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Is Female Attractiveness Related to Final Reproductive Success?

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A B S T R A C T

In order to test the assumption that female attractiveness relates to reproductive success, photographs of 47 rural Polish women taken in their youth were rated for attractiveness, and BMI at age 18 was recorded; these measures of attractiveness were then compared with their subsequent life histories. Facial attractiveness did not relate to number of children or grandchildren. It also did not relate to age of marriage or husband's education. It did relate to number of marriages and husband's height. BMI at age 18 did not relate significantly to any of the outcome variables. These results suggest that although more attractive women may have married higher quality (taller) husbands and may in ancestral population have achieved greater reproductive success this way, there is no evidence in a modern, European Catholic society for their having greater reproductive success.

***Key words**: attractiveness, BMI, reproductive success, height, faces*

Introduction

Evolutionary approaches to female attractiveness commonly suppose that many aspects of female appearance are subject to sexual selection and signal factors relating to fertility[1,2]. There does appear to be valid reasons for linking attractiveness and fertility. For instance, Singh[3] proposed that female body shape (specifically waist-hip ratio: WHR) relates to fertility and males have thus been selected to prefer more curvy female shapes. There is some validity in this hypothesis; men tend to prefer smaller waists[3–5] and WHR has been shown to significantly predict likelihood of conception amongst women attending an artificial insemination clinic for the first time[6,7] and relates to oestrogen levels[8], which are in turn also related to ability to conceive[9]. When controlling for other factors influencing birthweight, WHR is negatively related to the birthweight of first child (which is negatively correlated with newborns mortality and morbidity)[10]. WHR can also distinguish between normally cycling and post-menopausal women[11] with waist size increasing over menopause. Similarly, a low body mass index (BMI: weight(kg) / height(m)^2) is also considered highly attractive in Western cultures (perhaps more so than a low WHR) and is related to fertility[12].

Cues to youth are also believed to be very attractive and to signal fertility. Older women are less likely to conceive[6] and are more likely to have a miscarriage[13]. Feminised faces also appear younger[14] and are associated with higher levels of oestrogen[15].

Not only do women's bodies and age give evidence of reproductive potential, but faces are also among the most important physical features on the human mate market in Western culture. There has been a vast amount of research conducted regarding female facial attractiveness. Men appear to prefer more feminine, younger looking faces[14,16–18] and prefer more symmetric faces[19]. Women's faces contain valid cues to valuable information, such as age[20], health[21], longevity[22], menstrual cycle phase[23], and developmental stability[24].

Thus, it is commonly assumed within evolutionary literature that key aspects of female attractiveness have been selected for due to their links with biological fertility, and as such should be predictive of long term reproductive success under conditions of natural fertility. However, no evidence to date has been presented for this assumption. Indeed, in terms of facial attractiveness, it is only in recent

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years that photography has been wide spread enough for long enough to enable this kind of research.

The main aim of the current study, therefore, was to investigate the relationship between female attractiveness and reproductive success. The research was carried out with a rural Polish population who would have been less likely to utilise birth control and who were fairly homogenous in terms of socioeconomic factors due to the political system up to 1989 (the vast majority of the participants' families were farmers). By collecting photographs of post-menopausal women from their youth (primarily wedding pictures) and asking them to report height and weight at age 18 (for which there is evidence of accurate recall[25]), it was then possible to compare their facial attractiveness, and slimness, before they began reproduction with their final reproductive outcomes. It was also possible to collect further information on other aspects of reproductive success such as number of grandchildren, age of marriage and husband's quality (as indexed by height and education).

Material and Methods

The data and photographs were collected in a village in central Poland (in the Lódź region, c. 50 km north of Czestochowa) in 2003. At the time of data collection the village had a population of 772, which included 157 women over the age of 40. Of these women, 49 (31.2%) were willing and able to provide photographs of themselves when they were young (many people did not have photographs, while many others declined to take part). A further two women were excluded because they already had children when the donated pictures were taken. This left a final sample of 47 women.

The mean age of the women at the time of the photographs was 22.98 (SD=2.35) years (range: 18–27 years). The mean age of the women at the time of data collection was 57.8 (SD=10.92) years.

All women answered questions regarding their age, height, present weight and weight at age 18 (from which BMI was calculated) and education. They also provided information about the following indices of reproductive success: number of children, number of grandchildren, number of marriages, age of first marriage, and age, education, height and weight of their husbands. The mean number of children was 3.06 (SD=1.09). There were 15 women with 2 children, 21 with 3 children, 7 with 4 children and 4 with more than four children (up to 7). Due to small samples of women with more than 4 children women were split into 3 categories: those with 2, 3, and 4+ children. Only four women were married twice, all of whom were divorced; there were no other divorces in our sample.

All pictures were sent to a Scottish university where 68 individuals (42 females aged 28.31 (SD=10.9); 26 males aged 30.15 (SD=9.8), rated the attractiveness of all 49 women on a 7 point Likert scale (from 1=very unattractive to 7=very attractive). Each photograph was presented individually on a computer screen, and raters clicked on a number from 1 to 7 to trigger presentation of the next face. Order of presentation was randomised. Attractiveness ratings for each photograph were averaged together to produce an attractiveness score. Male and female ratings were highly correlated (r_{47}=0.94; although males tended to give lower values: t_{66}=3.36, $p<0.001$) and so male and female ratings were averaged together. In 12 cases one woman contributed two photographs to the study. In these cases, the picture with the higher attractiveness score was used.

Results

Direct measures of reproductive success

The mean attractiveness for the 47 female faces was 3.20 (SD=0.84, range: 1.94–5.24) and did not relate to age at the time of the photograph (r_{47}=0.06). There was no relationship between number of children (in three categories: 2 children, 3 children and more than 3 children) and attractiveness ($F(2,44)=1.1$, $p=0.34$). The same was true when we compared only two categories (2 children vs more: $t=1.50$, $p=0.14$). As some women were young enough to still have children of reproductive age, number of grandchildren was corrected for age by calculating the residuals after number of grandchildren was regressed onto current age (inverse curvilinear regression provided the best prediction: $F=68.63$, $p<0.001$). Attractiveness did not correlate with number of grandchildren ($r=-0.083$, $p=0.58$) or number of grandchildren corrected for age ($r=-0.055$, $p=0.72$).

When the women were divided into two groups – those with lower (N=25) and higher attractiveness (N=22) than the mean – there was also no difference in number of children ($Z=-0.11$, $p=0.90$), number of grandchildren ($t=0.19$, $p=0.85$), or number of grandchildren corrected for age ($t=0.17$, $p=0.87$).

BMI at age 18 did not correlate with number of children, number of grandchildren or number of grandchildren corrected for age (all $r<0.1$, all $p>0.45$). Neither did it correlate with facial attractiveness ($r=0.03$, $p=0.85$).

Factors relating to reproductive success

Attractiveness also did not correlate with husband's education ($r=0.229$, $p=0.12$) or age of marriage ($r=0.082$, $p=0.58$). However, there was a marginal relationship between attractiveness and husband's height ($r=0.266$, $p=0.07$). When the women were divided into two groups, those in the more attractive group had significantly taller husbands (means: 174.1 vs 170.5 cm; $t_{44}=-2.02$; $p<0.05$). However, there was no difference in height between the two groups of women ($t_{45}=1.56$, $p=0.13$) – the tendency was opposite, those who were in more attractive group had an average height of 161.4 cm, compared to 163.5 cm. Women in the more attractive group did not differ from other women on age of marriage ($t_{45}=-0.73$, $p=0.47$) or husband's education ($t=1.30$, $p=0.20$).

When compared with the rest of the sample, those women who had married more than once were assessed as significantly more attractive ($t = -2.26$, $p = 0.03$). They did not differ on BMI at age 18 ($t = 0.14$, $p = 0.89$).

BMI at age 18 did not correlate with husband's education, husband's height or age at marriage ($r = -0.17$, $p = 0.25$) or height ($r = 0.04$, $p = 0.81$). There was a significant relationship between BMI and age at marriage ($r = 0.35$, $p < 0.05$) such that slimmer women married at a younger age.

Discussion

The aim of this study was to assess whether female attractiveness in youth related to final reproductive success. Facial attractiveness did not appear to relate to either number of children, or number of grandchildren, even corrected for age. Neither did it relate to two factors which may in turn relate to reproductive success (age of marriage, husband's education). Facial attractiveness did however relate to other relevant factors: husband's height and number of marriages. More attractive women had taller husbands, and women who married twice were significantly more attractive than women who only married once (although this is a very small sample). BMI at age 18, an alternative measure of female mate value, did not relate to any outcome measures except a positive relationship with age of marriage.

The lack of relationship between attractiveness and reproductive success seems to contradict one of the fundamental assumptions of evolutionary approaches to attraction. One might argue that rather than affecting the woman's reproductive success, attractiveness rather predicts the man's reproductive success (e.g. more attractive women may be more faithful, increasing the male's paternity certainty, although there is no evidence for this). Alternatively, attractiveness and fertility may not have a simple linear relationship. If fertility is very high only at very high levels of attractiveness, and only very unattractive women risk childlessness, then the sample here may not have had enough variability in attractiveness to show any effects. No women in this study were rated on average as extremely attractive (6/7 or 7/7) or extremely unattractive (1/7). Furthermore, the variation in the number of children in our sample is also relatively small (no childless and with only one child women) and it is likely that such variation is too small to expect effects of selection in terms of positive relationship between woman's attractiveness and her reproductive success.

However, it may also be that cultural aspects of behaviour could have prevented a genuine difference in biological fertility from translating into differences in final reproductive success. For instance, although Poland is a strongly Catholic country and the rural population tested was highly traditional, it may be that nonetheless couples were deliberately limiting family size. It was not possible (due to the traditional nature of the society and the lack of anonymity) to ask about contraception, however the fact that most women in the sample had only two or three children suggests that contraception (or possibly abstinence) or some form of abortion may have been practiced. It is highly unlikely that small families were the result of malnutrition as only four women were sufficiently underweight to be at risk of amenorrhoea (with BMIs at age 18 below 19) and excluding them from the analyses did not affect the results. Therefore, final reproductive success of rural Polish women may not reflect what their reproductive success would have been in early human populations.

Given that evolution has acted in the past to produce the preferences we have now, the possible incongruence between rural Polish reproduction and ancestral populations' reproduction means the lack of effect seen here does not necessarily imply that female attractiveness has not in the past served to indicate, and related to, final reproductive success. Therefore, the factors relating to reproductive success may be more informative. Higher attractiveness in women was associated with taller husbands and with multiple marriages. There is evidence that tallness is a sexually selected trait in men[26–29], and has been shown to relate to better health[30], lower mortality[31] and higher socioeconomic status[32,33]. Therefore, more attractive women may be gaining higher quality husbands and should therefore have higher quality offspring, despite not having a higher quantity. High offspring quality could in the past have lead to higher reproductive success through polygynous sons. However, there is no clear evidence for paternal height relating to offspring mortality/morbidity in modern populations. Furthermore, the fact that women who married twice were more attractive suggests that in a population in which serial monogamy was the norm (such as the West, and hunter-gatherers such as the Ache[34]) these women could have higher reproductive success – both in terms of wider variety in their offspring (and therefore greater pathogen resistance for instance) and perhaps in terms of number of offspring if males are in demand. Similarly, the relationship between BMI at 18 and age of marriage suggests that in naturally fertile and ancestral populations, body-attractiveness may lead to earlier mating and thus a longer reproductive career. Due to the relatively small sample, however, our results and the above discussion should be treated very cautiously.

In general, these data suggest that even in a traditional Catholic society, female attractiveness does not translate into higher reproductive success, but does relate to factors that may relate to offspring quality and thus may have once enhanced reproductive success in ancestral populations. The photographs used in this study were not all of high quality and it would be desirable in years to come to repeat such research by taking good quality, standardised pictures now of populations known not to practice any form of contraception, in order to allow a more controlled test of this issue. In the meantime, however, the assumption that attractiveness cues for fertility should be treated with caution.

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