Received: 10 January 2020 | Revised: 14 July 2021 | Accepted: 26 September 2021

DOI: 10.1111/desc.13206

Developmental Science WILEY

PAPER

Adults' pedagogical messages engender children's preference for self-resembling others

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Abstract

These studies investigate the influence of adults' explicit attention to commonalities of appearance on children's preference for individuals resembling themselves. Three findings emerged: (1) An adult's identification of two dolls' respective similarity to and difference from the child led 3-year-olds to prefer the similar doll (study 1, $n = 32$). (2) When the adult did not comment on similarity, children age 6 years but not younger preferred physically similar individuals (study 2, $n = 68$), suggesting that a spontaneous preference for physically similar others does not emerge before school age. (3) Four- but not 3-year-olds generalized an adult's pedagogical cues about similarity, leading them to prefer a self-resembling doll in a new context (study 3, $n = 80$). These findings collectively suggest that the preference for individuals resembling ourselves develops through a process of internalizing adults' attention to, and messages about, similarities of appearance.

KEYWORDS
cognitive development, preferences, similarity, social cognition, social development

1 | INTRODUCTION

Homophily—our love of the similar—guides predictions about affiliation and social connectedness across many dimensions (McPherson et al., 2001), both in children and adults (Johnson, 1989; Jordan & Dunham, 2021; Singh, 1973; Yeong Tan & Singh, 1995). Self-other similarity strongly influences liking and trust (DeBruine, 2002): Shared attitudes (Byrne & Nelson, 1965), activities (Werner & Parmelee, 1979), personality traits (Klohnen & Luo, 2003), and even motor behaviors (Chartrand & Bargh, 1999; LaFrance, 1979) increase initial attraction and promote social smoothness. Some of these preferences appear early in development; for instance, attraction to those with similar attitudes emerges in preverbal infants (Mahajan & Wynn, 2012) and is pronounced by middle childhood (Erwin, 1985).

Appearance similarity also influences social preferences (Bailenson et al., 2008; Bressan & Zucchi, 2009; DeBruine, 2002; DeBruine, 2004; Kocsor et al., 2011). However, studies examining the origins of this link are few: In one, 5-year-olds preferred photographs of faces subtly resembling them (Richter et al., 2016); in another, 3-year-olds preferred a self-resembling doll when an experimenter highlighted one doll's similarity to and another's difference from the child based on perceptible physical traits (Fawcett & Markson, 2010). Interestingly, preschool-age children do not uniformly prefer self-resemblance: For example, children between the ages of 3–5 years and of ranging skin colors identify with and prefer lighter-hued individuals (Clark & Clark, 1940; Johnson, 1992; Powell-Hopson & Hopson, 1988; Shutts et al., 2011), which suggests the impact of societal factors on their preferences. This raises an interesting question: Might adults' social messages drive the development of physical trait similarity preference?

The present experiments explore the age that children begin to spontaneously prefer self-resemblance, and the role that adults' messages about similarity play in the emergence of this preference. Prior

work demonstrates ingroup favoritism among 3–5-year-old children following adults' verbal highlighting of visually marked peer groups (Patterson & Bigler, 2006). And outgroup disfavor among children ages 4–9 years increases when adults supply negative messages about novel groups, with such effects strengthening with age (Conder & Lane, 2021; Lane et al., 2020). Here we hypothesized that adults' explicit messages about similarity/difference facilitate young children's preference for similar others.

1.1 | The studies

Study 1 examined children's preferences for self-resembling dolls with and without adults' explicit remarking on resemblance. We tested 3-year-old children to conceptually replicate an appearance-based homophily preference using the same age group that Fawcett and Markson tested (2010). Our study 2 motivation was twofold: we tested a new group of 3–6-year-olds to (1) rule out the possibility of performance-based failure among 3-year-olds in study 1 in the absence of explicit commentary on similarity or difference, and (2) pinpoint the age at which children spontaneously prefer a self-resembling doll when an adult only provides implicit commentary on similarity and difference. Finally, study 3 assessed the breadth of influence of explicit similarity remarks among 3- and 4-year-olds: Specifically, whether adults' comments about similarity along one dimension influence children's preference for those resembling themselves along another dimension.

2 | STUDY 1

Study 1 examined the impact of adults' similarity messages on 3-year-olds' preferences for self-resembling others. Following the design of Fawcett and Markson (2010), in one condition an experimenter overtly identified two dolls' physical traits as respectively similar to and different from those of the child. Our study differed from theirs in several key respects. First, we elected to manipulate two stable physical traits, hair and eye color, rather than hair and shirt color, as children in the original study showed stronger homophily preferences for the stable as opposed to the transient trait. We also expanded the shade range to capture more variation along the trait dimensions. We modified the procedure so that the experimenter who asked children about their preferences differed from the one who provided them with information about their physical traits. This was to undermine the interpretation that the experimenter expected children to respond in a particular way.

In another condition, the experimenter merely provided labels for the dolls' traits without explicitly stating which doll was the same and which doll was different. Adding this condition allowed us to assess the relative influence of explicit verbal messages on children's homophily preference.

2.1 | Method

Participants were 32 3-year-olds (implicit condition: $n = 16$; eight female, M_{age} 3;6, range 3;0–3;11; explicit condition: $n = 16$, eight female, M_{age} 3;6, range 3;0–3;11), exposed to English at least 50% of the time (based on parent report). For all studies, we recruited participants from the New Haven area. We elected to test 32 participants based on pilot testing; this sample is of comparable size to that of related work (e.g., Fawcett & Markson, 2010).[1] We excluded and replaced four additional participants from analyses for responding incorrectly to the first comprehension question ($n = 1$), failure to make a final choice ($n = 1$), experimenter error ($n = 1$), and parent interference during choice ($n = 1$). We did not collect data on participants' race or family income; however, given the demographic profiles of our participant database and testing sites we believe most participants were white and from middle-income families. Parents provided written, informed consent, and each child provided verbal assent to participate. (See Supplemental Method & Results for details on our exclusion criteria).

RESEARCH HIGHLIGHTS

- These studies investigate the influence of adults' explicit attention to commonalities of appearance on children's preference for individuals resembling themselves.
- An adult's identification of two dolls' respective similarity to and difference from the child led 3-year-olds to prefer the similar doll.
- Only by age 6 years did children spontaneously prefer physically similar individuals.
- Four- but not three-year-olds generalized an adult's pedagogical cues about similarity, leading them to prefer a self-resembling doll in a new context.

Materials and design. We randomly assigned participants to the *explicit* ($n = 16$) or the *implicit* ($n = 16$) condition. All participants viewed two gender-matched dolls (girls had long hair; boys had short hair): The hair and eye colors of one doll closely matched the participant's, while those of the other doll differed noticeably from the participant's; dolls were identical in all other respects. To ensure this, prior to testing, parents viewed a chart depicting four hair and eye shades, indicated which best matched their child's features, and provided descriptive color labels for their child's features (see Table S1 for participants' hair and eye shades and Figure S1 for the color chart). The different doll had features two shades away from the participant's own (Figure 1).

2.2 | Procedure

Doll introduction. The two dolls sat beside each other on a stand located across the table from the participant, and experimenter 1 (henceforth, E1) introduced them to the child naming their hair and eye colors using the labels provided by the child's parent for the similar doll and the labels we assigned to each shade for the different doll.

[1] See Supplemental Method and Results for power analysis.

FIGURE 1 An example doll stimuli pair with hair and eye colors of one "blonde" and four "dark brown," respectively (left); and three "light brown" and two "green," respectively (right)

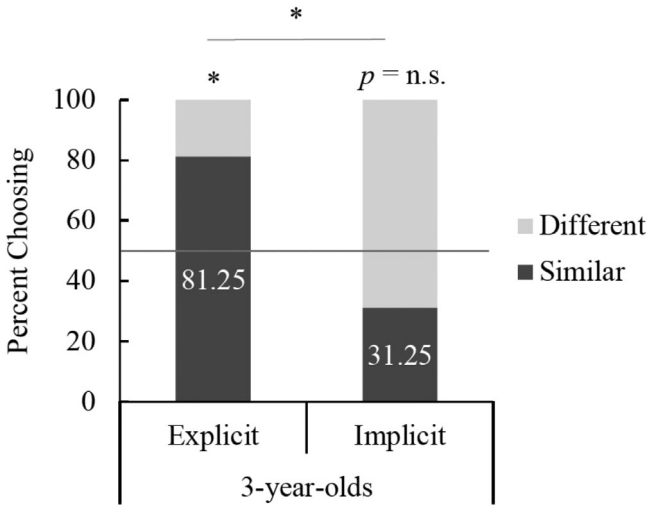

FIGURE 2 The percentage of children choosing the similar and different dolls in study 1. In the explicit condition, 3-year-old children selected the similar doll at above-chance levels (50%) (*$p < 0.05$, binomial test) and to a significantly greater extent than children in the implicit condition (*$p < 0.05$), who chose at chance levels ($p > 0.05$, binomial test)

In the *explicit condition*, E1 not only named the dolls' hair and eye colors but explicitly identified them as similar to or different from the child's own: for example, "See her hair? < *pointing to similar doll* > It's blond, just like your hair." "See her hair? < *pointing to different doll* > It's light brown, different from your hair."

In the *implicit condition* E1 named the dolls' hair and eye colors but did not compare them to those of the child (see Supplemental Materials for full scripts). We counterbalanced the dolls' side position and introduction order.

Comprehension questions (2). Afterward, E1 asked the child two comprehension questions to ensure that the child had attended to and remembered the information given in the doll introduction phase just prior to making their choice. In the *explicit condition* E1 asked the child to identify the doll similar to and different from them, that is, "Which one has the same hair and eyes as you?" "Which doll has different hair and eyes than you?" In the *implicit condition* E1 asked the child to identify the dolls according to their trait colors, for example, "Which one has blond hair and blue eyes?" "Which one has brown hair and brown eyes?" For all studies, we counterbalanced question order. E1 asked each question up to three times until the participant provided a clear, visually-guided point toward a doll. She then exited the room.

Choice. To preclude any pragmatic implications that might carry over from the Doll Introduction phase (e.g., that E1 wanted the participant to select the similar doll), a second experimenter (henceforth, E2), unaware of the participants' condition assignment, conducted the Choice procedure. E2 entered the room, sat across the table from the participant and asked: "Which one do you want to play with?" while pushing the two dolls towards the participant. For all studies presented here, we considered a valid choice to be a visually-guided touch of one of the two dolls. E2 repeated the question if necessary, asking it up to three times until the child made a valid choice, or until 60 seconds elapsed.

Follow-Up questions (3). After the Choice procedure, E2 asked: "Why did you pick that one?" (If a participant failed to choose a preferred doll, E2 skipped this question.) E2 then asked two post-choice memory questions (in counterbalanced order), asking the child "Which one has the *same* hair and eyes as you?", and "Which one has *different* hair and eyes than you?". These questions assessed whether children were aware of the similarity and difference information at the end of the procedure.[2]

2.3 | Results

For all studies, we excluded and replaced participants who failed to do any of the following: make a doll choice, respond to the first comprehension question, or respond to the first comprehension question correctly. This was to ensure that we only included children who remembered the critical information from the doll introduction just prior to making their choice. We analyzed participants' choice data using a two-tailed binomial test for each group: 13 of 16 3-year-olds selected the similar doll in the *explicit condition*, $p = 0.021$, relative risk = 1.63, while only five of 16 did so in the *implicit condition*, $p = 0.210$. These patterns of preference differed significantly across the two conditions, χ^2 (1, $N = 32$) = 6.22, $p = 0.013$, Wald's odds ratio = 9.53 (Figure 2). (See Supplemental Results for analyses of the Follow-up Questions and participants' doll preferences based on light vs. dark traits).

These results suggest that preferences for those who share one's physical traits are (i) present by the fourth year of life, and (ii) are likely due to adults' explicit messaging about similarity and difference—a point we return to in study 3.

[2] For studies 1 and 3 we analyzed choice data from only children who responded to the first post-choice comprehension question correctly; these analyses resulted in statistically comparable response patterns to those reported here (see Supplemental Method and Results).

2.4 | Discussion

Adults' overt highlighting of two dolls' respective similarities to and differences from participants elicited a reliable similarity-of-appearance preference. Without explicit similar/different comparison children showed no such preference, suggesting that self-resemblance preferences require adult input to emerge.

Importantly, the experimenter treated both dolls identically, and never told children the similar doll was "better" or preferable. Children's self-resemblance preference when given explicit similarity/difference messaging indicates a readiness to identify *similar* along a given dimension as preferable to *different* when an adult verbally highlights the distinction.

Before making firm conclusions, however, we must rule out the possibility of performance-based failure. It is possible that the 3-year-olds in our implicit condition lacked the information needed to determine which doll was similar or different prior to choosing a doll to play with, specifically they may have lacked labels for their own traits in addition to the dolls' traits. And our initial comprehension questions only allowed us to assess whether these children knew the dolls' trait labels, but not their own. Children in the implicit condition also struggled to accurately identify which doll was similar and different during the follow-up questions (see Supplemental Results). If these children did not know (or recall) their hair and eye colors, they would have insufficient information to compute their similarity to each doll, and thus would be unable to reveal an underlying similarity preference. Study 2 addresses these concerns. Finally, we tested a wider age range to determine when in development children come to value similarity of appearance.

3 | STUDY 2

To ensure that participants had sufficient information to compute their similarity to each doll, we told children their own trait colors prior to introducing each of the dolls. We also expanded our age range to pinpoint when in development children spontaneously prefer self-resembling others in the absence of similarity input, as studies of developmental populations above age 3 and adults (DeBruine, 2002; Richter, Tiddeman & Haun, 2016) have found evidence of appearance-based homophily in the absence of explicit messaging.

3.1 | Method

Participants were a new group of 68 3- to 6-year-old children (3-year-olds: $n = 17$, nine female, M_{age} 3;6, range 3;0–3;11; 4-year-olds: $n = 17$, 10 female, M_{age} 4;7, range 4;5–4;11; 5-year-olds: $n = 16$, nine female, M_{age} 5;5, range 5;0–5;11; 6-year-olds: $n = 18$, eight female, M_{age} 6;5, range 6;0–6;11). We elected to run 16 participants per cell; however, we included data from four additional participants tested by accident.[3]

[3] Analyses containing only the first 64 observations resulted in statistically comparable patterns (see Supplemental Method & Results).

We excluded and replaced four additional 3-year-old children due to failure to respond ($n = 1$) or incorrect response to the first comprehension question ($n = 1$), and failure to make a choice at test ($n = 2$). We excluded and replaced a 4-year-old child due to an incorrect response to the first comprehension question, two 5-year-old children due to failure to make a choice at test and experimenter error, respectively, and a 6-year-old child because the parent discussed the hair and eye color chart with the child extensively prior to the experiment.

Materials and design. We tested all participants in a *modified implicit condition*, modeled after the implicit condition of study 1, in which E1 provided the child with his or her own trait labels prior to the doll introduction by E2. Importantly, we never commented on the dolls' similarity to/difference from the child. We had separate experimenters provide information about the participant's and dolls' trait colors, respectively, to eliminate any pragmatic implication that an adult was comparing the child's traits to those of the dolls, which might have occurred if a single experimenter had provided all of the information.

3.2 | Procedure

Trait introduction. We used an identical procedure to study 1 except for the following: E1 provided trait labels to each child at the beginning of the task, for example, "Guess what color hair you have; it's black." Although E1 positioned the similar and different dolls across from the participant prior to this, E1 never mentioned, motioned toward, or looked toward either doll. Afterward, E1 exited the room.

Doll Introduction and comprehension questions. E2 entered, and (exactly as in the implicit condition of study 1) made no comment on either doll's similarity to or difference from the child, but merely provided each doll's trait labels and asked our two comprehension questions: "Which one has (e.g.) blond hair and blue eyes?" "Which one has (e.g.) brown hair and brown eyes?". E2 was unaware that E1 labeled the child's hair and eye colors, and of the hypothesis that children's knowledge of their own hair and eye colors might influence their preference; thus, E2 had no basis for expecting that children might respond differently in this study than in experiment 1.

Choice and follow-up questions. E2 then administered the Choice, asking children which doll they preferred.

After the choice offering, E2 asked children two sets of questions: first, if they could state their own hair and eye colors, and second, if they could point to which of the of the two dolls had similar/different traits. The purpose of these additional questions was to ensure that children retained the labels that E1 provided them with prior to the doll show. Finally, she asked the follow-up similarity/difference comprehension questions as in study 1.

3.3 | Results

Choice. We analyzed participants' choice data using a two-tailed binomial test for each group. Only the 6-year-olds preferred the self-resembling doll (15 of 18, $p = 0.008$, relative risk = 1.67). The

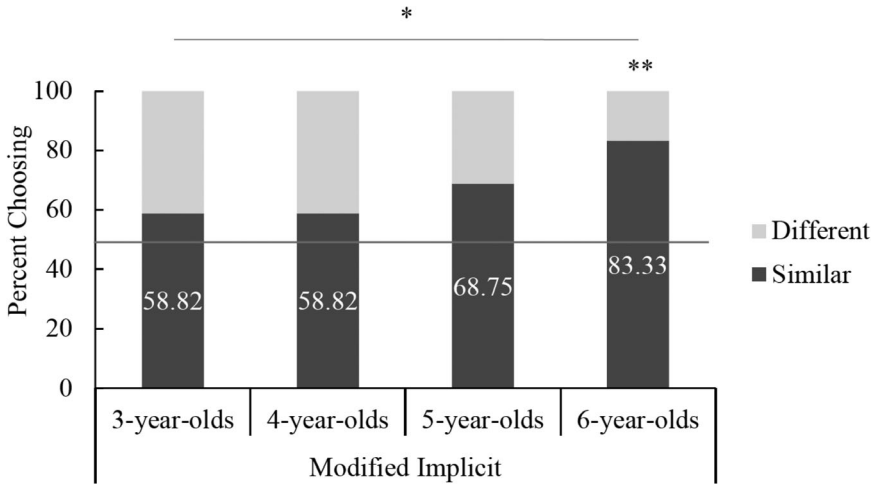

FIGURE 3 The percentage of children choosing the similar and different dolls in the modified implicit condition of study 2. Children's tendency to select the similar doll increased with age (*$p < 0.05$, Mann-Kendall test), and by age 6 years, children selected the similar doll at above-chance levels (50%) (**$p < 0.01$, binomial test)

proportion of children selecting the self-resembling doll did not differ from chance for the 3-year-olds (10 of 17), 4-year-olds (10 of 17), or 5-year-olds (11 of 16) ($p = 0.629$, 0.629, and 0.210, respectively). A Mann-Kendall test indicated that children's tendency to select the self-resembling doll increased with age, $\tau = .226$, df = 3, $p = 0.043$, two-tailed (Figure 3) (See Supplemental Results for analyses of the Follow-up questions and participants' doll preferences based on light vs. dark traits).

3.4 | Discussion

We investigated the age at which children spontaneously exhibit preferences for self-resembling others by having one adult provide children's trait colors before a different adult introduced two dolls and stated their trait colors. Six-year-olds spontaneously recruited this information to inform their preferences; younger children did not. With our findings from study 1 these results suggest that younger children's preferences for similar-appearing others is based on a readiness to identify similar as "better" or preferential to different—but only in situations in which adults attend to, and remark upon, resemblance along specific traits.

4 | STUDY 3

Here we turn our attention to two alternative explanations of why similarity messages guided preschoolers' preferences in study 1. Prior work shows that homophily effects emerge when specific instances of self-other similarity are made salient (e.g., Leonardelli & Brewer, 2001; Mahajan & Wynn, 2012; Mullen et al., 1992). The explicit statements made salient to children that one doll shared their traits while the other did not; this salience, combined with a readiness to value similarity over difference, may have been sufficient to induce self-resemblance preference. We call this the *salience hypothesis*.

Another possibility is the *pedagogical hypothesis*—that children interpreted E1's comments as *intentionally instructive*. Even prevertbal infants are sensitive to pedagogical cues (e.g., Csibra & Gergely, 2006; Csibra & Gergely, 2009)—that an adult is intentionally conveying important, generalizable information—and these cues guide toddlers' learning and inductive generalization (e.g., Butler & Tomasello, 2016). In the explicit condition of study 1, E1 (a) spoke looking directly to the child, (b) pointed to each doll, and (c) made explicit assertions of fact (regarding the dolls' respective similarity to and difference from the child). These are hallmark behaviors that elicit pedagogical-learning stance in infants and children (Csibra & Gergely, 2009; Grassmann & Tomasello, 2010; Tomasello & Farrar, 1986).

Experiments 3a and 3b test these two alternatives. In the *salience-only experiment, 3a*, we made similarity and difference salient while omitting strong pedagogical cues: rather than *instructing* participants about which doll was similar/different, E1 *asked* participants about this, making salient children's explicit identification of the similar and different dolls without asserting it pedagogically. The salience hypothesis thus predicts that children will favor similarity in this experiment, while the pedagogical hypothesis predicts no such preference, as E1 does not teach participants the critical information.

The *generalization-only experiment, 3b*, builds on the phenomenon that children selectively treat pedagogically acquired information as generalizable. Accordingly, we asked whether children would generalize pedagogically provided information, conveying the importance of self-resemblance, to a new context. Specifically, E1 explicitly identified two dolls' resemblance to and difference from the child in a specific respect; afterward, E2 assessed children's spontaneous preference for a similar-appearing doll *in a different respect*. If the pedagogical hypothesis is correct, this should support an inference of the following sort: "E1 is intentionally noting that A resembles me while B differs. Thus, she is conveying that appearance similarity and difference are important," leading children to generalize the importance of self-resemblance to other individuals, and along other dimensions than those highlighted in the initial learning context.

There is a noteworthy age development: While even infants show heightened learning in the presence of pedagogical cues, children's ability to *generalize* pedagogical information to new contexts shows extended development; it is robust by age 4 years, but unreliable at

TABLE 1 Study 3: Hypotheses and results

Will children prefer the similar doll? As predicted by the salience & pedagogical accounts				
	Salience-only exp. (3a)		Generalization-only exp. (3b)	
	3-year-olds	4-year-olds	3-year-olds	4-year-olds
Salience account	Yes	Yes	No	No
Pedagogical account	No	No	?	Yes
Our results	No	No	No	Yes

Note. Experiment predictions by account and findings for study 3.

younger ages (Butler & Markman, 2012; Butler & Markman, 2016). This development constrains the predictions of the pedagogical hypothesis: It strongly predicts generalization in 4-year-olds but is agnostic about 3-year-olds' performance. In contrast, the salience hypothesis predicts that children of both ages choose at chance, given that the new dolls' similarities/differences have not been made salient (See Table 1).

Thus, the following studies help to adjudicate between these two explanations for children's similarity preference in study 1.

4.1 | Method

Participants were a new group of 80 3- and 4-year-old children (3-year-olds, salience-only: $n = 16$, 11 female, M_{age} 3;4; range 3;0–3;11; 4-year-olds, salience-only: $n = 18$, seven female, M_{age} 4;7; range 4;0–4;11; 3-year-olds, generalization-only: $n = 22$, 10 female, M_{age} 3;7; range 3;2–3;11; 4-year-olds, generalization-only: $n = 44$, 13 female, M_{age} 4;7; range 4;0–4;11). We elected to run participants until we reached a minimum of 16 per cell. We excluded and replaced 24 additional 3-year-old children who were excluded due to failure to answer the first comprehension question ($n = 5$), an incorrect response to the first comprehension question ($n = 16$), failure to make a choice at test ($n = 1$), and experimenter error ($n = 2$). We excluded and replaced 12 additional 4-year-old children who were excluded due to failure to answer the first comprehension question ($n = 1$), an incorrect response to the first comprehension question ($n = 9$), failure to make a choice at test ($n = 1$), and experimenter error ($n = 1$).

Materials and design. In addition to the stimuli from study 1, we used two colors of scarves (orange and yellow) and bracelets (red and purple).

We randomly assigned participants to one of two experiments. In the *salience-only experiment*, E1 asked participants which of the two dolls had the same or different hair and eye colors as their own before E2 administered the choice procedure. In the *generalization-only experiment*, E1 provided explicit information about which of two dolls was similar to and different from the child with respect to possessions—scarf and bracelet colors, rather than traits—hair and eye colors.

Salience-only (*experiment 3a*):

Doll introduction and comprehension questions. E1 stated each dolls' hair and eye colors without mentioning similarity or difference. Afterward, E1 asked the child our two comprehension questions: "Which one has the same (different) hair and eyes as you do (than you do)?"

Generalization-only (*experiment 3b*):

Item selection. E1 showed the child two scarves (yellow and orange) and two bracelets (purple and red) in turn, asking which of each they preferred, and then placed the indicated bracelet on the child's wrist and the scarf around their neck, telling the child (e.g.) "This is your scarf."

Doll set A introduction and comprehension questions. E1 then revealed one doll with an identical scarf and bracelet to the participant's and another with a scarf and bracelet of the other colors. Both dolls' hair and eye colors differed from the participant's traits. E1 introduced each doll's scarf and bracelet colors explicitly: "See her scarf? It's (e.g.) orange, just like your scarf." She then asked two comprehension questions about which doll had similar and different scarf and bracelet colors, before removing the dolls and items from the participant's view.

Doll Set B introduction & comprehension questions. Next, E1 presented two new dolls, one matching the participant in hair and eye color, the other differing. E1 introduced the dolls as in the implicit condition of study 1, stating their hair and eye color but not mentioning similarity to or difference from the child. Before exiting the room she asked the participant to identify the doll with each set of hair and eye colors.

Choice and follow-up questions. Finally, for each of the two experiments (3a and 3b) E2 presented the Choice and Follow-up Questions, as in study 1.

4.2 | Results

Choice. We analyzed participants' choice data using a two-tailed binomial test for each group. In the *salience-only experiment*, 3- and 4-year-olds showed no preference: Seven of 16 3-year-olds and 11 of 18 4-year-olds selected the similar doll ($p = 0.804$ and .481, respectively); performance did not differ between the two age groups, χ^2 (1, $N = 34$) = 0.446, $p = 0.504$. Participants' lack of preference was not due to a failure to compute which doll resembled them: 75.75% of these children correctly identified the similar/different doll in the Follow-up Questions (see supplemental results for analyses of the follow-up questions and participants' doll preferences based on light vs. dark traits). Of these children who responded correctly only six of 10 3-year-olds and eight of 15 4-year-olds selected the similar doll ($p = 0.754$ and 1.00, respectively). This pattern conflicts with the predictions of the salience hypothesis and matches those of the pedagogical hypothesis.

In the *generalization-only experiment*, as predicted by the pedagogical hypothesis and less consistent with the predictions of the salience hypothesis, 4-year-olds significantly preferred the self-resembling doll (19 of 24, $p = 0.007$, relative risk = 1.58). Only eight of 22 3-year-olds did so, not different from chance ($p = 0.286$, two-tailed). Performance across the two age groups differed significantly, χ^2 (1, $N = 46$) = 6.99, $p = 0.008$, Wald's odds ratio = 6.65 (Figure 4).

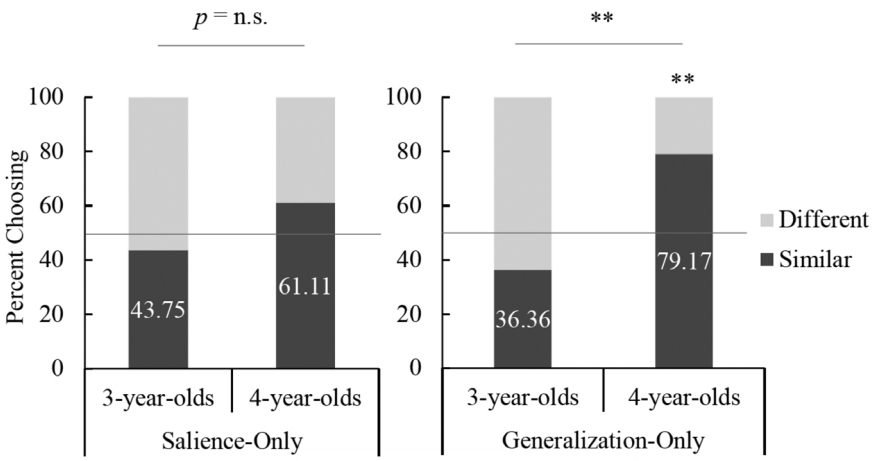

FIGURE 4 The percentage of children choosing the similar and different dolls in Study 3. In the salience-only experiment, both age groups performed at chance (50%). In the generalization-only experiment, 4-year-old children selected the similar doll at above-chance levels (**$p < 0.01$, binomial test) and to a significantly greater extent than 3-year-old children (**$p < 0.01$, Chi-square test), who chose at chance levels ($p > 0.05$, binomial test).

4.3 | Discussion

Results from the generalization-only experiment confirm the predictions of the pedagogical hypothesis. By age 4 children generalized adults' messages conveying the importance of shared accessories to infer the importance of shared physical traits, which led them to select a self-resembling doll. We did not observe generalization among 3-year-old children likely due to their less developed ability to generalize pedagogically provided information (e.g., Butler & Markman, 2012, 2016). Given our high exclusion rates based on comprehension question performance, it is also worth noting the possibility that the task may have been more difficult for children, especially 3-year-olds. Nevertheless, children of both age groups performed comparably on the follow-up questions, which suggests that performance differences between the two age groups were not due to a lack of task understanding among the youngest children.

Results from the salience-only experiment are less consistent with the salience hypothesis: even though children robustly identified the similar/dissimilar dolls—confirming that the information was salient—this similarity computation did not engender a preference for either doll. While we do advise caution in the interpretation of null findings we believe that study 3's results support the pedagogical account of children's appearance-based social preferences given the positive results from the generalization experiment.

5 | GENERAL DISCUSSION

Collectively, our studies provide initial evidence that adults' messaging is a key component in the development of children's preference for similar-appearing others. Our findings suggest the following developmental story: (i) Preschool-age children show no *inherent* preference for individuals who resemble them over those who differ, preferring the former *only when* an adult identifies similarities/differences explicitly and pedagogically (Studies 1, 3); (ii) by 4 years of age, the influence of adults' explicit, pedagogical identification of similarity/difference along one dimension facilitates preference for self-resemblance along another (Experiment 3b); and (iii) not until 6 years of age do children show a preference for self-resembling others in the absence of such explicit identification (study 2).

Study 3 particularly probed what types of comments about similarity/difference are sufficient to elicit self-resemblance preference in children: Might *any* such mentioning, even in the form of questioning, elicit this preference? Or must comments about similarity/difference be presented in a manner in which they are likely *interpreted as conveying important social information*? The pattern of results from both experiments were most consistent with the pedagogical account: Simply compelling children to attend to and compute similarity by questioning them did not engender a preference in either 3- or 4-year-olds for the similarly colored doll. However, when 4-year-olds interacted with an adult, who explicitly highlighted similarity/difference of accessories, this led them to form a preference with a different adult for a doll who resembled them in hair and eye color. This was not observed in 3-year-olds, an age at which the ability to generalize pedagogically presented information is unreliable; Butler & Markman, 2012, 2016.

Still, it is important to better understand the extents and boundaries of children's pedagogical generalization as it pertains to the development of social preference. For example, children may only generalize in the manner we observed when adults highlight similarities among social stimuli. Moreover, work in this vein can determine whether evoking similarity abstractly (e.g., Walker & Gopnik, 2014) is sufficient to engender self-resemblance preference.

Together, our results indicate that the developmental trajectory of appearance-based homophily is more dependent on social input than previous literature suggests. Like past work (e.g., Fawcett & Markson, 2010), we observed preference for self-resembling others at age 3 years—and found that this occurs only in the presence of explicit messaging about similarity and difference. Testing broader ages, we found that children do not spontaneously prefer self-resembling others in the absence of such messaging until 6 years of age. Finally, we adjudicated between two alternative explanations of the emergence of appearance-based homophily. We conclude that children first internalize messages about shared appearance, appreciating them as pedagogical, then they come to value self-resemblance unprompted.

This prompts an alternative interpretation of prior results: Fawcett and Markson (2010) suggested that the salience of shared physical

traits educes an intuitive sense of camaraderie in children. Our findings suggest that adults' statements about shared appearance are construed pedagogically, and thus guide young children's attention to traits that they otherwise do not spontaneously select friends based on (until later in development).

There are several limitations of the present work that are important to acknowledge. First, our sample sizes are modest, thus we may have failed to detect positive results in some cases due to a lack of robust statistical power. Second, we tested children whom we estimate are majority white and from middle-income US households, which limits our ability to make strong generalizable claims about the social preferences of children from racial minority, low socioeconomic, or non-US backgrounds. It is also worth noting that we did not collect these demographics from participants directly; rather, we inferred our estimates from the demographic profile of our participant database. Future research should assess the effects we obtain here among children from more diverse communities and using more diverse stimuli (Roberts et al., 2020). Indeed, it is possible that racially diverse children have different levels of exposure to noticeable differences in hair and eye color traits, and thus may think differently about similarity of appearance when adults' messages are present versus absent.

Third, it is possible that children may have interpreted the similarity messages provided throughout these experiments as more positive than the difference messages. And doing so could have contributed to children's similarity preference. We attempted to undermine such an interpretation among participants by training experimenters to present both types of information using comparable affect and tone. Still, children may generally regard sameness more favorably than they do difference, and future work should explore this possibility.

Finally, we focused here on appearance similarity, but we consider the application of pedagogical messages to other aspects of similarity an interesting topic for future study. More work in this vein can determine whether the pedagogical explanation that we find evidence for here applies more broadly, for example, to arbitrary similarities or similarities that are not appearance-based.

In conclusion, our studies provide new evidence that messaging, which conveys the importance of physical resemblance, is crucial and perhaps a main driving force of early appearance-based homophily. Understanding what promotes the development of our tendency to prefer those who share our appearance may be critical to developing interventions that successfully reduce appearance-based social biases.

ACKNOWLEDGMENT

The authors thank members of the Yale Infant Cognition Center, including Alexandra Daniels for stimuli creation, Kiarra Alleyne, Clarise Ballesteros, and Hong Bui for assistance with the lion's share of data collection, and Leslie Schneider for assistance with secondary analyses. They also thank the preschools that served as testing sites, including The Children's Center of New Milford, Children's Village, Shagbark Day Nursery, and Wolcott Early Childhood Programs. This work was generously supported by the John Templeton Foundation, Grant No. 56036.

DATA AVAILABILITY STATEMENT

The data that support the findings presented in this paper are openly available on the Open Science Framework at https://osf.io/h4ydg/.

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How to cite this article: Jordan, A. E., & Wynn, K. (2022). Adults' pedagogical messages engender children's preference for self-resembling others. *Developmental Science*, *25*, e13206. https://doi.org/10.1111/desc.13206