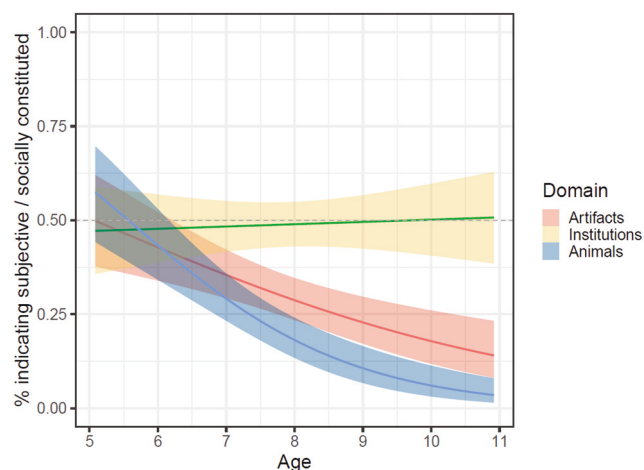
Method

Initially, we had preregistered collecting 30 adults per condition. However, prior to collecting the adult sample, but after collecting the developmental samples, we decided to enlarge our sample sizes to match the full sample of children. We recruited 180 adult participants from Amazon Mechanical Turk. The sample had a mean age of 35.79 years old, range: 21 to 71; 179 participants indicated their gender: 126 women, 52 men, 1 genderqueer/nonbinary; 176 people indicated their race: 137 as White, 18 Asian, 14 as Black, seven as multiracial.

Results and Discussion

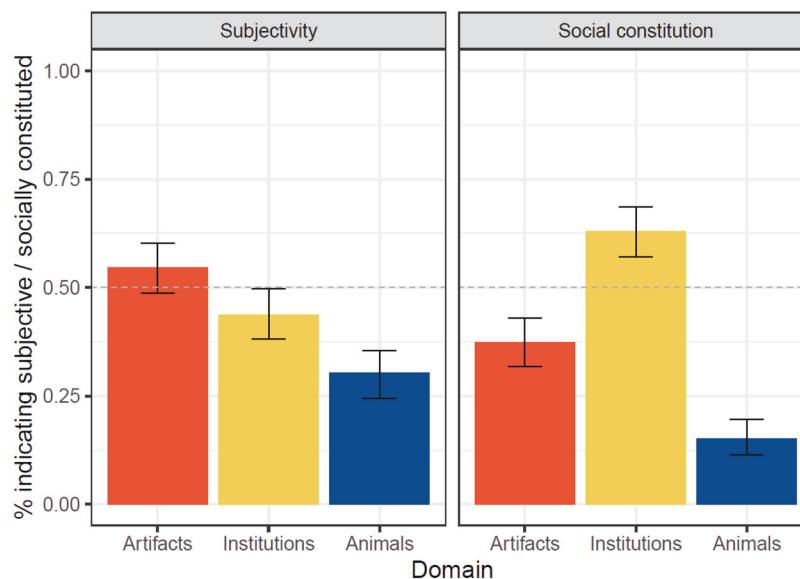
Overall, we found a qualitatively similar pattern (see Figure 4). Consistent with our predictions, (a) adults judged artifactual categories as more subjective than animal categories, $b = 1.02$, $SE = .20$, $p < .001$; (b) adults judged institutional categories as more socially constituted than animal categories, $b = 2.25$, $SE = .27$, $p < .001$; (c) and, critically, the comparison between artifactual categories and social-institutional categories differed by measure, $b = 1.67$, $SE = .32$, $p < .001$. One notable difference is that adults judged institutional categories as socially constituted more often than predicted by chance, $b = .53$, $SE = .14$, $p < .001$, whereas children were not significantly different from chance, demonstrating that the developmental trajectory observed in the 5- to 10-year-olds continued beyond the age ranges tested. Thus, adults revealed clearly distinct patterns of judgments by measure. Further, we found that children's responding approximates

Figure 3
Relationship Between Age and Response Across Domain



Note. Error bars are 95% bootstrapped confidence intervals. Dotted line represents chance (50%). Graph uses geom_smooth with binomial GLM. See the online article for the color version of this figure.

Figure 4
Adult's Belief About Subjectivity and Social Constitution



Note. Chance (50%) is represented by dotted line. Error bars are bootstrapped; error bars are informative relative to chance and between study, but not within study as those comparisons are within subject. See the online article for the color version of this figure.

this mature response pattern, with developmental change occurring primarily in children's reasoning about social constitution.

Study 3

We conducted a replication of Study 1's social constitution condition to clarify the developmental trajectory, because young children's responses suggested a lack of comprehension. Specifically, we added a brief warm-up phase at the beginning of the experiment and revised the test question for simplicity.

Method

Participants

Owing to changes in participant availability, we selected children ages 4–9 rather than 5–10. Because we expected the developmental transition to occur approximately around the 7th year, this shift downward was not expected to impact our ability to observe the relevant developmental trajectory. As with Study 1, we selected 30 children per 2-year age group, which were 4–5, 6–7, and 8–9 for this study. There were 47 boys and 43 girls. Sixty-one percent identified as White, 1% as Black, 4% as Asian, 23% as multiracial or another race; 10% did not report.

Design and Procedure

The design was identical to Study 1's social constitution condition with two changes. First, at the beginning of the experiment there was a warm-up phase. To familiarize children with the premise that communities can collectively change their intentions we asked children whether a community can change a conventional norm and a moral norm. For the conventional norm: "In the United

States, children aren't allowed to wear pajamas to school every single day. But imagine that everyone decided that it was okay now!" For the moral norm: "In the United States, children aren't allowed to hit people and make them cry. But imagine that everyone decided that it was okay now!" The intended answers were "yes" and "no," respectively. Children who did not provide the expected response were gently corrected (the experimenter shared what they thought was the correct answer) but were not asked to change their answer. Both answers were repeated at the end of the warm-up phase. Children produced the expected answer 50% of the time on the pajama question and 88% of the time on the hitting question. Therefore, children appeared biased to reject norm changes. Children who answered both questions correctly were slightly older than children who did not: 7.29 and 6.80, respectively.

Second, we simplified the test question: "Look at this on the left—it's an X! Imagine that everyone decides that it should change into a Y now! Could it change into a Y?" This question should be easier for children to understand and removes the concern that children may have interpreted the question as referring to substantial change in the entity's intrinsic features.

Results and Discussion

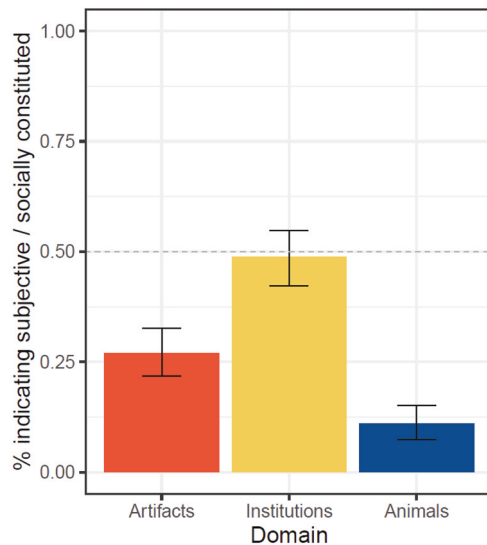
We coded results such that higher numbers indicate the category is more socially constituted, corresponding to "yes" to "does that make it a Y now?"

Analysis 1

As predicted, children judged institutional categories as significantly more socially constituted than animal categories, $b = 2.03$, $SE = .28$, $p < .001$, $OR = 7.65$ (see Figure 5). Children judged

Figure 5

Study 3: Children's Judgments About the Social Constitution of Artifactual, Institutional, and Animal Categories



Note. Chance (50%) is represented by dotted line. Error bars are bootstrapped; error bars are informative relative to chance and between study but not within study as those comparisons are within subject. See the online article for the color version of this figure.

institutional categories as significantly more socially constituted than artifactual categories too, $b = .95$, $SE = .17$, $p < .001$, $OR = 2.58$. Children judged artifactual categories as more socially constituted than animal categories, $b = 1.09$, $SE = .25$, $p < .001$, $OR = 2.96$.

Analysis 2

Children judged animal categories as socially constituted less often than predicted by chance, $b = -2.08$, $SE = .28$, $p < .001$, $OR = 8.00$. Children judged artifactual categories as socially constituted less often than predicted by chance, $b = -.99$, $SE = .17$, $p < .001$, $OR = 2.70$. Children judged social-institutional categories no different from chance, $b = -.04$, $SE = .14$, $p = .729$.

Exploratory

Children who answered both warm-up questions correctly indicated that artifactual, institutional, and animal categories were socially constituted 20%, 47%, and 4% of time, respectively. Children who answered one or more of the questions incorrectly reported that artifactual, institutional, and natural categories were socially constituted 32%, 50%, and 16% of the time. Therefore, we see a qualitatively similar pattern of results; both subsets of children judged institutional categories as more socially constituted than artifactual categories and artifactual categories as more socially constituted than animal categories ($ps \leq .001$).

Analysis 3

With age, children less frequently judged animal categories as socially constituted, $b = -.61$, $SE = .25$, $p = .012$, $OR = 1.85$ —although Figure 6 shows that children were below chance as early

as 4. Children's judgments about artifact categories did not change with age, $b = .10$, $SE = .11$, $p = .387$, $OR = 1.10$. With age, children were more likely to judge institutional categories as socially constituted, $b = .21$, $SE = .09$, $p = .018$, $OR = 1.23$; Figure 6 shows that children were initially below chance and then were significantly above chance, crossing the midpoint at roughly 7. Overall, the methodological changes appeared to aid children's comprehension. Indeed, children's responses more closely resembled the adult end state (Study 2) than they did in Study 1. Further, the youngest children revealed a systematic pattern (they were significantly below chance for all conditions) and this systematic pattern is consistent with prior literature (Kalish et al., 2000; Noyes et al., 2018, 2020).

Study 4

We presented adults with a larger set of items (32 category pairs; Table 1) to clarify the domain comparisons observed in Studies 1 and 2. Specifically, we wanted to probe the generalizability of the prior results to additional stimuli and we wanted to systematically contrast social roles with institutional objects. We presented 16 pairs of social-institutional categories split between social roles and institutional objects, so we could verify our decision to consider these members of the same domain. Otherwise, the design and procedure were identical to Studies 1 and 2.

Method

Participants

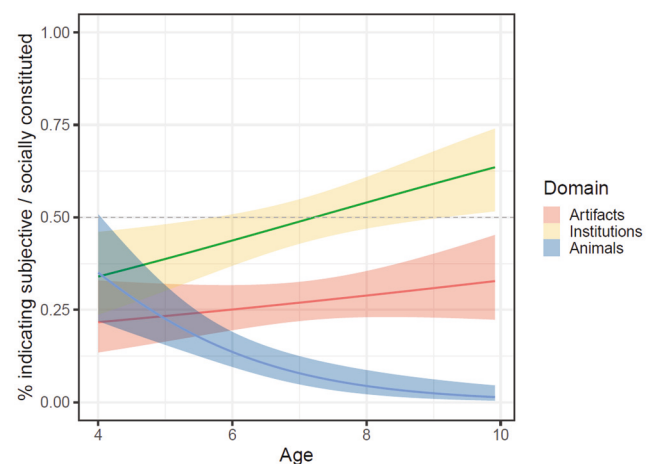
We recruited 180 adult participants from Amazon Mechanical Turk. We did not collect demographic information for this sample.

Stimuli

We used a much broader set of category pairs from each domain. We also included a full set of social roles and institutional objects for comparison.

Figure 6

Relationship Between Age and Response Across Domain



Note. Error bars are 95% bootstrapped confidence intervals. Dotted line represents chance (50%). Graph uses geom_smooth with binomial GLM. See the online article for the color version of this figure.

Table 1
Stimuli Used in Study 3

Institutions			
Objects	Roles	Artifacts	Animals
Police badges–	Artists–	Tables–	Dogs–
Driver's License	Teachers	Bookcases	Cats
Notary seals–	Surgeons–	Chairs–	Wolves–
Postage stamps	Scientists	Desks	Lions
Birth Certificates–	Plumbers–	Hammers–	Frogs–
Social Security Cards	Janitors	Screwdrivers	Turtles
Checks–	Farmers–	Forks–	Goats–
Money Orders	Construction workers	Spatulas	Pigs
Arcade tickets–	Police officers–	Cars–	Horses–
Poker chips	Judges	Trains	Cows
Bus passes–	Congress members–	Ovens–	Spiders–
Parking permits	Lawyers	Dishwashers	Scorpions
Chess queens–	Senators–	Shorts–	Squirrels–
Card aces	Attorney Generals	Dresses	Rabbits
Concert VIP pass–	Football kickers–	Toilets–	Chickens–
Movie tickets	Soccer goalies	Sinks	Seagulls

Results and Discussion

We found the same qualitative pattern of results as Studies 1 and 2 (see Figure 5). Indeed, we confirmed the predictions from those studies: (a) Adults judged artifactual categories as more subjective than animal categories, $b = .69$, $SE = .14$, $p < .001$; (b) Adults judged institutional categories as more socially constituted than animals, $b = 2.32$, $SE = .26$, $p < .001$; (c) the comparison between artifact and institutional categories varied by measure, $b = 1.00$, $SE = .17$, $p < .001$. There were two notable differences in the pattern of results. Although the mean of institutional categories on the subjectivity measure was intermediate here, too (see Figure 7), the difference was only significant when contrasting institutional categories with animal categories, $b = .39$, $SE = .13$, $p = .003$, but not when contrasting them with artifact categories, $b = -.11$, $SE = .10$, $p = .293$. Additionally, adult judgments about artifact categories on the social constitution measure did not differ from chance, $b = -.02$, $SE = .16$, $p = .871$, whereas adults responded below chance in Study 2.

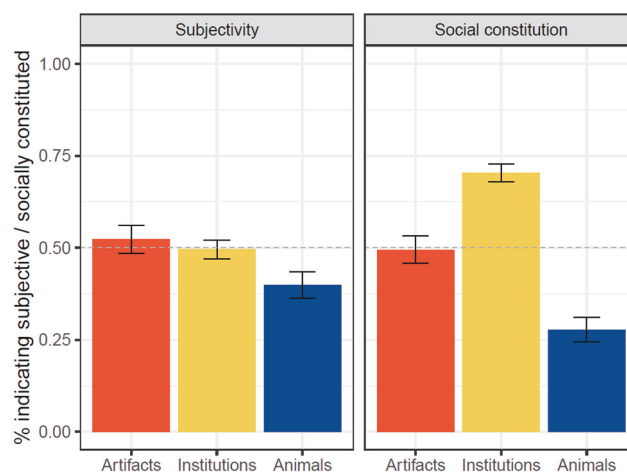
Critically, adults reasoned about institutional objects and social roles similarly. There was no significant difference between institutional objects ($M = .49$) and social roles ($M = .50$) on the question of their subjectivity, $b = .03$, $SE = .12$, $p = .225$, nor was there a significant difference between institutional objects ($M = .69$) and social roles ($M = .72$) on the question of their social constitution, $b = .17$, $SE = .18$, $p = .324$. This result is important because it empirically validates our methodological decision to consider them members of the same domain in Studies 1–3. It further demonstrates that it is inappropriate to consider institutional categories like *money* as members of the same domain as artifactual categories. Institutional objects like *money* are conceptually similar to social roles and both are dissimilar to artifacts.

General Discussion

Children and adults in our samples distinguished social constitution and subjectivity. Consistent with prior literature, children and

adults indicated that animal categories were objective and depended on intrinsic features, whereas they indicated that artifactual categories were somewhat subjective and somewhat socially constituted—although in no case did children or adults judge artifactual categories as subjective or socially constituted more often than predicted by chance alone. If one only observed the contrast between animal and artifactual categories, one might conclude that subjectivity and social constitution were psychologically conflated or derived from the same underlying intuitions (e.g., intuitions about essences). But institutional categories complicate this picture: Children and adults in our samples indicated that, compared

Figure 7
Adults' Belief That Classifications or Entities in a Domain Are Socially Constructed Using a Greater Diversity of Items From Each Domain



Note. Chance (50%) is represented by dotted line. Error bars are bootstrapped; error bars are informative relative to chance and between study, but not within study as those comparisons are within subject. See the online article for the color version of this figure.

with artifactual categories, institutional categories were far more socially constituted but slightly less subjective (the subjectivity difference was significant in three out of four studies). This crossover interaction supports a psychological distinction between subjectivity and social constitution.

Conceptual Development

Children in our samples conformed to different developmental trajectories in their reasoning about subjectivity and social constitution. Children's beliefs about subjectivity were qualitatively similar early and late in development and looked similar to adults. But their reasoning about social constitution looked different early and late in development: young children did not distinguish between animals, artifacts, and social institutions, whereas older children and adults did. The stark difference in the developmental trajectories of subjectivity and social constitution further supports their independence, especially because the trajectories did not converge at any point in development. The distinct developmental trajectories suggest that the development of these beliefs depend on different learning experiences or cognitive processes. That conclusion is qualified by the inevitable use of different measures, which may impose different demands on children's reasoning. Nevertheless, prior work using slightly different measurement strategies found similar results (Kalish, 1998; Noyes et al., 2018; Rhodes & Gelman, 2009). Further empirical work could leverage the difference between subjectivity and social constitution, in combination with greater task variety, to identify how these beliefs develop.

Previous studies find a similar developmental change in children's reasoning about social constitution (Noyes et al., 2018, 2020): In those studies, children did not initially draw a distinction between institutional actions (e.g., buying goods with money) and physical actions (e.g., knocking fruit out of trees). They indicated that neither of these actions depended on the community's social practices. All of these studies relied on persistence conditions: A community's social practices changed, and children were asked to report if the kind membership or functional affordances of an object changed. Persistence conditions are important consequences of people's beliefs about the causal and constitutive structure of objects, and they provide particularly stringent tests of these beliefs. However, even if children do not appear to distinguish categories on these measures, they may distinguish categories in other ways—as our subjectivity measures show. For example, even toddlers understand that artifacts have purposes and animals do not, as demonstrated by a spontaneous question-asking task (Greif et al., 2006). Therefore, future work could use additional measures to identify earlier insights into the differences between institutional categories and artifactual categories.

Another avenue for understanding how these beliefs develop is by comparing children in different communities. Rhodes and Gelman (2009) showed that, with age, children in liberal households came to understand race and gender categories as more subjective than children in conservative households. In comparison, children in both communities reasoned that animal categories were more objective than artifactual children. Gaither et al. (2020) found that thinking about having multiple identities (e.g., being both a friend and neighbor) causes children to indicate categories as more subjective (this effect appears to generalize across all category domains tested but this was not the focus of the studies). Children

in bicultural and biracial households may judge categories as more subjective because their families prompt them to think about multiple identities and because they have early, first-hand experience with cultural differences. Future research could systematically contrast subjectivity with social constitution in context, which will help to further interrogate their conceptual relationship and provide more insight into their development. We speculate that the cultural experiences that lead children to judge all categories as more subjective will not increase their tendency to judge categories as more socially constituted. This is because subjectivity, as measured, involves value judgments: We ask children to describe a different classification practice as “right” or “wrong.” Experiences that improve children's evaluations of cultural difference will likely manifest as greater acceptance of alternative classifications. By contrast, social constitution does not involve evaluations of whether social practices, in general, are right or wrong but whether kind membership depends on social practices in and of themselves. That being said, experience with cultural diversity may lead to greater maturity in children's reasoning about social constitution, such that they distinguish between domains earlier than children without exposure to cultural difference.

Institutional Categories

Prior theorizing proposes that institutional categories, such as *money* and *lawyer*, are a coherent domain of concepts distinct from artifacts and animals (Noyes et al., 2018): The proposal is that people represent institutional categories as having a unique causal structure that distinguishes them from other category domains (i.e., physical artifacts and natural kinds). Our results add further support to this proposal: Children and adults judged institutional categories as socially constituted more often than predicted by chance alone, which was not true of physical artifacts or animals. Moreover, children drew highly similar inferences about institutional objects and occupational roles, suggesting that these two types of entities are conceptually related and that people attribute to them similar causal structures. Therefore, research trying to understand conceptual representation and development should consider including institutional categories in their theorizing and test sets. Including these categories can alter conclusions.

Domain Differences in Conceptual Structure

An important question in the study of concepts is whether there are deep differences in how people represent categories across domains. Previous research has supported the existence of domain differences (Brandone & Gelman, 2009; Diesendruck & Gelman, 1999; Malt, 1990). In particular, there are robust differences between how people reason about natural categories (e.g., animals, plants, and chemical substances) and human-made objects (e.g., furniture, tools, and vehicles). What is the best way to describe those differences? As outlined in the premise of the present article, the distinction between natural and non-natural categories is not so clear cut. In particular, socially constituted categories like *money* and *woman* highlight this issue. Such categories clearly relate to social practices and come about at least in large part through them, but may nonetheless be objective in the sense that the categories refer to external facts about the world, such as a person's position in sex-based hierarchies (Haslanger, 2005; Hacking, 1999; Guala,

2016). In Study 2, adult participants judged categories as socially constituted and objective. This serves as an existence proof that adults can represent categories as both objective and socially constituted, which is consistent with prior work finding that people can treat socially-constituted categories as coherent and as inductively rich as biological categories (Noyes, 2022; Noyes & Keil, 2019, 2020; Vasilyeva et al., 2018; Vasilyeva & Lombrozo, 2020).

We contend that the differences between natural, institutional, and artifactual categories are not best understood as differences in objectivity, inductive potential, or coherence but rather as differences in causal and constitutive structure. On one extreme, categories like *gold* and *tiger* depend on intrinsic structures, such as their genetic and chemical make-up. On the other extreme, categories like *money* and *police officer* depend on extrinsic, social structures, such as their position in social structures. In support of this contention, we found consistently large differences in participants' judgments about social constitution: Participants indicated that institutional categories were socially constituted, animal categories were not, and artifactual categories were somewhere in between. In contrast, there were smaller differences in judgments about subjectivity. Participants indicated that none of these domains were subjective more often than expected by chance. Even in the case of animal categories, the mean response on the subjectivity measure was closer to zero than the mean response on the social constitution measure, suggesting that participants had weaker intuitions here.

The weaker intuitions about subjectivity raised concerns about the measure itself. However, previous work found that the difference between animal and artifactual categories depended on the level of the category assessed (superordinate versus basic; Kalish, 1998) and the type of alternative classification tested (classifications that collapsed across a single distinction were accepted more than reclassifications of three exemplars; Rhodes & Gelman, 2009), supporting the conclusion that intuitions about subjectivity are simply less consistent. For example, in one study, participants indicated that basic-level artifact categories were as objective as basic-level animal categories, whereas they indicated that superordinate-level artifact categories were more subjective than superordinate-level animal categories (Kalish, 1998). It may also depend on which superordinate category is used. Participants indicated that superordinate categories like *food container* were subjective. This makes sense: An object is only a food container because people have decided the object belongs to the category *food container*. But artifacts can be placed into other superordinate categories: A hammer is one manifestation of the simple machine category *lever* as well as the mechanical category *force amplifier*. If prior work examined these types of mechanical/structural superordinate categories, then participants might have even judged superordinate artifactual categories as objective too.

Indeed, one possible reason why participants did not reliably judge the distinction between *hammer* and *screwdriver* as objective or subjective in our studies may be that basic-level categories capture both purposes and mechanical structures. On the one hand, the category *hammer* refers to "things for hammering" and *screwdriver* refers to "things for screwdriving," such that objects belong to the categories because people conceptualize them as members of those categories. On the other hand, the category *hammer* refers to a type of mechanical structure (dealing with "lever"-type principles) and a *screwdriver* refers to a different type of mechanical structure (dealing with "wheel-and-axle"-type principles). Indeed,

previous studies of artifacts have found support for both of these intuitions. In some studies, participants based their category judgments on the judgments of the creator (Bloom, 1996). In other studies, participants considered physical affordances and the causal efficiency of the object's form and composition (Chaigneau et al., 2004). Both the psychological and philosophical literature remain contentious on how best to characterize artifact concepts (Carrara & Mingardo, 2013).

We believe that subjectivity intuitions would vary considerably across task permutations and the category pairs used, whereas social constitution judgments would hold constant. For example, participants might indicate that the boundary between *teacher* and *professor* is more subjective than the boundary between *teacher* and *ballerina*, whereas they would judge both types of category boundaries as equally socially constituted. In any case, the best avenue for future empirical work is to probe the sources of intuitions about subjectivity by broadly canvassing different permutations of the task and the categories used, with the aim of understanding why categories within the same domain can produce such different intuitions.

Conclusion

Children and adults in our samples distinguished what is subjective from what is socially constituted. Our results further demonstrate that concepts of institutional categories differ from concepts of artifactual categories; researchers should study institutional categories in their own right, and one cannot a priori expect concepts of institutional categories to resemble concepts of artifactual categories. Lastly, our results find an interesting dissociation between the development of beliefs about subjectivity and social constitution, suggesting that these beliefs depend on different cognitive processes or require different kinds of learning.

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