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Unattractive infant faces elicit negative affect from adults

Stevie S. Schein* and Judith H. Langlois

The University of Texas at Austin, Psychology, 108 E. Dean Keeton, Austin, TX 78712, United States

Abstract

We examined the relationship between infant attractiveness and adult affect by investigating whether differing levels of infant facial attractiveness elicit facial muscle movement correlated with positive and negative affect from adults ($N = 87$) using electromyography. Unattractive infant faces evoked significantly more *corrugator supercilii* and *levator labii superioris* movement (physiological correlates of negative affect) than attractive infant faces. These results suggest that unattractive infants may be at risk for negative affective responses from adults, though the relationship between those responses and caregiving behavior remains elusive.

Keywords

Attractiveness; Electromyography; EMG; Infant facial attractiveness

Facial attractiveness can elicit preferential treatment beginning in infancy (Langlois et al., 2000), both from parents (Langlois, Ritter, Casey, & Sawin, 1995) and strangers (Stephan & Langlois, 1984). Stereotypes about children's and infants' abilities based on their physical attractiveness can influence behavior toward those children, which in turn affects the children's social interaction and personality development (Langlois & Stephan, 1981). This research seeks to examine attractiveness as a characteristic that elicits differential affect from adults, using electromyography to detect subtle affective changes.

1. Adult judgments of children based on attractiveness

Adults' ability to judge the attractiveness of infants is highly reliable and consistent (Langlois et al., 2000), indicating that they are aware of differences in attractiveness. For children judged as "cute," this may be beneficial: Adult women presented with photographs of infants looked longer at infants rated high on cuteness (Hildebrandt & Fitzgerald, 1978). Meanwhile, children lower in attractiveness may face greater challenges, as research has shown that adults have negative biases and stereotypes about their abilities and personal characteristics (Stephan & Langlois, 1984; Ritter, Casey, & Langlois, 1991). Stephan and Langlois (1984) presented undergraduates with a set of photographs of a sample of infants and asked them to rate the infants for attractiveness and for 10 evaluative adjective pairs.

They found that more attractive babies were rated as smarter and more likeable, whereas less attractive babies were rated as causing parents more problems.

These positive and negative judgments may be related to adults' aversion to looking at unattractive children's faces as well as their preference for looking at attractive children's faces. When presented with photographs of normal and abnormal baby faces (including babies with Down's syndrome, cleft palate, and fetal alcohol syndrome), men chose to increase their viewing time of normal baby faces. Likewise, women chose to decrease their viewing time for abnormal baby faces (Yamamoto, Ariely, Chi, Langleben, & Elman, 2009). More baby like faces also elicit increased protection from adults (Alley, 1983), while infants with cranio-facial anomalies elicited less smiling and vocalizing from their mothers (Field & Vega-Lahr, 1984). This further suggests that adults may have preferences for normal and attractive infant faces over abnormal or unattractive ones and that even infants may be at risk for invoking negative affective and behavioral responses based on their facial appearance.

More generally, adults prefer to view attractive faces and perceive them more positively, while simultaneously rating unattractive faces as less intelligent, social, and altruistic than medium and high attractive faces (Griffin & Langlois, 2006). The assumption that unattractive faces are associated with more negative attributes may be related to humans' tendency to pay more attention to negative information in faces (Oehman, Lundqvist, & Esteves, 2001) due to their potential threat, or may reflect a larger pattern of negativity bias across domains (Vaish, Grossman, & Woodward, 2008).

2. Measuring affect: Electromyography

Electromyography (EMG) is often used to study affect and is a particularly useful technique because it can detect subtle changes in facial muscle movement associated with affective response and because recording is non-invasive and painless (de Wied, van Boxtel, Zaalberg, Goudena, & Matthys, 2006). Certain muscles are correlated with specific affective responses and indications of liking, including participant self-reports of emotion (Larsen, Norris, & Cacioppo, 2003). Cacioppo, Petty, Losch, and Kim (1986) found that facial EMG yields reliable information about both the valence and the intensity of emotional reactions to stimuli. Facial EMG activity can occur even without awareness of the specific facial expression (Dimberg, Thunberg, & Elmehed, 2000), and additionally can detect mild affective reactions to subtle stimuli that do not elicit fully developed emotional expressions (Dimberg et al., 2000).

Due to these methodological advantages, facial EMG has been used in several studies to capture differential affective reactions toward a variety of stereotyped groups. For example, Vanman, Saltz, Nathan, and Warren (2004) used EMG to show differences in muscle activation when looking at African-American/Caucasian faces. Participants showed differential EMG responses toward faces of different races. These differences had not emerged for the same participants using the Implicit Association Test but were, in fact, more predictive of discriminatory behavior toward African-Americans.

Facial EMG has also been used in several studies to assess affect with regard to differential facial attractiveness. Researchers have found that neural activities related to attractiveness perception are engaged even when participants are not explicitly asked to judge it (Aharon et al., 2001; Trujillo, Jankowitsch, & Langlois, 2014), which furthers the argument that EMG can be used to reliably assess differential reactions from participants. Specifically, attractiveness effects have been found in the activation of *zygomaticus major* (ZM; pulling the corner of the lips into a smile; a positive affect response) and unattractiveness effects in the activation of *corrugator supercili* (CS; knitting the brow; a negative affect response) and *levator labii superioris* (LLS; raising the nostril; a disgust response) (Gerger, Leder, Tinio, & Schacht, 2011; Principe & Langlois, 2011).

Hildebrandt and Fitzgerald (1978) previously utilized electromyography to explore adults' affective responses to infant faces of varying attractiveness, but failed to establish that the attractiveness of infant faces could elicit differential types and levels of facial muscle movement responses from adults. However, we believe that this null finding can be explained by their use of a single electrode site (ZM), resulting in data that captured only positive affective responses.

This paper aims to replicate and extend the work of Principe and Langlois (2011), who studied affective responses to adult faces of varying levels of attractiveness, as well as the work of Hildebrandt and Fitzgerald (1978), who explored positive affective responses to infants varying in attractiveness. Our goal was to explore whether infant attractiveness influenced adults' positive and negative affective responses, as measured by facial muscle movement. We hypothesized: (1) Participants would show increased levels of negative affect, as measured by facial EMG (CS and LLS sites), while looking at images of unattractive infants, and (2) Participants would show increased levels of positive affect (ZM site) while looking at images of attractive infants.

3. Method

3.1. Participants

Ninety-three undergraduates ($M = 20.26$ years old, $SD = 2.91$ years; 49 female) were recruited through their Introductory Psychology course and received course credit in exchange for their participation. We excluded data from analysis for 6 participants for the following reasons: equipment error ($n = 3$), participant off-task ($n = 2$), and real-life parent ($n = 1$). The final sample included 87 participants (44 female) and included 35% Caucasian, 28% Asian/Asian-American, 27% Hispanic/Latino, and 10% African-American undergraduates.

3.2. Stimuli

The images were 14 faces of 3-month-old infants. Seven of the faces were attractive and seven were unattractive. The photos displayed color cropped images of the infants' faces against a white background. The faces were occluded such that the neck and shoulders of the infant were not visible to decrease variation across images and focus attention on the infants' faces. Images were standardized for size, head tilt, color saturation, and blur level.

These faces were taken from a larger research study, and their inclusion was based on photo quality, infant neutral expression, infant age, and previously acquired attractiveness ratings from 60 raters (on a seven-point Likert scale: for the attractive infants, $M = 5.10$; for the unattractive infants, $M = 2.28$; we conducted a paired-samples t-test to compare the set of attractive faces to the set of unattractive faces and found them to be significantly different $t(1420) = 33.53$ $p < 0.001$).

3.3. Procedure

The experimenter instructed participants that we would be measuring their psychophysiological responses to images of infants. They were invited into the study room and sat in front of a computer. The experimenter attached to the participant's face seven Ag–AgCl electrodes filled with conductive gel. The electrodes were placed over the *corrugator supercilii* (brow muscle), the *zygomaticus major* (cheek muscle), and the *levator labii superioris* (nostril muscle) and at the top of the forehead as a control site using guidelines developed by Fridlund and Cacioppo (1986) for electrode site placement.

After the electrodes were attached, participants viewed a series of images of faces presented one at a time on a computer monitor. All images were shown for 2000 ms, with 4000–8000 ms variable ISI. The images were presented so that all faces were shown in random order once, then shown in random order a second time.

3.4. Data coding and dependent variables

The dependent measure was facial muscle activity, as reflected by wave amplitude measured in microvolts (mV). We used a 500Hz pass band to filter the data to remove artifact and amplifier noise (Principe & Langlois, 2011; Fridlund & Cacioppo, 1986). We averaged across each of the two electrodes attached to each site of interest. The sites of interest were the CS (negative affect), LLS (negative affect), and ZM (positive affect) (Fridlund & Cacioppo, 1986).

We averaged the amplitude of the wave form for the 2000 ms of stimuli observation for each electrode site and subtracted the baseline, which is the average amplitude for the 2000 ms immediately preceding stimuli onset for that site. This number indicated the average muscular reaction to each infant face for each presentation. We then averaged across the two stimuli presentations, so that each of the 14 stimuli faces had 3 dependent scores (CS, LLS, ZM).

4. Results

To control for individual participants' variation in baseline size of facial muscle movements, as well as individual variation in responsive facial muscle movements (i.e. the possibility that some participants would react more strongly to the differences in stimuli attractiveness than others), we analyzed the data using Hierarchical Linear Modeling (see also Principe & Langlois, 2011) with one-tailed tests, to reflect our specific hypotheses about the directions of each muscle movement with regard to infant attractiveness.

4.1. Corrugator supercilii

Using HLM, we isolated the random effects structure using restricted maximum likelihood to predict CS movement from infant attractiveness. Our analysis showed that the best model included both random intercepts and random slopes, and using a fixed-effects continuous attractiveness variable (the previously acquired attractiveness ratings), significantly predicted CS movement, $b = -0.018$, $t(1130) = -3.75$, $p < 0.001$, ICC = 0.208. Despite individual variation in facial muscle movement at a baseline of attractiveness, and individual variation in the magnitude of response to faces across the attractiveness spectrum, there was a main effect of infant attractiveness on CS movement, such that unattractive infant faces elicited significantly more CS movement than attractive infant faces (see Fig. 1).

4.2. Levator labii superioris

We found evidence of electrode cross-talk between the *levator labii superioris* and the *zygomaticus major* (see similar findings in Principe & Langlois, 2011; Vrana, 1993). Because of the muscles' proximity to one another, interference from the neighbor muscle obscured the relationship between attractiveness and target muscle. To remedy electrode cross-talk and examine LLS independently of the influence of ZM, we regressed ZM on LLS, and used the residuals as the outcome in an HLM model predicting LLS from a fixed-effects variable of infant attractiveness. This model also necessitated random intercepts and slopes, and significantly predicted LLS movement, $b = -0.011$, $t(1130) = -2.41$, $p = 0.01$, ICC = 0.482. This means the baseline affective response and the magnitude of affective response to stimuli both varied across individuals, but there was a main effect of LLS movement such that unattractive infant faces elicited significantly more LLS movement than attractive infant faces (see Fig. 2).

4.3. Zygomaticus major

For ZM, we utilized the same technique we used for LLS, controlling for electrode-cross talk by using participants' residualized scores in the analysis, thus stripping away the influence of LLS movement from ZM movement. In this case, the random effects structure also dictated that we use both random intercepts and slopes. However, there was no statistical significance of the fixed effect of attractiveness on ZM movement, $b = 0.014$, $t(1130) = 1.52$, $p = 0.13$, ICC = 0.368.

5. Discussion

As expected, we found a strong relationship between participants' physiological negative affective reactions, as measured by muscle movement, and the attractiveness of infant faces. This was true both for the CS site and the LLS site and indicates that unattractive infant faces elicit more general negative affect as well as more disgust reactions than attractive infant faces. These results parallel Principe and Langlois' (2011) findings with adult faces and demonstrate that affective responses are stable across facial stimuli regardless of the age of the stimuli. Adults are sensitive to the attractiveness of both adult and infant faces, and accordingly display movement of facial muscles that are correlated with emotional reactions to these faces. Results from Langlois et al. (1995) suggested this in real interactions where mothers engaged in more affectionate behavior with attractive than unattractive infants.

Our findings also parallel both Principe and Langlois (2011) and Hildebrandt and Fitzgerald (1978) in failing to find a result for the ZM muscle in response to attractive facial stimuli. The CS and LLS findings, paired with the lack of ZM finding, provide support for the ugly-is-bad model outlined by Griffin and Langlois (2006), which describes attractiveness stereotypes as being driven by negative responses to unattractive faces, rather than positive responses to attractive faces.

Other studies (Stephan & Langlois, 1984; Ritter et al., 1991) have shown that adults make judgments about infants' personalities, behavior, and abilities based on their attractiveness, but the current study is the first to directly indicate that infant attractiveness may also influence adults' physiological affective reactions. The muscle movements demonstrated in the present study indicate that adults are processing and affectively reacting to those differences in infant attractiveness. Additionally, the finding that these affective responses are generally driven by negative affect toward unattractive infants, rather than positive affect toward attractive infants, is important one.

Another strength of this study is the use of HLM: relatively few EMG studies have statistically controlled for individual variation in participant facial muscle movement. Other studies have used MANOVAs (de Wied et al., 2006), correlation (Vanman et al., 2004), and *t*-tests (Dimberg et al., 2000). Controlling for individual variation with HLM is a stronger statistical test, which emphasizes the validity of our findings.

These findings provoke a number of questions about whether these emotional reactions cascade into attitudes about the infant, and how these affective reactions could potentially cascade into behavioral outcomes, especially the differential treatment of attractive and unattractive infants. One EMG study focusing on race has already shown that implicit attitudes measured by EMG responses are predictive of stereotyping in real-world situations (Vanman et al., 2004), so it is reasonable to hypothesize that a similar process might ensue in adult-infant interactions, with the stereotyping based on attractiveness rather than race.

It is also unclear what the effect of repeated exposure to unattractive infant faces might be on the adults who encounter them. Might these negative affective reactions build up over time, especially for the primary caretaker for an unattractive infant? Future studies might investigate whether mothers of unattractive infants are more likely to show symptoms of depression.

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Highlights

- Unattractive infant faces elicit more negative affect than attractive infant faces.
- Adults display significant disgust responses to unattractive infant faces.
- Adults affectively differentiate between attractive and unattractive infants.

Fig. 1.

Corrugator supercilii response as a function of infant attractiveness.

Fig. 2.
Levator labii superioris response as a function of infant attractiveness.