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1 There is a paucity of literature investigating the extent to which human personality
2 predicts lifetime (age-controlled) offspring. The present study contributes to this field in
3 assessing whether the inter-related 'dark' personalities that have been linked to mating
4 success (i.e., narcissism, Machiavellianism, and psychopathy: the 'Dark Triad') predict
5 number of children. Analyses from an online sample ($N = 314$) revealed that for men,
6 psychopathy was a negative predictor, and narcissism a positive predictor of lifetime
7 offspring. For women, psychopathy emerged as a negative predictor of lifetime offspring.
8 Results are discussed in respect of the importance of these traits to fitness-related
9 outcomes, including reproduction, and the need to consider sex differences, as these traits
10 may have a different function in men and women.

11

12 **Keywords:** Reproduction, Dark Triad, narcissism, Machiavellianism, psychopathy

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14

15 **Introduction**

16 The Dark Triad is a trio of sub-clinical personality traits, encompassing
17 narcissism, Machiavellianism, and psychopathy (Paulhus & Williams, 2002). These traits
18 are moderately intercorrelated, and share a disagreeable, callous, and self-interested core,
19 yet each also has unique defining aspects, correlates, and outcomes. Narcissism is defined
20 by an exaggerated sense of self-importance and need for success in competition with
21 others (Raskin & Terry, 1988). Machiavellianism is characterised by behavioural
22 flexibility and the use of interpersonally manipulative and exploitative tactics (Christie &
23 Geis, 1970). Psychopathy represents a cold, emotionless inter-personal orientation,
24 coupled with a tendency for risk-taking, impulsive behaviour (Hare, Neumann, &
25 Widiger, 2012).

26 Although historically considered to be maladaptive (e.g., McHoskey et al., 1999),
27 evolutionary psychologists have articulated multiple ways in which the Dark Triad relate
28 to beneficial mating outcomes. All three Dark Triad traits are associated with success in
29 short-term mating (Jonason, Li, Webster, & Schmitt, 2009), which could be achieved via
30 inter- or intra-sexual selection, or sexually-coercive strategies. Indeed, although
31 individuals high in the Dark Triad are considered initially attractive (e.g., Aitken, Lyons,
32 & Jonason, 2013; Jauk et al., 2016), it is well-documented that they also engage in
33 coercive and exploitative mating (Blinkhorn, Lyons, & Almond, 2015; Holtzman &
34 Strube, 2012; Jonason, et al., 2009; Jones & Olderbak, 2014; Muñoz, Khan, & Cordwell,
35 2011). Further, the Dark Triad is also associated with higher degrees of intra-sexual
36 competition for mates (Brewer & Abell, 2015a; Carter, Montenaro, Linney, & Campbell,
37 2015) and mate poaching (Jonason, Li, & Buss, 2010). The elevated interest in short-term

38 mating and the use of diverse mating tactics should, theoretically, have a positive impact
39 on reproductive success.

40 However, relatively little work has addressed the extent to which manipulative
41 attitudes and behaviour translate into increased lifetime offspring. Ample empirical
42 evidence in non-human animals suggests that boldness and aggression, especially in
43 males, has a positive correlation with fitness (e.g., Smith & Blumstein, 2008). In humans,
44 high extraversion (Alvergne, Jokela, & Lummaa, 2010; Jokela, Alvergne, Pollet, &
45 Lummaa, 2011), delinquency (Wei, Loeber, & Stouthamer-Loeber, 2002), and leadership
46 (Jokela & Keltikangas-Jarvinen, 2009) have a positive relationship with number of
47 children. This suggests that traits that are associated with status-seeking and risk-taking
48 may correlate with number of lifetime offspring. The Dark Triad is characterised by
49 boldness, aggression (Jones & Paulhus, 2010), and increased search for status and power
50 (Lee et al., 2013), hence these traits may also have an association with increased fitness
51 as measured by the number of offspring.

52 Much of the research on the Dark Triad has focussed on reproductive success as
53 measured by the number of matings, reflecting that individuals high in these traits
54 prioritise mating over parenting effort (Jonason, Valentine, Li, & Harbeson, 2011).
55 However, to our knowledge, there are few studies investigating the Dark Triad in relation
56 to actual number of offspring produced, something that we intend to address in the
57 present study. One exception is a study by Međedović, Petrović, Želeskov-Đorić, and
58 Savić (2017), who investigated psychopathy and reproductive success in a sample of
59 male prisoners in Serbia. They found that the “lifestyle” (i.e., impulsive, irresponsible)
60 facet of psychopathy had a relationship with having fewer offspring, and interpersonal-

61 facet (i.e., manipulation and dishonesty) was associated with an increased number of
62 children. Interestingly, the interpersonal facet has also been suggested to be part of
63 “successful psychopathy”, which could facilitate an evolutionarily adaptive cheater
64 strategy (Lyons, 2015). However, Međedović et al. (2017) also found that another aspect
65 of successful psychopathy (i.e., affective) had a negative correlation with the number of
66 children. Thus, at least in a sample of Serbian prisoners, the associations between
67 psychopathy and the number of offspring is related to different facets of psychopathy in a
68 very specific manner.

69 Another relevant study looked at outpatients at a personality disorder unit in
70 Spain, and found no association between the number of children and psychopathy-like
71 traits (antagonism, asociality, impulsive sensation seeking; Vall et al., 2016). This study
72 would imply that the impulsivity aspect of psychopathy is not a relevant factor in
73 determining reproductive success. However, the participants for these two studies come
74 from forensic and clinical settings, which may not be generalizable to other populations
75 (e.g., student or community samples). Thus, these confusing findings could be partially
76 due to sample characteristics. It would be beneficial to extend the research to non-
77 incarcerated, non-clinical populations, using all three Dark Triad measurements
78 simultaneously to control for the shared variance between the traits.

79 With regards to narcissism and Machiavellianism, we are not aware of any studies
80 that have looked at the offspring number of people high in these traits. Narcissism seems
81 to be the most adaptive trait in the Dark Triad constellation, demonstrated by an
82 association with increased self-reported physical and mental health (Jonason, Baughman,
83 Carter, & Parker, 2014), physical attractiveness (Holtzman & Strube, 2010), and higher

84 current and childhood socio-economic status (Jonason, Icho, & Ireland, 2016). Further,
85 using a facial morphing methodology, Marcinkowska, Lyons, and Helle (2016)
86 demonstrated that those women who had a higher number of children had also an
87 increased preference for high narcissistic facial morphs. It is possible that having
88 offspring with narcissistic men is beneficial to women's reproductive success, and
89 supports the idea that narcissism serves an adaptive function for men in relation to mating
90 (e.g., Holtzman & Strube, 2012). Thus, we would expect that narcissism has a positive
91 relationship with offspring number, especially in men. Machiavellianism, in turn, has
92 been associated with a more cautious approach to short-term mating (e.g., Jones & de
93 Roos, 2017). If short-term mating orientation is a reasonable proxy for the number of
94 children produced, we would expect that Machiavellianism has either no association, or
95 has a negative association with the number of children.

96 In summary, the present study adds to the existing literature by investigating the
97 association between the Dark Triad traits and self-reported number of children in a
98 community sample of heterosexual male and female participants. This study is important
99 in terms of looking at the actual number of children, rather than proxies for reproductive
100 success (e.g., mating interests) that have been used in previous studies. We hope to
101 highlight the possible adaptive functions of the Dark Triad in both sexes, rather than
102 focussing on the traits as "male mating adaptations" (Jonason et al., 2009). On the bases
103 of previous research on short-term mating orientation, we would expect that psychopathy
104 and narcissism are associated with higher number of offspring, and Machiavellianism is
105 either negatively related, or has no association with the number of children.

106 **Method**

107 *Participants, materials, and procedure*

108 Following ethical approval, we recruited 314 heterosexual participants (174 men),
109 primarily from the United Kingdom, United States, and Canada (95%), via advertisement
110 on participant-recruitment websites and snowball sampling. Participant age ranged from
111 18-69 years ($M_{AGE} = 35.04$; $SD = 11.18$). We asked participants whether they were
112 partnered ($n = 170$), single ($n = 142$), or other ($n = 2$), and their socio-economic status
113 (SES) based on their annual income before tax (grouped into ten categories, varying
114 between 1 = less than £10 000 and 10 = more than £100 000).

115 Following demographic questions (as above), participants were asked “how many
116 children do you have?”, which was used as an outcome variable in the analyses. Number
117 ranged from 0 – 4 children ($M = .56$, $SD = .97$). Participants then completed the Short
118 Dark Triad (SD3) inventory (Jones & Paulhus, 2014). The SD3 assesses each of the Dark
119 Triad traits across three nine-item subscales. Participants respond on a 5-point Likert
120 scale (1 = *strongly disagree*; 5 = *strongly agree*) to statements including “I insist on
121 getting the respect I deserve” (narcissism), “Make sure your plans benefit you, not
122 others” (Machiavellianism), and “People who mess with me always regret it”
123 (psychopathy). Items were averaged to create indices of narcissism (Cronbach’s $\alpha = .80$),
124 Machiavellianism ($\alpha = .65$), and psychopathy ($\alpha = .83$). Participants were subsequently
125 debriefed, and thanked for their time.

126 *Data analysis*

127 Data were first explored with cross-correlational analyses separately for each sex.
128 This was followed by step-wise linear multiple regression analyses, where the number of
129 offspring was entered as the outcome variable. We entered SES, age, and relationship

130 status as predictor variables at Step 1, and the three Dark Triad traits as predictors at Step
 131 2. We decided to add SES, age, and relationship status as control variables in regression
 132 analyses, as they each had a significant relationship with number of offspring (SES $r =$
 133 $.19, p < .001$; age $r = .54, p < .001$; relationship status $F(2, 311) = 11.92, p < .001$; We
 134 created dummy variables for the categorical variable of relationship status, where 1 = in a
 135 relationship ($n = 170$), and 0 = single or other ($n = 144$).

136 Results

137 Men scored higher for each of the Dark Triad traits, in keeping with existing
 138 findings (e.g., Jonason et al., 2009). There was no significant difference for lifetime
 139 offspring between the sexes. Descriptive statistics and sex differences are provided in
 140 Table 1.

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Table 1

Descriptive statistics and sex differences for Dark Triad traits and lifetime offspring

	<i>M (SD)</i>			<i>t</i>	<i>d</i>
	Overall	Women	Men		
	(<i>N</i> = 314)	(<i>n</i> = 140)	(<i>n</i> = 174)		
Narcissism	2.67 (.75)	2.43 (.75)	2.87 (.69)	5.32**	.61
Machiavellianism	3.09 (.57)	3.00 (.57)	3.12 (.57)	2.36*	.20
Psychopathy	2.38 (.78)	2.19 (.94)	2.54 (.72)	4.08**	.42
Lifetime offspring	.56 (.97)	.66 (1.00)	.48 (.94)	-1.70	.18

Note. ** $p < .001$, * $p < .05$

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144 To calculate the relationship between the Dark Triad traits and lifetime offspring,
 145 we conducted a series of correlation and regression analyses. Analyses were undertaken
 146 separately for men and women. Relationships between the Dark Triad lifetime offspring
 147 are presented in Table 2, which shows the Pearson's cross-correlations and standardised
 148 regression coefficients (controlling for age, SES, relationship status, and the shared
 149 variance between the Dark Triad variables).

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Table 2

Pearson correlations and standardised regression coefficients for Dark Triad traits and lifetime offspring

Lifetime offspring	<i>r</i> (β)		
	Narcissism	Machiavellianism	Psychopathy
Men	.10 (.27**)	.03 (.03)	-.30** (-.16*)
Women	-.31** (.01)	-.11 (.09)	-.42** (-.26*)

Note. * $p < .01$, ** $p < .001$. The Beta coefficients are based on regressions where the age, SES, relationship status, and the two other Dark Triad variables are controlled for.

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156 The cross-correlations indicate that psychopathy has an inverse association with
 157 number of children in both sexes, and narcissism had an association with fewer children

158 in women. The correlation co-efficients were significantly different between the sexes
159 only for narcissism and the number of children (Fisher's $z = 3.67, p < .001$).

160 For the regression analyses, we first entered age, SES, and dummy-coded
161 relationship status variable, followed by the three Dark Triad variables. For women, the
162 model was significant at Step 1, where age, SES, and relationship status collectively
163 explained 26% of the variance in the number of children ($F(3, 136) = 17.30, p < .001$).
164 Age ($\beta = .48, t = 6.58, p < .001$) and relationship status ($\beta = .17, t = 2.36, p < .01$) were
165 both positive predictors for the number of children in women. At Step 2, the model was
166 still significant ($F(6, 133) = 9.95, p < .001$), with all the variables predicting 31% of the
167 variance in number of children. The Dark Triad variables added only 3.4% to the
168 variance at Step 2, with psychopathy emerging as a significant negative predictor ($\beta = -$
169 $.26, t = 2.40, p < .01$). At Step 2, age ($\beta = .35, t = 3.70, p < .01$) and relationship status (β
170 $= -.17, t = 2.39, p < .01$) remained as significant predictors.

171 For men, the model was significant at Step 1, where age, SES, and relationship
172 status collectively explained 40% of the variance in the number of children ($F(3, 170) =$
173 $37.81, p < .001$). Age ($\beta = .53, t = 8.88, p < .001$), SES ($\beta = .22, t = 3.65, p < .001$), and
174 relationship status ($\beta = .13, t = 2.08, p < .05$) were all positive predictors for the number
175 of children in men. At Step 2, the model was still significant ($F(6, 167) = 23.25, p <$
176 $.001$), with all the variables predicting 46% of the variance in number of children. The
177 Dark Triad variables added 6% to the variance at Step 2, with narcissism as a significant
178 positive ($\beta = .27, t = 3.97, p < .01$), and psychopathy as a significant negative ($\beta = -.16, t$
179 $= -2.19, p < .01$) predictor. Age ($\beta = .55, t = 8.50, p < .01$), SES ($\beta = .15, t = 2.43, p <$

180 .02), and relationship status ($\beta = .12, t = 1.97, p < .05$) remained significant predictors in
181 Step 2.

182 **Discussion**

183 Previous research has suggested that the Dark Triad evolved as a mating
184 adaptation (e.g., Carter et al., 2015; Jonason et al., 2009). However, rather than
185 investigating the actual number of offspring produced, most studies have utilised sexual
186 behaviour and attitudes as a proxy for reproductive success. In this brief survey, we
187 investigated the relationship between the Dark Triad of personality, and an important
188 reproductive outcome variable: the number of children an individual has. We found that
189 narcissism in men was a positive predictor, and psychopathy in both sexes was a negative
190 predictor of self-reported number of offspring. The results are intriguing, suggesting that
191 any reproductive benefits of the Dark Triad may be localised to narcissism, and only in
192 men. Despite mating-oriented behaviours in high Dark Triad individuals, the three traits
193 are not equally adaptive when it comes to measuring a crucial reproductive currency, the
194 number of children.

195 The results for narcissism are in line with theoretical literature suggesting that
196 narcissism serves an adaptive function for men in relation to mating (e.g., Holtzman &
197 Strube, 2012). In the contemporary Western world, narcissism is associated with higher
198 socio-economic class (Jonason et al., 2016; Piff, 2014), and higher class is related to
199 greater number of children, but only in men (Hopcroft, 2015). Women may be able to
200 increase their reproductive success by choosing high-status (Bereczkei & Csanaky, 1996)
201 and high-narcissistic (Marcinkowska et al., 2016) partners. Thus, the positive association
202 between male narcissism and number of children could be due to women's choice for

203 higher-status mates for both partnerships and extra-marital affairs (see also Von Rueden,
204 Gurven & Kaplan, 2010 for evidence in a small-scale society).

205 The finding that psychopathy had a relationship with fewer children in both sexes
206 concurs with recent finding from a study on prisoners in Serbia (Međedović et al., 2017).
207 These results contradict the notion that psychopathy is adaptive as a personality trait
208 promoting a fast life history strategy (Jonason, Koenig, & Tost, 2010). Psychopathy in
209 women is related to sexual health (including miscarriages and pain during sex),
210 suggesting that the trait may have more costs and fewer benefits for women (Jonason &
211 Lavertu, 2017). It is possible that poor sexual health explains the link between
212 psychopathy and a reduced number of children in women. Further, psychopathy is linked
213 to risky sexual behaviour in both sexes (Kastner & Sellbom, 2012), including lower
214 likelihood of condom use (Fulton, Marcus, & Payne, 2010; Jonason et al., 2015), and
215 higher incidence of sexually-transmitted diseases (Beaver et al., 2014), which, in turn,
216 reduces fertility (Apari, de Sousa, & Müller, 2014). It is possible that the costs of risky
217 sexual behaviour in psychopathy outweigh the benefits, casting doubt over the idea that
218 psychopathy is an adaptive trait promoting a fast life history strategy, at least in large-
219 scale societies (see also Gladden, Figueredo, & Jacobs, 2009). In industrial societies with
220 widespread access to contraceptives, it is of course difficult to separate proximate and
221 ultimate relationships (Pérusse, 1993) and additional research in traditional populations is
222 required.

223 In the present study, Machiavellianism did not relate to number of offspring for
224 either sex. The emotional detachment and cynicism which characterise Machiavellianism
225 (Christie & Geis, 1970) may suggest a reluctance to produce children. Susceptibility to

226 infidelity and engagement in sexual behaviour for physical pleasure or to attain a goal,
227 etc. (each related to Machiavellianism) may, however, increase opportunities for
228 reproduction (Brewer & Abell, 2015b). The strategic and exploitative nature of
229 Machiavellianism may result in children only where the costs and benefits can be
230 managed. For example, those high on Machiavellianism may be more likely to produce
231 children if this confers status and reduces the stigma associated with childlessness. Those
232 high on Machiavellianism may be particularly encouraged to reproduce if their partner or
233 extended family provide substantial resources and support.

234 In terms of limitations, we used the SD3, a short-form measure of Dark Triad,
235 which has been criticised for failing to capture some facets of the Dark Triad traits, such
236 as vulnerable narcissism (Maples, Lamkin, & Miller, 2014). Future work could use
237 longer-form measures of the traits, in order to allow investigation of theoretically relevant
238 sub-components of narcissism and psychopathy. Second, we do not differentiate between
239 planned and non-planned pregnancies (Berg, Rotkirch, Vaisanen, & Jokela, 2013) and
240 include data from one parent only. Future research may obtain a more detailed record of
241 participant reproductive histories and examine dyadic predictors of offspring number
242 (Hutteman, Bleidorn, Penke, & Denissen, 2013). Third, most of our participants were
243 from Western, Educated, Industrialised, Rich and Democratic countries (i.e., WEIRD;
244 Henrich, Heine, & Norenzayan, 2010). Previous research has found differential correlates
245 between extraversion and number of children in women in pre-industrial (Alvergne et al.,
246 2010) and industrialised (Jokela et al., 2011) societies, demonstrating that the fitness
247 consequences of personality traits could be highly context-specific. For instance, the
248 prevalence of sexually-transmitted diseases is lower in small-scale, traditional societies

249 (Ohenjo et al., 2006), and it is possible that the benefits of promiscuous mating may
250 outweigh the costs in these circumstances. Thus, the association between psychopathy
251 and number of offspring could be different in small-scale communities than in large,
252 more anonymous societies.

253 Despite these limitations, our findings are important for a number of reasons.
254 Firstly, they pertain to a discernable, critical measurement of reproductive success: age-
255 adjusted number of offspring, previously considered in relation to one Dark Triad trait
256 only. The findings also support previous research which has found that the outcomes
257 associated with the Dark Triad vary by sex (Jonason, Lyons, Bethell & Ross, 2013;
258 Lyons et al., 2017) and trait (Paulhus & Williams, 2002). Research on the Dark Triad is
259 advancing at an exponential rate (Marcus & Zeigler-Hill, 2015), yet relatively little work
260 has been undertaken in areas such as this. Increasingly, researchers are emphasising the
261 importance of these traits from an evolutionary perspective. The present study joins
262 formative work on issues including longevity, and health-related behaviours (Hudek-
263 Knežević, Kardum, & Mehić, 2016; Jonason et al., 2015; Jonason et al., 2010).

264 Finally, we hope we have drawn attention to the need to both explore and explain
265 how the Dark Triad functions in different ways for males and females. The traits do not
266 function identically across sex: research has identified instances of comparable outcomes
267 related to mating (e.g., Jonason, Lyons, & Jones, 2013) but also cases where these differ
268 (e.g., Lyons & Rice, 2014). In respect of the current finding, though none of the Dark
269 Triad predicted increased lifetime offspring for women, there may be other factors that
270 we were not able to directly assess. Hence future research should consider offspring
271 quality and longer term reproductive success as measured by number of grandchildren

272 (Berg, Lummaa, Lahdenpera, Rotkirch, & Jokela, 2014). Good genes, acquired from a
273 short-term partner, may represent a functional trade-off for women for a lack of
274 investment, and also contribute to reproductive success (Fisher, 1915; Gangestad, 1993;
275 Li & Kenrick, 2006). Given existing knowledge about highly-narcissistic women's sexual
276 competitiveness (Carter et al., 2015) and women's relatively high demand for mate
277 quality (compared with men's) in short-term mating (Jonason et al., 2011), this might
278 explain how high levels of the Dark Triad traits function for women characterised by
279 them. Future work should continue to consider and study this issue.

280 In conclusion, the present study reinforced earlier work (Lynn, 1995; Međedović
281 et al., 2017) regarding 'dark' personality and reproductive output. We specifically
282 identified narcissism as a positive predictor of offspring in men, suggesting that
283 narcissism could have evolutionary roots as a male mating adaptation (Holzman &
284 Strube, 2012). Psychopathy emerged as a negative predictor of offspring for both sexes,
285 casting doubt over the adaptiveness of the trait in modern populations. Rather than using
286 promiscuous mating in Western populations as a proxy for reproductive success, future
287 research should focus on outcomes such as the number and quality of children and the
288 generations beyond.

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