Reported maternal tendencies predict the reward value of infant facial cuteness, but not cuteness detection

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Abstract

The factors that contribute to individual differences in the reward value of cute infant facial characteristics are poorly understood. Here we show that the effect of cuteness on a behavioral measure of the reward value of infant faces is greater among women reporting strong maternal tendencies. By contrast, maternal tendencies did not predict women's subjective ratings of the cuteness of these infant faces. These results show, for the first time, that the reward value of infant facial cuteness is greater among women who report being more interested in interacting with infants, implicating maternal tendencies in individual differences in the reward value of infant cuteness. Moreover, our results indicate that the relationship between maternal tendencies and the reward value of infant facial cuteness is not due to individual differences in women's ability to detect infant cuteness. This latter result suggests that individual differences in the reward value of infant cuteness are not simply a byproduct of low cost, functionless biases in the visual system.

Keywords: incentive salience; motivational salience; baby; parental behavior; maternal desire
Facial cuteness can have important effects on adult responses to infants. Adults report being more likely to care for, protect, and form close bonds with infants displaying cute facial characteristics [1-4]. Similar patterns of results have been observed in studies of the actual care provided for infants [5]. Furthermore, neuroimaging [6] and behavioral [7,8] studies suggest that cute infant facial characteristics are rewarding. Similar results have also been reported for responses to infants with and without cleft lips [9-12] or displaying positive and negative emotional expressions [13].

Some studies report that the effects of infant facial cuteness on perceptual judgments and the reward value of infant faces (the latter assessed via behavioral key-press tasks similar to those used to study the motivational salience of stimuli in non-humans) are greater among women than men [7,8,14,15]. Although it has been suggested that this pattern of results occurs because women's interest in caring for infants is, on average, greater than men's [7,14,15], there have been no direct tests for links between individual differences in women's interest in caring for infants and their responses to infant facial cuteness. Indeed, some studies have not observed stronger responses to infants in women than men [16-19], further calling into question the presumed link between interest in caring for infants and women's responses to infant facial cuteness.

In light of the above, we investigated how nulliparous women's reported interest in caring for infants (i.e., what some researchers have called reported
maternal tendencies [20,21]) relates to their responses to experimentally
manipulated infant facial cuteness in two tasks: a perceptual cuteness rating
task and a behavioral key-press task. Because responses on perceptual
rating and behavioral key-press tasks are thought to measure different
constructs (subjective appraisal or ‘liking’ and ‘wanting’ or motivational
salience, respectively [22]), maternal tendencies need not necessarily relate
to responses on both tasks in the same way.

Methods

Participants
Two hundred heterosexual nulliparous women (mean age=21.93 years,
SD=4.58), recruited by following links from social bookmarking websites (e.g.,
StumbleUpon.com), participated in this online study. Participants were not
compensated for their participation. All procedures were approved by the
University of Glasgow Psychology Ethics Review Board.

Stimuli
We used computer-graphic techniques [23] to create high-cuteness and low-
cuteness prototypes. These possessed the average shape information of the
20 infant faces that received the highest and lowest cuteness ratings,
respectively, in a previous study [15]. We then created high-cuteness versions
of 10 different infant face images by adding 50% of the linear differences in
2D shape between the high-cuteness and low-cuteness infant prototypes to
each of the 10 infant face images (Figure 1). Low-cuteness versions of the 10
infant face images were created by subtracting 50% of the linear differences
in 2D shape between the high-cuteness and low-cuteness infant prototypes from each of the 10 infant face images (Figure 1). Mouth shape was held constant [see 14].

Procedure

Half of our participants completed a key-press task used to assess the reward value of infant facial cuteness in previous studies [e.g., 7]. The other half completed a rating task used to assess the effect of morphological cues on infant facial cuteness [e.g., 14]. Participants were randomly allocated to either the key-press or rating task to ensure that possible differences in findings for these tasks could not be due to systematic differences in the characteristics of the two groups of women. See Supplemental Materials for instructions. All participants completed a maternal tendencies questionnaire. The order in which participants completed their face rating/key-press task and the questionnaire was randomized.

Key-press task. All 20 images were presented in a fully randomized order. Participants controlled the viewing duration of each face image by repeatedly pressing designated keys on their keyboard after initiating each trial by pressing the space bar. Participants could either increase the length of time a given face was displayed by alternately pressing the 7 and 8 keys or decrease the length of time a given face was displayed by alternately pressing the 1 and 2 keys. Each key press increased or decreased the viewing duration by 100ms. The default viewing duration for each image (i.e., the length of time a face remained onscreen if no keys were pressed) was 4 seconds. All
participants key pressed at least once during the task. Participants completed a block of practice trials at the start of the key-press task. Responses to faces assessed using key-press tasks are good predictors of neural measures of the reward value of faces [24].

Key-press scores for each face were calculated by subtracting the number of key presses made to decrease viewing time from those made to increase viewing time. These key-press scores were then used to calculate each participant’s cuteness reward score by subtracting the mean key-press score for the low-cuteness versions of infant faces from that for the high-cuteness versions (M=5.91, SD=10.41). Higher scores indicate a greater effect of cuteness on reward value.

Rating task. All 20 infant face images were presented in a fully randomized order and were rated for cuteness on a 1 (not cute) to 7 (very cute) scale. We calculated each participant’s cuteness perception score by subtracting the mean rating they gave to the low-cuteness versions of infant faces from that they gave to the high-cuteness versions (M=0.36, SD=0.52). Higher scores indicate that cuteness had a greater effect on ratings.

Maternal tendencies questionnaire. Participants completed a version of Ahrons’ [25] Parental Involvement Scale, in which they were asked to rate on a 1 (not at all) to 5 (very much) scale how involved they would like to be in ten aspects of child raising (e.g., dressing and grooming your child, taking them for recreational activities). Maternal tendencies were also assessed by asking
participants to rate, using a 1 (much less than average) to 7 (much more than average) scale, and relative to others of their age and sex, how much they enjoy interacting with children, how maternal they consider themselves to be, and how strongly they want to have children. These additional questions have been used to assess maternal tendencies in prior work on individual differences in nulliparous women’s maternal tendencies [20,21]. Factor analysis of women’s average scores on the Parental Involvement Scale and scores on each of the additional questions produced a single maternal tendencies factor with which scores on the three additional questions were highly correlated (all $r>.88$) and with which the Parental Involvement Scale score was moderately correlated ($r=.47$). Scores on the maternal tendencies factor and participant age were not correlated ($r=-.08$, $p=.26$).

**Results**

In all analyses, $N=100$. We used non-parametric tests for all analyses because some scores were more than three standard deviations from the mean (i.e., were potential outliers). Alternative analyses using t-tests and Pearson’s correlations showed identical patterns of results, however.

A Wilcoxon signed ranks test comparing cuteness reward scores with chance (i.e., zero) showed that women looked longer at high-cuteness versions than low-cuteness versions ($Z=6.33$, $p<.001$, $M=5.91$, $SEM=1.04$, $d=0.57$). There was also a significant positive correlation between cuteness reward scores and scores on the maternal tendencies factor ($rho=.35$, $p<.001$, Figure 2), indicating cuteness had a greater positive effect on the reward value of infant
faces among women reporting greater maternal tendencies. Cuteness reward scores were also positively and significantly correlated with each of the individual measures of maternal tendencies (all ps < .012).

A Wilcoxon signed rank test comparing cuteness perception scores with chance (i.e., zero) showed high-cuteness versions were rated significantly higher than low-cuteness versions (Z = 5.96, p < .001, M = 0.36, SEM = 0.05, d = .69). However, there was no significant correlation between cuteness perception scores and scores on the maternal tendencies factor (rho = -.15, p = .14). The correlation between cuteness reward scores and scores on the maternal tendencies factor was significantly stronger than that between cuteness perception scores and scores on the maternal tendencies factor (Z = 3.60, p < .001).

Discussion

In common with previous work [14,15], women perceived high-cuteness versions of infant faces to be cuter than low-cuteness versions. Also in common with previous work [7,8], responses on the key-press task indicated that high-cuteness versions of infant faces were more rewarding than low-cuteness versions. Importantly, however, reported maternal tendencies were positively correlated with the reward value of infant facial cuteness, but not with perceptions of infant cuteness. These results suggest that (i) maternal tendencies are more closely linked to the reward value of infant facial cuteness than it is to perceptual judgments of infant cuteness and (ii) the relationship between maternal tendencies and the reward value of infant facial cuteness.
cuteness are not simply due to individual differences in women’s ability to
detect infant cuteness. This latter result is noteworthy, since it suggests that
the relationship between maternal tendencies and the reward value of infant
facial cuteness is not simply a byproduct of low cost, functionless biases in
the visual system. Because we investigated this issue in nulliparous women
only, further work is needed to investigate whether motherhood has additional
effects on the relationship between reported maternal tendencies and
responses to infant cuteness.

That the relationship between maternal tendencies and responses to infant
facial cuteness appears to be task-specific (i.e., was evident in responses on
the key-press task, but not perceptual ratings) is consistent with prior research
suggesting that key-pressing and perceptual judgments measure different
components of approach responses: ‘wanting’ or motivational salience and
subjective appraisal or ‘liking’, respectively [22]. For example, heterosexual
men’s subjective ratings distinguish physically attractive from unattractive
faces regardless of their sex, but responses on the key-press task distinguish
physically attractive from unattractive faces for female stimuli only [24]. Our
data extend this distinction between reward value and subjective ratings by
demonstrating that only individual differences in the reward value of infant
cuteness are related to nulliparous women’s reported maternal tendencies.
References


Figure Captions

Figure 1. High-cuteness (left) and low-cuteness (right) versions of faces used in our study.

Figure 2. Correlation between cuteness reward scores and scores on the maternal tendencies factor.
Author contributions
ACH/BCJ/LMD designed the study; ACH/BCJ carried out statistical analyses; ACH/BCJ/LMD wrote the manuscript; all authors gave final approval for publication.

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Competing interests statement
The authors state that they have no competing interests

Data accessibility
The data have been made available as electronic supplementary material.

Ethics & Consent
All procedures were approved by the local Ethics Review Board at the University of Glasgow and all participants provided informed consent prior to beginning the study.
Supplemental Materials

All study interfaces were custom-written in php and Javascript.

Instructions for key-press task
In this study, you will look at baby faces for 1.5 minutes. How long you look at each face is up to you. You can change the time each image is on the screen by pressing buttons like you did in the button-pressing training task you just completed.

As in the training task, press 7 and 8 to keep the image on the screen. Press 1 and 2 to remove the image from the screen.

Instructions for cuteness rating task
In this study, you will be shown a series of baby faces and asked to rate how cute you think they are. Please look closely as some images will be very similar in appearance. For each face, please type your rating on the 1 (not cute) to 7 (very cute) scale in the box below and press enter to submit.

Reported participant ethnicities
70% White, 8% Latina, 6.5% mixed-race, 3.5% East Asian, 2.5% African, 1.5% Native American, 1.5% Arabic, 6.5% other/undisclosed.

Reported participant geographic location
60% North America, 31% Europe, 7% Oceania, 2% South America.