

Is female attractiveness related to final reproductive success?

by

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Word Count

Abstract: 124

Main body: 2 194

Total: 3 076

Abstract

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 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 (e.g. Buss & Schmitt, 1993; Thornhill & Gangestad, 1999). There does appear to be valid reasons for linking attractiveness and fertility. For instance, Singh (1993) 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 (Singh, 1993, 1995) and WHR has been shown to significantly predict likelihood of conception amongst women attending an artificial insemination clinic for the first time (Zaadastra et al, 1993; Wass et al., 1997) and relates to oestrogen levels (Jasienska et al, 2004), which are in turn also related to ability to conceive (Sher & Rahman, 2000). When controlling for other factors influencing birthweight, WHR is negatively related to the birthweight of first child (which is highly correlated with the biological fitness) (Pawlowski & Dunbar, in press). WHR can also distinguish between normally cycling and post-menopausal women (Bjorklund et al, 1996) with waist size increasing over menopause. Similarly, slimness is also considered highly attractive (perhaps more so than a low WHR) and is related to fertility (see e.g. Tovée et al, 1999, for discussion).

Cues to youth are also believed to be very attractive and to signal fertility. Older women are less likely to conceive (Zaadastra et al, 1993) and are more likely to have a miscarriage (Coste et al, 1991). Feminised faces also appear younger (Perrett et al, 1998) and are associated with higher levels of oestrogen (Law Smith, unpublished data).

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 (Berry & McArthur, 1985; Cunningham et al, 1995; Perrett et al, 1998; Rhodes et al, 2000) and prefer more symmetric faces (Perrett et al, 1999). Women's faces contain valid cues to valuable information, such as age (Furnham et al, 2004), health (Rhodes et al., 2001), longevity (Henderson & Anglin, 2003), menstrual cycle phase (Roberts et al., 2004), and developmental stability (Hume & Montgomerie, 2001).

The aim of the current study was to investigate the relationship between female facial attractiveness and reproductive success. It is only in recent years that photography has been wide spread enough for long enough to enable this kind of research and although there are strong reasons to believe attractiveness should relate to fertility (that is, the ability to conceive), there is little evidence that is related, as supposed, to actual 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), it was then possible to compare their facial attractiveness before they began reproduction with their final reproductive outcomes. It was also possible to collect further information on both their early attractiveness (body-mass index (BMI), for which there is evidence of accurate recall, Goodman et al, 2000) and 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 Łódź 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 ± 2.35 years (range: 18-27 years). The mean age of the women at the time of data collection was 57.8 ± 10.92 years.

All women answered questions regarding their age, height, weight, 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 ± 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, 4 and more children.

All pictures were sent to St Andrews where 68 individuals (42 females aged 28.31 ± 10.9 ; 26 males aged 30.15 ± 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 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. The same was true when we compared only two categories (2 children vs more: $t=1.54$, $p=0.13$). 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 (in fact 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 ($t = 1.30$, $p = 0.20$).

There were only 4 women who were married more than once (which is not surprising given the highly traditional, Catholic nature of the society). When compared with all the rest, these women 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 facial attractiveness in youth related to final reproductive success. Attractiveness did not appear to relate to either number of children, or number of grandchildren, even corrected for age. Neither did attractiveness relate to two factors which in turn relate to reproductive success (age of marriage, husband's education). 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 a relationship between attractiveness and reproductive success is somewhat surprising (particularly given the good evidence of links between biological fertility and traits usually considered attractive) and contradicts 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).

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) was indeed being used. 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 a naturally fertile society.

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 (Pawlowski & Koziel 2002; Pawlowski et al, 2000; Pierce, 1996), and has been shown to relate to better health (Silventoinen et al, 1999), lower mortality (Waller, 1984) and higher socioeconomic status (Bielicki & Charzewski, 1982; Meyer & Selma, 1999). 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. 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: Hill & Hurtado, 1996) these women would 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.

In general, these data suggest that even in a traditional Catholic society, female facial 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 pictures *now* of populations known not to practice any form of contraception, in order to test more directly what this study hoped to look at. In the meantime, however, the assumption that attractiveness cues for fertility should be treated with caution.

Acknowledgements:

The authors wish to thank Tony Little for image processing assistance, and the many women who donated their time and photographs to the study. This research was supported by an individual grant 2057/W/KA/2002 to B Pawlowski by the University of Wroclaw. L Boothroyd was supported during preparation of the manuscript by an ESRC postdoctoral fellowship.

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Short title: Female attractiveness and reproductive success.