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Original Article

Women's reproductive success and the preference for Dark Triad in men's faces☆,☆☆,★

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ABSTRACT

Women's preference for male partners that signal either genetic or parenting advantages for their progeny is predicted to be favoured by natural selection. However, currently there are few studies on how such mate preferences are associated with women's reproductive success. We examined whether preferences for the Dark Triad personality traits (i.e., Machiavellianism, narcissism, and psychopathy) in men's faces were related to reproductive success in contemporary women. Because out of three Dark Triad features narcissism is most clearly associated with social success and physical and psychological health benefits in men, we predicted that women's preference for narcissism could be most strongly related to their reproductive success. In line with this, we found that women with preference for high narcissistic men's faces gave birth to more offspring whilst controlling for their age, sexual openness (sociosexuality) and self-rated health. Moreover, women with strong preference for Machiavellian male faces reported fewer offspring than their same-aged peers with weak preference, whereas preference for psychopathic men's faces was unrelated to women's current number of offspring. These findings suggest that in modern society, women's preference for some of the Dark Triad traits in men may be related to their reproductive success.

1. Introduction

Numerous cognitive processes facilitate searching for and then choosing a partner. Mate choice in modern humans is heavily influenced by preferences for certain facial characteristics of the potential partner (Lyons, Marcinkowska, Helle, & McGrath, 2015; Rhodes, Simmons, & Peters, 2005). In addition to cultural or social influences, such preferences may be shaped by natural selection, as faces provide information on the individual's ability to produce high quality offspring (Pisanski & Feinberg, 2013), and can reveal qualities (such as cooperativeness) that could be desirable in a long-term partnership (Tognetti, Berticat, Raymond, & Faurie, 2013). Facial characteristics have been associated with individual differences in personality (Little & Perrett, 2007), and it is possible that mate choice is guided also by personality-related information (Jonason, Lyons, & Blanchard, 2015; Moore, Smith, & Perrett, 2014; Valentine, Li, Penke, & Perrett, 2014). Both a person's facial attractiveness (Jokela, 2009) and personality characteristics like neuroticism, openness, and extraversion (Jokela, Alvergne, Pollet, & Lummaa, 2011) have been found to affect the number of offspring people have. However, it is not clear if a preference for personality characteristics in a potential mate have impact on an individual's reproductive success.

Female mate choice serves to gain both genetic and non-genetic benefits, such as parental care that maximises offspring's survival (Kokko, Brooks, Jennions, & Morley, 2003), and much research is based on the assumption that individuals prefer certain characteristics in prospective partners owing evolutionary reasons. Despite the theoretical importance of female mate choice only few studies have directly looked at how mate choices are associated with the fecundity: Bereczkei & Csanaky (1996) found that women who were married to high status men had higher number of children and Nettle and Pollet (2008) found a positive selection on male income driven by increased childlessness amongst low-income men.

It is thus possible that preference for personality traits in men that relates to dominance, resource acquisition and striving for status enables women to increase their reproductive success. Following, as narcissism, Machiavellianism, and psychopathy (the Dark Triad of personality) relate to dominance (Rauthmann & Kolar, 2013) and desire for power (Lee et al., 2013), there could be differences in reproductive success amongst women who prefer men being high or low in these traits.

The Dark Triad is a combination of traits characterised by superiority and dominance (narcissism), social charm and manipulativeness (Machiavellianism), and callousness and impulsivity (psychopathy)

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(Jonason, Li, Webster, & Schmitt, 2009; Paulhus & Williams, 2002). High Dark Triad individuals take advantage of people (McHoskey, 2001) and successfully extract and control resources (Campbell, Bush, Brunell, & Shelton, 2005; Zeigler-Hill, Southard, & Besser, 2014), which can lead to personal gain in brief social interactions and better abilities in resource acquisition. However, high Dark Triad men show lowered self-control (Jonason & Tost, 2010), risk-taking tendencies and high impulsivity (Campbell, Goodie, & Foster, 2004), all of which can constitute to lowered value on a mating market and parenting propensities.

Although socially aversive, there are several reasons for suggesting that women's preference for Dark Triad features can have evolutionary roots. First, female preference for the Dark Triad traits in men could be driven by female choice for putative genetic benefits for their offspring. For example, men high in the Dark Triad traits have good self-reported short-term mating success (Jonason et al., 2009) and women were found to prefer high Dark Triad personalities of men especially in short-term relationships (Aitken, Lyons, & Jonason, 2013; Jonason, Lyons et al., 2015). A recent study also found that narcissism is associated with increased, and Machiavellianism and psychopathy with decreased, self-reported physical and psychological health (Jonason, Baughman, Carter, & Parker, 2015). Further, narcissism has a small but significant relationship with physical attractiveness (Holtzman & Strube, 2010). These findings indicate that by preferring highly narcissist men women could secure good genes for their male offspring. Second, women who prefer high Dark Triad characters may increase their reproductive success by non-genetic means. Some aspects of the Dark Triad are related to high status in men, and partnership with high status men may be associated with increased reproductive success in women (Bereczkei & Csanaky, 1996). Again, narcissism has been branded as the most socially successful of the Dark Triad traits (Jonason, Koenig, & Tost, 2010), and may thus provide the most likely candidate for a trait that would be preferred by women owing to natural selection. Third, mating with high Dark Triad men may also have detrimental effects on fitness. Dark Triad traits are related to a fast life history strategy, implying decreased parenting effort (Jonason et al., 2009), and increased propensity towards short-term mating strategy (Lee et al., 2013). Pairing with high Dark Triad man can thus also decrease woman's reproductive success by reduced parental provisioning from her partner.

The aim of this study was to examine whether female preference for the Dark Triad facial characteristics in males is related to their reproductive success in contemporary populations. In particular, we predicted that female preference for narcissistic faces should be most closely related to their reproductive success, because of the three Dark Triad traits, this trait in men signals the highest mate value for women. Women with strong preference for narcissistic faces should thus have higher reproductive success. To our knowledge, this is the first study to examine such associations. By taking advantage of structural equation modelling (SEM), we examined how female preferences for Machiavellianism, narcissism and psychopathy in computer manipulated male faces were associated with the number of offspring women had, controlling for their age, general health (measured by self-reported health and regularity of menstrual cycles) and sexual openness.

2. Materials and methods

2.1. Experimental procedure

The study was advertised in on-line magazines, on university Web pages and via social media platforms. Participants were not compensated for the completion of the on-line survey. All responses were SSL coded. Participants provided consent for participation in this Web-based study and were asked for demographic information, including age, sexual orientation (Kinsey Scale; (Kinsey, Pomeroy, & Martin, 1948), self-rated health, regularity of the menstrual cycle (regular/not regular) and the 9-item Sociosexual Orientation Inventory (SOI-R) measuring sexual openness (Penke & Asendorpf, 2008); see Tables 1 and 2 for a correlation matrix between the variables studied and Table S1 from Electronic Supplementary Material 1 for country-specific data, available on the journal's Web site at www.ehbonline.org). Regularity of the cycle and self-reported health were used as a general estimator of health of an individual. Irregular cycles are related to possible anomalous fluctuations of hormonal levels and hence lower conception probability and worsen health (Hahn et al., 2013), which in turn is likely negatively associated with women's number of offspring.

Next, the participants were asked to pick more attractive of two faces; "high" and "low" Dark Triad morphs (see electronic supplementary materials for more details, available on the journal's Web site at www.ehbonline.org), in 15 (5 face pairs × 3 Dark Triad trait) 2-Alternative-Forced choice trials. Average "high" and "low" feature faces were taken from a previous study, where men were classified as high and low on three Dark Triad scales and then photographed (Holtzman, 2011). Average examples for three features were made as a composite of 10 men from each end of the scale (Tiddeman, Burt, & Perrett, 2001). Participants were shown all pictures twice, separately for short- and long-term mating context (block order was randomised), after being presented with a short description of the context (Little, Cohen, Jones, & Belsky, 2006) and question whether they have understood the definition of short- or long-term mating. Preference for each trait was computed as the proportion of high choices per trait (0 – only low feature choices, to 1 – only high feature choices). Participants were excluded from the study if they completed less than 50% of the preference trials (n = 9), if they were non-heterosexual (scoring 3 or higher on the Kinsey Scale, n = 72) or if they stated that the definition of long- or short-term relationships was not clear (n = 132), resulting in a final sample of 2370 participants.

2.2. Statistical methods

Structural equation modelling (SEM) with latent variables (Kaplan, 2009) was used to examine the influence of preference for Dark Triad traits on the number of offspring born to women. Preference for Dark Triad traits was modelled as latent factors by using preferences for each Dark Triad trait (Machiavellianism, narcissism and psychopathy) from both short- and long-term mating contexts as continuous indicators for these three factors. The factor loading (i.e. a correlation between the indicator and the factor) for the preference for Dark Triad traits in long-term mating context was fixed to unity to set the scale for the factor. The main advantage of latent variable approach here is the ability to include measurement error in the estimated preferences and thus to obtain less-biased coefficients on their influence on women's reproductive success (Kaplan, 2009). As there is large amount of overlap between the Dark Triad traits (Jonason et al., 2009), covariances between these factors were also freely estimated. Furthermore, participant age, self-rated health, the regularity of menstrual cycle and sociosexuality index were included in the model as predictors of the number of offspring born. Participant age was also assumed to influence self-rated

Table 1
Descriptive statistics for the variables included in this study.

	n	Median/mean	SD	min	max
Number of offspring born	1504	1	1.220	0	7
Long-term Machiavellianism	2370	0.456	0.226	0	1
Long-term narcissism	2370	0.457	0.237	0	1
Long-term psychopathy	2370	0.443	0.218	0	1
Short-term Machiavellianism	2368	0.464	0.228	0	1
Short-term narcissism	2368	0.449	0.237	0	1
Short-term psychopathy	2368	0.427	0.217	0	1
Age	2370	34.370	10.867	17	70
Health	2354	5.248	1.232	1	7
Regular cycles (yes = 0, no = 1)	2125	0.234	0.423	0	1
Sociosexuality index	2351	3.530	1.897	1	9

The location of the distribution of variables is given as a mean, but in the case of number of offspring it is given as a median.

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Table 2
Correlation matrix of the variables used in the study.

	Age	Health	Regcyc	Ltmach	Ltnarc	Ltpsych	Stmach	Stnarc	Stpsych	Fecundity	SOI
Age	1										
Health	0.035	1									
Regcyc	0.011	−0.106	1								
Ltmach	−0.045	0.027	−0.029	1							
Ltnarc	0.02	−0.028	0.063	0.075	1						
Ltpsych	−0.033	0.015	−0.016	0.167	−0.007	1					
Stmach	0.036	0.012	−0.023	0.335	0.051	0.114	1				
Stnarc	0.024	−0.011	−0.003	0.033	0.284	−0.02	0.068	1			
Stpsych	−0.027	0.013	0.011	0.116	0.03	0.167	0.141	−0.003	1		
Fecundity	0.463	0.027	−0.005	−0.044	0.032	−0.023	−0.033	0.057	−0.053	1	
SOI	0.052	−0.022	0.005	−0.049	0.013	−0.061	−0.049	0.05	−0.037	0.062	1

Note that all available information was used to calculate the pair-wise correlations, instead of e.g. list-wise deletion. Lt – long-term mating context, St – short-term mating context, mach – preference for Machiavellian face, psych – preference for psychopathic face, narc – preference for narcissistic face.

health, the regularity of menstrual cycles (a binary response), sociosexuality index and factors representing preference for Dark Triad traits. The influence of participant age on all these outcomes, after grand mean centering, was modelled as a quadratic function of age, as a prior screening of bivariate plots suggested several nonlinear associations. Furthermore, participants' country was used as a design-based clustering factor to obtain unbiased estimates and robust standard errors. This approach using generalised estimating equations (GEEs) and independent structure of the working covariance matrix has been shown to perform reasonably well in cases like ours where we are modelling a discrete outcome and have relative few observations per cluster but the number of cluster is moderate (McNeish, 2014). The SEM diagram of this model is shown in Fig. 1.

Our response variable of main interest, the number of offspring born, was modelled as a count variable. In order to contrast Poisson and negative binomial distributions as well as their zero-inflated

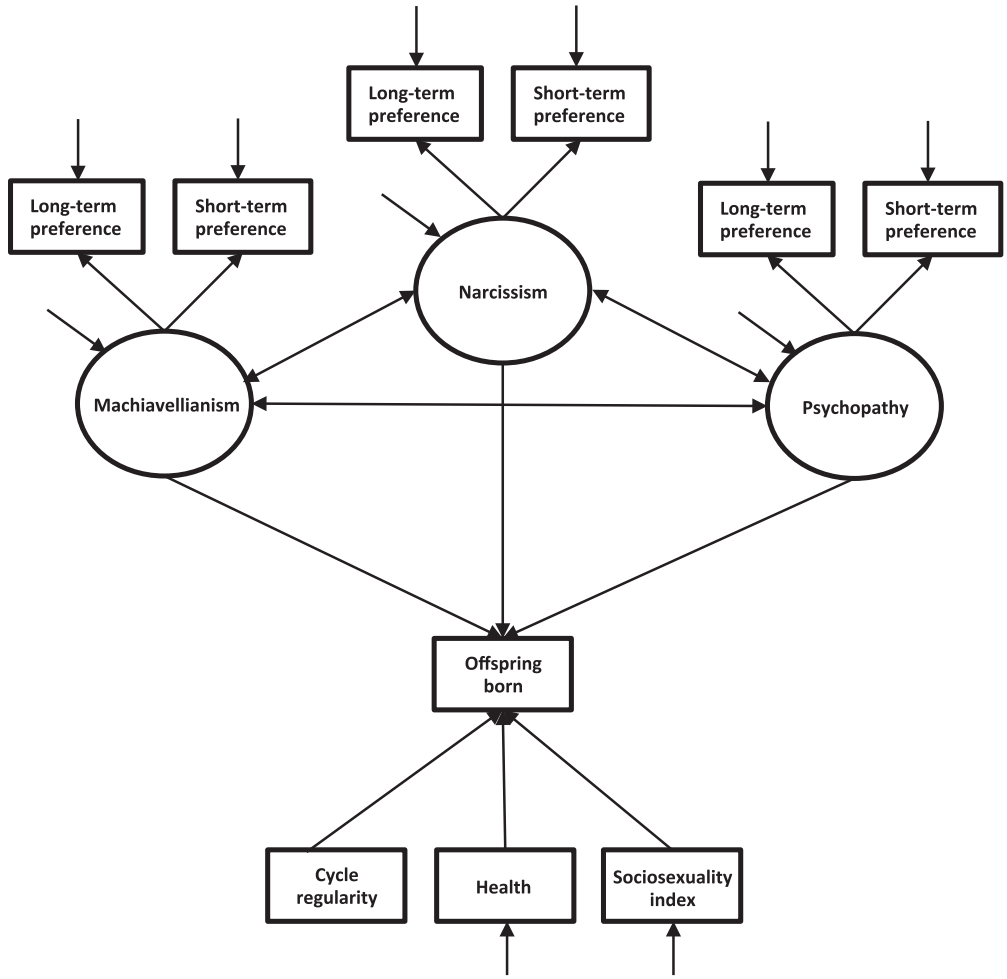

Fig. 1. Graphical representation of structural equation model used to examine the influence of female preference for Dark Triad traits, namely Machiavellianism, narcissism and psychopathy, in male faces on their number of offspring born whilst controlling for linear and quadratic influences of participant age (omitted from the graph to preserve simplicity), self-rated health, the regularity of menstrual cycles and sociosexuality index. Unobserved latent factors, measuring preferences for Dark Triad traits using preference in long-term and short-term mating contexts, are represented as circles. Observed measured variables are represented as boxes. Single-headed arrows from latent factors to their observed indicators represent factor loadings whereas single-headed arrows between observer or unobserved independent and dependent variables represent assumed causal path coefficients. Two-headed arrows represent covariances between the variables whereas short arrows pointing at factors and the non-discrete response variables represent variances and residual variances, respectively.

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counterparts to solve the appropriate error distribution for our count outcome (JM, 2011), we used sample-size adjusted Bayesian information criterion (SABIC) that is shown to perform well in model selection tasks in SEM framework (Tofighi & Enders, 2007). Poisson distribution fitted the data best (see Electronic Supplementary Material 1, Table S2, available on the journal's Web site at www.ehbonline.org). Because of the count response, no commonly used tests and absolute fit indexes were available to assess whole model fit to the data, because means, variances and covariances are not sufficient for model estimation in this case. The model was estimated by robust maximum likelihood estimator (MLR) with Monte Carlo integration (5000 integration points). Missing data were handled with full-information likelihood (FIML) approach, which uses all the available information in structural equations to estimate the parameters in each equation, thus preserving the maximum sample size (Enders & Bandalos, 2001). MPlus version 7.31 was used in analyses (Muthén & Muthén, 2009).

3. Results

We found that the number of offspring born to women given for their age was associated with women's preference for narcissistic and Machiavellian male faces, but not with preference for psychopathic male faces (Table 3). Preference for narcissism was positively associated with the age-adjusted number of offspring born to women, as a 10% increase in preference was, on average, associated with 5.17% (95% confidence intervals, CI = 0.33, 10.01) higher offspring number (see Table 3). By contrast, a 10% increase in preference for Machiavellianism was, on average, associated with 2.88% (95% CI = 1.36, 4.41) lower offspring number in women (Table 3). Furthermore, women's health and sociosexuality index were positively associated with their age-adjusted number of offspring. Increases of one unit of self-rated health and sociosexuality index were associated with 1.01% (95% CI = 0.30, 1.82) and 0.70% (95% CI = 0.10, 1.31) higher number of offspring, respectively (Table 3). Participant's age had a concave influence on the number of offspring, indicating that increasing age correlated with higher number of offspring but this association diminished as women reached advanced ages. We also found weak but positive covariances between preference for narcissism and Machiavellianism ($r = 0.183$), as well as between preference for Machiavellianism and psychopathy ($r = 0.569$) (Table 3).

Table 3
The results of structural equation model (SEM) examining the influences of female preference for Dark Triad traits in male faces (n = 2370) on number of offspring born.

Factor loadings	exp^B	B	s.e.	z	p
Machiavellianism					
Long-term preference		1.000			
Short-term preference		0.904	0.098	9.229	<0.0001
Narcissism					
Long-term preference		1.000			
Short-term preference		0.878	0.129	6.819	<0.0001
Psychopathy					
Long-term preference		1.000			
Short-term preference		0.892	0.129	6.902	<0.0001
Structural path coefficients					
Number of offspring born					
Machiavellianism	0.712	−0.340	0.109	−3.116	0.002
Narcissism	1.517	0.417	0.163	2.561	0.010
Psychopathy	0.866	−0.144	0.286	−0.503	0.615
Health	1.010	0.010	0.004	2.729	0.006
Age	1.260	0.231	0.020	11.500	<0.0001
Age^2	0.998	−0.002	0.000	−10.723	<0.0001
Cycle regularity	0.988	−0.012	0.026	−0.462	0.644
Sociosexuality index	1.007	0.007	0.003	2.448	0.014
Machiavellianism					
Age		0.000	0.003	−0.033	0.974
Age^2		0.000	0.000	−0.090	0.928
Narcissism					
Age		0.001	0.003	0.430	0.667
Age^2		0.000	0.000	−0.298	0.766
Psychopathy					
Age		−0.003	0.001	−2.975	0.003
Age^2		0.000	0.000	2.639	0.008
Health					
Age		0.013	0.009	1.424	0.154
Age^2		0.000	0.000	−1.014	0.311
Cycle regularity					
Age		−0.035	0.046	−0.753	0.452
Age^2		0.001	0.001	0.875	0.381
Sociosexuality index					
Age		0.098	0.050	1.973	0.048
Age^2		−0.001	0.001	−2.148	0.032
Factor covariances					
Machiavellianism, narcissim		0.003	0.001	4.503	<0.0001
Psychopathy, Machiavellianism		0.007	0.001	8.418	<0.0001
Psychopathy, narcissism		0.000	0.000	0.141	0.888
Intercepts					
Health		5.248	0.012	421.801	<0.0001
Long-term Machiavellianism		0.456	0.01	48.870	<0.0001
Long-term narcissism		0.457	0.005	103.782	<0.0001
Long-term psychopathy		0.443	0.002	175.075	<0.0001
Short-term Machiavellianism		0.464	0.01	43.012	<0.0001
Short-term narcissism		0.449	0.005	81.006	<0.0001
Short-term psychopathy		0.427	0.005	68.207	<0.0001
Sociosexuality index		3.529	0.095	37.023	<0.0001
Number of offspring born		−0.091	0.051	−1.789	0.074
Thresholds					
Cycle regularity		1.16	0.042	27.342	<0.0001
Residual variances					
Machiavellianism		0.019	0.002	8.117	<0.0001
Narcissism		0.018	0.003	7.090	<0.0001
Psychopathy		0.009	0.001	6.701	<0.0001
Long-term Machiavellianism		0.032	0.002	27.680	<0.0001
Long-term narcissism		0.037	0.003	11.732	<0.0001
Long-term psychopathy		0.038	0.001	62.915	<0.0001
Short-term Machiavellianism		0.036	0.002	22.687	<0.0001
Short-term narcissism		0.042	0.002	14.352	<0.0001
Short-term psychopathy		0.040	0.002	33.522	<0.0001
Health		1.517	0.020	75.013	<0.0001
Sociosexuality index		3.562	0.120	29.709	<0.0001

Because the number of offspring was modelled as a Poisson process (see Methods), the associations of main interest here are on log-scale and relative risks (exp^B) are given for these associations. All coefficients are unstandardized.

4. Discussion

This study represents the first attempt to relate women's preferences for Dark Triad facial characteristics in males to their reproductive success and provides support for the idea that women's facial mate preferences may affect their evolutionary success. Results show that women with strong preference for high narcissistic male faces had higher number of offspring for their age, whereas women with strong preference for high Machiavellian faces had fewer offspring for their age than women with weak preferences. Preference for psychopathic male faces was unrelated to women's number of offspring born. From three Dark Triad features, preference for narcissistic male faces showed the strongest association with reproductive success. These results are thus in line with our predictions, as narcissism is proposed as the most socially beneficial of the Dark Triad traits (Jones & Paulhus, 2011; Rauthmann & Kolar, 2013).

Several mechanisms may underlie the relationship between increased female age-adjusted fecundity and preference for high narcissistic male faces. First, out of three Dark Triad features narcissism is the one most closely related with extraversion (Lee & Ashton, 2005), and extraverted men have been found to have the highest number of offspring amongst Big Five personality traits (Berg, Lummaa, Lahdenpera, Rotkirch, & Jokela, 2014; Jokela et al., 2011). If narcissistic men have higher fertility, then women's choice to pair with narcissistic men can enhance their reproductive success. Second, women may have an increased reproductive success due to resource acquisition abilities of highly narcissistic mates. Narcissism relates to high status, career success, and leadership in men (Brunell et al., 2008; Hirschi & Jaensch, 2015), and high status in men is linked to higher reproductive success

of women who pair with those men (Bereczkei & Csanaky, 1996; Nettle & Pollet, 2008). Third, pairing with high status men may only be beneficial for female reproductive success, if the male allocates his resources to parental care. Interestingly, narcissism has been associated with lower likelihood of relationship dissolution and infidelity compared to the other two Dark Triad traits (Jones & Weiser, 2014), and could be more beneficial for female reproduction in long-term relationships than psychopathy or Machiavellianism. Finally, narcissism has been associated with physical attractiveness (Holtzman & Strube, 2010), and physical attractiveness is a phenotypic marker of good health (Nedelec & Beaver, 2014). It is possible that narcissism is similar to masculinity (Lyons et al., 2015), and pairing with highly narcissistic man may bring genetic benefits to the offspring (Rantala et al., 2012), harnessing the offspring with parasite and disease-resistant genes, and (similarly to "sexy sons" hypothesis (Huk & Winkel, 2008)), attractive characteristic from the father, enhancing own reproductive success.

Preference for Machiavellian faces was associated with the reduced number of offspring born to women. It is possible that due to a likelihood of infidelity and deception (Brewer & Abell, 2015), women who have a preference for high Machiavellian men may expect lowered putative paternal provision, and hence may intentionally limit their reproductive success (for example via contraception). Interestingly, a recent study found that women with increased sociosexuality had a lowered preference for high Machiavellian faces, suggesting that these faces can be adversive for women who have a high mating interest (Marcinkowska, Helle, & Lyons, 2015). However, it is currently not clear what ultimate factors may account for the low preference. There is more scope for studies investigating how Machiavellianism, as opposed to narcissism and psychopathy, affects parenting and reproductive decisions in long-term, committed relationships.

It is currently hard to make predictions about evolutionary change in mean female preferences for Dark Triad characteristics because little is known about their underlying genetic bases. The only study so far found a significant heritable component for narcissism ($h^2 = 0.59$) and psychopathy ($h^2 = 0.64$), but not for Machiavellianism ($h^2 = 0.31$) (Vernon, Villani, Vickers, & Harris, 2008). Moreover, based on a twin study significant positive genetic correlations were reported between narcissism and psychopathy and between psychopathy and Machiavellianism, but not between narcissism and Machiavellianism (Vernon et al., 2008). These results suggest that there may be potential for evolutionary changes in female mate preference for Dark Triad traits, although the potential genetic correlations between preferences for Dark Triad characteristics and conflicting phenotypic selection pressures on these characteristics found here make evolutionary predictions difficult.

An alternative explanation for the obtained results could be, that women who had children earlier (what in our analyses could result in higher adjusted offspring number) utilised "fast" life history strategy (i.e., early procreation). As the Dark Triad traits are related to fast life strategy (McDonald, Donnellan, & Navarrete, 2012), it could be that our results stem from assortative mating – women with fast life strategy choose men executing same strategy. Unfortunately, without knowing time of first reproduction of our participants we are unable to support this explanation.

The most significant limitation of the current study is that we do not know whether women's preferences for Dark Triad traits were actually manifested in their partnership, as we have no data on their partners. We also used the age-adjusted number of offspring born to women as a proxy of their evolutionary fitness. This has two potential downsides: i) natural selection likely maximises lifetime rather than age-adjusted fecundity (although high early fecundity is emphasised in growing populations) and ii) it does not take offspring mortality into account. A solution for the former issue would have been to include only post-menopausal women into the analysis. However, this would have caused an overfitting problem owing to estimating (even in a simplified model excluding regularity of cycles and nonlinear age-effects) 36 parameters with a sample size of just 215 women. Moreover, because the great majority of our participants lived in Western countries with low offspring mortality, and it is well acknowledged that most variation in fitness in modern populations is due to variation in fertility and not mortality, this latter bias is likely to be of minor importance. In addition, since this study measured women's current preference for the Dark Triad traits in male faces, the causality between women's preference and their offspring number is hard to determine and can go in opposite direction than assumed in our model. In other words, we cannot for example exclude the possibility that women with many children develop a higher preference for narcissism traits in men. However, since most Dark Triad traits have suggested to have a genetic component (Vernon et al., 2008) we suggest that preference for the Dark Triad trait drives the associations found here.

Further, it is possible that the Dark Triad facial characteristics in men are related to other facial features that were actually preferred by women, and could thus explain the relationships found here. We have unpublished data on women rating the Dark Triad faces on a number of characteristics, suggesting that all of the high Dark Triad faces are perceived as significantly less happy and more aggressive than the low faces (Lyons et al., 2015). In addition, narcissistic and Machiavellian faces are perceived as more masculine and dominant, and psychopathy and Machiavellian faces as more cold-hearted and dishonest (Lyons et al., 2015). In the current data set unfortunately we were unable to check for the preference for other features and fecundity. We suggest that another large-scale study with number of offspring and preference for above mentioned features could help understand better whether other, related features could be driving the relationship behind the Dark Triad preference and fecundity.

5. Conclusion

Our results suggest that women's preference for male personality characteristics may play a role in their reproductive success. There is currently surprisingly little research in humans investigating how mate choice affects the number of offspring an individual has. Our results suggest that preference for high narcissist male faces relates to increased number of children in women from contemporary populations. The mechanisms behind this association are still unclear, and should provide a fruitful area of investigation in future studies.

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