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THE EFFECT OF INFANT FETAL ALCOHOL SYNDROME FACIAL FEATURES ON ADOPTION PREFERENCE

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Infant facial characteristics may affect discriminative parental solicitude because they convey information about the health of the offspring. We examined the effect of Fetal Alcohol Syndrome (FAS) infant facial characteristics on hypothetical adoption preferences, ratings of attractiveness, and ratings of health. As expected, potential parents were more likely to adopt "normal" infants, and they rated the FAS infants as less attractive and less healthy. Cuteness/attractiveness was the best predictor of adoption likelihood.

KEY WORDS: **Adoption preference; Fetal Alcohol Syndrome; Infant attractiveness; Infant health; Parental solicitude**

There is a wealth of evidence indicating that people are attracted to other people who are physically attractive (e.g., Berscheid and Walster 1974; Hatfield and Sprecher 1986). Among adults, physically attractive people are generally more likely to be chosen as dating partners (Byrne et al. 1968; Curran and Lipold 1975; Landolt et al. 1995) and are more likely to have positive personality characteristics attributed to them (Dion et al. 1972). Researchers have uncovered a host of specific facial features that are related to judgments of physical attractiveness in adults, including facial

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symmetry and averageness (Grammar and Thornhill 1994; Perrett et al. 1999; Rhodes et al. 1998, 1999; Thornhill and Gangestad 1993).

A preference for particular facial features is not limited to judgments of the attractiveness of adults but extends to infants as well. Sternglanz and colleagues (1975) investigated adults' reactions to various drawings of infant faces, manipulating features such as chin and eye size, and found a general preference for "average" features. Hildebrandt and Fitzgerald (1979) replicated the Sternglanz et al. study (1975) using photos of real infants and found the same general preference for averageness. Specific facial features seem to play a role in perception of infant attractiveness as well. Research supports a preference for large eyes, a large forehead, and a small chin (Hildebrandt and Fitzgerald 1979; Sternglanz et al. 1975), although contradictory findings do exist (e.g., Kirkland and Smith 1978).

Studies also show that the "beautiful is good" stereotype applies to adults' ratings of infants. Infants who were rated as attractive were also more likely to be rated as smart, likeable, and well behaved (Stephan and Langlois 1984), as well as more developmentally competent (Casey and Ritter 1996; Ritter et al. 1991). In addition, mothers of less attractive infants have been shown to be less affectionate, playful, and attentive during mother-infant interactions than mothers of attractive infants (Langlois et al. 1995).

Researchers typically interpret these findings on infant attractiveness as being in line with the idea that infants have developed certain facial features through the process of natural selection because they elicit parental care and that parents have been selected to respond to those characteristics with parental care because of their ability to convey information about the health of the infant. Moreover, there is evidence that facial symmetry in adults is linked to underlying developmental stability (Thornhill and Gangestad 1993). Specifically, facial symmetry has been linked to parasite resistance, a quality that may well have provided a substantial survival advantage during our ancestral history.

The possibility that certain facial characteristics can serve as cues to an individual's health is difficult to dispute. Some forms of severe mental retardation, such as Down Syndrome, are easily recognized by the typical facial phenotype. Fetal Alcohol Syndrome (FAS) is also characterized by a set of typical facial features, including short palpebral fissures (the width of the eyes relative to the distance between the eyes), a smooth philtrum (the vertical indentation between the nose and upper lip), and a thin upper lip (Streissguth 1997). These features tend to be present in newborns, and they remain recognizable throughout development. People diagnosed with FAS experience cognitive and behavioural dysfunction, as well as growth deficiencies (Williams et al. 1994).

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Given the finding that adults prefer infant faces that converge on "average" (Hildebrandt and Fitzgerald 1979; Sternglanz et al. 1975), it is likely that adults would show an aversion to infant faces that appear "abnormal," such as those of infants with FAS or other recognizable developmental deficiencies. In support of this suggestion, Kelley and colleagues (1996) found that mothers rated low-birth-weight infants with postnatal head-molding as significantly less attractive than either normal-birth-weight infants or low-birth-weight infants without postnatal head-molding. The authors suggest that normal baby head shape is important for eliciting sensitive maternal responses. Indeed, one study on mother-infant interactions showed that mothers of infants with craniofacial deformity were consistently less nurturing than mothers of normal infants, even though they rated their parental satisfaction *more* positively than the mothers of normal infants (Barden et al. 1989). Furthermore, Frodi et al. (1978) showed that, when paired with premature infant faces, infant cries were more unpleasant to adults than when paired with normal infant faces.

Parental investment in a particular infant could be allocated to other activities that would increase chances of reproductive success, such as seeking a mating partner (Westneat and Sherman 1993). If the infant is at a survival and/or reproductive disadvantage, the chance of the investment paying off decreases. In short, natural selection may have resulted in the motivation to invest parental care only in infants who appear to be healthy enough to justify the costs in terms of lost time and resources. In fact, several studies have suggested that infants and children who are known to have health problems may be at a disadvantage in terms of eliciting parental care. Engelmann et al. (1996) showed that a significant portion of college students predicted that they would abort a fetus with serious medical problems. Furthermore, Mann (1992) found that mothers of prematurely born twins tended to behave in a more caring manner toward the healthier of the twins. A report on parental care in a Brazilian ghetto revealed that mothers of sick infants were more likely to generate excuses for not caring for their infants than were mothers of healthy infants, and that the abuse and neglect of sick infants was generally socially sanctioned by the community (Schepher-Hughes 1985). Finally, Daly and Wilson (1999) reported that children who had a serious handicap or other serious health problems were more likely to be abused at the hands of fathers and stepfathers than were physically healthy children.

The present study extends the work of Sternglanz et al. (1975) and Hildebrandt and Fitzgerald (1979) on the influence of infant facial features on ratings of attractiveness and elicitation of parental care. A significant limitation of their studies concerned the stimuli that they used—fairly crude sketches of infant faces. In order to increase ecological validity, we had

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adults rate pictures of real infants. A second, and possibly more severe, limitation of those studies is that they did not provide a rationale for choosing the features that they manipulated. The present study addressed their research question from a more specific and theoretically based perspective. Photographs of average infants were manipulated to produce images of infants whose faces resembled the typical Fetal Alcohol Syndrome (FAS) face. Specifically, palpebral fissure length was reduced, the upper lip was made thinner, and the philtrum was removed. Adults were then asked to rank and rate the FAS and average faces on several dimensions, including how much they would like to adopt each infant in a fictional adoption scenario, which was used as a proxy for parental investment.

FAS was chosen to represent a constellation of abnormal facial features for several reasons. Most importantly, Astley and Clarren (1996) showed that people with FAS could be reliably discriminated from people without FAS according to a mathematical formula based on three defining facial characteristics: short palpebral fissures, a thin upper lip, and an indistinct philtrum. Other relevant advantages of studying FAS include its appreciable prevalence, which is estimated as up to two cases per thousand births in the United States (May and Gossage 2001), and its severe, lifelong impact on sufferers (Astley and Clarren 1996). The prevalence and severity of FAS are significant in that any trends that are found may be immediately applicable to a very real social problem. In addition, the severity of the developmental difficulties experienced by an individual diagnosed with FAS provides the basis for the suggestion that adults may have evolved to recognize and minimize investment in infants displaying FAS-related features.

The argument being presented is not that people have been naturally selected to recognize and discriminate based on the characteristics of Fetal Alcohol Syndrome per se. The facial abnormalities manifested in this condition may be representative of any number of conditions that arise from damage to the developing fetus as a result of some kind of environmental trauma or genetic anomaly. Indeed, one or more of the aforementioned FAS-defining facial characteristics are also symptoms in a number of other severe infant disorders (Green 1986; Waldrop and Halverson 1971). Evolutionary pressures may simply have equipped parents with the ability to discriminate between certain "healthy" and "unhealthy" facial characteristics and with the motivation to minimize investment in infants who appear to be unhealthy.

We used a hypothetical adoption paradigm in order to assess feelings toward parental care. Although adoption can be motivated by a wide variety of goals, from resource distribution (Brady 1976) to substitution for genetic offspring (Pertman 2000), the judgmental processes presumed to be measured in this study were those related to substitution adoption and

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parental investment rather than on other motivations for adoption. This kind of paradigm has been successfully employed in studies using female sperm donor choice as a proxy for hypothetical mate choice (Scheib 1994; Scheib et al. 1997), and in a previous study of infant parental resemblance and parental solicitude (Volk and Quinsey 2002).

We expected that adults would prefer to adopt infants whose faces did not contain features that are characteristic of FAS. We also predicted that adults would rate the non-FAS faces as more attractive and more healthy than the FAS faces. Finally, we predicted that adoption preference ratings would be influenced by ratings of perceived health and attractiveness, in that participants would be more likely to choose healthy and attractive infants when making the hypothetical adoption decisions and ratings.

METHODS

Participants

Participants were solicited from the first-year psychology undergraduate subject pool and from the local community. Undergraduate students earned course credit, while members of the general public responded to a newspaper advertisement offering $10 for participation. The undergraduate group consisted primarily of young Caucasians with high socioeconomic status (SES) and education level, and no parental experience. The community group was also predominately Caucasian, with a wide range of ages, SES, and parental experience.

A total of 77 participants were recruited. Three participants were excluded from statistical analyses due to noncompliance with instructions, and one was excluded due to incomplete data. The final sample consisted of 73 people (mean age = 29.4, s.d. = 15.4), with 27 men (mean age = 31.9, s.d. = 16.1) and 46 women (mean age = 28.0, s.d. = 15.0). Forty participants were undergraduate students (mean age = 19.1, s.d. = .69), while the remaining 33 participants were from the Kingston community (mean age = 42.0, s.d. = 15.4). Approximately 25 of these community participants had recently participated in another study that used a similar adoption paradigm and a similar procedure for presenting photographs of infant faces. However, none of the stimuli presented in this study had been used in the previous study.

Image Selection

Nineteen photographs of Caucasian infant faces were obtained from the Internet, primarily from personal web pages that were considered public domain. All photographs depicted an infant face looking directly at the

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camera. The head angle, image size, and image quality were similar for all photographs. Using ArcSoft Photo Studio 2.0, the palpebral fissure length/inner canthal distance ratio was measured as a proxy for palpebral fissure length in all of the infant photographs and compared to the average palpebral fissure length/inner canthal distance ratio previously measured in a control group without FAS (Astley and Clarren 1996). Fourteen photographs were selected as stimuli whose palpebral fissure length/inner canthal distance ratio fell within one standard deviation of the mean value obtained by Astley and Clarren (1996: mean = 0.83, s.d. = 0.09).

A fifteenth photograph, containing the face of an infant with FAS, was developed from a slide (Streissguth and Little 1994) and digitally scanned using FireWire technology. Palpebral fissure length/inner canthal distance was measured for this photo as well and was found to fall within one standard deviation of the mean ratio for a group of participants with FAS as measured by Astley and Clarren (1996: mean = 0.67, s.d. = 0.07). The final set of images thus consisted of 14 "normal" infant faces and one "FAS" infant face. All images were shrunk/enlarged/rotated, and cropped as needed to produce fifteen images that were similar in size and orientation.

Image Manipulations

Each of the 14 "normal" infant facial images was duplicated, and one copy of each was digitally manipulated to yield a face containing the three differentiating facial features of Fetal Alcohol Syndrome, as defined by Astley and Clarren (1996): smooth philtrum, thin upper lip, and short palpebral fissures. The degree of perceived "smoothness" of a philtrum is the result of the contrast in luminosity between the philtrum furrow and ridge (Astley and Clarren 1996). In order to generate the appearance of a smoother philtrum in the "FAS" copy of each face, this furrow/ridge contrast was decreased by zooming into the philtrum area and lightening the pigmentation along the ridge using ArcSoft Photo Studio 2.0. Next, Gryphon MORPH Version 1.5 software was used to yield a thinner upper lip and shorter palpebral fissures in the "FAS" copy of each of the images. The morphing of the images was accomplished by selecting a number of landmark points on the target feature and using a warping tool to alter the shape/size by moving the landmarks while keeping all other features constant. In line with Astley and Clarren's (1996) finding that their FAS group had an upper lip circularity (a proxy for width) of roughly half that of the normal control group, upper lip width in each "FAS" copy was decreased by approximately half using the zoom feature and visual estimation. The palpebral fissure/inner canthal distance ratio was decreased in each "FAS" copy using visual estimation until it fell within one standard deviation of Astley and Clarren's (1996) average value for their FAS participants.

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Next, a duplicate of the photograph of the infant with FAS was generated and manipulated in order to make it appear more "normal." The philtrum ridge pigmentation was darkened in order to increase the philtrum furrow/ridge contrast and make it appear more distinct, upper lip width was approximately doubled, and the palpebral fissure length/inner canthal distance ratio was increased such that it fell within one standard deviation of Astley and Clarren's (1996) average value for their control group. Finally, the "normal" and the "FAS" versions of each infant were paired together on a pink background using Corel Photo-Paint 9, with the "FAS" version randomly appearing on the either the right or the left side of the "normal" version.

Procedure

Before beginning the experiment, participants were given an information sheet to read and asked to sign a consent form, after which they received either course credit or $10 in cash. Participants performed the experiment one at a time. They were seated at a television/computer station, and were presented with a series of 15 slides consisting of the 15 "normal"/"FAS" image pairs arranged in random order, using software designed by Limestone Technologies. For each slide, participants were asked to use two control buttons feeding into the computer to specify which infant of the pair they would be most likely to adopt if they were looking to adopt an infant.

Participants were then presented with each "FAS" face and each "normal" face in random order. Members of each pair were presented separately, for a total of 30 images. They were asked the following three questions: "If you were going to adopt an infant, how likely is it that you would choose this one?" "How cute/attractive is this infant?" and "How healthy does this infant look?" They were asked to write down their responses to each of these questions by selecting a point on a seven-point scale, where a value of 1 represented "very unlikely/unattractive/unhealthy" and a value of 7 represented "very likely/attractive/healthy." Following completion of this task, participants were thanked for their time and given a debriefing sheet to take with them.

RESULTS

Forced-Choice Task

An a priori alpha level was set at .05 for all statistical tests. The forced-choice responses for each pair of infant faces were analyzed using a series of one-tailed sign tests. The sign test entails adding the sum of the rank-

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ings for each group (normal and FAS) and evaluating the significance of the difference between these sums using the *z*-distribution. The two assumptions of independence of observations and continuous distribution of the variable under question were met. Table 1 details the *z*-scores obtained using the sign test for each pair of infant faces. In seven of the fifteen pairs, the "normal" face was significantly preferred to the "FAS" face. In six additional pairs, the "normal" face was preferred, but not significantly. Only Pair 14 generated a significant preference for the "FAS" face. It was observed following analyses that there was a fairly noticeable difference in color intensity between the "normal" and "FAS" version of the infant in Pair 14, such that the "FAS" infant's skin appeared more pink/rosy, which may have been used as a cue for health. Two independent observers were solicited to look through all fifteen pairs and asked to identify which one(s), if any, contained a noticeable difference between the two infants in terms of color intensity, and Pair 14 was selected by both. All remaining analyses were conducted with and without the data collected from Pair 14, and all of the findings were identical with respect to statistical significance. Thus, the analyses that excluded Pair 14 are reported herein, unless otherwise specified.

In order to assess sex differences in choice of face type, a two-tailed independent samples *t*-test was performed. The total number of "FAS" choices made by each participant was summed, and the mean number of "FAS" choices was then compared for men and women. Men (mean = 5.89,

Table 1. Sign Test Results for Infant Face Pairs Forced-Choice Task

Pair	*"Normal" Choices*	*"FAS" Choices*	*z-Score*	*Mean to "z"*
1	40	33	−0.7	0.258
2	45	28	−1.87	0.4693
3	45	31	−1.17	0.379
4	54	19	−3.98*	0.4999
5	59	14	−5.15*	0.5
6	38	35	−0.23	0.091
7	40	33	−0.7	0.258
8	51	22	−3.28*	0.4994
9	47	26	−2.34*	0.4904
10	52	21	−3.51*	0.494
11	44	29	−1.64	0.4495
12	47	26	−2.34*	0.4904
13	37	36	0	0
14	13	60	5.38*	0.5
15	56	17	−4.45*	0.5

* Denotes statistical significance at .05 alpha level

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s.d. = .48) made significantly more "FAS" over "normal" choices than did women (mean = 4.59, s.d. = .30, $t_{71} = 2.44$, $p < .05$).

Adoption Likelihood, Cuteness, and Healthiness Ratings

A series of 2 × 2 ANOVAs was conducted to detect differences between ratings of adoption likelihood, cuteness, and healthiness for the "normal" and the "FAS" faces, and for participant sex. Adoption likelihood was significantly higher for the "normal" infant faces than the "FAS" faces ($F_{1,71} = 16.17$, $p < .001$; $\eta^2 = .19$). There were no main effects for participant sex ($F_{1,71} = .04$, n.s.). Interactions between type of face ("normal" or "FAS") and sex ($F_{1,71} = 1.11$, $p = .30$.) were not significant. Cuteness/attractiveness ratings were significantly higher for the "normal" infant faces than the "FAS" faces ($F_{1,71} = 29.30$, $p < .001$; $\eta^2 = .29$). There were no main effects for participant sex ($F_{1,71} = .52$, $p = .47$). There was a small significant interaction between type of face and sex ($F_{1,71} = 5.35$, $p < .05$; $\eta^2 = .07$), with women giving higher ratings of cuteness for the "normal" group than did men. Perceived healthiness was significantly higher for the "normal" infant faces than for the "FAS" faces ($F_{1,71} = 26.35$, $p < .001$; $\eta^2 = .27$). There were no main effects for participant sex ($F_{1,71} = 3.69$, $p = .06$) or interactions between type of face and sex ($F_{1,71} = 1.34$, $p = .25$).

In order to ensure that the results described above apply to both participant groups studied, psychology undergraduate students and adults from the community, three additional mixed design 2 × 2 ANOVAs were performed, with the first factor representing face type ("normal" or "FAS") and the second factor representing participant group. There were no significant main effects for the samples in terms of adoption likelihood ($F_{1,71} = .02$, $p = .89$), cuteness/attractiveness ($F_{1,71} = .003$, $p = .95$), or healthiness ($F_{1,71} = .68$, $p = .41$). In addition, there were no significant interactions between face type and sample for adoption likelihood ($F_{1,71} = .41$, $p = .53$), cuteness/attractiveness ($F_{1,71} = .03$, $p = .86$), or healthiness ($F_{1,71} = .84$, $p = .36$).

In order to determine the relationships between the variables for the FAS and normal faces, average zero-order correlations were calculated. Each separate infant face (stimulus) was treated in much the same way as a separate trial in a repeated-measures design. For example, the correlation between adoption preference and cuteness for the first infant face was composed of 146 participants × 2 variables. This procedure would then be repeated for each of the 28 infant stimuli, yielding 14 correlations for each group (normal and FAS). These correlations were tested for homogeneity (Strube 1988) and then transformed into *z*-scores using Fisher's *z'* transformation (Silver and Dunlap 1987). The *z*-scores were then averaged to yield the average, within-stimulus correlations between two variables (Dunlap,

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Jones, and Bittner 1983; Hays 1962). Using Howell's recommendation for treating z' transformed correlations as data (1992), independent-measures t-tests (df = 26, equal variances) and within-sample t-tests (df = 13) were performed. The results are presented in Table 2. The average correlations for the FAS faces are italicized and listed below the correlations for the average faces in each cell. All of the correlations were large, positive, and significantly greater than zero ($p < .01$), but no significant differences existed between the two groups.

DISCUSSION

The findings generally confirm the predictions made at the outset of this study. The discovery that for seven of the fifteen infant face pairs participants chose to adopt the "normal" face significantly more often than the "FAS" face tentatively supports the idea that people prefer average infant faces to faces that contain FAS-related features, particularly given that in six additional pairs the "normal" face was chosen more often, although not significantly. More strikingly, the subtlety of the manipulations lends support to the idea that people can make very fine discriminations when judging infant faces. Anecdotally, numerous participants commented that they could barely perceive a difference between the faces, yet almost every participant made his or her decisions in a very rapid manner. Only one stimulus pair yielded an adoption preference for the "FAS" face. As discussed earlier, it is highly likely that this finding can be explained by a difference in color intensity that made the "FAS" infant's face appear far more rosy than its "normal" counterpart.

Ratings of adoption likelihood concur with the tentative findings of the forced-choice task, showing that participants were more likely to adopt the "normal" infants than the "FAS" infants. The analysis of variance also revealed a large effect size, providing further support for the ability of par-

Table 2. Average Correlations for "Normal" and "FAS" Infant Faces

Rating	*1*	*2*	*3*
Adoption Likelihood	—	0.81	0.55
		0.81	*0.53*
Cuteness		—	0.61
			0.59
Healthiness			—

All correlations are significant at < .01 alpha level; FAS values italicized

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ticipants to make fine discriminations between facial feature patterns in infants, and for their preference for faces that do not contain FAS-related features. That this finding remained constant across both sexes and both populations, and was unrelated to age, provides further support for the strength of these results.

Consistent with evolutionary theory, we found that men chose FAS over normal choices more often than women did. In every culture surveyed by scientists, including hunter-gatherer societies, women provide the majority of parental care to infants (Hewlett 1988; Konner 1981). Thus, the costs of investing in any given infant are typically greater for women than for men. As such, women may be better equipped than men to recognize facial cues of infant fitness, and they may be more motivated to avoid investing in infants that display signs of illness or reproductive disadvantage.

The finding that ratings of both cuteness/attractiveness and healthiness followed the same pattern as adoption likelihood is not surprising, and it confirms predictions made at the outset of this study. Both cuteness/attractiveness and healthiness were judged to be higher for the "normal" faces than for the "FAS" faces, a finding that remained constant across both sexes and both populations, and that was unrelated to age. In agreement with previous studies (Hildebrandt and Fitzgerald 1979; Kelley et al. 1996; Sternglanz et al. 1975), ratings of infant attractiveness seem to be positively related to the degree of facial averageness, and negatively related to deformities. Interestingly, the FAS features manipulated in this study might have sent signals about infant health directly because people's subjective ratings of health as well as cuteness revealed a preference for the "normal" faces. In addition, the fact that the "normal" faces received higher health ratings than the "FAS" faces suggests that there were no obvious health problems in our "normal" stimuli.

The finding that participants' age did not play a significant role in ratings of adoption likelihood, cuteness, or healthiness was somewhat unexpected. It can be argued from an evolutionary perspective that older women (and especially postmenopausal women; see Turke 1997) should be more willing than younger women to invest in infants with health problems. Older women are less likely to be able to carry a healthy infant to term (Green 1986), and the benefits of investing in an unhealthy child might thus outweigh the costs. While our study lacked the statistical power to explore this issue properly, the eight women age 50 years and older exhibited a non-significant trend toward giving higher adoption ratings, despite a trend towards giving lower healthiness ratings. In the forced-choice task, participants were asked to choose between and compare "normal" infants and infants that were manipulated to appear less healthy. Presumably, an older woman would be better off choosing the healthier of two infants from a reproductive perspective. If our design had

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forced participants to decide whether they would adopt an infant or not (yes/no), a difference might have been found between older and younger women, with older women being more willing to adopt the infants that were manipulated to look like they had FAS. This issue has been more rigorously pursued in an unpublished study (Langford et al. n.d.).

Cuteness and health were both significantly and positively related to adoption preference, suggesting that people prefer infants who are perceived as cute and healthy. The fact that there were no significant differences between the average correlations for the normal faces and the average correlations for the FAS faces suggests that adults in both groups perceived the same relationships between desire to adopt and health and cuteness. Therefore, the participants' greater desire to adopt the normal faces versus the FAS faces appears to be due to a greater preference for these infants and not to a difference in the relationships between the variables. It is also worth noting that cuteness and health were highly correlated. This further reinforces the hypothesis that cuteness/attractiveness may be related to signs of physical well-being.

It is perhaps not surprising that the infant who actually had FAS was rated as less desirable as an adoption choice, less attractive, and less healthy than either the "normal" infants or the experimentally manipulated "FAS" infants. Although Astley and Clarren (1996) identified short palpebral fissures, thin upper lip, and indistinct philtrum as the three discriminating features of FAS, other irregular features are often associated with the condition, such as ear anomalies, a short nose, and a flat midface (Streissguth 1997). The actual FAS infant included in this study clearly possessed some of these features (a short nose and low-seated ears), and these additional abnormalities likely led to a more adverse response in potential caregivers. The normalized FAS infant face's relatively low ratings may be due to the failure of the subtle corrections that were made to counter the other abnormal features.

Perhaps more importantly, the trend for people to prefer the image of the actual FAS infant that had been manipulated to appear more "normal" over the original infant supports the validity of the methodology used in the present study and suggests that it might be possible to manipulate FAS faces to elicit a more favorable response from potential caregivers, although the non-significance of the result weakens the strength with which this statement can be argued. Most importantly, the fact that the morphed "normal" copy of this infant was at least as likely to be chosen for adoption as the "FAS" copy demonstrates that the significant results cannot be attributed to the mere fact that the "FAS" infant images had undergone some kind of unnatural manipulation.

Although the hypothetical adoption paradigm appears to engage the judgmental processes involved in the allocation of parental solicitude as intended, a number of important questions remain unanswered. First, it is

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still unclear whether the factors that influence the hypothetical elicitation of parental care, such as cuteness and, to some extent, perceived healthiness, are consciously weighed when the adoption decision is being made. Future studies could investigate the cognitions that are consciously experienced during the decision-making process. Furthermore, a replication of these findings with a sample of actual potential adoptive parents, who might differ in meaningful respects from the sample used in our study, would be necessary to establish the ecological validity of our results.

This line of research has important implications for the quality of care received by infants and children who are suffering from FAS or other severe disorders that leave a physical mark. It has been shown that unattractive infants are rated more negatively and receive less maternal attention than attractive infants (Casey and Ritter 1996; Langlois et al. 1995; Ritter et al. 1991; Stephan and Langlois 1984). Similarly, infants with health-related deformities are rated as less attractive and receive less affection from their mothers (Barden et al. 1989; Kelley et al. 1996). Parental neglect has been linked with anxiety problems and suicide in children and adolescents (Gruener et al. 1999; Klimes-Dougan et al. 1999). If infants or children with visible developmental deficiencies fail to elicit a caring response, or do so to a lesser extent than "normal" infants and children, they are at risk for not getting appropriate attention and care, even though they might need it the most (e.g., Astley and Clarren 1996; Waldrop and Halverson 1971).

These problems could potentially be reduced through targeted interventions for parents with alcohol-affected infants, including education and enhanced support. A more radical potential intervention is one that has already been applied widely to the area of adult facial abnormalities: plastic surgery. Given that the minor changes implemented in this study produced significant results, even subtle alterations might benefit an at-risk child or infant.

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