From foods to artifacts: Children’s evaluative and taxonomic categorization across multiple domains☆

Simone P. Nguyen

Department of Psychology, University of North Carolina Wilmington, 601 South College Road, Wilmington, NC 28403-5612, USA

ARTICLE INFO

Keywords:
Food
Domains
Evaluative
Taxonomic
Categorization

ABSTRACT

In previous research, the domain of food has been the main test case for examining children’s use of evaluation as a basis for conceptual organization. The present research investigates how children’s evaluative category representation of foods compare to the domains of animals, artifacts, plants, and people. Three studies were conducted with children (N = 176, range = 3;22 – 8;78 years) involving categorization tasks. Results reveal domain similarity in younger and older children’s developing ability for evaluative categorization. Results also demonstrate domain differences in younger and older children’s tendency to categorize based on evaluative versus taxonomic relations. Applications of these findings are discussed within the context of methods to enhance children’s healthy food choices and consumption.

1. Introduction

Within the concepts and categories literature, the domain of food has been the primary test case for examining children’s use of evaluation as a basis for conceptual organization. Evaluative categorization is germane to the domain of food given that judicious food selection is vital for survival, especially within an environment that has a wide variety of food sources. As omnivores, early in development, humans must learn to evaluate which foods are acceptable, safe, healthy, and delicious to eat (e.g., Dial & Musher-Eizenman, 2019; Girgis & Nguyen, 2018; Lafraire, Rioux, Giboreau, & Picard, 2016; Nguyen, 2008, 2007a; Nguyen & McCullough, 2009; Rozin, 1990; Rozin, Hammer, Oster, Horowitz, & Marmora, 1986; Siegal, 1995; Siegal & Share, 1990), and understand the consequences of eating (e.g., Guerin & Thibaut, 2008; Inagaki & Hatano, 2002; Raman, 2014; Slaughter & Ting, 2010; Thibaut, Nguyen, & Murphy, 2016; Toyama, 2000; Wellman & Johnson, 1982). Foods in an evaluative category are related by their shared evaluation or value-laden assessment (e.g., healthy foods, delicious foods). Evaluative categorization has been distinguished from other forms of conceptual organization such as taxonomic categorization, in which membership is based on shared properties (Nguyen & Murphy, 2003; Ross & Murphy, 1999; see also Thibaut et al., 2016). For example, the evaluative category of healthy foods cuts across a number of taxonomic categories (e.g., vegetables, dairy, and meats) to include spinach, yogurt, fish, etc. (see Nguyen, Gordon, Chevalier, & Girgis, 2016 for discussion regarding how evaluative categories may be influenced by objective and subjective information). Past research demonstrates that children have the ability to form different evaluative categories of food (e.g., Dial & Musher-Eizenman, 2019; Nguyen & McCullough, 2009; Nguyen, 2008, 2007a; Nguyen & Murphy, 2003; see also Mura Paroche, Caton, Vereijken, Weenen, & Houston-Price, 2017 for review). For example, in an initial study, Nguyen and Murphy (2003) explored 4- and 7-year-olds’ ability to categorize foods into evaluative, taxonomic, and script (i.e., event/routine-based) categories by

☆ I gratefully acknowledge Gregory Murphy for discussions regarding this research. I am indebted to members of the Cognitive Development Lab for their research assistance and the children and adults who participated in this research.

E-mail address: nguyens@uncw.edu.

https://doi.org/10.1016/j.cogdev.2020.100894

Received 4 June 2019; Received in revised form 1 May 2020; Accepted 26 May 2020

Available online 14 August 2020

0885-2014/ © 2020 Elsevier Inc. All rights reserved.
presenting children with nonconflict picture triads that did not pit two category choices against each other, these researchers were able to provide independent tests of children's evaluative, taxonomic, and script knowledge. For instance, the evaluative triads included an evaluative target (e.g., healthy food: banana), an evaluative choice (e.g., spinach), and a distractor choice (e.g., Cheetos). The taxonomic triads included a taxonomic target (e.g., vegetables: green beans), a taxonomic choice (e.g., potato), and a distractor choice (e.g., cheese). The script triads included a script target (e.g., dessert: brownie), a script choice (e.g., pie), and a distractor choice (e.g., pizza). The results demonstrated that 4-year-olds, and with increased ability among 7-year-olds, selected the appropriate category matches for the evaluative triads as well as the taxonomic and script ones with no difference in performance between the category types. In another study focusing on evaluative categorization, Nguyen (2008) presented children with both classification and induction tasks. The results showed that 4-year-olds accurately classified foods as healthy (e.g., carrot) or junky (e.g., French fry) and were sensitive to which type of inference is best supported by these categories (meaningful inferences about the human body, but not arbitrary or unrelated ones). The results also showed developmental improvements by age 7 years.

Although there is corroborating evidence for children' evaluative category representation of food, it is not well understood how children evaluatively represent this domain relative to other domains. Many questions remain about whether children are particularly precocious at evaluative categorization of foods and have a propensity for this form of conceptual representation of foods compared to nonfoods (e.g., Nguyen & McCullough, 2009; Nguyen, 2007b, 2008; Nguyen & Murphy, 2003). The current investigation aimed to extend the existing literature on evaluative categorization of food in two primary ways. The first aim was to comprehensively compare children's ability for evaluative categorization of foods against other domains. While past research has been telling of children's evaluative categorization ability within the domain of food, there is yet to be a systematic comparison between foods and multiple nonfood domains using the same methodology within a single study. The second aim was to determine children's tendency to conceptualize foods and nonfoods based on evaluative versus taxonomic relations. Despite the extensive body of research characterizing children's taxonomic categorization (e.g., Markman & Hutchinson, 1984; Smiley & Brown, 1979; Waxman & Namy, 1997), there has yet to be a direct comparison between taxonomic versus evaluative categorization.

To achieve these aims, this investigation focused on the domains of foods, animals, artifacts, people, and plants. In particular, animals and artifacts were of interest because of past proposals that animal categories are natural, objectively true whereas artifact categories are invented, subjectively defined by people's intentions and uses (e.g., Bloom, 1996; Gelman, 2003). With these proposals in mind, artifacts may be especially conducive to evaluative category structure because they are treated as conventions that people decide upon (see Kalish, 1998). For example, some artifacts may be evaluated as fun/not fun (e.g., a board game versus a mop) or safe/unsafe for children (e.g., a teddy bear versus a knife). However, other work demonstrating that young children are more attentive to threatening than nonthreatening animals (e.g., snakes vs. frogs) (e.g., LoBue, 2010; LoBue & DeLoache, 2008; Penkunas & Coss, 2013a, 2013b) suggests that evaluative category structure may be relevant within the domain of animals as well. Hence, evaluative representations within this domain may be quite useful in guiding children's interactions with animals (e.g., based on perceived danger, attractiveness, companionship, Kellert, 1983, 2002).

In addition, the domain of people was of interest because evaluative processing has been viewed within the adult social cognition literature as fundamental to social perception (e.g., Zajonc, 1980) and has been demonstrated to be an integral part of person cognition (e.g., Rosenberg & Olshan, 1970; Rosenberg, Nelson, & Vivekananthan, 1968). Recent research has also highlighted the importance of evaluative processes in children's decisions about who to rely on when learning about foods (e.g., teacher versus child, Nguyen, 2012; accurate versus inaccurate informants, Nguyen et al., 2016) and children's judgments of other people's conventional and nonconventional food choices (DeJesus, Gerdin, Sullivan, & Kinzler, 2019). Thus, there may be potentially many dimensions upon which children evaluatively categorize people (e.g., trustworthy or untrustworthy individuals).

Finally, plants were of interest because junky foods may be similar to "weed trees" documented in the adult concepts literature. Medin, Lynch, Coley, and Atran (1997) found that the sorting of trees is tied to people's interests and goals (e.g., tree selection for landscaping) and that membership in the "weed tree" category (e.g., white poplar, weeping willow, eastern cottonwood) is associated with undesirable properties (e.g., weak wood, drops plant material, and maintenance problems) (see also Shipman & Boster, 2008). Recently, studies have also underscored the crucial task that infants are faced with in learning to discriminate dangerous from beneficial plants that are suitable to eat as food (see Elsner & Wertz, 2019; Wertz & Wynn, 2014a, 2014b, 2019).

Drawing cross-domain comparisons in this investigation is important given the longstanding question of whether categorization is driven by domain general or domain specific mechanisms (see Gelman & Noles, 2011; Murphy, 2002; Rakison & Lawson, 2013; Wellman & Gelman, 1992, 1998 for review). Recently, there has been increasing interest in whether there is an early-emerging domain-specific pattern of reasoning about food given its ecological and evolutionary imperativeness (e.g., DeJesus, Kinzler, & Shufts, 2018; Shufts, Kinzler, & DeJesus, 2013; see also Rozin, 1990, 1999; Siegal, 1995). A number of studies have focused on different aspects of reasoning about food, and have either directly or indirectly investigated the question of domain-specificity (e.g., Lavin & Hall, 2001; Liberman, Woodward, Sullivan, & Kinzler, 2016; Lumeng, Cardinal, Jankowski, Kaciroti, & Gelman, 2008; Macario, 1991; Nguyen, 2007a, 2012; Nguyen et al., 2016; Rioux, Leglave, & Lafraire, 2018; Santos, Hauser, & Spelke, 2002; Shufts, Banaji, & Spelke, 2010; Shufts, Condry, Santos, & Spelke, 2009; VanderBorghi & Jaswal, 2009). Altogether, there is mixed evidence for the presence or absence of a domain-specific system of reasoning for foods, including evidence derived from studies pertaining to categorization. One the one hand, some studies of categorization suggest that children reason differently about foods and nonfoods. For example, children classify foods (e.g., color, textures, odors) and artifacts (e.g., shape and rigidity) based on distinct properties (Lavin & Hall, 2001; Macario, 1991; Santos et al., 2002; See also Rioux et al., 2018). On the other hand, there is also categorization research suggesting that children reason similarly about foods and nonfoods. For example, apparent domain-differences have not been found in children's taxonomic and script cross-classification of foods, animals, buildings, clothing, furniture,
people, toys, and vehicles, indicating that cross-classification is not domain-specific, but rather pertinent to any domain where it is possible for the same items to be categorized based on these two relations (Nguyen, 2007b).

Although the primary purpose of the current investigation was not to resolve the issue of domain-specificity, it did seek to provide a comprehensive comparison of children’s evaluative categorization of foods versus animals, artifacts, people, and plants. In doing so, this comparison could enhance understanding of the processes that underlie children’s evaluative category representations. The current investigation was comprised of a series of three studies. Younger and older children were tested in these studies to identify the developmental progression of evaluative categorization of food relative to the other domains. These specific age ranges were selected because previous studies have found evidence for the development of evaluative category representation in the domain of food among 4- and 7-year-olds (e.g., Nguyen, 2008; Nguyen & Murphy, 2003).

Specifically, Study 1 examined children’s ability for evaluative categorization of foods compared to animals, artifacts, people, and plants. To test ability, Study 1 employed nonconflict triads in which there was a target and a choice that shared an evaluative category relation with the target and a distractor choice from the opposite evaluative category as the target. A key aspect of the nonconflict triads is that they present one appropriate category choice and one inappropriate category choice as opposed to placing two potentially appropriate category choices from different categories in conflict (see Nguyen, 2008; Nguyen & Murphy, 2003; Nguyen & Girgis, 2014). This way, children have the opportunity to demonstrate their evaluative categorization ability by selecting the choice that shares an evaluative category relation with the target. It is possible that children are equally capable of evaluative categorization within all of the domains on the basis of prior research that has not found domain differences in children’s taxonomic and script categorization (e.g., Nguyen, 2007a). Alternatively, it is possible that domain differences do exist, perhaps related to the various reasons described earlier for their inclusion in this investigation.

Study 2 and Study 3 examined children’s tendency to use evaluative versus taxonomic categorization within the domain of foods, animals, artifacts, people, and plants. Although past research has documented children’s ability to categorize foods based on either taxonomic or evaluative relations by testing each relation independently within the context of nonconflict triads (e.g., Nguyen, 2008; Nguyen & Murphy, 2003), studies have yet to directly compare children’s use of these two different forms of categorization for foods as well as nonfoods. To compare children’s use of evaluative versus taxonomic categories, Study 2 and Study 3 employed conflict triads in which there is a target and two potentially appropriate category choices pitted against each other, an evaluative category choice and a taxonomic category choice. By placing the two categories in conflict, children must choose between the two category relations, revealing children’s tendency to use one kind of categorization over the other (e.g., see Bauer & Mandler, 1989; Déak & Bauer, 1996; Greenfield & Scott, 1986; Smiley & Brown, 1979; Waxman & Nam, 1997 for discussion).

Thus the importance of pitting evaluative and taxonomic relations within the context of conflict triads is to uncover the relative strengths of these relations. For both studies, it is conceivable that the evaluative relationship is stronger than the taxonomic relationship given the relevance of evaluative category representation in everyday life (e.g., Divesta, 1966; Rhine, Hill, & Wandruff, 1967), especially foods (e.g., Dial & Musher-Eizenman, 2019; Girgis & Nguyen, 2018; Lafraire et al., 2016; Nguyen, 2007b, 2008; Nguyen & McCullough, 2009; Rozin, 1990; Rozin et al., 1986; Siegal, 1995; Siegal & Share, 1990). Conversely, it is also conceivable that the taxonomic relationship is stronger than the evaluative relationship given the primacy of taxonomic relations in children’s conceptual development (e.g., Markman, 1990, 1991; Markman & Hutchinson, 1988; Mervis, 1983, 1987, 2017; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976; Waxman, 1990; Waxman & Gelman, 1986). The relative strength of these two category types may vary by domain as well.

2. Study 1

Study 1 examined children’s ability for evaluative categorization within the domain of foods compared to the domains of animals, artifacts, people, and plants. In considering how to compare evaluative categories of food to other domains, it was essential to focus on value-laden assessments that do not apply solely to foods. For example, it would not make sense to test children on evaluative categories of food based on assessments of only health or taste, which are relevant to foods, but irrelevant to other domains. Hence, a variety evaluative categories of foods, animals, artifacts, people, and plants were tested in Study 1 and the subsequent studies to capture evaluative categories that are applicable across domains. Both positive and negative evaluative categories were tested from these different domains so that results could be more generalizable across varying evaluative relations. Of particular interest in Study 1 was whether younger and older children have comparable ability in the evaluative categorization of foods, animals, artifacts, people, and plants.

2.1. Method

2.1.1. Participants

The participants were 30 younger children (M_{age} = 4.73 years, range = 3.22 – 5.88 years, 15 females) and 25 older children (M_{age} = 6.99 years, range = 6.04 – 8.22 years, 10 females). Six additional children participated in Study 1, but their data were excluded from the analyses for not following directions. Sample sizes for Study 1 and subsequent studies were determined a priori based on past studies on children’s evaluative categories of food (e.g., Nguyen & Murphy, 2003; Nguyen, 2008).

A separate set of children (N = 10, M_{age} = 4.08 years, range = 3.25 – 6.07 years, 6 females) and adults (N = 47, M_{age} = 19.89 years, range = 16.96 – 39.83 years, 33 females) also assisted with preparing the stimuli, and piloting the procedure for Study 1. None of these children and adults were participants in Study 1.

The Institutional Review Board of the University of North Carolina Wilmington approved the procedure for Study 1 and
subsequent studies. All of the children and adults were English-speakers and were recruited from either preschools, schools, or a university located in a mid-size predominately White, middle class community within the United States. All of the children’s parents provided written informed consent, and children who received parental consent also provided verbal assent. All of the adults provided written informed consent.

2.1.2. Materials

The stimuli included 40 photographs collected from Internet sources. The photographs were arranged into 20 nonconflict triads, four each of the following five domains: foods, animals, artifacts, people, and plants. As seen in Appendix A, each triad included a positive/negative domain target and an evaluative category choice that shared an evaluative relationship with the target and a choice that was a distractor from the opposite evaluative category as the target (e.g., grape: chickadee, prisoner). The two choices were counterbalanced across triads such that the distractor choice for one triad was the evaluative choice for another triad, and vice versa (e.g., (moldy) bread: prisoner, friend).

Each nonconflict triad was printed on an 8.5” by 11” sheet of white paper, and placed into a 3-ring binder. The domain target was at the top of the paper and underneath were the photographs of the two choices. Each photograph had a typed label. The presentation of the two choices under the left or right side of the domain target was counterbalanced.

Many steps were taken to calibrate the stimuli and procedure. First, 12 adults (Mean age = 19;83 years) rated the visual similarity of each target and its two choices separately (e.g., grape and chickadee, grape and prisoner) on a scale ranging from 1 (not at all visually similar) to 7 (very visually similar). The absolute level of visual similarity for each target and its two choices was very low, and there was not a significant difference between them (Ms = 1.01, 1.00, SDs = 0.03, 0), p = .166. Thus, there was not a concern that visual similarity would direct participants’ choices in the study.

Second, to ascertain the evaluative status of the targets and choices within each nonconflict triad, 10 children (Mean age = 4;08 years) and 19 adults (Mean age = 18;92 years) participated in a classification task. Participants were asked to classify a total of 60 items (40 taken from Study 1, plus 20 fillers) as positive or negative. Therefore, the items were not presented within the context of a nonconflict triad, but rather presented randomly as separate items, one at a time. For example, on one trial, participants were asked whether a grape was “good or bad”. On another trial, participants were asked if a chickadee was “good or bad”。 Also, on another trial, participants were asked if a prisoner was “good or bad”. Participants responded by saying either “good” or “bad”. Children and adults (Ms = 95%, 98%; SDs = 3%, 2%) were extremely accurate at classifying these 60 items, performing significantly above chance (50%), t(9) = 38.18 and t(18) = 101.18, p’s < .001, d’s > 7.00.

Finally, 16 adults (Mean age = 18;68 years) piloted a match to sample procedure with the 20 nonconflict triads in which they were asked to match the target with one of the two choices within the triads. Adults were extremely accurate at selecting the evaluative category choices (M = 90%, SD = 10%), performing significantly above chance (50%), t(15) = 14.83, p < .001, d = 3.70. Overall, these results confirmed that the evaluative category choice had a noticeably stronger relation to the target than the distractor choice, and that adults were able to categorize based on this evaluative relation.

2.1.3. Procedure

The researcher tested children individually in a quiet area of the children’s preschool or school for approximately 15–20 min. The researcher introduced the task to children by explaining that they would be playing a game involving pointing to pictures that are the same kind. Then, the researcher presented children with 20 nonconflict picture triads, one at a time, in one of two random orders. For each trial, the researcher labeled the domain target and two choices, asking which choices of the choices is the “same kind” as the target. For example, the researcher pointed to a food domain target and said, “This is a grape,” and asked, “Is a chickadee or prisoner the same kind of thing as a grape?” Children provided an answer by pointing to either the “chickadee” (evaluative category choice) or “prisoner” (distractor choice). At the end of the task, the researcher provided children with a small prize (e.g., stickers) for their participation.

2.2. Results and discussion

For each nonconflict triad, a 1 was assigned to children’s selection of the evaluative category choice and a 0 was assigned to children’s selection of the distractor choice. These scores served as the basis for calculating composite scores. Initially, five composite scores for the positive evaluative triads for each of the domains were calculated by summing across the two positive triads per domain. Five composite scores for the negative evaluative triads for each of the domains were also calculated in this manner. These 10 raw composite scores were then converted into percentages by dividing the totals by two. Next, five composite scores for each of the domains were calculated by combining the scores of their respective positive and negative triads. These five raw composite scores were then converted into percentages by dividing the totals by four.

Preliminary analyses showed no significant effects of the positive/negative valence of the evaluative triads, so this variable was not included in subsequent analyses. Thus, a $2 \times 5$ (Age Group [younger children, older children] x Domain [foods, animals, artifacts, people, plants]) ANOVA was conducted with total composite scores for each of the five domains as the dependent variable. See Fig. 1.

The results showed a significant main effect of Age Group such that older children (M = 92%, SD = 7%) were significantly more likely to select the evaluative category choice than younger children (M = 80%, SD = 15%), $F(1, 53)$ = 12.18, $p = .001$, $η_p^2 = .18$. There was not a significant effect of Domain or an interaction between Age Group and Domain.

Children’s performance on each domain was also compared to chance, 50%. Both younger and older children performed
significantly above chance on the domain of foods as well as the domains of animals, artifacts, people, and plants, $p$’s < .001, $d$’s > 1.00.

In summary, the main effect of Age Group suggests that evaluative categorization improves with age. The lack of a main or interactive effect of Domain as well as children’s above chance performance on each of the domains indicate that evaluative categorization ability does not differ for foods compared to nonfoods.

Overall, these findings are consistent with studies that have documented evidence for children’s developing ability for the evaluative categorization of foods (e.g., Dial & Musher-Eizenman, 2019; Nguyen & McCullough, 2009; Nguyen, 2007b, 2008; Nguyen & Murphy, 2003). These findings also dovetail with research that has found no domain differences in children’s taxonomic and script cross-classification (Nguyen, 2007a). The current findings expand on this past work by revealing for the first time children’s ability for evaluative categorization in multiple domains. These findings suggest that children are not more precocious at evaluatively categorizing foods, but are equally capable of representing evaluative category relations across the domains of foods, animals, artifacts, people, and plants.

3. Study 2

Although Study 1 found that children are capable of evaluative categorization in multiple domains, it is still unknown the extent to which children use this form of conceptual organization compared to taxonomic categorization. As discussed in the Introduction, while past studies have demonstrated children’s ability for evaluative and taxonomic categorization within the domain of food when each relation is tested separately in nonconflict triads (e.g., Nguyen & Murphy, 2003; Nguyen, 2008), these relations have yet to be directly compared within a single test.

Therefore, Study 2 was designed to examine children’s tendency to use evaluative versus taxonomic categorization for foods as well as nonfoods. In Study 2, children were presented with conflict triads in which there is a domain target and an evaluative category choice pitted against a taxonomic category choice. Although either category choice would be appropriate, the purpose of pitting the two choices against each other was to see if children have a tendency to use one form of conceptual organization more than the other (e.g., see Bauer & Mandler, 1989; Dedik & Bauer, 1996; Greenfield & Scott, 1986; Smiley & Brown, 1979; Waxman & Namy, 1997 for discussion).

Thus, in Study 2, the conflict triads could reveal the relative strengths of evaluative and taxonomic relations. Of particular interest was whether evaluative or taxonomic categories would dominate younger and older children’s choices across domains, especially given the real-world pertinence of evaluative category representation (e.g., Divesta, 1966; Rhine et al., 1967) and primacy of taxonomic relations in conceptual development (e.g., Markman, 1990, 1991; Markman & Hutchinson, 1988; Mervis, 1983, 1987, 2017; Rosch et al., 1976; Waxman, 1990; Waxman & Gelman, 1986).

3.1. Method

3.1.1. Participants

The participants were 24 younger children ($M_{\text{age}} = 4;93$ years, range = 4;06 – 5;92 years, 11 females) and 22 older children ($M_{\text{age}} = 7;31$ years, range = 6;00 – 8;78 years, 7 females). In addition, 27 adults ($M_{\text{age}} = 20;68$ years, range = 18;59 – 27;98 years, 14 females) helped prepare the stimuli and pilot the procedure for Study 2. Children and adults were drawn from the same community as before, but did not participate in Study 1.

3.1.2. Materials

There were a total of 40 photographs: 35 adapted from Study 1 and five additional photographs procured from Internet sources. The photographs were arranged into 20 conflict triads, four from the following domains: foods, animals, artifacts, people, and plants. As seen in Appendix B, each triad included a positive/negative domain target and an evaluative category choice that shared an evaluative relationship with the target and a taxonomic choice that shared a taxonomic relationship with the target (e.g., grape: Fig. 1. Percentage of evaluative choices in Study 1 by age group and domain. Error bars represent standard errors.
chickadee, (spoiled) milk). The related evaluative and taxonomic category choices were also counterbalanced across triads such that the evaluative category choice for one triad was the taxonomic category choice for another triad and vice versa.

Ten adults (M\textsubscript{age} = 19;97 years) rated the visual similarity of each target and its evaluative category choice (e.g., grape and chickadee) and taxonomic category choice (e.g., grape and (spoiled) milk) separately on a scale ranging from 1 (not at all visually similar) to 7 (very visually similar). Visual similarity between targets and their evaluative choices as well as between targets and their taxonomic choices was extremely low (M\textsubscript{S} = 1.01, 1.05, SD\textsubscript{S} = 0.02, 0.07), and did not differ significantly from each other, t (9) = -2.22, p = .053. This result minimized concern that visual similarity would bias children’s category selection during testing.

The same 10 adults also rated the typicality of the evaluative and taxonomic choices for each target separately. Adults rated each choice in terms of how typical of an example it is of a given evaluative category (e.g., positive things) or taxonomic category (e.g., plant). Thus, adults’ selection of either the evaluative or taxonomic choices would be telling of which form of conceptual organization they tend to use when these relations are in conflict. In contrast with the results from the adult pilot with the nonconflict triads in Study 1 (M = 90%, SD = 10%), the results for the conflict triads in Study 2 indicate that adults’ overall selection of evaluative category choices (M = 48%, SD = 26%) was at chance level (50%), t(16) = -0.27, p = .78. However, upon closer inspection, it appears that only five (out of the 17) adults selected the evaluative choice between 45–55% of the time as opposed to all of the adults selecting at chance. Rather, six adults consistently selected the evaluative choices 60% or more of the time and six adults consistently selected the taxonomic choices 60% or more of the time (i.e., selected the evaluative choices 40% or less of the time). These results suggest individual differences in adults’ tendency to use evaluative and taxonomic categories when both forms of conceptual organization are pitted against each other within conflict triads (c.f., thematic and taxonomic categories, Lin & Murphy, 2001; Mirman & Graziano, 2012; Murphy, 2001).

### 3.1.3. Procedure

The procedure was the same as in Study 1 except that children were presented with 20 conflict picture triads. For example, the researcher pointed to a food domain target and said, “This is a grape,” and asked, “Is a chickadee or (spoiled) milk the same kind of thing as a grape?” Children provided an answer by pointing to either the “chickadee” (evaluative category choice) or “(spoiled) milk” (taxonomic choice).

### 3.2. Results and discussion

The same scoring and data analytic approach from Study 1 was applied to Study 2. For each conflict triad, a 1 was assigned to children’s selection of the evaluative category choice, otherwise, a 0 was assigned to children’s selection of the taxonomic choice. Composite scores for the evaluative, negative triads, and totals were then calculated for each of the five domains, and converted into percentages. Thus, as in Study 1, the percentages for each of the domains indicate children’s evaluative category selection.

Preliminary analyses did not indicate any significant effects of evaluative triad valence, so this factor was excluded from the primary analyses in Study 2. A 2 \times 5 (Age Group [younger children, older children] x Domain [foods, animals, artifacts, people, plants]) ANOVA was conducted with total composite score for each of the domains as the dependent variable. See Fig. 2.

The results showed significant main effects of Age Group, F(1, 44) = 4.21, p = .046, \eta\textsuperscript{p} = .08, and Domain, F(4, 176) = 45, p < .001, \eta\textsuperscript{p} = .50, as well as a significant interaction between Age Group and Domain, F(4, 176) = 3.17, p = .015, \eta\textsuperscript{p} = .06. To begin examining the Age Group by Domain interaction, younger and older children’s performance was compared on each domain. For foods, younger children had a significantly higher percentage of evaluative category selection compared to older children, t(44) =

![Fig. 2. Percentage of evaluative choices in Study 2 by age group and domain. Error bars represent standard errors.](image-url)
2.71, \( p = .009, d = 0.81 \). For plants, younger children also had a higher percentage of evaluative category selection than older children, \( t(44) = 3.04, p = .004, d = 0.91 \). For artifacts, animals, and people, there were no significant differences between younger and older children.

To further examine this interaction, performance on foods was specifically compared to the other domains for each age group separately. Here, only the food comparisons are reported; others can be found in Appendix D. For younger children, there was a significantly lower percentage of evaluative category selection for foods than artifacts, \( t(23) = -3.90, p = .001, d = -0.79 \). For older children, there was also a significantly lower percentage of evaluative category selection for foods than artifacts, \( t(21) = -10.93, p < .001, d = -2.33 \), and for foods than people, \( t(21) = -4.50, p < .001, d = -0.95 \). There were no significant differences between foods and the other domains per age group.

Children’s evaluative category selection for each domain was also compared to chance, 50%. Younger children’s evaluative category selection for foods was at chance, \( t(23) = -0.60, p = .54 \). Older children, however, selected evaluative category choices for foods significantly less often than expected by chance, \( t(21) = -4.69, p < .001, d = 1.00 \). As for the other domains, the results for both younger and older children were virtually identical. Both younger children, \( t(23) = 5.44 \), and older children, \( t(21) = 5.66 \), selected evaluative category choices for artifacts significantly more often than expected by chance, \( p's < .001, d's > 1.00 \). In contrast, both younger children, \( t's(23) > -3.0 \), and older children, \( t(21) > -5.0 \), selected evaluative category choices for animals and plants significantly less often than expected by chance, \( p's < .05, d's > 0.04 \). Both younger and older children’s selection of evaluative category choices for people was at chance, \( p's > .05 \).

Four findings warrant further discussion. First, although the Age Group by Domain interaction showed that younger children tend to use evaluative relations for foods (and plants) more than older children, younger children were still at chance in their responding. An interpretation of younger children’s chance-level responding is that children were unable to discriminate between evaluative and taxonomic relations within the domain of food. To explore this possibility, younger children’s individual responses patterns were examined for each of the four food conflict triads. It appears that only three out of the 24 younger children selected the evaluative choice 50% of the time (on two of the four food conflict triads). Ten of the younger children consistently selected the evaluative choice 75–100% of the time (on three or all four of the food conflict triads). In contrast, 11 of the younger children consistently selected the taxonomic choice 75–100% of the time (meaning that they selected the evaluative choice on zero or one of the food conflict triads). Thus, younger children’s chance level responding was not necessarily due to overall difficulty with discriminating between the evaluative and taxonomic relations of foods. Rather, this pattern of responding (similar to the pilot with adults that revealed individual differences) appears to be due to some younger children favoring evaluative categorization for foods whereas some younger children favoring taxonomic categorization within this domain.

Second, both younger and older children had a strong tendency to use evaluative categorization for artifacts compared to foods. This tendency was somewhat surprising. However, perhaps children are already more inclined to evaluatively categorize artifacts because these items are conceived as matters of judgment, which is compatible with proposals that children view artifact categories (but not natural kinds) as subjective and conventionalized (e.g., Bloom, 1996; Gelman, 2003; Kalish, 1998).

Third, and to less of a surprise, both younger and older children tended to use taxonomic categorization for animals and plants. Although, older children also tended to use taxonomic categorization for foods. These overall findings are in line with past research showing children’s sensitivity and appreciation for taxonomic structure (e.g., Markman, 1990, 1991; Markman & Hutchinson, 1988; Mervis, 1983, 1987, 2017; Rosch et al., 1976; Waxman, 1990; Waxman & Gelman, 1986). Finally, the findings with the domain of people is much more difficult to explain, and will need to be further explored in future research, including how responding may be affected by recognition that people can be classified through many possible strategies.

4. Study 3

Whereas the results of Study 1 show similarity in children’s ability to evaluatively categorize foods compared to artifacts, animals, people, and plants the results of Study 2 show some dissimilarity in children’s tendency to use evaluative and taxonomic categorization for foods versus other domains. An unexpected finding from Study 2 was that evaluative relations did not dominate children’s choices, especially within the domain of food. A possible explanation for this finding is related to centrality or the importance of the category relations within the context of the categorization task in Study 2 (see also Sloman & Ahn, 1999; Sloman, Love, & Ahn, 1998 for a similar discussion of feature centrality). It is possible that in order for evaluative relations to dominate children’s category decisions, this form of category representation needs to be made central or important to the task as opposed to being peripheral. However, in Study 2, there may not have been a clear reason or purpose for children to engage in evaluative processing when presented with the conflict triads.

Study 3 was designed to test this explanation regarding the centrality or importance of the evaluative relations in the conflict triads. In Study 3, children were presented with the same conflict triads as in Study 2, but were initially shown evaluative picture primes (or taxonomic ones as a point of comparison) that were intended to cue the centrality or importance of the category relations. This way, the relative strength of these relations could be better revealed within the conflict triads. Although this explanation has not been previously tested in regards to children’s evaluative categorization, related past studies on taxonomic categorization can be used as a basis for predictions. These past studies have demonstrated how changes to task characteristics (e.g., instructions, stimuli) can increase taxonomic responding over and above a competing category relation such as thematic or associative ones (e.g., Deák & Bauer, 1996; Markman & Hutchinson, 1984; Waxman & Gelman, 1986). Thus, for Study 3, it was predicted that evaluative priming should have a facilitative impact on children’s evaluative category decisions, increasing children’s tendency to use evaluative categorization for foods (as well as for animals, people, and plants). A similar effect was also predicted for taxonomic priming,
particularly for artifacts.

4.1. Method

4.1.1. Participants
The participants were 75 children (Mage = 5;38 years, range = 4;02–6;94 years, 41 females) who were randomly assigned to either the evaluative or taxonomic condition. There were 21 younger children (Mage = 4;79 years) and 20 older children (Mage = 6;09 years) in the evaluative condition. There were 17 younger children (Mage = 4;68 years) and 17 older children (Mage = 5;98 years) in the taxonomic condition. A separate group of 25 adults also assisted in piloting the priming procedure (Mage = 19;57 years, range = 18;12–21;64 years, 23 females). Children and adults were recruited from the same community as in Study 1 and Study 2, but were not participants in these studies.

4.1.2. Materials
The materials were the 20 conflict triads from Study 2. The materials also included seven priming pictures obtained from the Internet. Each picture was printed on an 8.5" by 11" sheet of white paper. Specifically, for the evaluative condition, there were two picture primes, one positive (i.e., line drawing of a gender-neutral smiling face) and one negative (i.e., line drawing of a gender-neutral frowning face). For the taxonomic condition, there were five taxonomic picture primes, one of a variety of foods, animals, artifacts, people, and plants, none of which appeared in the conflict triads.

These pictures were piloted on adults to test their priming efficacy. Thirteen adults (Mage = 18;07 years) were presented with the evaluative picture primes and 12 adults (Mage = 19.48 years) were presented with taxonomic picture primes, one at a time, before each conflict triad from Study 2. The researcher initially displayed and labeled the picture prime, and then removed it before showing the conflict triad. Adults were then asked to match one of two choices to the target. The results showed that adults selected the evaluative category choices significantly more often after exposure to the evaluative (M = 82%, SD = 22%) than the taxonomic (M = 28%, SD = 27%) picture primes, t(23) = 5.31, p < .001, d = 2.21. These results provided confidence that the pictures could effectively prime evaluative and taxonomic categorization.

4.1.3. Procedure
The procedure was the same as in Study 2 with two random orders of triads, except that the researcher displayed a picture prime before each conflict triad. In the evaluative condition, children saw a positive/negative picture prime before each conflict triad that corresponded with the positive/negative valence of its domain target. For example, the researcher initially presented children with a smiling face and said, “Look at this picture. It’s a good face.” In the taxonomic condition, children saw a picture of foods, animals, artifacts, people, or plants before each conflict triad from the corresponding category. For example, the researcher initially presented children with a picture of foods and said, “Look at this picture. These are foods.” Then, in both conditions, the researcher removed the picture prime from view, and presented children with a conflict triad as in Study 2 (e.g., “This is a grape. Is a chickadee or (spoiled) milk the same kind of thing as a grape?”).

The procedure with the primes took approximately 20–25 min.

4.2. Results and discussion
The same scoring and data analytic approach from Study 2 was applied to Study 3. Preliminary analyses did not reveal significant effects of the valence of the evaluative triads, so this factor was excluded from the primary analyses in Study 3. The results of a 2 x 2 x 5 (Age Group [younger children, older children] x Condition [evaluative, taxonomic] x Domain [foods, animals, artifacts, people, plants]) ANOVA showed significant main effects of Condition, F(1, 71) = 142, p < .001, ηp² = .66, and Domain, F(4, 284) = 43.58, p < .001, ηp² = .38, as well as a significant interaction between Condition and Domain, F(4, 284) = 16.90, p < .001, ηp² = .19. There

Fig. 3. Percentage of evaluative choices in Study 3 by domain and condition. Error bars represent standard errors.
were no significant main and interactive effects of Age Group.

The interaction between Condition and Domain is displayed in Fig. 3. An initial examination of this interaction showed significantly higher evaluative category selection in the evaluative condition than the taxonomic condition for each of the domains of foods, animals, artifacts, people, and plants, \( t(40) > 2.5, p's < .01, d's > 1.0 \). Further examination of the interaction compared performance on foods versus the other domains within each condition separately. Here, only the food comparisons are reported; additional comparisons can be found in Appendix E. For the evaluative condition, there was not a significant difference between foods versus animals, artifacts, people, and plants, \( t(40) < 2.5, p > .01 \). For the taxonomic condition, although there was not a significant difference between foods versus animals, people, and plants \( (p > .01) \), there was significantly lower evaluative category selection for foods than artifacts, \( t(33) = -8.82, p < .001, d = -1.51 \).

Children’s evaluative category selection within each condition for each domain was also compared to chance, 50%. For the evaluative condition, both younger children, \( t(20) > 3.0 \), and older children, \( t(19) > 3.0 \), were above chance in their evaluative category selection for foods, animals, artifacts, people, and plants, \( p < .001 \), \( d > 0.80 \). For the taxonomic condition, both younger and older children’s evaluative category selection was significantly below chance for foods, animals, people, and plants, \( t(16) > -12 \), \( p > .01 \), \( d > -3.50 \), but significantly above chance for artifacts, \( t(16) > 3.0 \), \( p < .01 \), \( d > 0.90 \).

In sum, the findings suggest that children’s tendency to use evaluative categorization for foods (as well as people, plants, and animals) is relatively flexible, and can be facilitated by increasing the centrality of this category relation. Most strikingly, the results of Study 3 demonstrate that even a minimalistic evaluative picture prime in the form of a line drawing of a smiling and frowning face was sufficient to exert an influence on children’s evaluative categorization. In terms of foods, the results of Study 3 indicate that younger children (who displayed individual differences in their use evaluative or taxonomic categorization for foods in Study 2) and older children (who favored taxonomic categorization for foods in Study 2) will use evaluative relations as a basis for their category decisions within this domain when this form of categorization is central to the task at hand.

In contrast, children’s tendency to use evaluative categorization for artifacts seems resistant to taxonomic priming, that is, both younger and older children continued to favor evaluative categorization within this domain (as in Study 2) regardless of exposure to taxonomic picture primes. This finding is generally in line with previous research that has found that children do not view artifacts in an absolute manner, but rather subjectively defined by social convention or pragmatics (see Diesendruck & Gelman, 1999; Rhodes, Gelman, & Karuza, 2014; Rhodes & Gelman, 2009b, 2009b). An area of future work is to explore the exact connection between children’s view of artifacts and children’s tendency for evaluative categorization within this domain.

While Study 3 focused primarily on increasing the centrality or importance of evaluative (and taxonomic) relations through priming, future research should also consider how task instructions may impact children’s performance. For example, using conflict picture triads, it would be interesting to compare how children would respond when asked to match a target to a choice that they would consider as their “favorite” as opposed to the “same kind”. It is possible that instructions that are explicitly evaluative may elicit more evaluative responding than instructions that might imply taxonomic categorization as in the “same kind” phrasing used in the present research.

5. General discussion

In prior research, food has been the main test case for the study of children’s evaluative category representation given the significance of value-laden judgments within this domain. The present investigation sought to broaden the scope of this body of research by exhaustively comparing children’s ability and tendency to use evaluative category representation for foods and nonfoods. Collectively, the findings from Studies 1–3 reveal similarities and differences in children’s evaluative category representations across domains. Study 1 demonstrated domain similarity in younger and older children’s ability to evaluatively categorize foods, animals, artifacts, people, and plants. With respect to development, improvements were observed between younger and older children’s evaluative categorization ability in each of the domains. Study 2 and Study 3 demonstrated some domain differences in children’s tendency to use evaluative and taxonomic categorization. Notably, Study 2 showed that younger and older children prefer to use evaluative categorization for artifacts more than foods. Study 3 showed that both younger and older children can be effectively primed to evaluatively categorize foods, but seem impervious to the taxonomic priming of artifacts.

Overall, the findings of Studies 1–3 converge with past categorization studies that have uncovered evidence for food’s domain-specificity (e.g., Lavin & Hall, 2001; Macario, 1991; Santos et al., 2002; see also Rioux, Leglaye et al., 2018) as well as domain-generality (e.g., Nguyen, 2007b, 2007b). Although the current findings do not provide a definitive resolution to whether domain-general or domain-specific mechanisms drive children’s evaluative categorization of food, they do provide new insight into the issue. By comparing food against many domains in the same tasks, children displayed domain-generality in their evaluative categorization ability and domain-specificity in their tendency to use evaluative or taxonomic category representation. Thus, these findings begin to lend support for an interactionist position that blends the domain-general and domain-specific positions in regards to children’s evaluative categorization across domains (see also Diesendruck & Perez, 2013). Such a position points to the complexity of children’s evaluative categorization, and how both mechanisms may operate within children.

A few methodological limitations of the present investigation should be acknowledged, however. One is that a broad, inclusive set of positive and negative evaluative categories were tested in these studies. An advantage of this design is that it allowed for a comparison of evaluative category representation across a variety of domains as opposed to limiting comparison to only one or two domains for which the same specific value-laden assessment is possible. Importantly, children in the present studies (and adults in the pilots) judged that the items shared enough similarity to render them members of the same evaluative category.

At the same time, a disadvantage of this design is that it did not allow for precise comparison of specific types of evaluative
category representations between domains. Future research will need to consider the myriad ways that foods, animals, artifacts, people, and plants can be evaluatively categorized and identify evaluative categories that can be sensibly applied across these diverse domains. This future research should also look beyond binary evaluative categories to consider graded structure, and how evaluative category membership may vary by degree (see Rosch, 2011). Future research could also explore evaluative category judgments pertaining to hybrid (e.g., water as a natural and artifact kind, Bloom, 2007) and ambiguous (e.g., liquid mixtures; Noyes, Dunham, & Keil, 2020; Noyes & Keil, 2018) items across domains.

Another disadvantage of testing broad positive and negative evaluative categories in the present studies is the inability to thoroughly examine value-laden assessments that apply exclusively to foods. Within the domain of food, future research should examine food-specific evaluations such as palatability, the foods that children like or dislike the taste of, in comparison to children’s taxonomic relations. It would be interesting to test whether children are more willing to use evaluative categorization over taxonomic categorization for foods if the evaluative relations are based on children’s specific food preferences. It would also be interesting to directly pit various kinds of taxonomic categories of food (e.g., fruits, dairy) against evaluative ones to see whether there is an impact on children’s willingness to use evaluative versus taxonomic categorization. Such an examination could shed light on the possibility that taxonomic structure may have been especially salient for children in Study 2 and 3 because the targets (e.g., grapes) and taxonomic choices (e.g., (spoiled) milk) were drawn from distinct taxonomic categories (e.g., fruits, dairy). Had the taxonomic choices been drawn from the same taxonomic categories as the targets perhaps evaluative category structure would become more salient for children.

Second, only four targets from each of the five domains (foods, animals, artifacts, people, and plants) were included in these studies. The benefit of this small number of targets is that it allowed the procedure to be a reasonable length for children in terms of total number of trials and duration of the task (see Thibaut & Witt, 2015 for discussion on cognitive costs of multiple comparisons). However, the drawback is that a detailed analysis of different kinds of foods was not possible. An interesting future direction is to explore how children evaluatively conceptualize foods that intersect with other domains such as animal-based and plant-based foods (see Hussar & Harris, 2010; Hahn & Gillogly, 2019; Wertz & Wynn, 2019) as well as modified foods (see Rozin, 2005; Gelman & Echelbarger, 2019), which also raises intriguing questions about the interaction between evaluative category representation, the history, and the ethics of food.

Thirdly, the evaluative categories were developed, piloted, and tested within a single community located in the United States. However, because evaluative category representations are grounded in value-laden assessments, judgments about the category membership of items may vary greatly depending upon children’s social-cultural context. For example, which foods are evaluatively categorized as positive or negative may be mediated by numerous sociocultural factors (e.g., customs, values) (see Rozin, 1996a, 1996b; Rozin & Fallon, 1986 for discussion). Therefore, future work should analyze the relationship between evaluative categorization and sociocultural factors in order to glean information about the generalizability of the current findings as well as to enrich understanding of factors that influence children’s evaluative category representation of food. Such work would also add to the growing literature on the social nature of food (e.g., DeJesus et al., 2019; DeJesus, Shutts, & Kinzler, 2017; Liberman et al., 2016).

Despite these limitations, the hope herein is that these findings can be eventually applied to the enhancement of children’s food-related decision making and eating behaviors (see Schultz & Danford, 2016, for review). Methods to promote the acceptance or consumption of healthy foods may wish to take into consideration children’s evaluative and taxonomic categorization abilities and tendencies. Indeed, recent research suggests a link between children’s food categorization and food behavior. For instance, Nicholson, Barton, and Simons (2018) found that children are more inclined to choose healthy foods for a snack in a hypothetical situation if they are capable of categorizing foods based on health. Research by Rioux and colleagues also attests to the relationship between children’s food rejection and difficulty with categorization and induction with fruits and vegetables (e.g., Rioux, Picard, & Lafraire, 2016; Rioux, Laframre, & Picard, 2018; Rioux, Lafraire, & Picard, 2018). In addition, methods to promote the acceptance or consumption of healthy foods may wish to take into consideration priming effects on children’s categorization. Examining the potential influence of subtle, simple line drawings of faces (like the ones in Study 3 of the present investigation) on children’s food preferences would be an interesting area for future exploration (see Salgado, Tapia Leon, Elliot, Salgado, & Spence, 2015 for research on adults), and would complement the body of research on the impact of more obvious media character branding (e.g., Hebden, King, Kelly, Chapman, & Innes-Hughes, 2011; Kraak & Story, 2015; Ogle, Graham, Lucas-Thompson, & Roberto, 2017).

**Declaration of Competing Interest**

None.

**Appendix A**

**Study 1: Nonconflict Triads**

<table>
<thead>
<tr>
<th>Domain Target</th>
<th>Evaluative Choice</th>
<th>Distractor Choice</th>
<th>Younger Children Evaluative Choice Means (SDs)</th>
<th>Older Children Evaluative Choice Means (SDs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grape</td>
<td>Chickadee</td>
<td>Prisoner</td>
<td>77 (43)</td>
<td>92 (27)</td>
</tr>
<tr>
<td>Sandwich</td>
<td>(Plush) Sheep</td>
<td>Spider</td>
<td>93 (25)</td>
<td>84 (37)</td>
</tr>
</tbody>
</table>
### Appendices

**Appendix B**

#### Study 2: Conflict Triads

<table>
<thead>
<tr>
<th>Domain</th>
<th>Target</th>
<th>Younger Children</th>
<th>Older Children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Evaluative Choice</td>
<td>Taxonomic Choice</td>
<td>Evaluative Choice Means (SDs)</td>
</tr>
<tr>
<td>Foods</td>
<td>Chickadee</td>
<td>(Spoiled) Milk</td>
<td>46 (50)</td>
</tr>
<tr>
<td></td>
<td>(Plush) Sheep</td>
<td>(Rotten) Apple</td>
<td>46 (51)</td>
</tr>
<tr>
<td></td>
<td>(Moldy) Bread</td>
<td>Prisoner</td>
<td>Cracker</td>
</tr>
<tr>
<td></td>
<td>(Moldy) Cheese</td>
<td>Stranger</td>
<td>Juice</td>
</tr>
<tr>
<td>Animals</td>
<td>Kitten</td>
<td>Juice</td>
<td>Spider</td>
</tr>
<tr>
<td></td>
<td>Puppy</td>
<td>Cracker</td>
<td>Tiger</td>
</tr>
<tr>
<td></td>
<td>Alligator</td>
<td>Poison Ivy</td>
<td>Chickadee</td>
</tr>
<tr>
<td></td>
<td>Snake</td>
<td>(Wild) Mushroom</td>
<td>(Plush) Sheep</td>
</tr>
<tr>
<td>Artifacts</td>
<td>Blanket</td>
<td>Friend</td>
<td>Matches</td>
</tr>
<tr>
<td></td>
<td>Teddy bear</td>
<td>Grandma</td>
<td>Scissors</td>
</tr>
<tr>
<td></td>
<td>Gun</td>
<td>Tiger</td>
<td>Book</td>
</tr>
<tr>
<td></td>
<td>Knife</td>
<td>Spider</td>
<td>Toy (Doll)</td>
</tr>
<tr>
<td>People</td>
<td>Mom</td>
<td>Sunflower</td>
<td>Stranger</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>Green bean plant</td>
<td>Prisoner</td>
</tr>
<tr>
<td></td>
<td>Pirate</td>
<td>(Rotten) Apple</td>
<td>Friend</td>
</tr>
<tr>
<td></td>
<td>Robber</td>
<td>Matches</td>
<td>Grandma</td>
</tr>
<tr>
<td>Plants</td>
<td>Daisy</td>
<td>Toy (Doll)</td>
<td>Poison Ivy</td>
</tr>
<tr>
<td></td>
<td>Houseplant</td>
<td>Book (Wild) Mushroom</td>
<td>21 (41)</td>
</tr>
<tr>
<td></td>
<td>(Holly) Berry</td>
<td>Scissors</td>
<td>Green bean plant</td>
</tr>
<tr>
<td></td>
<td>Cactus</td>
<td>(Spoiled) Milk</td>
<td>Sunflower</td>
</tr>
</tbody>
</table>

**Notes:** For each domain, the first two targets are positive and the second two targets are negative. () indicates how the item appeared in the photograph.
### Appendix C

**Study 3: Conflict Triads**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Target</th>
<th>Evaluative Choice</th>
<th>Taxonomic Choice</th>
<th>Evaluative Condition Younger Children, Older Children</th>
<th>Taxonomic Condition Younger Children, Older Children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Choice Means (SDs)</td>
<td>Choice Means (SDs)</td>
</tr>
<tr>
<td>Foods</td>
<td>Grape</td>
<td>Chickadee</td>
<td>(Spoiled) Milk</td>
<td>71 (46), 95 (22)</td>
<td>18 (39), 0 (0)</td>
</tr>
<tr>
<td></td>
<td>Sandwich</td>
<td>(Plush) Sheep</td>
<td>(Rotten) Apple</td>
<td>90 (30), 80 (41)</td>
<td>24 (43), 6 (24)</td>
</tr>
<tr>
<td></td>
<td>(Moldy) Bread</td>
<td>Prisoner</td>
<td>Cracker</td>
<td>86 (35), 80 (41)</td>
<td>29 (46), 12 (33)</td>
</tr>
<tr>
<td></td>
<td>(Moldy) Cheese</td>
<td>Stranger</td>
<td>Juice</td>
<td>95 (22), 90 (30)</td>
<td>29 (46), 6 (24)</td>
</tr>
<tr>
<td>Animals</td>
<td>Kitten</td>
<td>Juice</td>
<td>Spider</td>
<td>86 (36), 90 (30)</td>
<td>18 (39), 12 (33)</td>
</tr>
<tr>
<td></td>
<td>Puppy</td>
<td>Cracker</td>
<td>Tiger</td>
<td>86 (35), 85 (36)</td>
<td>11 (33), 12 (33)</td>
</tr>
<tr>
<td></td>
<td>Alligator</td>
<td>Poison Ivy</td>
<td>Chickadee</td>
<td>71 (46), 90 (31)</td>
<td>41 (50), 47 (51)</td>
</tr>
<tr>
<td></td>
<td>Snake</td>
<td>(Wild) Mushroom</td>
<td>(Plush) Sheep</td>
<td>71 (46), 75 (44)</td>
<td>29 (46), 24 (43)</td>
</tr>
<tr>
<td>Animals</td>
<td>Blanket</td>
<td>Friend</td>
<td>Matches</td>
<td>86 (35), 85 (36)</td>
<td>71 (46), 71 (46)</td>
</tr>
<tr>
<td></td>
<td>Teddy bear</td>
<td>Grandma</td>
<td>Scissors</td>
<td>90 (30), 100 (0)</td>
<td>71 (46), 76 (43)</td>
</tr>
<tr>
<td></td>
<td>Gun</td>
<td>Tiger</td>
<td>Book</td>
<td>100 (0), 100 (0)</td>
<td>76 (43), 88 (33)</td>
</tr>
<tr>
<td></td>
<td>Knife</td>
<td>Spider</td>
<td>Toy (Doll)</td>
<td>100 (0), 95 (22)</td>
<td>82 (39), 59 (50)</td>
</tr>
<tr>
<td>People</td>
<td>Mom</td>
<td>Sunflower</td>
<td>Stranger</td>
<td>86 (35), 85 (36)</td>
<td>18 (39), 18 (39)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>Green bean plant</td>
<td>Prisoner</td>
<td>76 (43), 70 (47)</td>
<td>12 (33), 29 (46)</td>
</tr>
<tr>
<td></td>
<td>Pirate</td>
<td>(Rotten) Apple</td>
<td>Friend</td>
<td>71 (46), 70 (47)</td>
<td>24 (43), 12 (33)</td>
</tr>
<tr>
<td></td>
<td>Robber</td>
<td>Matches</td>
<td>Grandma</td>
<td>86 (35), 90 (30)</td>
<td>35 (49), 41 (50)</td>
</tr>
<tr>
<td>Plants</td>
<td>Daisy</td>
<td>Toy (Doll)</td>
<td>Poison Ivy</td>
<td>81 (40), 85 (36)</td>
<td>24 (43), 12 (33)</td>
</tr>
<tr>
<td></td>
<td>Houseplant</td>
<td>Book</td>
<td>(Wild) Mushroom</td>
<td>86 (35), 90 (31)</td>
<td>35 (49), 12 (33)</td>
</tr>
<tr>
<td></td>
<td>(Holly) Berry</td>
<td>Scissors</td>
<td>Green bean plant</td>
<td>71 (46), 70 (47)</td>
<td>41 (50), 12 (33)</td>
</tr>
<tr>
<td></td>
<td>Cactus</td>
<td>(Spoiled) Milk</td>
<td>Sunflower</td>
<td>67 (48), 65 (48)</td>
<td>6 (24), 0 (0)</td>
</tr>
</tbody>
</table>

**Notes:** For each domain, the first two targets are positive and the second two targets are negative. () indicates how the item appeared in the photograph.

### Appendix D

**Study 2: Additional Domain Comparisons**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Younger Children ($df = 23$)</th>
<th>Older Children ($df = 21$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$t$</td>
<td>$p$</td>
</tr>
<tr>
<td>Animals-Artifacts</td>
<td>$-5.36$</td>
<td>.000</td>
</tr>
<tr>
<td>Animals-People</td>
<td>$-2.14$</td>
<td>.043</td>
</tr>
<tr>
<td>Animals-Plants</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Artifacts-People</td>
<td>3.68</td>
<td>.001</td>
</tr>
<tr>
<td>Artifacts-Plants</td>
<td>4.92</td>
<td>.000</td>
</tr>
<tr>
<td>People-Plants</td>
<td>2.07</td>
<td>.050</td>
</tr>
</tbody>
</table>

### Appendix E

**Study 3: Additional Domain Comparisons**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Evaluative Condition ($df = 40$)</th>
<th>Taxonomic Condition ($df = 33$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$t$</td>
<td>$p$</td>
</tr>
<tr>
<td>Animals-Artifacts</td>
<td>$-3.11$</td>
<td>.003</td>
</tr>
<tr>
<td>Animals-People</td>
<td>0.55</td>
<td>.585</td>
</tr>
</tbody>
</table>
References


