Asymmetries in Infants' Attention Toward and Categorization of Male Faces:

The Potential Role of Experience

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Abstract

Infants typically have a preponderance of experience with females, resulting in visual preferences for female faces, particularly high attractive females, and in better categorization of female relative to male faces. We examined whether these abilities generalized to infants' visual preferences for and categorization of perceptually similar male faces (i.e., low masculine males). Twelve-month-olds visually preferred high attractive relative to low attractive male faces within low masculine pairs only (Exp. 1), but did not visually prefer low masculine relative to high masculine male faces (Exp. 2). Lack of visual preferences was not due to infants' inability to discriminate between the male faces (Exps. 3 & 4). Twelve-month-olds categorized low masculine, but not high masculine, male faces (Exp. 5). Infants could individuate male faces within each of the categories (Exp. 6). Twelve-month-olds' attention toward and categorization of male faces may reflect a generalization of their female facial expertise.

Keywords: visual preference, face discrimination, categorization, masculinity, attractiveness

Asymmetries in Infants' Attention Toward and Categorization of Male Faces: The Potential Role of Experience

Infants' experience with others influences how they visually attend to people and subsequently structure their social categories (e.g., Anzures, Quinn, Pascalis, Slater, & Lee, 2010; Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002). Early visual preferences and categorization abilities provide insight into how infants mentally represent faces (Quinn, 2002). Moreover, early perceptual abilities might serve as precursors to the development of social biases and stereotypes (Ramsey, Langlois, Hoss, Rubenstein, & Griffin, 2004). Before linking attributes to a particular social group, infants must first categorize similar looking, but distinguishably different, people as belonging to the same group. Studying infants' visual preferences for and categorization of different face types provides information about early social perceptions, which may provide the foundation for later emerging cognitive representations of social groups.

Despite the implications of infants' early perceptual abilities, minimal research has examined whether infants display visual preferences for certain types of male faces and whether and how they categorize male faces. Although males comprise 49% of the population in the United States (United States Census Bureau, 2012), they typically comprise only 30% of infants' experience with faces during the first year, at least among infants with female primary caregivers (Rennels & Davis, 2008; Sugden, Mohamed-Ali, & Moulson, 2014). A significant portion of the population is thus underrepresented in the infant's world, yet this is the time during which perceptual expertise begins to develop (Scott, Pascalis, & Nelson, 2007). The disproportionate amount of experience infants have with females compared with males could affect the cues infants attend to in male faces, so this research examined visual preferences for and categorization of male faces among infants with female primary caregivers.

Infants with female primary caregivers show visual preferences for female relative to male faces (Quinn et al., 2002; Quinn et al., 2008). Moreover, infants show visual preferences for high attractive relative to low attractive female faces (Langlois et al., 1987), whereas the evidence regarding visual preferences for high attractive males is mixed: Some studies show a preference, whereas others do not (Kramer, Zebrowitz, Giovanni, & Sherak, 1995; Langlois, Ritter, Roggman, & Vaughn, 1991; Samuels & Ewy, 1985; see Ramsey, Langlois, & Marti, 2005 for a review). These findings suggest infants' cognitive representation for faces is attractive and female-like (Quinn et al., 2002; Ramsey et al., 2005; Rubenstein, Kalakanis, & Langlois, 1999).

Several studies provide support that infants' facial representation is weighted toward attractive and female. When 16 or more faces from the same demographic are averaged together, adults judge the resulting averaged face as highly attractive (Langlois & Roggman, 1990). Six-month-olds also visually prefer averaged female faces when paired with low attractive female faces and can cognitively represent female facial averages (Rubenstein et al., 1999). After familiarization to four or eight female faces, 3- and 6-month-olds, respectively, looked longer at a familiar or novel female face when paired with an averaged face comprised of the female faces to which they were previously exposed (de Haan, Johnson, Maurer, & Perrett, 2001; Rubenstein et al., 1999). Infants, therefore, perceived the averaged female face as familiar, even more familiar than the familiarization faces, and formed a cognitive representation of the faces. For male faces, however, 6- and 8-month-olds did not show significant differences in their looking toward a familiar or novel male face when paired with an averaged face comprised of eight male faces to which they were previously exposed. These data suggest infants did not form a cognitive representation of male faces (Ramsey et al., 2005). Furthermore, after seeing a series of eight female or eight male faces, 3- to 4-month-olds looked more at a novel female than familiar

female face, whereas they showed no differences in looking toward novel and familiar male faces, respectively. Infants, therefore, more accurately represented individual female than individual male face exemplars (Quinn et al., 2002, Exp. 6). Thus, infants are significantly better at cognitively representing female than male faces whether in the form of averaged representations or exemplars and visually prefer averaged (attractive) female faces, implying that infants' facial representation is attractive and weighted toward female.

Certain facial cues contribute to some male faces appearing more perceptually similar to an attractive, female-like representation than others. Adult males' facial structure differs, on average, from females in that males possess wider and longer jaws, more protruding brows, and less full lips (Thornhill & Gangestad, 2006). Males with such sexually dimorphic features are considered high masculine, whereas males with narrower, shorter jaws, less protruding brows, and fuller lips are considered low masculine because their facial structure is similar to that of females. Additionally, the luminance contrast between the eyes and lips with the surrounding skin contributes to sexual dimorphism and attractiveness judgments of males and females (Russell, 2003, 2009). Increasing or decreasing the luminance contrast of an androgynous face causes the face to look more female or male, respectively, and the higher the luminance contrast, the lower the adult ratings of male facial masculinity (Russell, 2009). Decreasing luminance contrast increases male attractiveness, whereas it decreases female attractiveness (Russell, 2003). Low masculine male faces are, therefore, more similar to female faces as a function of having similar sexually dimorphic facial features and luminance contrast. High attractive faces within the low masculine male category are most perceptually similar to the cognitive representation (average) of that category and, thus, should be most configurally similar to an attractive, female-like facial representation compared with other male faces (see Figure 1).

Infants should most easily process faces similar to an attractive, female-like representation. Ease in processing elicits positive affect (Winkielman & Caccioppo, 2001), which might explain infants' visual preference for females, particularly high attractive females (Langlois et al., 1987; Quinn et al., 2002, 2008; Ramsey-Rennels & Langlois, 2006). Based on studies with female faces, we made two predictions regarding infants' visual preferences for male faces. First, infants should visually prefer high attractive relative to low attractive males only when face pairs are low masculine (a generalization of their preference for high attractive females). Second, infants should visually prefer low masculine relative to high masculine males (a generalization of their preference for females).

Infants also more easily categorize females than males (see Ramsey et al., 2005 and Ramsey-Rennels & Langlois, 2006 for reviews). For example, upon seeing a series of female-male face pairs and hearing either a female or male voice, 9- and 12-month-olds looked more at the female face when they heard a female voice, but did not match male faces and voices (Poulin-Dubois, Serbin, Kenyon, & Derbyshire, 1994). This finding suggests infants' category for females is better developed than that for males, likely due to their predominant experience with females during the first year (Rennels & Davis, 2008; Sugden et al., 2014).

Such asymmetries in categorization are not uncommon (see Quinn, 2002 for a review). For example, 3- to 4-month-olds grouped cats into a category that excluded dogs, but not dogs into a category that excluded cats (Quinn, Eimas, & Rosenkrantz, 1993). When Quinn et al. (1993) removed atypical dog faces from the stimulus set, thus reducing the variability among the dog stimuli, 3- to 4-month-olds excluded cats from their dog category. Infants' ability to represent categories is enhanced when within-category similarity is maximized (Oakes, Coppage, & Dingel, 1997), so what is typical to the infant or appears most perceptually similar should be

easiest for infants to categorize.

Asymmetries are also seen in infant categorization of human faces. Nine-month-old, but not 6-month-old, Caucasians looked longer at novel race adult faces after being familiarized to either own-race Caucasian or other-race Asian adult female faces (Anzures et al., 2010). Same-aged infants could discriminate between Caucasian, but not Asian, adult faces. Thus, 9-month-olds displayed categorization of Caucasian faces (grouping together similar looking, but distinguishably different, own-race faces), but displayed categorical perception of Asian faces (grouping together, but not distinguishing between other-race faces). Categorization requires an infant to perceive exemplars within a group as not only similar, but also distinct from one another, so it is important to test infants' discrimination of within-category exemplars (Quinn, 1987).

Asymmetries in infant categorization may also occur because infants spontaneously prefer one type of stimuli to another (Quinn, 2002). Three- to 4-month-olds looked more at a novel female than novel male test face after being familiarized to eight males, but looked equally toward novel female and male test faces after being familiarized to eight females (Quinn et al., 2002). Based on these findings, one might conclude that 3- to 4-month-olds more expertly categorized males than females. Three- to 4-month-olds, however, visually prefer female to male faces (Quinn et al., 2002), which makes infant looking toward novel category female faces in gender categorization tasks difficult to interpret (Leinbach & Fagot, 1993; Quinn et al., 2002). It is critical to choose test faces for which infants show no visual preferences when assessing their categorization or control for such visual preferences within the analyses (Quinn, 1987).

Based on these studies, we made the following predictions: Infants should categorize low masculine, but not high masculine, male faces because low masculine males' perceptual

similarity to female faces may make them seem more familiar or “typical.” Attractiveness is positively related to typicality (Trujillo, Jankowitsch, & Langlois, 2014) and high attractive faces are more similar looking to one another than low attractive faces (Potter, Corneille, Ruys, & Rhodes, 2007), so infants might also more easily categorize high attractive relative to low attractive male faces. Because we predicted an asymmetry in infants’ categorization of male faces, we conducted additional studies to ensure findings were not due to infants’ inability to discriminate between males within a category or to visual preferences for certain test faces (Quinn, 1987, 2002).

Experiments 1 and 2 examined how facial attractiveness and masculinity affected infants’ visual preferences for male faces. Experiments 3 and 4 assessed infants’ ability to discriminate between the face pairs from Experiments 1 and 2. Experiment 5 investigated infants’ use of masculinity and attractiveness to categorize male faces. Experiment 6 examined infants’ ability to discriminate male faces within each of the categories from Experiment 5.

General Method

Participants. To recruit infants with female primary caregivers, we obtained birth dates and family contact information from the state department of health, local birth announcements, or marketing lists. We sent letters or postcards to parents of eligible infants and followed up with telephone calls to schedule appointments. Table 1 shows participants’ ages, demographics, and criteria for deleted data for each study. Each infant provided data included in the analyses for only one of the six experiments reported.

Stimuli. All stimulus faces were digitized, color images of European American, adult male college students without substantial facial hair, glasses, or jewelry and posed with a neutral facial expression. Faces were similar to life-size (~18 cm x 25 cm). We used Adobe Photoshop

to standardize the image background and size. Faces paired together were similar in age and hair color. Clothing cues were masked. The men consented to have their images used in face perception research, but not to be published. Photos were taken using a procedure similar to Langlois & Roggman (1990). Ratings were collected at different times from different groups of undergraduates. Each face was projected onto a screen for 10 s. A minimum of 40 undergraduates, with relatively equal numbers of male and female raters, evaluated each face for attractiveness or masculinity. They noted their ratings on scantron sheets using a 5-point scale to rate facial attractiveness (1 = *very unattractive*; 5 = *very attractive*) or masculinity (1 = *very feminine/low masculine*; 5 = *very masculine/high masculine*). To avoid halo effects (Lucker, Beane, & Helmreich, 1981), independent groups rated the faces for attractiveness or masculinity. Ratings showed high interrater agreement ($\alpha > .90$). Measures of facial features and facial contrast (using Russell's 2009 method) for the male faces in Experiments 5 and 6 showed that: 1) low masculine males had significantly smaller jaw lengths and widths and non-significantly less facial contrast than high masculine males; 2) low attractive males had significantly fuller lips and more contrast in the lip region than high attractive males; and 3) low attractive, low masculine males had a larger distance between the pupil and eyebrow than low attractive, high masculine males and showed the non-significantly highest facial contrast (see supplementary materials for details).

Apparatus. An experimenter used Habit 2000 or Habit X 1.0 software (Cohen, Atkinson, & Chaput, 2000, 2004) on a computer connected to three monitors to conduct the study. An experimenter used one monitor in the control area and the other two monitors displayed the stimulus faces in the study area. For Experiments 1-4, the stimulus monitors were 28 cm apart, level with the infants' eyes, and ~91.5 cm away from the infant. For Experiments 5 and 6, which

were conducted at a different location, the stimulus monitors were 30.5 cm apart, level with the infants' eyes, and ~117 cm away from the infant. A large wooden structure in the study area framed the two monitors and occluded other objects from the infant's view. A video camera recorded the stimuli on the computer monitors to ensure faces displayed correctly. Another video camera, located midway between and below the two stimulus monitors, recorded infant looking so research assistants could code looks using Habit or SuperCoder (Hollich, 2005) and we could evaluate the reliability of looking times.

General procedure. During the study, infants sat on their parent's lap in a darkened room. Parents wore opaque sunglasses occluding their view of the stimuli to avoid influencing their infant's interest in the faces (Brooks & Meltzoff, 2002). Experimenters instructed parents to not interact with their infant (except to reposition them when requested). To start the study and in between each trial, a green circle growing larger and smaller appeared on the monitors accompanied by a whistle noise to direct the infant's attention toward the monitors. Once the infant looked toward the monitors, the experimenter presented the faces.

Data analyses. Typically, three research assistants, who were unaware of the faces infants saw, coded infant looking. We used intraclasscorrelation coefficients to examine reliability of the coded data and used the most reliable coder's data in the analyses. The most reliable coder was determined by examining how reliability changed if one coder was removed from the analysis. There were data from one infant in Experiment 1 and one infant in Experiment 3 for which we did not calculate reliability because the study was not recorded, so we used the experimenter's data. We checked for side preferences in all studies and did not keep the data if an infant looked to one side for 90% or more of their total looking time (Haaf & Diehl, 1976).

For all analyses of variance, we used SAS proc mixed with the repeated statement to

identify repeated trials within participants. To decompose interactions or any main effects involving more than two comparisons, we compared least squares means using Tukey-Kramer adjustments. We also used least squares means to examine whether infants' percentage of looking toward a particular face significantly differed from chance. Unlike arithmetic means, least squares means appropriately adjust for other effects in the model and any imbalances in design. The degrees of freedom reflect the df for these estimated population marginal means (SAS Institute Inc., 2008). When analyzing multiple comparisons to chance, we used adaptive linear step-up procedures to assess the false discovery rate (Benjamini, Krieger, & Yekutieli, 2006). This correction appropriately controls for Type I errors, but has more power compared with other methods, such as Bonferroni's correction (Benjamini et al., 2006). It is widely used in many areas of brain imaging, genomic, medicine, and social science research.

Because our tasks involved European American male faces, one possibility is that non-European American infants performed differently than European American infants due to less exposure (Rennels & Davis, 2008). To test this possibility, we conducted Spearman rho correlations between the dependent variable of interest and European American race familiarity (European American infant, non-European American infant) both across and within factors that significantly predicted results for all studies, but found no significant correlations.

Experiment 1

Experiment 1 investigated whether 6- and 12-month-olds showed visual preferences for male faces based on attractiveness and whether these preferences varied as a function of infant age, infant sex, or face pair masculinity. We predicted infants' preference for high attractive female faces (Langlois et al., 1987) would generalize to a preference for high attractive males within low masculine face pairs only. To test this hypothesis, infants saw males within high,

medium, or low masculine face pairs that differed in attractiveness. We included 6-month-olds for comparison to this age group's preference for attractive females (Langlois et al., 1987) and examined 12-month-olds to determine how cumulative experience with a female caregiver might strengthen or change visual preferences.

Method

Participants. See Table 1.

Stimuli. We included images of 15 pairs of faces of high ($M = 3.28$, $SD = 0.33$) and low ($M = 1.44$, $SD = 0.08$) attractive male that significantly differed in attractiveness, $t(14) = 21.14$, $p < .0001$, but were equal in masculinity, $t(14) = 1.41$, $n.s.$ Although masculinity within high-low attractive face pairs was constant, masculinity across face pairs varied. Low masculine pairs ($n=4$, $M = 3.05$, $SD = 0.14$) significantly differed from medium masculine pairs ($n=7$, $M = 3.48$, $SD = .04$), $t(9) = -8.14$, $p < .0001$, which significantly differed from high masculine pairs ($n=4$, $M = 3.87$, $SD = .10$), $t(9) = -9.64$, $p < .0001$.

Procedure. Infants viewed three pairs of male faces that differed in attractiveness. Each pair was shown for 10 s two times (left-right reversed during the second sequential display). The masculinity of the face pairs was randomly chosen, but presentation of low, medium, and high masculine face pairs was approximately balanced across infants.

Results

Interrater agreement of duration of infant looking on each trial ranged from .866-.981 ($M_{ICC} = .938$). To examine factors influencing visual preferences, we conducted a 3 x 2 x 2 (Face Pair Masculinity x Infant Age x Infant Sex) analysis of variance with percentage of total looking time (PTLT) to the high attractive faces (looking time toward the high attractive face divided by looking time toward both the high and low attractive faces) as the dependent variable. Face pair

masculinity was a random variable and infant age and sex were between-subjects variables. Results showed only a main effect for face pair masculinity, $F(2, 30) = 4.85$, $p = .02$, $f^2 = .05$. We next examined which high attractive face PTLTs significantly differed from chance (.50) based on face pair masculinity. Infants showed no preference for high attractive males within high masculine pairs, $t(30) = -0.87$, $p = .39$, or medium masculine pairs, $t(30) = -1.19$, $p = .24$, but did display a visual preference for high attractive males within low masculine pairs as predicted, $t(30) = 2.77$, $p = .01$, $d = 0.85$. Although the two age groups did not significantly differ in their looking toward high attractive, low masculine males, $p = .83$, an examination of the two age groups separately demonstrated that 12-month-olds' looking toward high attractive, low masculine males significantly differed from chance, $t(30) = 2.85$, $p = .008$, $d = 1.27$, but 6-month-olds' looking did not, $t(30) = 1.09$, $p = .28$ (Figure 2).

Experiment 2

Experiment 2 investigated whether 6- and 12-month-olds showed visual preferences for male faces based on masculinity and whether these preferences varied as a function of infant age, infant sex, or face pair attractiveness. We predicted infants' preference for female faces (Quinn et al., 2002) would generalize to a preference for low masculine males. To test this hypothesis, infants saw males within high, medium, or low attractive face pairs that differed in masculinity.

Method

Participants. See Table 1.

Stimuli. We included images of 15 pairs of faces of high ($M = 4.09$, $SD = 0.25$) and low ($M = 2.72$, $SD = 0.42$) masculine males that significantly differed in masculinity, $t(14) = -12.39$, $p < .0001$, but were equal in attractiveness, $t(14) = -0.03$, $n.s.$ Although attractiveness within high-low masculine face pairs was constant, attractiveness across face pairs varied. Low attractive

pairs ($n=5$, $M = 1.50$, $SD = 0.05$) significantly differed from medium attractive pairs ($n=5$, $M = 2.43$, $SD = .06$), $t(8) = -24.87$, $p < .0001$, which significantly differed from high attractive pairs ($n=5$, $M = 3.44$, $SD = .30$), $t(8) = -7.46$, $p < .0001$.

Procedure. Infants viewed three pairs of male faces that differed in masculinity. Each pair was shown for 10 s two times (left-right reversed during the second sequential display). The attractiveness of the face pairs was randomly chosen, but presentation of low, medium, and high attractive face pairs was approximately balanced across infants.

Results

Interrater agreement of duration of infant looking on each trial ranged from .888-.998 ($M_{ICC} = .949$). Two infants included in the analyses had missing data for one trial because they did not look at the faces during that trial. To examine factors influencing visual preferences, we conducted a $3 \times 2 \times 2$ (Face Pair Attractiveness $\times$ Infant Age $\times$ Infant Sex) analysis of variance with low masculine face PTLT (looking time toward the low masculine face divided by looking time toward both the high and low masculine faces) as the dependent variable. Face pair attractiveness was a random variable and infant age and sex were between-subjects variables. There were no main effects or interactions. We then examined whether low masculine face PTLT significantly differed from chance. Looking toward the low masculine males was at chance level across ages, $t(39) = -0.01$, $p = .99$, $M = 0.50$, $SE = 0.01$. A comparison of the two age groups showed they did not significantly differ in their looking toward the low masculine faces, $p = .86$, and an examination of each age group separately demonstrated that 6-month-olds, $t(38) = -0.13$, $p = .90$, $M = .50$, $SE = .02$, and 12-month-olds' looking, $t(38) = 0.12$, $p = .91$, $M = .50$, $SE = .02$, was at chance level. Infants showed no visual preference for low masculine males.

Discussion

As predicted, Experiment 1 showed that 12-month-olds visually preferred high attractive relative to low attractive male faces within low masculine pairs only. Experiment 2, however, did not find that infants visually preferred low masculine relative to high masculine males. Twelve-month-olds' visual preference for female-likeness and attractiveness is, therefore, very specific to attractiveness comparisons and not masculinity comparisons.

One question remaining is whether infants' lack of attractiveness preferences within medium or high masculine face pairs in Experiment 1 or the lack of masculinity preferences in Experiment 2 is due to infants' inability to discriminate between these face types. The purpose of Experiments 3 and 4 was to address this question.

Experiment 3

Experiment 3 investigated whether infants could discriminate between male faces similar in masculinity, but different in attractiveness. Because infants showed no visual preference for high or low attractive males within medium and high masculine face pairs in Experiment 1, our main interest was whether face pair masculinity affected infants' discrimination abilities.

Method

Participants. See Table 1.

Stimuli. Faces were the same as those used in Experiment 1.

Procedure. To test discrimination, we used the familiarization/novelty preference procedure with paired visual displays (e.g., Quinn et al., 2002 initial control experiment). Infants were randomly assigned to view one of the male faces from the high-low attractive pairs in Experiment 1 with the constraint that each infant within a particular age group was familiarized to a different face. During fifteen 10 s familiarization trials, infants saw the same male face presented on each monitor. Familiarization to a high or low attractive male face was

approximately balanced across infants. For the test trials, infants viewed the familiarized male face paired with a novel male face (the face with which it was paired in Experiment 1). The test face pair was shown for 10 s two times (left-right positions reversed during second display). The side on which the familiarized face was first shown during the test trials was counterbalanced across infants.

Results

Interrater agreement of duration of infant looking on each trial ranged from .921-.997 ($M_{ICC} = .978$).

Familiarization trials. Using infants' average looking time during the first three and last three familiarization trials as the dependent variable (Oakes, 2010), we conducted a 2 x 2 x 2 (Familiarization Trial x Infant Age x Infant Sex) analysis of variance to determine whether infants decreased their looking across familiarization trials. Familiarization trial was a within-subjects variable and infant age and sex were between-subjects variables. Results showed a main effect for familiarization trial, $F(1, 26) = 22.55, p < .0001, f^2 = .48$. Infants looked at the familiarized face significantly less during the last three familiarization trials ($M = 5.49, SE = 0.22$) compared with the first three familiarization trials ($M = 6.94, SE = 0.22$). This decrease in looking suggests that infants became familiarized to the male face. Results also showed a main effect for infant age, $F(1, 26) = 25.30, p < .0001, f^2 = .58$. Six-month-olds looked longer ($M = 6.99, SE = 0.22$) than 12-month-olds ($M = 5.45, SE = 0.22$).

Test trials. Using novel face PTLT (looking time toward the novel face divided by looking time toward both the familiar and novel faces) as the dependent variable, we ran a 2 x 2 x 3 (Infant Age x Infant Sex x Face Pair Masculinity [high, medium, low] – all were between-subjects variables) analysis of variance. There were no significant effects or

interactions. Analyses examining whether infants' novel face PTLT significantly differed from chance revealed that infants looked significantly longer at the novel face than would be expected by chance, $t(29) = 3.60$, $p = .001$, $d = 1.36$. A direct comparison of the two age groups showed they did not significantly differ in their looking toward the novel male face, $p = .52$, and an examination of each age group separately demonstrated that 12-month-olds, $t(28) = 2.98$, $p = .006$, $d = 1.65$, and 6-month-olds' looking toward the novel male face, $t(28) = 2.06$, $p = .049$, $d = 1.14$, significantly differed from chance (Figure 3).

Experiment 4

Experiment 4 investigated whether infants could discriminate between male faces similar in attractiveness, but different in masculinity.

Method

Participants. See Table 1.

Stimuli. Faces were the same as those used in Experiment 2.

Procedure. The procedure was the same as Experiment 3 except that infants were familiarized to one of the male faces from the high-low masculine pairs in Experiment 2.

Results

Interrater agreement of duration of infant looking on each trial ranged from .902-.998 ($M_{ICC} = .979$).

Familiarization trials. Using infants' average looking time during the first three and last three familiarization trials as the dependent variable, we ran a $2 \times 2 \times 2$ (Familiarization Trial x Infant Age x Infant Sex) analysis of variance to determine whether infants decreased their looking across familiarization trials. Familiarization trial was a within-subjects variable and infant age and sex were between-subjects variables. Results showed a main effect for

familiarization trial, $F(1, 26) = 27.47, p < .0001, f^2 = .96$. Infants looked at the familiarized face significantly less during the last three familiarization trials ($M = 4.88, SE = 0.28$) compared with the first three familiarization trials ($M = 6.92, SE = 0.28$). This decrease in looking suggests that infants became familiarized to the male face. Results also showed a main effect for age, $F(1, 26) = 6.48, p = .02, f^2 = .25$. Six-month-olds looked longer ($M = 6.40, SE = 0.30$) than 12-month-olds ($M = 5.41, SE = 0.25$).

Test trials. Using novel face PTLT as the dependent variable, we ran a 2 x 2 x 3 (Infant Age x Infant Sex x Face Pair Attractiveness [high, medium, low] – all were between-subjects variables) analysis of variance. There were no significant effects or interactions. Analyses examining whether infants' novel face PTLT significantly differed from chance revealed that infants looked significantly longer at the novel face than would be expected by chance, $t(29) = 5.28, p < .0001, d = 2.00$. A direct comparison of the two age groups showed they significantly differed in their looking toward the novel male face, $F(1, 28) = 7.62, p = .01, f^2 = 0.27$. Six-month-olds showed greater recovery to the novel male face compared with 12-month-olds (Figure 3). Despite the age difference, an examination of each age group separately demonstrated that both 12-month-olds, $t(28) = 2.19, p = .04, d = 1.21$, and 6-month-olds' looking toward the novel male face, $t(28) = 6.09, p < .0001, d = 3.38$, significantly differed from chance.

Discussion

Six- and 12-month-olds discriminated between male faces that differed in one cue (attractiveness or masculinity), but were similar in the other cue suggesting that the lack of certain visual preferences in Experiments 1 and 2 was not due to infants' inability to discriminate between the male faces. Rather, predominant experience with female faces likely guided the visual preference 12-month-olds displayed for high attractive, low masculine males in

Experiment 1 and lack of other visual preferences is likely due to infants' less frequent experience with males. Findings from Experiment 4 also suggest that masculinity differences were highly salient to 6-month-olds; their recovery to the novel male face was particularly high. The greater social relevancy of female faces might guide them to more strongly differentiate between female-like and non-female-like male faces relative to high and low attractive male faces. Such saliency might facilitate categorization of males based on facial masculinity.

Experiment 5

Experiment 5 investigated whether 6- and 12-month-olds use attractiveness and masculinity to categorize male faces. We hypothesized that infants' age and their predominant female facial experience (Rennels & Davis, 2008; Sugden et al., 2014) should guide how they categorize faces. We predicted 12-month-olds would be most likely to categorize the faces because social categorization abilities typically do not emerge until the second half of the first year (Anzures et al., 2010; Younger & Fearing, 1999). Specifically, we expected 12-month-olds to categorize low masculine, but not high masculine, male faces due to greater similarities between females and low masculine males. High attractiveness might also aid infants' ability to categorize the faces because of their greater typicality and perceptual similarity to one another compared with low attractive faces (Potter et al., 2007; Trujillo et al., 2014). Because infants showed particularly high recovery to a novel male face that differed in masculinity during Experiment 4, we predicted infants might more readily recover interest to a novel male face that differed from the familiarized category in masculinity compared with attractiveness.

Method

Participants. See Table 1.

Stimuli. We included images of 28 faces with seven males from each of the

following categories: a) high attractive, high masculine; b) high attractive, low masculine; c) low attractive, high masculine; and d) low attractive, low masculine. Six faces were used in Experiment 1 and 14 were used in Experiment 2. Ratings for high attractive faces ($M = 3.42$, $SD = .31$) significantly differed from low attractive faces ($M = 1.39$, $SD = .16$), $t(26) = -21.85$, $p < .001$. Ratings for high masculine faces ($M = 4.11$, $SD = .27$) significantly differed from low masculine faces ($M = 2.71$, $SD = .41$), $t(26) = -10.80$, $p < .001$.

Procedure. To test categorization, we used the familiarization/novelty preference procedure with paired visual displays (Quinn et al., 2002; Ramsey et al., 2004). We randomly assigned infants to view male faces from one of the four categories during familiarization trials with the constraint that a relatively equal number of infants viewed faces from each category ($n = 48$ -49 infants per category with 24-25 in each age group). Infants saw four faces presented three times within randomized blocks with the constraint that no face was seen two trials in a row (because of a computer presentation error, one 12-month-old included in analyses saw one of the faces four times and another face two times, with the remaining two shown the usual three times). The same face displayed on both monitors during a trial.

During the test trials, infants saw three pairs of novel faces, presented twice (left-right reversed during the second sequential display) within blocked trials that were randomized across participants. Test face pairs included a novel face from the familiar category and a novel face from a novel category that differed in attractiveness, masculinity, or both attractiveness and masculinity (i.e., test comparison). The familiarization and test trials each lasted 15 s.

Given infants' less frequent experience with male faces (Rennels & Davis, 2008), we used 15 s familiarization trials to ensure infants had sufficient time to encode the individual faces. We also wanted to control infants' visual preference for high attractive, low masculine males

(Exp. 1 findings). Visual preferences likely reflect positive affect that results from easily processing these face types (Trujillo et al., 2014; Winkielman & Cacioppo, 2001). Positive affect associated with ease in processing is experienced immediately, but briefly, in adults (Winkielman & Cacioppo, 2001), so we piloted whether use of 15 s trials would lessen the visual preference displayed during Experiment 1's 10 s trials. In the pilot study, 6- and 12-month-olds ($Ns = 73$ and 69) saw eight pairs of male faces that differed in attractiveness, masculinity, or both cues. Pairs were presented twice (left-right reversed during the second sequential display). Orders were randomized across infants. Test faces paired together in Experiment 5 were ones that 6- and 12-month-olds showed statistically equal looking toward during the pilot study ($ps > .20$). Any differences in looking that infants exhibit during the test trials in Experiment 5, therefore, should not be because of a priori visual preferences.

Results

Interrater agreement of duration of infant looking on each trial ranged from .849-.999 ($M_{ICC} = .962$).

Familiarization trials. To determine if infants became familiarized to the male faces, we conducted a 2 x 2 x 2 x 4 (Familiarization Trial x Infant Age x Infant Sex x Familiarization Category) analysis of variance using average looking time during the first four and last four familiarization trials as the dependent variable. Familiarization trial was a within-subjects variable, and infant age, sex, and familiarization category were between-subjects variables. Results showed a significant effect for familiarization trial, $F(1, 178) = 36.76, p < .0001, f^2 = .15$. Infants looked significantly less at the faces during the last four familiarization trials ($M = 9.53, SE = 0.18$) than during the first four familiarization trials ($M = 11.07, SE = 0.18$). There was also a significant effect for age, $F(1, 178) = 11.87, p < .001, f^2 = .09$. Six-month-olds looked longer

($M=10.73$, $SE=0.18$) than 12-month-olds ($M=9.86$, $SE=0.18$). Lack of a familiarization category interaction with trial suggests infants became familiarized to the male faces in each category.

Test trials. Using novel category PTLT (looking time toward the novel category face divided by looking time toward both the novel and familiar category faces) as the dependent variable, we conducted a $2 \times 2 \times 4 \times 3 \times 3$ (Infant Age x Infant Sex x Familiarization Category x Test Order [first, second, or third test pair shown] x Test Comparison [test faces differed in attractiveness, masculinity, or both]) analysis of variance. Infant age, sex, and familiarization category were between-subjects variables, whereas test order and test comparison were within-subjects variables. Results yielded an Age x Familiarization Category interaction, $F(3, 178) = 2.74$, $p = .045$, $f^2 = .35$, an Age x Test Comparison interaction, $F(2, 260) = 3.14$, $p = .045$, $f^2 = .35$, and a Familiarization Category x Test Comparison interaction, $F(6, 260) = 4.22$, $p < .001$, $f^2 = .35$. These two-way interactions were superseded by the predicted Age x Familiarization Category x Test Comparison interaction, $F(6, 260) = 2.39$, $p = .029$, $f^2 = .35$. Results also yielded an Infant Sex x Test Order interaction, $F(2, 260) = 3.30$, $p = .039$, $f^2 = .27$.

For the predicted three-way interaction between age, familiarization category, and test comparison, we compared novelty category PTLT to chance. Results showed that 6-month-olds familiarized to high attractive, high masculine males recovered to the novel category face when the test faces differed in both attractiveness and masculinity, $t(260) = 5.11$, $p < .0001$, $d = 1.05$. Six-month-olds showed no evidence of differentiating novel category faces from any of the other male face categories to which they were familiarized (Figure 4a). The 12-month-old findings were quite different and fit with our predictions. Twelve-month-olds familiarized to low attractive, low masculine males or high attractive, low masculine males recovered to the novel category face when the test faces differed in masculinity, $t(260) = 2.50$, $p = .01$, $d = .51$, and

$t(260) = 2.19, p = .03, d = .45$, respectively. Twelve-month-olds showed no evidence of differentiating familiar and novel category faces following familiarization to high attractive, high masculine or low attractive, high masculine males (Figure 4b).

The Infant Sex x Test Order interaction occurred because girls showed higher novel category PTLTs when seeing the third test pair compared with the first, $t(260) = -2.90, p < .05, d = .60$, whereas their novel category PTLTs when seeing the second test pair did not significantly differ from either the first or third test pair. Only girls' novelty category PTLTs for the third test pair significantly differed from chance, $t(260) = 2.50, p < .05, d = .52$. In contrast, boys showed no difference in novel category PTLTs based on test order (Figure 5).

Discussion

As predicted, 12-month-olds categorized low masculine, but not high masculine, males. Twelve-month-olds' cumulative experience with females and better-developed category of female faces likely facilitated their ability to categorize low masculine males. They relied on low facial masculinity (a perceptually familiar cue) for group inclusion and a change in masculinity (i.e., high masculinity, a less perceptually familiar cue) for group exclusion. This experience-based explanation suggests 12-month-olds' male face categorization reflects their perceptual expertise. Effect sizes were moderate suggesting this finding is of practical significance. Lack of a large effect is likely because the finding reflects a generalization of their female face expertise to similar-looking face types.

The 6-month-olds categorized high attractive, high masculine faces and excluded only faces that differed in both masculinity and attractiveness from the category, consistent with our prediction that attractiveness might facilitate categorization because high attractive faces are more similar looking to one another than low attractive faces (Potter et al., 2007). Although high

attractive, low masculine males should also be more similar looking to one another than low attractive faces (Potter et al., 2007), high attractive, high masculine males had less variability in face shape: The standard deviation for measures of these faces' jaw width was substantially lower than it was for high attractive, low masculine males (see supplementary Table 2). Similarities in facial configuration and shape, therefore, likely aided 6-month-olds' ability to categorize high attractive, high masculine males. Moreover, the novel category faces that differed in both masculinity and attractiveness were the most dissimilar from the familiarized category (low attractive, low masculine males differed in terms of averageness, sexually dimorphic features, and luminance contrast), and this perceptual dissimilarity likely facilitated 6-month-olds' recovery to these faces types.

This low-level perceptual explanation might not apply to the 12-month-olds, who did not show evidence of categorizing high attractive, high masculine males, likely because their social experience with faces is now a more significant predictor of how they categorize faces. Note that this explanation is analogous to the perceptual narrowing that occurs by the end of the first year in which infants show increased specialization in discrimination of socially relevant face types (Scott et al., 2007). In this case, however, narrowing influences the cues infants use to group faces together. By 12 months of age, the greater social relevancy of females relative to males might cause infants to become particularly attuned to female-like characteristics and enhanced ability to group together familiar face types. Our categorization findings are unlikely to be explained by infants' visual preferences for certain test faces because our pilot sample of 6- and 12-month-olds showed no a priori visual preferences for particular faces.

Interestingly, girls recovered to the novel category test face when viewing the third test face pair. This recovery occurred regardless of the category to which they were familiarized and

the test comparison being made. The finding suggests that learning occurred during the test trials for the girls. For example, the first four test trials likely permitted them to actively compare the test faces and better encode the familiarized category toward the end of the test trials.

Simultaneous paired presentations of different dogs (or cats) during familiarization enabled 4- and 6-month-olds to categorize dogs (or cats), whereas successive presentation of individual dogs (or cats) did not (Oakes & Ribar, 2005). Our findings suggest that simultaneously presented stimuli during the test trials might also facilitate categorization, at least for female infants. Importantly, test order did not interact with the other significant results, so it is unlikely to explain our main findings.

Experiment 6

Experiment 6 investigated whether 6-month-olds could discriminate between male faces within the four different categories in Experiment 5 to determine whether infants displayed categorization (grouping discriminably different male faces) or categorical perception (grouping, but not discriminating; Anzures et al., 2010) in Experiment 5. Because infants saw four male faces (presented three times) from the same category during the familiarization trials in Experiment 5, we examined their ability to discriminate between a familiarized male face and novel male face after exposure to four males (one familiar, three novel) from the same category. Evidence of such discrimination would suggest they were able to differentiate the four males upon the first presentation of the faces in Experiment 5. This procedure was developed by Fagan (1970) and adapted by others (e.g., Roder, Bushnell, and Sasseville, 2000). It overcomes a limitation of the traditional familiarization procedure used in Experiments 3 and 4 in which the infant is exposed to a face for a longer period of time than they would have to encode the face in the categorization study.

Method

Participants. See Table 1.

Stimuli. Faces were the same as those used in Experiment 5.

Procedure. We randomly assigned infants to view one of the 28 male faces during the first trial with the constraint that a relatively equivalent number of infants saw faces within each of the four male face categories. There were a total of four trials. During the first trial, infants saw the same familiarization face presented in both monitors for 5 s (Roder et al., 2000). The next three trials were 15 s each and presented the familiarized face paired with a novel face from the same category, with the novel face differing on each trial (Fagan, 1970). The familiar face always appeared on the same monitor within infants to maintain the predictability of its position, but the left-right positioning of it was counterbalanced across infants (Roder et al., 2000). The order in which infants saw the faces was randomly determined.

Results

Interrater agreement of duration of infant looking on each trial ranged from .859-.999 ($M_{ICC} = .966$).

Familiarization trial. Infants spent most of the familiarization trial looking at the familiarization face ($M = 4.67$, $SE = .08$). Neither infant sex nor familiarization category affected infant looking time during this trial.

Test trial. To determine if infants could discriminate between male faces within the same category, we conducted a 2 x 4 (Infant Sex x Familiarization Category) analysis of variance with novel face PTLT during the fourth (last) trial as the dependent variable. Infant sex and familiarization category were between-subjects variables. Neither infant sex nor familiarization category affected infants' novel face PTLT. We therefore collapsed across these factors and

compared novel face PTLT to chance. Infants showed a significant preference for the novel face, $M = .58$, $SE = .03$, beyond what would be expected by chance, $t(78) = 2.74$, $p < .01$, $d = .62$. Infants, therefore, discriminated between male faces similar in both masculinity and attractiveness.

Discussion

These results show that infants can discriminate faces from the same masculinity and attractiveness category. Experiment 5's findings can, therefore, be attributed to infants' categorization of male faces (i.e., perceiving male faces as unique, but having similar characteristics; Quinn, 1987) as opposed to categorical perception of male faces. Moreover, infants differentiated these faces quite quickly. For the familiarization trials in Experiment 5, infants saw four male faces from a category presented three times. Ideally, infants should be able to discriminate between those four male faces at the first presentation. Results from this study suggest infants were able to make such discriminations within four trials.

General Discussion

These studies examined infants' visual preferences for and categorization of male faces based on masculinity and attractiveness. For infants with female primary caregivers, we predicted that their attractive, female-like facial representation would guide their visual preferences for and categorization of male faces most perceptually similar to this representation (Ramsey et al., 2005). Results generally supported our hypotheses. As predicted, 12-month-olds visually preferred high attractive relative to low attractive males within low masculine face pairs only (Exp. 1), but unexpectedly did not prefer low masculine relative to high masculine males (Exp. 2). Lack of visual preferences within face pairs was not due to the inability to discriminate between the male faces (Exps. 3 and 4). As predicted, 12-month-olds categorized low

masculine, but not high masculine, male faces (Exp. 5). Infants discriminated between male faces within each of the categories (Exp. 6), so they were indeed categorizing faces in Experiment 5. These results suggest that infants' visual preference for high attractive females generalizes to high attractive males with low masculine facial characteristics. In addition, infants' ability to categorize female faces generalizes to an ability to categorize low masculine male faces by the end of the first year. These perceptual abilities suggest infants' female facial expertise extends to males most similar looking to females and demonstrate another asymmetry in infant categorization abilities.

Generalized Visual Preferences

Twelve-month-olds generalized their preference for high attractive females to high attractive, low masculine males, but did not generalize their preference for females (in general) to low masculine males. By 18 months, however, toddlers visually prefer low masculine relative to high masculine males (Kayl, 2012), so the visual preference for female faces does eventually generalize. It just takes some time to develop. Compared with visual preferences for females, which manifest within the first few months following birth (Langlois et al., 1987; Quinn et al., 2002), the generalized visual preferences for low masculine males manifest substantially later. Needing time to generalize experience-based face perception abilities is evident in other areas of development. For example, 3.5-month-olds display expertise in encoding and recognizing changes in their mother's facial expressions, but typically do not generalize these abilities to unfamiliar individuals until ~7 months of age (Walker-Andrews, Krogh-Jespersen, Mayhew, & Coffield, 2011).

Three- to 4-month-olds' visual preference for females presumably emerges as a function of experience with the primary caregiver (Quinn et al., 2002). Infants' generalized visual

preferenceto low masculine males, however, likely requiressubstantial experience with other exemplars from the female face category. Compared with 2-month-olds, 8- and 11-month-olds have more than triple the experience with non-caregiver females (Rennels & Davis, 2008), which may play an important role in infants' developing a category for and robust facial representation of female faces. Once established, infants might more easily notice the cues low masculine males share with females and generalize their preferences. Of interest, however, is that the generalized preference for high attractive, low masculine males emerges before the preference for low masculine males. This delay parallels differences in the emergence of infants' visual preferences for high attractive female faces and female faces in general. Infants' visual preference for high attractive female faces emerges within the first couple days following birth (Slater et al., 1998), whereas the visual preference for female relative to male faces is not evident among similar-aged newborns and the earliest documentation of this preference is between 3 to 4 months of age (Quinn et al., 2008). The delay between when these female visual preferences first emerge is, therefore, also evident in generalizations of these visual preferences to male faces.

An alternative or complementary possibility is that it might be easier for infants to generalize their visual preference when both faces within the pair are low masculine (i.e., both are perceptually similar looking to females) as opposed to just one face being low masculine. Contexts in which both stimuli are perceptually familiar better facilitate generalized responding compared with contexts in which one is familiar and one is novel, likely because the former context helps elicit the representation of the familiar stimuli (Honey, 1990).

Male Face Categorization

Twelve-month-olds' ability to categorize low masculine male faces was contingent on the test comparison being made. They excluded male faces from low masculine categories that

differed in masculinity only, but not faces that differed in both masculinity and attractiveness. Test comparisons in other studies that have examined infant categorization of race or gender involved differences between one dimension only, such as a difference in race with gender constant (Anzures et al., 2010) or a difference in gender-typicality with race constant (Younger & Fearing, 1999). It is unclear how infant performance might change in those studies if an additional cue differed at test, but Experiment 5's results suggest 12-month-olds' attunement to masculinity differences is very specified. Subsequently, when cues in addition to masculinity change, it may result in a re-examination of both test faces and a lack of preference for either the familiar or novel category face.

Twelve-month-olds' inability to categorize high masculine male faces provides evidence of infants' greater difficulty in categorizing facial cues uncharacteristic of females. Compared with low masculine male faces, high masculine male faces should be less similar to a high attractive, female-like facial representation and thus less typical (Quinn et al., 2002; Ramsey et al., 2005). High masculine male faces' dissimilarity to females likely made it difficult for 12-month-olds to categorize those faces.

Our and others' examination of infants' social categorization abilities suggest that toward the end of the first year, infants are parsing people in their social world into "familiar" groups (females, low masculine males, familiar races) and excluding unfamiliar face types from those groups. Their lesser experience with unfamiliar face types (e.g., unfamiliar races, male-like faces) renders those faces as less typical and, therefore, more difficult to categorize (Anzures et al., 2010; Ramsey et al., 2005). Although some data suggest that older infants can categorize male faces (Leinbach & Fagot, 1993; Newell, Best, Gastgeb, Rump, & Strauss, 2011), neither of the studies controlled for infants' spontaneous preference for female faces (Quinn et al., 2002),

making the results ambiguous. Results from intermodal matching studies suggest 9- to 12-month-olds have a better developed category for female than male faces (Poulin-Dubois et al., 1994), which fits with the notion that infants' social categorization abilities become specialized toward the end of the first year and reflect who is most socially relevant to the infant.

The Saliency of Masculinity

Results show facial masculinity is a salient cue to infants. In addition to finding support for most of the predicted visual preference and categorization abilities, masculinity differences were also salient when infants discriminated between male faces—6-month-olds' recovery to a novel male face that differed in masculinity was particularly high. Taken together, our results suggest apredilection in infants toward attending more to male facial masculinity relative to attractiveness. There is some support for a developmental continuation of a difference in saliency of these male facial cues. Four- and 5-year-olds more quickly and accurately identify males' sex based on masculinity as compared with attractiveness (Hoss, Ramsey, Griffin, & Langlois, 2005). Additionally, when adults view feminine-looking men, their first reaction is to categorize these faces based on masculinity before categorizing them based on biological sex (Freeman & Ambady, 2009; Freeman, Ambady, Rule, & Johnson, 2008). Children and adults' initial reliance on masculinity cues to categorize males in these studies may have its origins in infancy.

Limitations

Although masculinity appeared to be a more salient cue to infants than attractiveness, the psychophysical differences between high and low masculine males and between high and low attractive males in our study cannot be fully equated. We ensured that there were significant differences in ratings between these male face categories and that there were not significant differences in ratings for faces within the categories. This approach was necessary given the

featural, configural, and luminance differences that distinguish high and low masculine males and high and low attractive males (Langlois & Roggman, 1990; Russell, 2003, 2009; Thornhill & Gangestad, 2006), but meant we only estimated the psychophysical differences between males at the high and low ends of attractiveness and masculinity.

Our data support the interpretation that infants categorize female-like facial cues (low masculinity) by 12 months, but we can only infer that predominant female experience is the reason why 12-month-olds categorized low masculine, but not high masculine, male faces. Others have inferred that facial experience explains infants' other perceptual abilities, such as visual preferences for female faces and categorization of familiar and unfamiliar races faces (Anzures et al., 2010; Quinn et al., 2002). Indeed, Kayl (2012) found that toddlers' attention toward female faces during actual social interactions was the best predictor of their visual preference for low masculine males relative to self and gender knowledge. Nevertheless, it is important to examine how infants with male primary caregivers or increased male facial experience categorize male faces. If facial experience influences social categorization, these infants should differ in their categorization of male faces (e.g., categorize high masculine males) compared with infants with predominant female experience.

It is also important to determine whether categorization abilities are limited to the lab setting or evident in real world social settings, and whether infants would perform in the same manner if they were familiarized to and tested with both female and male faces. Currently, it is unclear whether infants categorize the faces of low masculine ("gender atypical") males as male or female (see Newell et al., 2011), but given the time lag between when infants' visual preferences for females first manifest before generalizing to low masculine males, it seems unlikely that infants perceive low masculine males as female. Assessing whether infants look

more toward a low masculine relative to high masculine male when hearing a female voice during an intermodal matching task is one way to potentially examine such categorization.

Conclusions

This research has advanced knowledge of how infants' familiarity with females might affect visual preferences for and discrimination and categorization of males. These findings are important because it is one of few studies in the infant face perception literature that specifically examines male face processing. If early emerging social categories serve as precursors to development of masculinity stereotypes (as per Ramsey et al.'s 2004 model), future research should examine when and how young children begin linking differential behaviors and traits to males who differ in masculinity. Work is also needed to examine when children begin categorizing males by attractiveness and how that affects development of male attractiveness stereotypes.

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Table 1

Infant Ages, Demographics, and Reasons for Deleted Data in Each Study

Experiment	Participant Ages in Months and Days	Participant Race & Ethnicity	Deleted Data
1 – Attractiveness	6 months ($n=22$); $M = 181.77$, $SD = 8.28$	34 European American, 3	Fussy (8), preterm (8), parent
Visual Preferences ($N=44$, 25males)	12 months ($n=22$); $M=366.59$, $SD = 9.67$	Multiracial/other race, 1 African American/Black, 2 Asian American, 4 did not report 4 Hispanic/Latino	interaction (3), equipment error (1), male primary caregiver (1), low reliability (1), experimenter error (1)
2 – Masculinity	6 months ($n=20$); $M = 180.70$, $SD = 7.83$	35 European American, 2	Parent interaction (1), male
Visual Preferences ($N=40$, 19males)	12 months ($n=20$); $M=366.75$, $SD = 7.40$	Multiracial/other race, 1 African American/Black, 1 Asian American, 1 did not report 1 Hispanic/Latino	primary caregiver (1), side preference (1), experimenter error (1), not on task (1)

3 – Discrimination of Males Similar in Masculinity (<i>N</i> =30, 14males)	6 months (<i>n</i> =15); <i>M</i> = 173.73, <i>SD</i> = 5.24	22 European American, 2 African American/Black, 1 Asian American/Pacific Islander, 1 Multiracial, 1 Native American, 3 did not report, 4 Hispanic/Latino	Side preference (3), fussy (1), preterm (1), parent interaction (1)
4 – Discrimination of Males Similar in Attractiveness (<i>N</i> =30, 18 males)	6 months (<i>n</i> =15); <i>M</i> = 176.47, <i>SD</i> = 7.53 12 months (<i>n</i> =15); <i>M</i> = 361.07, <i>SD</i> = 8.15	24 European American, 1 African American/Black, 1 Asian American/Pacific Islander, 1 other race, 3 did not report, 4 Hispanic/Latino	Fussy (9), side preference (2), preterm (1), not on task (1), parent stopped study (1)
5 – Categorization (<i>N</i> =194, 99 males)	6 months (<i>n</i> =96); <i>M</i> = 180.86, <i>SD</i> = 8.62 12 months (<i>n</i> =98); <i>M</i> = 363.92, <i>SD</i> = 8.61	146 European American, 26 Multiracial/other race, 5 African American/Black, 2	Fussy (34), preterm or developmental delays (27), experimenter error (14),

		American Indian/Alaska	previously participated in this
		Native, 1 Native Hawaiian, 1	study or Exp. 6 (9), parent
		Asian American, 13 did not	interaction (8), male primary
		report	caregiver (6), equipment error
		38 Hispanic/Latino	(1)
6 – Within	6 months ($n = 79$); $M = 179.59$, $SD = 8.93$	52 European American, 15	Preterm or developmental
Category		Multiracial/other race, 3	delays (7), side preference (6),
Discrimination		Asian American, 2 African	male primary caregiver (5),
($N=79$, 39 males)		American/Black, 1 Native	experimenter error (4), parent
		American, 6 did not report	interaction (2), did not look at
		11 Hispanic/Latino	faces during one or more trials
			(1)

Figure Captions

Figure 1. The averaged faces were created from 32 female faces, 32 low masculine male faces, or 32 high masculine male faces, respectively. Note how the low masculine male averaged face is more perceptually similar to the female averaged face as compared to the high masculine male averaged face in terms of jaw length and width and brow protrusion.

Figure 2. Infants' percentage of total looking time (PTLT) toward the high attractive faces based on face pair masculinity in Experiment 1. Bars represent standard error.

Figure 3. The percentage of total looking time (PTLT) infants directed toward the novel face in Experiments 3 and 4. Bars represent standard error.

Figure 4. Infants' percentage of total looking time (PTLT) directed toward the novel category face as a function of familiarization category and test comparison in Experiment 5: (a) 6-month-olds' data and (b) 12-month-olds' data. Bars represent standard error.

Figure 5. Infants' percent of total looking time (PTLT) toward the novel category face as a function of infant sex and test order. Bars represent standard error.

Figure 1

Female averaged face

Low masculine male averaged face

High masculine male averaged face

Figure 2

Figure 3

Figure 4a

Figure 4b

Figure 5