



How cues to social categorization impact children's inferences about social categories

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ABSTRACT

Social categorization involves two crucial processes: First, children seek properties on which they can categorize individuals, i.e., they learn to form social categories; then children make inferences based on social category membership and might develop affective responses toward social categories. Over the last decade, a growing number of research in developmental psychology started to use novel social categories to investigate how children learn and reason about social categories. To date, three types of cues have been put forward as means to form social categories, namely linguistic, visual, and behavioral cues. Based on social category membership, children draw inferences about the shared properties of social category members and about how social category members ought to behave and interact with each other. With additional input, children might apply essentialist beliefs to social categories and develop affective responses toward social categories. This article aims to provide key insights on the development of stereotypes and intergroup biases by reviewing recent works that investigated how children learn to form novel social categories and the kind of inferences they make about these novel social categories.

1. Introduction

Social interactions are pervasive in our everyday life. We encounter countless of people every day, by going to work, having a coffee, or taking a course at the gym. We are immersed in this rich and complex social environment from our first day of life. Classifying people into categories is an efficient way of structuring and simplifying the amount of information we encounter in the social world (Bigler & Liben, 2006; Rhodes, 2013; Sherman et al., 2013; Tajfel, 1969). In fact, social categorization allows children, like adults, to predict and explain new individuals' actions by drawing on past experiences (Baron, 2009; Rhodes, 2013; Rhodes & Baron, 2019). Yet, social categorization also sets the ground for the development of stereotypes and intergroup biases (Bigler & Liben, 2006; Rhodes & Baron, 2019; Tajfel, 1970). As such, a precise understanding of the processes involved in social categorization can shed light on the origins of stereotypes and intergroup biases. Specifically, two processes are involved in social categorization: First, children seek properties on which they can categorize individuals, i.e., they learn to form social categories; then children make inferences based on social category membership and might develop affective responses toward social categories (Baron et al., 2014; Over & McCall, 2018; Shutts & Kalish, 2021). The present article aims to provide key insights on the

development of stereotypes and intergroup biases by reviewing recent works that investigated how children learn to form novel social categories and the kind of inferences they make about these novel social categories.

From an evolutionary perspective, social categorization serves the adaptive purpose of detecting potential social partners, alliances, and coalitions (Kinzler et al., 2010; Spelke & Kinzler, 2007). Humans have thus developed a system for thinking about others as social category members, which is present early in ontogeny: Between 3 and 9 months, infants show looking preferences and categorization abilities (Charlesworth and Banaji, in press; Liberman et al., 2017). Based on social category membership, children are able to predict the properties and interactions of people belonging to the same social category (Baron, 2009; Liberman et al., 2017; Rhodes, 2013). Specifically, recent works in developmental psychology showed that children expect members of the same social category to share traits, activities, behaviors, physical attributes, and preferences (Over & McCall, 2018), that the properties marking social category members will endure over time (Liberman et al., 2017), and that social category members are obligated to one another, namely by cooperating and engaging in prosocial behaviors (Kaufmann & Clément, 2014; Rhodes & Chalik, 2013). Therefore, social categorization has cognitive advantages, reducing the complexity of the social

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world and allowing us to quickly encode and retrieve information about people (Rhodes, 2013), but it also has serious social and psychological drawbacks, namely intergroup biases.

The types of inferences children make about social categories are directly related to stereotypes and intergroup biases. Indeed, research in social psychology proposes that stereotypes correspond to the set of shared beliefs about the properties of social categories (Klein & Bernard, 2015), whereas attitudes are defined as positive or negative affective responses toward a social category (Kurdi et al., 2019). Although stereotypes consist in shared beliefs about a social category, they do not necessarily imply an affective aspect (e.g., one can hold a stereotype that gay couples have good taste in fashion *versus* believing that gay couples are deviant). Attitudes, however, involve a positive or negative evaluation (associating a category with good/bad), which can in turn lead to prejudices or even discrimination (e.g., favoring one category over another) (Fiske & Taylor, 2013). As previously mentioned, social categorization can lead to associating properties to social category members (which corresponds to forming stereotypes), and to developing a preference for some categories over others (which corresponds to developing positive and negative attitudes). Studying social categorization among children can reveal important aspects of how stereotypes, attitudes, and prejudices develop. As Devine (1989) argued, beliefs formed in childhood might be more rooted and thus less accessible to consciousness than recently acquired beliefs. Consequently, it is crucial to have a better understanding of how children infer social category's characteristics and develop affective responses toward a social category.

The present paper is articulated in two main sections, corresponding to the two processes involved in social categorization. The first part of the article presents the types of cues on which children rely to identify social categories. Previous theoretical accounts proposed that different cues can trigger social categorization, namely linguistic, visual, and behavioral cues (Bigler & Liben, 2006; Rhodes & Baron, 2019; Sherman et al., 2013). The second part of this article focuses on the types of inferences children draw based on social category membership. Research in developmental psychology showed that inferences can be about the social category's properties (Over & McCall, 2018), patterns of interpersonal interactions (Lieberman et al., 2017), and essentialist beliefs about the social category (Rhodes, 2013). In addition, social categorization can also yield affective responses toward a social category (Spelke & Kinzler, 2007). This review focuses on studies using novel and abstract social categories as opposed to real-world social categories. This choice is motivated by the growing number of research using novel social categories over the last decade (with a few exceptions beforehand, for e.g., Ford & Stangor, 1992; Gregg et al., 2006; Levy et al., 1998). Moreover, investigating the processes of social categorization with novel social categories has the advantage of identifying more general aspects of social categorization that are not tied to cultural settings. As argued by Baron et al. (2014) using novel social categories “allows us to examine the abstract principles by which children create [and reason about] social categories in the first place.” (p. 241) Because this review aims to propose opportunities for future research, it seems particularly interesting to focus on research with novel social categories as they uncover general processes and inferences that might be tested and replicated in other cultures. The studies reviewed in the present article were thus selected on the basis of the following criteria: (a) experimental study, (b) use of novel social categories; (c) tested population included infants, preschoolers and/or school-aged children; (d) assessment of how social categories are formed (i.e., social category formation) and/or (e) assessment of social category inferences (i.e., similarity inferences, deontic inferences, essentialist beliefs, or affective responses), and (f) publication date comprised between January 2010 and December 2021. Table 1 provides an overview of the selected studies for the present review. Altogether, the present article delineates how specific cues to identify novel social categories can lead to different types of inferences, draws key conclusions about the conditions under which children learn and make inferences about novel social categories, and proposes

Table 1
Summary of research using novel social categories.

Cues primarily tested in the study	Additional cues used in the experimental procedure	Process of social categorization under investigation	References
Linguistic (labels, generics, specifics)	Visual (clothes colors)	Social category formation	Rhodes, Leslie, Bianchi, and Chalikh (2018)
Behavioral	Visual (clothes & hair colors)	Social category formation Similarity inferences (activity)	Riggs (2019)
Visual (clothes, hat, skin colors) versus Linguistic (labels)		Social category formation Similarity inferences (activity)	Baron et al. (2014) Diesendruck and Weiss (2015)
Linguistic (labels, generics)		Affective responses Similarity inferences (physical features)	Diesendruck and Eldror (2011)
Linguistic (labels, specifics)	Visual (clothes style & colors)	Similarity inferences (preferences, physical features, knowledge)	Kalish (2012) Soley (2019) Riggs et al. (2014)
Linguistic (labels, generics)	Visual (clothes colors)	Similarity inferences (preferences)	Jordan and Dunham (2021) Moty and Rhodes (2021)
Behavioral versus Linguistic (labels, generics, specifics, quantifiers)	Visual (clothes style)	Similarity inferences (preferences) Essentialist beliefs	Hoicka et al. (2021)
Linguistic (labels & generics versus labels & specifics)	Visual (clothes style)	Essentialist beliefs	Foster-Hanson et al. (2019) Foster-Hanson and Rhodes (2020) Hoicka et al. (2021) Leshin et al. (2021) Noyes and Keil (2020) Rhodes, Leslie, Saunders, et al. (2018) Rhodes et al. (2012)
Linguistic (labels, generics)	Visual (clothes style)	Deontic inferences (conforming)	Foster-Hanson et al. (2021) Roberts, Gelman, and Ho (2017)
Visual (clothes style)		Deontic inferences (conforming)	Foster-Hanson et al. (2021) Roberts, Gelman, and Ho (2017) Roberts, Ho, and Gelman (2017) Riggs and Long (2020)
Behavioral	Linguistic (labels, generics, specifics) Visual (clothes & hair colors)	Deontic inferences (conforming)	
Linguistic (labels)	Visual (clothes colors)	Deontic inferences (harmful actions, friendship, saving, helping, moral actions)	Chalikh and Rhodes (2018) Chalikh and Dunham (2020) Chalikh et al. (2014) Jin and

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Table 1 (continued)

Cues primarily tested in the study	Additional cues used in the experimental procedure	Process of social categorization under investigation	References
Visual (clothes colors)		Deontic inferences (harm)	Baillargeon (2017) Rhodes (2012, 2014) Rhodes and Chalik (2013) Chalik and Rhodes (2014)
Linguistic (labels, generics)		Affective responses	Charlesworth et al. (2020) Gonzalez et al. (2017) Lane et al. (2020)
Visual (clothes colors & countries)		Affective responses	Skinner et al. (2020)

opportunities for future research.

2. Cues to form and learn social categories

This section reviews studies in developmental psychology that tested how children identify and learn about social categories, i.e., on what kind of cues children rely to represent novel social categories. Linguistic cues, such as labels and generic statements, have been considered as powerful markers of social category (Rhodes & Baron, 2019) as they convey information about a social category as a whole (Riggs et al., 2014; Shutts & Kalish, 2021). Another perspective considers that perception plays a crucial role in how children form social categories: As infants notice perceptual differences, they also start to develop a tendency to categorize people based on these visual criteria (Bigler & Liben, 2006; Rhodes & Baron, 2019). A related proposition considers that children not only form social categories based on salient visual differences, but also on the behavioral regularities they observe in their environment. This proposition stems from models of learning, proposing that children detect regularities in their environment and draw inferences from those regularities (Bigler & Liben, 2006; Oakes et al., 2009; Park & Hastie, 1987; Sherman et al., 2013). According to this perspective, children, as “sophisticated pattern-detectors,” are able to track common features and behaviors of social agents and, subsequently identify the boundaries of social categories (Riggs, 2019, p. 67; see also Gopnik, 2012). In the following sections, research that employed and tested each type of cues is reviewed.

2.1. Linguistic cues

While a broad area of research, initiated in the late 80s, investigated how labels affected children's inductive inferences about social category members (for e.g., Gelman et al., 1986; Gelman & Heyman, 1999; Gelman & Markman, 1986; Heyman & Gelman, 1999, 2000a, 2000b), these earlier studies did not assess whether labels would lead children to form and identify social categories. One study in particular addressed this question by testing whether labels could help young infants (19–26 months old) to identify members of social categories (Diesendruck & Deblinger-Tangi, 2014). Specifically, in this study, infants were introduced to pictures of real-world category exemplars (e.g., pictures of various women) either accompanied with an abstract label (e.g., “Look a Tiroli”) or not (e.g., “Look at this”). The presence of a label helped 19-months toddlers to identify two people as belonging to the same category.

This finding was extended to novel social categories (Rhodes, Leslie, Bianchi, & Chalik, 2018). In their study, Rhodes, Leslie, Bianchi, and

Chalik introduced toddlers (28- to 36-months old) to novel social categories either with a label and specific language (“This Zarpie eats flowers”), with a label and generic language (“Zarpies eat flowers”) or without label (“This one eats flowers”). The results showed that infants of 32-months (and older) accurately ascribed characters to the same category when a label was used (either with specific or generic language), but not when only visual cues, without label, were provided (e.g., introducing a category member visually marked by clothes color while stating “This one eats flowers”). In addition, Rhodes, Leslie, Bianchi, and Chalik (2018) found that younger toddlers, between 28 and 32 months old, were able to select accurately individuals as belonging to the same social category only when the social category was introduced with labels in combination with generic language (e.g., “Zarpies eat flowers”). This study revealed an important developmental shift during the second year of life: From 28 months, children can form novel social categories when labels in combination with generic language are employed, but it is only later, around 34 months, that children can form novel social categories based on labels only. Importantly, while labels mark people as belonging to the same group, generic language convey information about the category as a whole: When provided with generic descriptions of a labeled social category, children assume that the communicated information applies to each and every member of the social category (Foster-Hanson et al., 2019; Riggs et al., 2014). Together, these findings show that labels facilitate social categorization. From 19 months, infants can identify similarly labeled people as belonging to the same existing social category, from 28 months infants can form novel social categories based on labels in combination with generic language, and from around 34 months, labels alone are sufficient for infants to form novel social categories.

Please note that this section focused only on studies that investigated how linguistic cues serve the *formation* of novel social categories. On the other hand, an important number of studies investigated the effect of linguistic cues on children's *inferences* about novel social categories. Works inscribed within this later line of research are presented in Section 3, which reviews studies that assessed children's inferences about social categories, and in Section 4, which presents in detail how linguistic cues modulate children's inferences about social categories.

2.2. Visual cues

Perceptual features are considered as another important cue to form social categories, as they are noticeable with a minimum of effort (Kinzler et al., 2010). According to Bigler and Liben (2006), a marked perceptual distinction between groups of people can be the source of social categorization. This view supports the idea that as soon as children notice a perceptual difference between groups of people, they start to categorize people based on these visual criteria (Aboud, 1988; Baron, 2009; Rhodes & Baron, 2019). However, a contrasting view proposes that, although children notice perceptual similarities among people, these similarities are not sufficient for children to form a rich representation of social categories (Baron et al., 2014; Shutts & Kalish, 2021). Unfortunately, very few studies assessed the formation of social categories based on visual cues only. Most of the time, visual cues are employed as a mean to ensure that children keep track of the social categories during the experimental task. For instance, social categories are visually marked (e.g., by clothing style, hair or clothes colors), while other cues to social categories (e.g., labels, generic statements, behavioral regularity) are the focus of investigation (see Table 1).

Only a couple of studies directly assessed whether visual cues alone would be sufficient for children to form novel social categories (as opposed to studies using visual cues in combination with labels and generic claims). Diesendruck and Weiss (2015) investigated whether children separated people into social categories based on labels and/or physical features. To test this, they used two real-world social categories (race and gender), as well as an artificial social category (shirt colors). After being introduced to the social categories, 5-years old children had

to assign different individuals to the given social categories. Importantly, the individuals varied in their degree of similarity with the categories' exemplars (e.g., people wearing shirt colors ranging from red to yellow) and were either referred to by a label or not. In the no-label condition, children categorized individuals based on perceptual similarity for all three social categories (race, gender, and shirt colors). In the label condition, however, children's responses were modulated by the type of social category, i.e., the degree to which the social category is essentialized. Specifically, children disregarded perceptual similarity in favor of labels to categorize individuals differing in shirt colors (the least essentialized category). In contrast, for the gender category (the most essentialized category), children ignored the labels and based their categorization on perceptual similarity. For the race category, children's categorization was at chance level. [Diesendruck and Weiss' \(2015\)](#) study showed that from 5 years of age, children were able to form categories based on perceptual similarity. However, when pitted against each other, labels prevailed over visual cues for novel social categories.

Similarly, [Baron et al. \(2014, Experiment 2\)](#) tested whether children would form novel social categories based on shared intrinsic (i.e., skin color) or nonintrinsic (i.e., hat colors) perceptual features. Children between 4 and 7 years old learned about novel social category members (introduced with individuating names) that shared a visual property. This experiment revealed that only 7-year-olds, but not 4-year-olds, were able to predict that characters sharing a visual feature, be it skin or hat color, would behave similarly. Interestingly, in an additional experiment, [Baron et al. \(2014, Experiment 3\)](#) found that children of both age groups were able to predict that social category members would behave similarly when provided with linguistic cues in addition to visual cues. These findings suggest that only 7-year-olds were able to identify novel social categories based on visual cues; younger children needed an additional linguistic cue to form novel social categories. Interestingly, [Baron et al. \(2014, Experiment 1\)](#) also showed that 4-year-olds were able to predict, in the absence of visual cue, that characters sharing the same label would behave similarly. This finding goes in the same direction as the studies of [Diesendruck and Deblinger-Tangi \(2014\)](#) and [Rhodes, Leslie, Bianchi, and Chalikh \(2018\)](#). Altogether, these studies show that children of 5 years and more can form novel social categories based exclusively on visual cues; younger children rely on linguistic cues.

While research investigating children's social categorization based on perceptual similarity is scarce, many studies were conducted with animal categories. An important line of research showed that preschoolers can separate the animal world into categories based on visual similarity or shared internal properties (see for e.g., [Diesendruck et al., 1998](#); [Diesendruck & Peretz, 2013](#)). Previous studies also showed that preschoolers expect animals with similar appearances only, i.e., not referred to by labels, to share the same morphological (e.g., "have four stomachs"; [Davidson & Gelman, 1990](#); [Sloutsky et al., 2007](#)) and behavioral properties (e.g., "living in nests"; [Gelman & Coley, 1990](#); [Jaswal & Markman, 2007](#)). Interestingly, when labels conflicted with visual similarity, children's animal categorization was only slightly affected by labels ([Diesendruck & Peretz, 2013](#); [Sloutsky & Fisher, 2004](#)), but when children had to predict animals' behaviors, labels guided children's inferences ([Jaswal & Markman, 2007](#)). These findings on animal categorization contrast with research on social categorization. While preschoolers tend to readily form novel animal categories from visual similarity, they are less likely to do so for novel social categories, for which they need additional linguistic cues. According to [Diesendruck and Weiss \(2015\)](#), this difference comes from the fact that animal categories, even if they are novel, are essentialized to a greater extent than novel social categories. As such, the degree to which a category is essentialized seems to mediate whether children rely on visual or linguistic cues to determine category membership.

2.3. Behavioral cues

Some models of learning propose that children detect regularities in their environment and draw inferences from them ([Bigler & Liben, 2006](#); [Oakes et al., 2009](#); [Park & Hastie, 1987](#); [Rhodes & Baron, 2019](#); [Sherman et al., 2013](#)). According to this perspective, children would infer that some people belong to the same category based on the behavioral regularities they observe in their environment. Many past studies on children's capacity to detect regularities and infer patterns from regularities focused on language learning (e.g., word segmentation, [Saffran et al., 1996](#); or phonetic learning, [Maye et al., 2008](#)) or causal learning (e.g., [Buchsbbaum et al., 2011](#); [Gopnik et al., 2001](#)). Recently, research started to explore how children's capacity to detect regularities plays a role in how they learn and reason about their social environment, and more specifically about social categories. This section reviews recent studies that assessed how observing regular behaviors influenced children's inferences about novel social categories [Section 3](#).

Even though the following studies did not directly assess children's formation of novel social categories, we might argue that, if children are able to draw inferences about a social category, they must have identified and acquired a representation of the social category and its members beforehand. This choice of review is motivated by the fact that studies started to employ behavioral cues only recently and are consequently not numerous (see [Section 3](#) for a detailed review on social category inferences). For instance, [Riggs \(2019\)](#) investigated whether 4- to 8-year-old children would generalize a behavior to social category members based on statistical evidence, i.e., whether a behavior was demonstrated by a large group of people, a subset of people, or a specific individual. Children observed the behaviors of five individuals, belonging either to the same social category or to different social categories. The number of individuals displaying the same behavior (e.g., kneeling before leaving a room) varied across conditions (for details about the conditions, please consult [Riggs, 2019](#), p. 69). The results showed that children consistently inferred the behavior of a novel individual when they observed four category members displaying the same behavior. Children between 4 and 8 years old can thus attend to behavioral regularities and use them to identify and reason about social categories.

A related study investigated whether representing a high proportion of category members behaving similarly would lead children to generalize the behavior to other social category members ([Hoicka et al., 2021](#), Experiment 2). In this study, 5- and 6-year-olds learned about three members of a novel labeled social category. All three members demonstrated the same behavior (e.g., bouncing a ball on their head). The authors found that children did not generalize a behavior based on their observation of three category members. However, when children were provided with additional linguistic cues to high proportions (i.e., generic claims and proportion quantifiers, such as "most," "many," or "some"), they expected that other social category members would demonstrate the same behavior. It would thus seem that 5–6-year-old children have difficulty reasoning about social category members solely based on behavioral cues.

The current state of research using behavioral cues reached contrasting conclusions: While [Riggs \(2019\)](#) found that children could use statistical evidence to reason about social categories, [Hoicka et al. \(2021\)](#) showed that children needed additional linguistic cues, in combination with statistical evidence, to reason about social categories. Three possible explanations might be proposed to account for this discrepancy. First, the number of instances presenting the behavior of category members differed between the two studies. [Riggs \(2019\)](#) presented four category members performing the same behavior, whereas [Hoicka et al. \(2021\)](#) presented three instances of similarly behaving category members. Second, whereas [Riggs' \(2019\)](#) stimuli consisted of behaviors only (e.g., kneeling, clapping, raising arms, doing push-ups, etc.), the stimuli used in [Hoicka et al.'s \(2021\)](#) study comprised preferences (e.g., love to eat flowers, like to sing, etc.), morphological

properties (e.g., have freckles on their feet, have stripes in their hair), and behaviors (e.g., bounce a ball on their head, climb tall fences, etc.). These discrepancies in the type of properties used might have affected whether children drew inferences about category members (see [Section 3.1](#) for details on how the type of properties affects children's category inferences). It is consequently possible that the diversity of properties used in [Hoicka et al.'s \(2021\)](#) study in comparison to [Riggs' \(2019\)](#) study impacted on the overall results. Third, the age range of children in [Riggs' study](#) was broader than in [Hoicka et al.'s study](#). There might thus be a developmental shift in children's capacity to learn and reason about social categories from observed behavioral regularities that occurs after 5–6 years old. Future studies could assess this possibility (see [Section 4](#) for further discussion).

3. Inferences about social categories

What do children assume about a person once they know to which social category she belongs? One perspective proposes that predictions about similarity are the main inferences that one can draw from social categories ([Rhodes & Baron, 2019](#); [Shutts & Kalish, 2021](#)). From this point of view, children assume that social category members share specific properties, such as traits, activities, behaviors, physical attributes, or preferences ([Liberman et al., 2017](#); [Over & McCall, 2018](#)). However, simple inferences about shared similarity might be too broad. Research on essentialism extends this perspective: Children might infer that there are deep and stable causal properties determining social category membership ([Bigler & Liben, 2006](#); [Foster-Hanson & Rhodes, 2020](#); [Gelman, 2003](#)). On this account, social category members are similar because of an underlying essence, i.e., because they share deep, stable, and intrinsic properties (for e.g., blood composition or internal psychological attributes; [Diesendruck & Eldror, 2011](#); [Diesendruck & Weiss, 2015](#)). Importantly, although children can show essentialist thinking from 4 years old, they do not automatically apply essentialist beliefs to novel social categories ([Leshin et al., 2021](#)). Research using novel social categories showed that children assume quite easily that category members share observable properties (e.g., behaviors, activities, external physical attributes; see [Section 3.1](#)), but they do not necessarily hold essentialist beliefs about novel social categories ([Hoicka et al., 2021](#); [Vasilyeva et al., 2018](#)). As a result of inductive inferences, children are prone to expect that social category members share observable similarities. With additional inputs (reviewed in [Section 3.2](#)), children might also come to assume that these observable similarities are caused by an underlying essence.

Moreover, social categories also entail expectations about how social category members ought to behave ([Rhodes & Baron, 2019](#); [Shutts & Kalish, 2021](#)). That is, social categories provide “a shared standard against which one's own and another's behavior can be assessed.” ([Shutts & Kalish, 2021](#), p. 351) This “shared standard” can concern social norms (e.g., conforming to the regular behaviors of the social category) or social obligations (e.g., engaging in prosocial actions with members of one's own social category) ([Bigler & Liben, 2006](#); [Liberman et al., 2017](#); [Over & McCall, 2018](#); [Rhodes, 2013](#)). As a consequence, children tend to ascribe a normative stance to social categories.

Finally, children might also show affective responses toward social category members, and thus develop positive or negative attitudes toward a social category ([Charlesworth et al., 2020](#); [Over & McCall, 2018](#); [Sherman et al., 2013](#)). Past research mainly focused on the effects of minimal grouping, by showing that simply assigning children to an arbitrary group (e.g., “the Greens”) led them to prefer and favor their own group over another group ([Kinzler et al., 2010](#); [Park & Judd, 2005](#); [Skinner et al., 2020](#)). However, recently studies started to explore the possibility that children develop affective responses toward a social category without identifying themselves to the social group. This trend of research revealed that children develop affective responses toward a social category by simply observing adults' nonverbal behaviors or by (over-)hearing adults' testimonies ([Brey & Pauker, 2019](#); [Eggleston et al.,](#)

[2021](#); [Over & McCall, 2018](#); [Sherman et al., 2013](#); [Shutts & Kalish, 2021](#); [Skinner et al., 2020](#)).

The following sections present the different types of expectations that children draw about people based on their membership to a novel social category, namely expectations about similarity ([Section 3.1](#)), essentialist beliefs ([Section 3.2](#)), deontic inferences ([Section 3.3](#)), as well as children's affective responses to social category members ([Section 3.4](#)).

3.1. Similarity inferences

Expectation about similarity is one of the main inferences one can draw from social categorization ([Rhodes & Baron, 2019](#); [Shutts & Kalish, 2021](#)). For instance, one might expect that a person will have a particular property because this property is characteristic of her social category. The kinds of properties that social categories are expected to share can be diverse and include traits, activities, behaviors, physical attributes, and preferences ([Liberman et al., 2017](#); [Over & McCall, 2018](#); [Sherman et al., 2013](#)). Studies typically assessed whether children would generalize a property they learned about a social category to other individuals belonging to this social category. The present section focuses on similarity inferences that children make about novel social categories (for a review on children's inferences about real-world categories, see [Charlesworth and Banaji, in press](#)).

Many studies using novel social categories assessed whether children would expect that social category members share preferences. For example, [Jordan and Dunham \(2021\)](#) found that children between 3 and 9 years old predicted that two individuals, from the same social category, would share activity preferences (e.g., “liking to fly kites”). In this study, social categories were introduced either by a label (e.g., “These kids are called the Zertles”) or by similarity (e.g., “These kids like to eat a food called zertles”). In both conditions, children expected that members of the same social category would share activity preferences. Similarly, [Moty and Rhodes \(2021\)](#) found that children, from 4.5 years old, expected that members of the same social category would be good at a specific activity (e.g., “baking pizzas”). Interestingly, their results also showed that children, after hearing generic claims, made predictions about unmentioned members of an opposite social category; they expected that members of the unmentioned category would not be good at the specific activity (for similar findings, see [Kramer et al., 2021](#)). Those results, however, contrast with the findings of [Kalish \(2012\)](#) who showed that 8-years old children did not generalize preferences to social category members. [Soley \(2019\)](#) reached similar conclusions, showing that children between 5 and 7 years old did not expect shared music preference among members of the same labeled social category. However, there is a major difference between these studies. [Kalish \(2012\)](#) and [Soley \(2019\)](#) introduced novel social categories using a label and specific language (e.g., “This Mitu likes this song”), whereas [Jordan and Dunham \(2021\)](#) and [Moty and Rhodes \(2021\)](#) used generic statements in addition to labels (e.g., “Zarpies are good at baking pizzas”). The type of linguistic cues employed to introduce a novel social category thus seems to mediate whether children expect social category members to share preferences (this question is further discussed in [Section 4](#)).

Another source of variation can come from the nature of the property itself. Recently, [Doan et al. \(2021\)](#) found that children between 2 and 3 years old expected some preferences to be shared, such as food and activities, but that other preferences, like color preferences, are more subjective. Thus, depending on the nature of a property, children will expect it to be generalizable even without generic statement. [Riggs et al. \(2014\)](#) assessed how the nature of a property would influence children's expectations. They introduced 3- to 5-year-olds to a member of a novel labeled social category with her associated property. The nature of the property varied across conditions, and was either morphological (e.g., “has plasma in the blood”) or historical (e.g., “got bit by a krem in the meadow”). Children generalized more morphological than historical properties to other category members. Similarly, [Diesendruck and](#)

Eldror (2011) showed that children generalized biological properties (e.g., “have melanin in their blood”) when they were presented as causing external properties (e.g., “have round bones”). In addition, Soley (2019) found that children predicted that social category members would share knowledge about music but would not necessarily like the same music. Therefore, children might consider activities, food preferences, physical features, and cultural knowledge as more generalizable than other kinds of properties.

What about psychological properties, such as traits? Relatively little research assessed whether children extend traits to novel category members despite theoretical approaches of stereotyping arguing that people tend to apply traits to social categories (e.g., women are caring) (Bigler & Liben, 2006; Sherman et al., 2013). Would children predict that a person is generous because she belongs to a social category that is characterized as generous? Although this question has not yet been directly addressed, studies on trait attribution provide possible answers and interesting perspectives. For example, Liu et al. (2007) showed that from 4 years of age, children are able to infer traits (e.g., selfish) from behaviors (e.g., not sharing), and vice versa. In addition, Heyman and Gelman (2000b) found that children expected that individuals described with the same trait (e.g., shy/outgoing) would share preferences. As such, children can attribute traits to people and make inductive inferences from traits: If two people are shy, they will engage in the same kind of activities (Heyman & Gelman, 2000a). In these previous studies, psychological traits were used to introduce a category (e.g., “shy people”). That is, children viewed traits as categories (C. M. Gonzalez et al., 2010). From these findings, it is most likely that children would also generalize psychological traits based on social category membership.

To summarize, the studies reviewed here revealed that children's similarity inferences are mediated by (a) the nature of the property, namely if the property is viewed as generalizable, children will expect it to be shared among category members marked by labels, and (b) the type of linguistic cue employed, specifically using generic claims or high proportion quantifiers will prompt children to assume that any property applies to every member of a social category.

3.2. Essentialist beliefs

Children assume quite easily that some properties are generalizable across category members, but they do not necessarily believe that there is an underlying essence that causes category members to be similar. In fact, expecting that a property is shared among social category members does not imply holding essentialist beliefs about the social category (Hoicka et al., 2021; Vasilyeva et al., 2018). It is only with additional inputs that children may develop essentialist beliefs about social categories and view them as natural kinds (Rhodes, 2013). Essentialist beliefs about social categories consist in inferring that there are stable, natural, and intrinsic causes to social category membership (e.g., boys are good at math because of some inherent properties specific to boys) (Bigler & Liben, 2006; Gelman, 2003; Rhodes & Baron, 2019; Shutts & Kalish, 2021). This belief also leads people to view social categories as discrete, such that members of two social categories are fundamentally different and members of the same social category are deeply similar (Foster-Hanson & Rhodes, 2020; Peretz-Lange & Muentener, 2020). These essentialist assumptions seem to emerge under certain conditions, where emerging cognitive biases and specific cultural inputs play an important role (Leshin et al., 2021; Rhodes, 2013; Rhodes et al., 2012). This section reviews studies that investigated whether children develop essentialist beliefs about novel social categories and if so, under what conditions (for a review of essentialist beliefs about existing social categories, see Peretz-Lange & Muentener, 2020).

To assess children's essentialist beliefs, researchers typically described the property of a novel social category, and then asked children to explain what caused the property, whether the property was inherited, and whether the property is generalizable to other category members. Regarding causality inferences, children's explanations about

what caused the category property are assessed with open-ended questions (e.g., “Why does this person do X?”). If children mention social category membership as being the cause of the property (e.g., “Because she is a Zarpie”), their answer is considered as essentialist. Multiple studies showed that simply using generic language when presenting a novel social category and its property (e.g., “Zarpies sleep in tall trees”) led 4- to 9-years old children to provide more explanations of the property as caused by social category membership than when they learned about social categories' properties through specific language (Cimpian & Markman, 2011; Leshin et al., 2021; Rhodes et al., 2012; Rhodes, Leslie, Saunders, et al., 2018). This was also true when high proportion linguistic cues were employed, such as “most” and “many” (Hoicka et al., 2021), and when a generic claim was subsequently negated (e.g., “That's not right about Zarpies,” Foster-Hanson et al., 2019). Interestingly, Foster-Hanson and Rhodes (2020) reached similar findings when the novel social categories were presented as created by a powerful being. Specifically, when the category was described as created by a powerful being (instead of being discovered by a standard person), 4-5-year-olds explained more often that the reason why a person had a certain property was due to her category membership. These studies showed that generic claims, high proportion linguistic cues, and the type of explanation provided about the category's origin led children to infer category membership as the cause of the property's occurrence.

Essentialist beliefs are also assessed with switched-at-birth paradigms to test children's inferences about the inheritance of a property. The task consists in asking children whether a member of social category A, raised in a family of social category B, will have the properties of the birth parents (from social category A) or of the adoptive parents (from social category B). If children expect that the individual inherited the property of category A, the answer is considered as essentialist. A first influential study showed that 4-year-olds and adults inferred more often that a property would be inherited when hearing generic compared to specific statements (Rhodes et al., 2012). However, subsequent studies revealed that generic claims and the origin of social category did not lead children (between 4 and 7 years old) to expect that the properties would be inherited (Foster-Hanson et al., 2019; Foster-Hanson & Rhodes, 2020; Hoicka et al., 2021). Interestingly, Noyes and Keil (2020) recently showed that the type of properties influenced children's responses in a switch-at-birth paradigm. When presented with generic statements, children from 6 years old – but not younger children – expected more that biological properties would be inherited (e.g., “feeling sick when drinking milk”) than cultural properties (e.g., “believing that fish talk to God”) (Noyes & Keil, 2020). These different patterns of results might be explained by a developmental change occurring between 4 and 9 years of age as suggested by Leshin et al.'s (2021) and Noyes and Keil's (2020) studies, which revealed that children make more refined inferences about properties' inheritance as they grow up. Consequently, the conditions under which children draw inheritance inferences are subject to developmental changes and remain to be specified.

Finally, essentialist beliefs have also been measured with induction questions: Would children infer that A shares properties with B because both are members of the same social category? As previously argued, expecting that a property is shared among category members does not necessarily imply that there is an underlying essence causing category members to be similar (Hoicka et al., 2021; Vasilyeva et al., 2018). For this reason, some researchers assessed essentialist beliefs by other means, such as questions pertaining to the inflexible aspect of a property (e.g., “Would this person only do X or would she sometimes do Y?”; Leshin et al., 2021) or to the extent to which the property is generalizable (e.g., “How many other members will do X?”; Foster-Hanson et al., 2019). Results showed that for each of these assessments, children provided answers congruent with essentialist beliefs when they learned about social categories through generic language. Specifically, 4-9-year-olds expected the property to be inflexible and absolute when they learned about the property through generic language (Leshin et al.,

2021). And 5–7-year-olds generalized a property more broadly – to more social category members – when generic claims were used compared to specific statements (Foster-Hanson et al., 2019). Together, these findings provide evidence that generic claims prompted children to infer that a property would be inflexible and broadly generalizable.

3.3. Deontic inferences

Children do not only expect similarity among category members, they also hold expectations about social obligations. Deontic inferences can relate to how social category members ought to behave (e.g., going to church) and to how they should interact with each other (e.g., helping each other). In fact, children tend to ascribe a normative stance to social category members' behaviors, namely, they consider that not conforming to one's own social category is unacceptable (Foster-Hanson et al., 2021; Roberts, Gelman, & Ho, 2017). In addition, social categorization supports inferences about how people are obligated to one another (Rhodes, 2013), for instance that members of the same social category are expected to cooperate (Kaufmann & Clément, 2014), restrain from harming each other (Rhodes & Chalikh, 2013), and engage in prosocial behaviors (Lieberman et al., 2017). Detecting social groupings has an important role in determining patterns of cooperation and competition (Kinzler et al., 2010; Rhodes & Baron, 2019). Similarly, adherence to norms and preference for conformity are proposed to support cultural learning and coordination throughout evolution (Chudek & Henrich, 2011; Roberts, Gelman, & Ho, 2017). Therefore, based on social category membership, children might rapidly form expectations about social obligations, namely that individuals should conform to their social category and engage in prosocial behaviors with their fellow category members.

Children, from a very young age, hold expectations about interpersonal interactions between category members, even when social categories are novel. The first line of studies exploring children's predictions about how category members should interact focused on harmful actions. From 3 years old, children were more likely to expect that harmful actions would be directed toward members of different social categories than toward members of the same social category (Chalikh et al., 2014; Chalikh & Rhodes, 2014; Rhodes, 2012). Other studies found that by age 4, children explained that harmful actions were perpetrated because of category membership (Chalikh & Rhodes, 2015; Rhodes, 2014). In addition, children of 4.5 years old viewed harmful actions as wrong when they involved people of the same social category, but not when the harmful actions were directed toward members of a different social category (Rhodes & Chalikh, 2013). Children's evaluations remained the same even when a rule stated that it was permissible to commit harmful actions (Rhodes & Chalikh, 2013). These results attest that children expected members of novel social categories, introduced by linguistic (labels) and visual (shirt colors) cues, to be intrinsically obligated not to harm each other.

Do children have expectations regarding only harmful actions, or do they also hold expectations about other types of intragroup relations? Chalikh and Rhodes (2018) investigated whether children's expectations about category members extended beyond harmful actions to include other social obligations. In their study, Chalikh and Rhodes tested (a) harmful behaviors (e.g., stealing, hitting), (b) prosocial actions (e.g., sharing, hugging, helping), (c) friendship relations, and (d) saving behaviors. Similar to the above-mentioned studies, preschool children predicted above chance that harmful actions would be directed at the members of another social category. Regarding the other predictions, children, around 4 years old, expected members of the same social category to engage in friendship relations and saving behaviors, but not consistently in prosocial actions. This later result should be clarified in the light of Jin and Baillargeon's (2017) findings, who showed that 17-month-olds expected members of the same social category to help each other. These contradictory results might be explained by the difference in the type of prosocial behaviors tested: Whereas Jin and Baillargeon

only included helping behaviors, Chalikh and Rhodes (2018) tested multiple prosocial behaviors (such as hugging, sharing, and helping). Finally, a study conducted by Chalikh and Dunham (2020) revealed that expectations relative to social obligations were mediated by morality. In fact, Chalikh and Dunham found that 4- to 5-year-olds expected members of the same social category to demonstrate positive moral actions toward each other and to engage in negative moral actions toward another category. When actions were not morally laden, children provided no specific prediction. Altogether, this line of research revealed that, already from 17 months old, children predicted that members of the same social category should engage in positive moral behaviors.

A related line of research revealed that children expected individuals to conform to their social category. Roberts, Gelman, and Ho (2017) and Roberts, Ho, and Gelman (2017) investigated whether children drew prescriptive judgements after being exposed to a social category's regular behavior. More precisely, 4- to 13-years old children learned about the regular properties of two novel social categories. The information was provided with generic statements (e.g., "Hibbles eat these kind of berries"). Children were then invited to evaluate the behavior of a new category member, that either conformed to the social category or not. The study revealed that children between 4 and 13 years disapproved more of non-conforming individuals than conforming individuals (for similar findings, see Foster-Hanson et al., 2021). Riggs and Long (2020) provided further evidence that children (4–8 years old) viewed a behavior as a norm, when they observed a majority of members from the same social category demonstrating the same behavior. Interestingly, children in Riggs and Long's study also predicted that a norm implied that all members of a social category should demonstrate the same behavior. In addition, several studies demonstrated that children, around 4 years, generalized more norms than preferences to social category members (Kalish, 2012; Kalish & Lawson, 2008; Riggs et al., 2014). That is, children expected that another "Lissian" would conform to her social category when a property was introduced as a norm (e.g., "has to travel by train") but not as a preference (e.g., "likes to travel by train"). Hence, children, from 4 years of age, do not only view norms as prescriptive, but they also draw prescriptive judgements from observing regular behaviors.

But would children also infer a norm solely based on category membership, rather than on the regularity of the behavior? Roberts, Ho, and Gelman (2017) investigated the kinds of information, on which children of 4 and 9 years based their prescriptive judgements about category members. The authors tested four kinds of cues with which novel social categories were introduced to children: simple group presence (e.g., three individuals of each group was presented in the background), use of a label only (e.g., "this Hibble eats this kind of berries"), use of a label with a generic claim (e.g., "Hibbles eat this kind of berries"), or without any particular information (e.g., "This one eats this kind of berries"). The experimental design replicated Roberts, Gelman, and Ho (2017); children judged if the behavior of an individual was okay or not, depending on whether the individual acted in conformity with her category or not. The results revealed that using simple labels, presenting category members, or uttering generic statements led children to disapprove of the behavior of a non-conforming individual. Roberts, Ho, and Gelman (2017) nonetheless noted an important difference between younger (4–6-years-olds) and older children (7–9-years-olds): It is only when provided with generic statements that younger children disapproved of non-conformity above chance. From 7 years old, children can rely on non-linguistic cues to make deontic inferences about novel social categories, whereas younger children, in the absence of generic language, have difficulty inferring how social category members ought to behave.

3.4. Affective responses

Showing positive or negative affective responses toward a social category corresponds to having positive or negative attitudes, which can

subsequently serve as a basis for prejudices or even discrimination (Fiske & Taylor, 2013; Kurdi et al., 2019). According to researchers in the field of social identity, the mere act of categorizing people suffices to produce a preference for one's own group over any outgroup (Bigler & Liben, 2006; Over & McCall, 2018; Spelke & Kinzler, 2007; Tajfel, 1970). That is, simply assigning children to an arbitrary group (e.g., "the Greens") leads them to prefer and favor their own group over another group (Kinzler et al., 2010; Park & Judd, 2005; Skinner et al., 2020). Studies that induced ingroup and outgroup distinctions with minimal group paradigms are not presented here, as they constitute a broad area of research and would be beyond the scope of the present article (for reviews, see Dunham, 2018; Over & McCall, 2018). However, recent studies revealed that, without identifying themselves with a social group, children developed affective responses toward a social category by simply observing adults' nonverbal behaviors (Brey & Pauker, 2019; Eggleston et al., 2021; Over & McCall, 2018; Sherman et al., 2013). In fact, former research with real-world social categories found that children's affective attitudes were correlated with those of their parents (for a meta-analysis, see Degner & Dalege, 2013). This important conclusion inspired a new area of research interested in determining how one communicates about, or interacts with, a novel social category affects children's evaluations of this social category. Specifically, children might develop affective responses toward a social category by directly observing adults' behaviors or by (over-)hearing adults' testimonies (Shutts & Kalish, 2021; Skinner et al., 2020). The present section thus reviews studies that explored how explicit messages and nonverbal behaviors shape children's affective responses toward novel social categories.

Testimony allows one to acquire information without direct observation (Harris, 2012), and can also serve as a mean to learn about social agents (Dunbar, 2004). Some have thus argued that children can learn how to evaluate social agents based on verbal statements (Charlesworth et al., 2020; Lane et al., 2020). In fact, Skinner and Meltzoff (2019) conducted a systematic review on the factors influencing children's intergroup biases about real-world categories (such as age, race, weight, gender, disability, or ethnicity). Their review revealed that one factor in particular was associated with increased intergroup bias: negative messages about social categories. Similarly, studies using novel social categories showed that children acquired novel implicit attitudes after hearing detailed stories describing the valenced behaviors of social category members (e.g., "Lups are very nice. They listen to what their parents tell them to do, they clean their room, ..."; Gonzalez et al., 2017), but also after hearing a single evaluative statement about a novel social category (e.g., "Longfaces are good"; Charlesworth et al., 2020). Therefore, children's implicit attitudes can emerge from overt messages about social categories.

But one might argue that it is unlikely that adults would directly express evaluative statements about social categories. A new area of research started to determine whether children would also form positive and negative attitudes from overheard messages. Lane et al. (2020) tested this hypothesis by providing 4- to 9-year old children with negative information about a novel social category (e.g., "Those Gearoos are really bad people"). The information was either directly addressed to children or overheard as part of a phone conversation (between the experimenter and a fake interlocutor). Children, who heard negative information, both directly and by eavesdropping, were less willing to be friends with the negatively portrayed social category and evaluated this social category more negatively. These findings represent the first evidence that children are sensitive to overheard negative messages about social categories.

In addition, adults are likely to communicate their own positive and negative attitudes through nonverbal behaviors. Several studies first explored the extent to which positive and negative nonverbal behaviors, demonstrated by an adult toward a specific individual – not associated to a social category – would influence children's evaluation of the individual (e.g., Brey & Pauker, 2019; Brey & Shutts, 2018; de Rosnay et al.,

2006; Skinner et al., 2017). Those former studies revealed that children were sensitive to adults' nonverbal behaviors when evaluating other people. Furthermore, Skinner et al. (2017) found that 4–5-year old children, after observing an adult's positive and negative nonverbal behaviors toward two individuals, showed a preference for the target of positive nonverbal behaviors, as well as the target's closest friend. This finding suggests that children acquired attitudes via nonverbal behaviors and that they generalized those attitudes to other individuals based on friendship relations (for similar findings, see Eggleston et al., 2021). In a subsequent study, Skinner et al. (2020) assessed whether children would generalize their attitudes to other individuals based on social category membership. In this study, preschool-aged children were introduced to two novel social categories and observed a neutral individual acting positively toward one social category member and negatively toward one member of another social category. Children again preferred the individual for which positive nonverbal behaviors were demonstrated, and this preference extended to the whole social category. Skinner et al.'s (2020) study provides evidence that exposure to valenced nonverbal behaviors toward a single category member can lead children to prefer a social category over another. Thus, nonverbal behaviors might play a crucial role in how children develop positive and negative attitudes toward social categories, especially because emotional reactions are pervasive and difficult to control (Clément & Dukes, 2017; Weisbuch & Ambady, 2008). Children might inevitably be exposed to and spot these nonverbal signals in their everyday life, and in turn use them to evaluate social agents.

4. Summary and propositions for future studies

Social categorization involves two crucial processes: Children first learn to form social categories and then, based on social category membership, children make inferences about, and develop affective responses toward category members (Baron, 2009; Baron et al., 2014; Over & McCall, 2018; Shutts & Kalish, 2021). This final section articulates how different types of cues to introduce novel social categories influence children's categorization of, and inferences about social categories. Opportunities for future research are also proposed.

4.1. Going beyond linguistic cues

From the research reviewed in this article, it seems that linguistic cues prevail over visual cues both on children's learning of, and inferences about novel social categories. This is somewhat contradictory with the proposition that visual cues should very early serve as a basis for the detection of social categories because they require a minimum of effort (Kinzler et al., 2010). These findings also contradict research in the animal domain showing that, without label, children tend to categorize animals and make inferences about animals based on their similar appearances (see for e.g., Davidson & Gelman, 1990; Diesendruck et al., 1998; Diesendruck & Peretz, 2013; Gelman & Coley, 1990; Jaswal & Markman, 2007; Sloutsky et al., 2007). A possible explanation might be that most of the visual cues employed in the studies reviewed here were too artificial to signal social category membership, as they consisted mostly of clothing style or clothing colors (except for Baron et al.'s (2014) study that used intrinsic properties, namely skin color, see Table 1). In fact, from an evolutionary perspective, other cues would be more informative than clothing, such as language, ritualistic behaviors, psychological traits, and group entitativity (Liberman et al., 2017; Liu et al., 2007; Sherman et al., 2013). Moreover, past research suggests that the degree to which a category is essentialized mediates whether children rely on visual cues to determine category membership (Diesendruck & Weiss, 2015). To date, visual cues were mainly employed to help children keep track of social categories during the experimental manipulation and were not necessarily considered *per se* as cues on which children would rely to identify and make inferences about novel social categories. Future studies could thus vary the extent to which

novel social categories are essentialized and employ more informative perceptual cues alone and in combination with linguistic cues. This would help to better understand whether linguistic cues constitute indeed a privileged means of learning and making inferences about novel social categories.

Surprisingly, although theoretical accounts propose that children attend to behavioral regularities in their environment to identify social categories (Bigler & Liben, 2006; Oakes et al., 2009; Park & Hastie, 1987; Sherman et al., 2013), this possibility has rarely been addressed in experimental research. Besides, the current field of research reached divergent conclusions: While Riggs (2019) found that children relied on perceived behavioral regularities to make inferences about novel social categories, Hoicka et al. (2021) showed that children needed additional linguistic cues. There is thus a clear need for research on this topic, and future studies should investigate how observed regularities shape children's representations of social categories. For example, would children assume that, if a majority of individuals demonstrate the same property, these individuals belong to the same social category? Would children need to observe the property in 5, 10, 20 or more social category members? (The actual state of research only tested behaviors that occurred 100 % of the time among 3 to 4 category members). What other inferences would children draw from observing regularities? Determining whether children learn about social categories based on the regularities they observe in their environment represents a great opportunity to tackle the possible role of contextual factors on children's acquisition of stereotypes.

4.2. Opening ways to study the acquisition of essentialist beliefs

Generic claims and noun labels (e.g., "She is a carrot-eater") have also been documented to play an important role in the development of essentialist beliefs (Gelman & Heyman, 1999; Leshin et al., 2021; Markman, 1989; Rhodes & Baron, 2019; Walton & Banaji, 2004). The studies reviewed in this article revealed that children, from 4 years of age, hold essentialist beliefs about novel social categories when the later were introduced with generic claims (but not with high proportion quantifiers). Moreover, recent studies showed that children allocated fewer resources to essentialized social categories (i.e., social categories introduced with generic claims) compared to categories that were not essentialized (i.e., introduced with specific language) (Leshin et al., 2021; Rhodes, Leslie, Saunders, et al., 2018). These studies extend previous findings: While previous research using minimal group paradigms showed that children allocate more resources to their in-group in comparison to an out-group (see for e.g., Benozio & Diesendruck, 2015; Dunham et al., 2011; Plötner et al., 2015), Leshin et al.'s (2021) and Rhodes, Leslie, Saunders, et al.'s (2018) studies revealed that children tend to refrain from allocating resources to essentialized categories. Altogether, there is considerable evidence that generic language fosters essentialist beliefs.

Yet, this general conclusion should be nuanced. Essentialist beliefs have been traditionally assessed as part of a composite score that collapses various measures of essentialism, including inheritance, causality, and induction inferences (Leshin et al., 2021). Taken separately, however, essentialist belief measures yielded contrasting results. Whereas generic claims led children to infer a property as inflexible (Leshin et al., 2021), broadly generalizable (Foster-Hanson et al., 2019), and caused by category membership (Cimpian & Markman, 2011; Leshin et al., 2021; Rhodes et al., 2012; Rhodes, Leslie, Saunders, et al., 2018), generics did not necessarily lead children to assume that a property was inherited (Foster-Hanson et al., 2019; Hoicka et al., 2021). Please note however, that school-aged children assumed that *biological* properties were inherited when presented with generic descriptions (Noyes & Keil, 2020). The current state of research thus seems to suggest that generics foster some types of essentialist beliefs rather than essentialist thinking in general. Future research on essentialist beliefs could clarify this possibility.

Multiple studies also showed that specific cultural factors can be responsible for the development of social essentialism. Until recently, generic language was predominantly studied as a way by which children develop essentialist beliefs. In fact, generic language constitutes a privileged cultural input that guides children's acquisition of essentialist beliefs, not only because they are understood as "communicating non-accidental generalizations," (Rhodes et al., 2012, p. 13527) but also because they appear in 3–4 % of parent-child exchanges (Gelman et al., 2008). However, a new area of research started to propose that other factors can foster social essentialism, such as explanations pertaining to the origin of social categories (Foster-Hanson & Rhodes, 2020), information regarding the social category's deep and intrinsic properties (Diesendruck & Weiss, 2015), personal motivational factors, such as the need to belong (Diesendruck, 2021), or the existence of segregation and social hierarchies (Rhodes et al., 2012; Rhodes, Leslie, Saunders, et al., 2018). Crucially, social essentialism can have serious implications: People holding essentialist beliefs assume that differences between social categories are due to some intrinsic and inflexible causes rather than to external and contextual factors (Cimpian & Salomon, 2014; Rhodes, Leslie, Saunders, et al., 2018; Salomon & Cimpian, 2014). As such, people who apply essentialist beliefs to social categories are more likely to accept social differences and inequalities and tend to disregard information about an individual (Cimpian & Salomon, 2014; Foster-Hanson & Rhodes, 2020; Rhodes, Leslie, Saunders, et al., 2018; Shutts & Kalish, 2021). In an endeavor to better understand the origins of negative intergroup biases, future studies should thus investigate under which circumstances children develop essentialist beliefs.

4.3. Exploring the development of affective responses toward social categories

Recent studies explored how children ascribe affective responses to social categories. Studies assessing the impact of direct or overheard messages introduced novel social categories with linguistic cues, namely labels and generic language (for e.g., "Longfaces are bad"; Charlesworth et al., 2020; Gonzalez et al., 2017; Lane et al., 2020). To date, only one study assessed the effect of positive and negative nonverbal behaviors on children's evaluations of novel social categories, marked with minimal visual cues (Skinner et al., 2020). This later study suggests that children might generalize affective responses to social category members even when their category membership is signaled with minimal cues.

The studies reviewed here focused mainly on the effects of others' emotions and testimony on children's development of affective responses toward novel social categories (Charlesworth et al., 2020; Gonzalez et al., 2017; Lane et al., 2020; Skinner et al., 2020). Yet, affective responses toward a social category can also be related to the kinds of properties that are associated with a social category (e.g., disliking a social category because it is thought to be lazy) (Shutts & Kalish, 2021). As argued in the Introduction, associating properties to social category members corresponds to forming stereotypes. If those properties are viewed as positive or negative, then stereotypes take on an affective aspect and become a source of positive or negative attitudes toward a social category (Allport, 1954). For instance, it is possible that a child who learns that a social category is generous, would more likely prefer and engage in friendship relations with this social category than with a social category depicted as stinky. Research on intergroup bias could thus benefit from future research on how valenced properties, and especially valenced psychological traits, might impact children's affective responses toward novel social categories.

5. Conclusion

The present article aimed to present the actual state of research in developmental psychology that investigates how children learn and make inferences about novel social categories. By delineating how specific cues to introduce social categories lead to different types of

inferences, this article provides some key insights on the way children might develop stereotypes, positive and negative attitudes, as well as intergroup biases. In the future, researchers should keep on using novel social categories in their experimental designs, because using novel social categories has the advantage of shedding light on general principles of social categorization, that are not tied to a specific cultural background. Studies with novel social categories offer a unique opportunity to compare and replicate findings across cultural contexts and to possibly identify universal conditions under which children learn and make inferences about social categories.

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