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The Impact of Parenthood on Physical Aggression: Evidence from criminal data.

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**Abstract**

Evolutionary theory proposes that individuals will engage in physical aggression only insofar as the potential benefits outweigh the likely costs to their inclusive fitness, with some authors focusing on the damage physical injury in particular would do to inclusive fitness, while others focus on the means by which success in physical competition may particularly enhance male fitness. This study tested a hypothesis derived from this theory: that parents would be less physically aggressive than nonparents because of the damage any physical injury would do to their inclusive fitness. Analysis was carried out using the United States federal sentencing records for 1994 to 1999 (22 344 individuals). Men were significantly more likely to commit violent thefts (robbery), as opposed to nonviolent thefts (larceny), than women. As predicted, nonparents were significantly more likely to be violent than parents. Parenthood had a similar effect on relative rates of aggression in men and women, although the baseline was considerably higher for men. There was also a significant effect in men of marital status, which interacted with parental status such that parenthood was only associated with a reduction in rates of violence if the male were recorded as partnered. The results are interpreted in terms of both evolutionary theory and recent work on the hormonal impacts of marriage and parenthood.

**Keywords** Aggression; parenthood; violent crime; testosterone; sex differences

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According to evolutionary theory, physically aggressive behaviour in either sex should be the result of scenarios in which the potential fitness benefits which could be achieved through aggression outweigh the potential costs in terms of death or injury. This basic principle has been very successfully applied to understanding overall sex differences in aggression. Explanations of sex differences in aggression may focus on explaining high rates of male aggression (despite the costs of injury) (e.g. Daly & Wilson, 1988) or on explaining lower rates of female aggression (despite the benefits of successful competition) (e.g. Campbell, 1999).

Daly & Wilson (1988) argued, based on their extensive cross-cultural analysis of homicide rates, that sex differences in same-sex aggression in particular exist because men face much higher levels of mate competition than females: men are more likely than women to reach the end of their life having never produced offspring and the potential benefits of success in males (numerous copulations and possible impregnations) are large compared to the possible consequences of not competing (few or no offspring). The psychological mechanism underlying men's high rates of aggression was postulated to be a 'taste for risk' or 'future discounting' which facilitated aggressive competition but also produced a more diffuse pattern of risky, dangerous behaviour (see also Wilson & Daly, 1997).

Female competition, while ubiquitous, tends to be pursued in a manner which minimises physical risk (Campbell, 2002; Bjorkvist, Lagerspetz & Kaukinen, 1992; Vaillencourt, 2013). Work exploring the constraints on female competition in non-human primates has shown that successful competitors may have increased fertility rates but higher levels of miscarriage and hence competition confers little overall benefit (Packer, Collins, Sindimwo, & Goodall, 1995; see also Stockley & Bro-Jørgensen, 2011). Campbell (1999) argued that the costs of competition have been higher for females than for males over evolutionary time because it is females who carry the principal burden of parental care (a sex difference in parental

investment beginning with the obligate gestation and lactation but often extending beyond these periods; see e.g. Marlowe, 2000). This created a selection pressure on females to safeguard their bodies by avoiding dangerous competition, mediated by levels of fear and behavioural inhibition greater than those of males. This may explain why, despite engaging in indirect (non-physical) competition at rates comparable to, or even higher than, men (Archer 2004; Archer & Coyne 2005), women commit very few assaults or homicides. Female arrests for crimes decrease as the danger involved in that crime increases (see e.g. Campbell et al., 2001 for further discussion).

The above evolutionary arguments also lead to clear predictions regarding within-sex differences in aggression, particularly with respect to the effects of parenthood. Although Campbell (1999) focused on the fact that women are more critical than fathers to offspring survival, there is evidence from traditional and early modern societies that *both* parents are important to the survival of offspring, with children whose fathers are absent having a higher mortality rate than children from intact families, although not as high as children missing their mothers (e.g. the Ache: Hill & Hurtado, 1996; the Krümmhorn: Volland, 1988; see also Sear & Mace, 2008 for a review of inconsistent father-absence effects). Paternal involvement is also beneficial to a child's later health outcomes (e.g. Rohner & Veneziano, 2001). The potential costs of aggressive competition to existing reproductive success must therefore be taken into account for parents. Furthermore, engaging in risky competition can be argued to have potential benefits *only* when risk-avoidance is likely to lead to reproductive failure (Cross, 2010; Wang, 2002). When this is no longer true (i.e. an individual has reproduced), the logic underlying risky competition may no longer hold. Parents – of either sex - have more to lose from aggressive competition than nonparents, and very little to gain. These two considerations have led theorists to suggest that the onset of parenthood may well reduce physical aggression in both men and women (Daly & Wilson, 1988; Archer, 1999).

Studies of both behaviour and physiology suggest that correlates of aggression decrease with parenthood. Longitudinal (Gettler et al., 2011; Storey, Walsh, Quinton, & Wynne-Edwards, 2000; see also Berg & Wynne-Edwards, 2001) and cross-sectional (e.g. Alvergne et al., 2009; Grey et al., 2002, 2006; Kuzawa et al., 2010) research suggests that fathers have reduced testosterone levels compared to nonfathers, and recent data has also suggested this pattern may exist for women – at least when their children are very young (Barrett et al., 2013; Kuzawa et al., 2010). While these changes in testosterone could plausibly affect aggression levels in parents, the relationship between testosterone levels and aggression is far from straightforward and might be mediated by other factors such as dominance (Dabbs, 1998) or risk-tolerance (Archer, 2006). A converging line of evidence, however, comes from a longitudinal study by Nash & Feldman (1982), which found that both mothers and fathers showed a decrease in scores on the masculinity scale of the Bem Sex Role Inventory after the birth of their child. Given that aggression is one of the traits loading into the masculinity scale of the Sex Role Inventory, this suggests that both men and women may become less aggressive after the birth of their first child.

There has been surprisingly little attention to aggression itself as a correlate of parenthood. Gray et al. (2007) found no evidence that self-reported physical aggression (on the Buss-Perry Aggression Questionnaire) varied between non-fathers and fathers in Jamaica, although the means were in the expected direction. Behavioural studies of the effect of parenthood on aggression are similarly hard to find; although van Anders et al. (2014) included a small group of fathers in their study of men's behavioural aggression in response to a crying infant, they did not report differences between fathers and nonfathers (their sample contained only seven fathers). Likewise, despite a number of studies examining the impacts of marriage and parenthood on criminality in general (e.g. Blokland & Nieuwbeerta, 2005; Graham & Bowland, 1996; Skarðhamar & Lyngstad, 2009) very few studies consider violent crimes specifically and those that do tend not to provide the necessary information for determining whether or not there is a difference between parents and nonparents (Bersani, Laub & Nieuwbeerta, 2009; Campbell & Robinson, 1997; Hirschi & Gottfriedson, 1983; Roundtree, Mohan & Mahaffey, 1980; Weisheit, 1984). Finally, although there is some evidence that men may engage in more domestic violence against female partners after the birth of the first child (paralleling a general decrease in relationship satisfaction and increase in relationship stress; e.g. Straus, Gelles & Steinmetz, 1981), these data do not allow us to assess the broader risky interpersonal aggression associated primarily with same-sex competition in the evolutionary theories above.

The aim of this study is to investigate the effect of parental status on physical aggression by using the US federal sentencing records. By using sentencing records rather than prison statistics it will be possible

to avoid the problem that parents might be more likely to receive non-custodial sentences. Although Daly & Wilson (1988) argue convincingly that homicide statistics represent the best ‘assay’ of aggressive behaviour in criminal data, there is (as they themselves point out) a lack of suitable datasets for analysing the effects of parenthood on homicide rates. Therefore, this study used a comparison of robbery versus larceny rates. Robbery and larceny are both property crimes in which some resource is unlawfully acquired. Resource acquisition is important to both sexes, and male and female rates of property crime are sensitive to similar environmental factors (Campbell, Muncer, & Bibel, 2001). Robbery, however, is a ‘quintessential male crime’ (Campbell, 1999) in that it involves physical risk by confronting and using or threatening violence against the victim. Larceny, on the other hand, does not involve any confrontation and just as women tend to use indirect rather than direct aggression (Bjorkvist, 1994), so they overwhelmingly tend to commit larceny rather than robbery (Steffensmeier & Haynie, 2000). Robbery and larceny therefore provide two crimes which have the same material goal (acquisition of resources) but differ in physical risk. This provides an ideal opportunity to test the predictions from evolutionary psychology that parenthood will decrease the willingness to engage in risky aggressive encounters by people who commit theft.

Since it is proposed that parents should be less aggressive on the grounds of needing to avoid physical risk and having reduced mate competition, it was hypothesised that of those convicted of property crimes, parents would be more likely to have committed larceny than nonparents, while nonparents would be more likely to have committed robbery than parents. Because partnership status is expected to be correlated with parental status, the effect of partnered status on the likelihood of violence was also tested. In line with previous work on crime and gender we anticipated that overall rates for robbery and larceny would be higher in men and lower in women, but that women would be relatively more likely to commit larceny than robbery.

## Method

### Data

The data used were the details for individuals sentenced in US federal courts between 1994 and 1999. These data were collected by the United States Sentencing Commission (USSC) and made available online through the Federal Justice Statistics Resource Centre. Following exclusions (see below) 22 344 individuals were sentenced for robbery or larceny, 80% of whom were tried on one count only. Where there was more than one count recorded, individuals were analysed on the basis of their first count. 85% of those sentenced were male.

### Variables

**Sex.** Each individual was identified as male (0) or female (1) by the USSC. Those coded as 5 (other) or 9 (missing) were omitted from analyses.

**Parental Status.** The variable ‘Number of Dependants’ was recoded such that those recorded as having no dependants were classified as 0 (nonparents). Those having a specified or unknown number of children were classified as 1 (parents). Those recorded as unknown were omitted.

**Education.** Education was included as the best available measure of socio-economic status (SES). Although ‘annual income’ was given as a variable, the data were frequently missing and there was no local deprivation data (or even city/ZIP code) available. Education also correlated significantly with citizen-immigrant status ( $r=0.3$ ,  $p<0.001$ ), which is itself associated with deprivation. The variable ‘Education’ was recoded into the category of education *completed*. Those recorded as having completed some, but not all elementary school were classified as ‘No Category’. Those who had completed elementary school or some high school were classified as ‘Elementary’. Those who had graduated high school or received a General Education Diploma, or had some college education were classified as ‘High School’. Those who had first degrees, associate degrees or had completed some postgraduate study were classified as ‘College’. Those who had completed postgraduate degrees were classified as ‘Postgraduate’. Individuals coded as having attended military college (which left us unable to determine which level of education they had completed therein) were excluded from analyses.

**Age.** Continuous age in years was recorded by the USSC. Age was included because the widely cited age-effect on crime and violence could coincide with and confound parental status. Although the relationship between age and aggression/criminality is typically non-linear, peaking in the early twenties and then declining, these data showed a significant, negative linear pattern ( $F_{1,22978}=1037.05$ ,  $p<.001$ ,

$R^2=.04$ ) with no evidence that any non-linear model was superior (non-linear  $R^2$ s ranged from .03-.04), most likely because few younger individuals were included in the dataset and thus there was no initial rise in violence. Therefore, age was treated as a linear variable in all analyses.

**Partner Status.** Because parenthood could be confounded by marital status, this variable was included although it only existed for the 1999 data (2508 males, 780 females). The USSC variable ‘Marital Status’ was recoded. Those coded as married or unmarried co-habiting were classified as ‘Partnered’. Those coded as single, divorced, separated or widowed were classified as ‘Single’.

**Type of Theft.** Robbery was coded as violent while larceny (felony or misdemeanor) was coded as nonviolent. USSC coders included under robbery: “bank robbery, aggravated bank robbery, Hobbs Act robbery, mail robbery, other robbery, and carjacking” and under larceny: “bank larceny, theft from benefit plans, other theft – mail/post office, receipt/possession of stolen property (not auto), other theft – property, larceny/theftmail/post office, larceny/theft – property (not auto), and theft from labor union”.

## Results

### Parental status and sex

The associations between parental status and sex, and offending, were tested using a binary logistical regression with Violence of Theft as the dependant variable. Age, education (using repeated analysis comparisons across categories) and sex were entered first, followed by parental status in the second block and the interaction term between parental status and sex in the third block. Results for all three blocks are shown in Table 1. Controlling for the effects of age, education and sex, parental status significantly predicted Violence of Theft such that nonparents were 1.6 times as likely as parents to be convicted of violent theft (see Table 1 for full results). There was also a main effect of sex, such that men were over seven times more likely to be convicted of a violent rather than nonviolent theft than women. There was no significant interaction between sex and parental status, indicating that the effect of parenthood was similar in men and women (see Figure 1 for sex-specific rates of violent theft). Furthermore, the overall sex difference in offending holds irrespective of parental status: although there was a strong effect of parental status in men, fathers were still significantly more likely to have committed a violent theft than women without children ( $\chi^2 = 622.76, p<0.001, 1df$ ).

As expected there was a significant association between age and offending, such that older individuals were less likely to have committed a violent theft, and a significant association between education and offending such that each successive level of education completed from elementary school up to a bachelors degree significantly reduced the likelihood of having committed a violent theft (see Table 1 for odds ratios.)

Figure 1. Proportion of parents and nonparents convicted of violent (versus nonviolent) thefts, split by parental status.

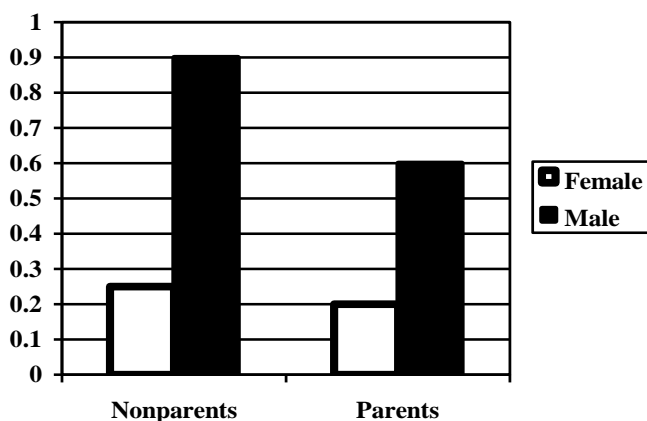


Figure 2. Proportion of men convicted of violent (versus nonviolent) thefts in 1999, split by parental and marital status

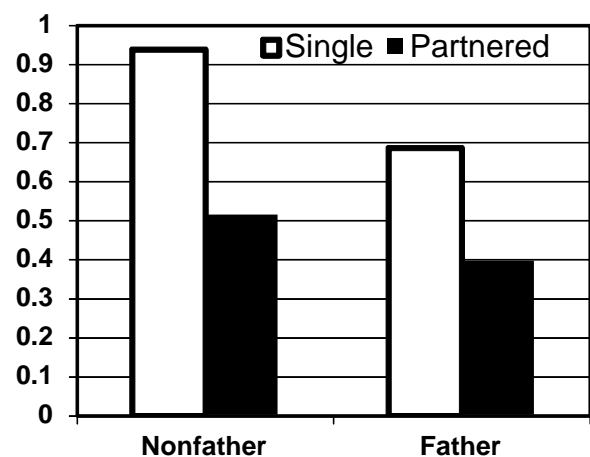


Table 1. Logistic regression predicting violence of theft by sex and parental status, controlling for education completed (repeated comparisons) and age.

		Wald	df	p	Exp(B)
Model 1 <sup>i</sup>	Age	616.36	1	.000	1.04
	Education				
	None completed	443.67	4	.000	
	Elementary	13.23	1	.000	1.70
	High school	226.49	1	.000	.61
	College	109.02	1	.000	.48
	Post-graduate	11.32	1	.001	.50
	Sex	1915.42	1	.000	7.70
Constant	171.02	1	.000	.38	
Model 2 <sup>ii</sup>	Age	564.72	1	.000	1.03
	Education				
	None completed	431.98	4	.000	
	Elementary	12.65	1	.000	1.69
	High school	222.78	1	.000	.61
	College	104.62	1	.000	.49
	Post-graduate	10.74	1	.001	.51
	Sex	1838.98	1	.000	7.43
Parental status	228.14	1	.000	1.56	
Constant	46.11	1	.000	.332	
Model 3 <sup>iii</sup>	Age	565.58	1	.000	1.03
	Education				
	None completed	432.14	4	.000	
	Elementary	12.65	1	.000	1.69
	High school	222.80	1	.000	.61
	College	104.69	1	.000	.49
	Post-graduate	10.75	1	.001	.51
	Sex	824.50	1	.000	7.19
Parental status	196.10	1	.000	1.55	
Sex x Parental status	.42	1	.515	1.06	
Constant	233.93	1	.000	.32	

i. Nagelkerke  $R^2 = .226$ ; ii. Nagelkerke  $R^2 = .237$ ; iii. Nagelkerke  $R^2 = .237$

### Parental status and marriage

Because some individual cells for females in the 1999 sample were very small (e.g. as low as 10 in some education categories) and we had *a priori* reasons for believing that men particularly would show a response to partnership in levels of aggression, we concentrated on male data for a comparison of the effects of marital status and parental status on offending types. When entered with age and education into a logistic regression, there were significant effects of both parenthood and partnership on men's offending such that nonfathers were again 1.6 times more likely to have committed violent theft, while partnered men were significantly less likely to have committed a violent theft. These were superseded however by a significant parenthood x partnership interaction (see Table 2 for full results). The analysis was therefore re-run with parental and partner status merged into a single dummy variable and subjected to repeated comparisons analysis across categories. This showed that single men were the most aggressive (with no difference between fathers and nonfathers), followed by partnered nonfathers and then partnered fathers. It is worth noting however that, as above, the partnered fathers did still commit significantly more violent thefts than women in any category ( $\chi^2 = 22.87$ ,  $p < 0.001$ , 1df)

Table 2. Logistic regression predicting violence of theft amongst men, by parental and partnership status, controlling for education completed (repeated comparisons) and age.

	Wald	df	p	Exp(B)
Model 1 <sup>i</sup>				
Age	11.83	1	.001	1.01
Education				
None completed	41.06	4	.000	
Elementary	1.43	1	.232	1.64
High school	7.99	1	.005	.77
College	18.55	1	.000	.41
Post-graduate	1.81	1	.178	.50
Parental status	8.60	1	.003	1.64
Partnership status	5.90	1	.015	.67
Parent x Partner	7.26	1	.007	.59
Constant	.26	1	.610	1.14
Model 2 <sup>ii</sup>				
Age	11.83	1	.001	1.01
Education				
None completed	41.06	4	.000	
Elementary	1.43	1	.232	1.64
High school	7.99	1	.005	.77
College	18.55	1	.000	.41
Post-graduate	1.81	1	.178	.50
Parent x Partner				
Single non fathers	89.74	3	.000	
Single fathers	.17	1	.682	1.04
Partnered non fathers	6.63	1	.010	.65
Partnered fathers	8.60	1	.003	.61
Constant	.05	1	.831	1.04

i. Nagelkerke  $R^2 = .102$ ; ii. Nagelkerke  $R^2 = .107$

## Discussion

This study provided a direct test of the relationship between parental status and engaging in violent as opposed to nonviolent crime using sentencing statistics for theft versus larceny from the United States. These data show clear evidence of a moderating effect of parenthood on willingness to engage in physical aggression among people who are motivated to commit property crime: amongst both men and women, nonparents were significantly more likely than parents to have committed robbery as opposed to larceny. Importantly, by restricting our analyses to one domain (property theft) we have reduced the potential confounds in this relationships (although the full data set across all crimes showed the same pattern in initial analyses: Boothroyd, 2001). Taken alongside other studies showing lower rates of other risky behaviour in parents than non-parents (see e.g. Gray & Crittenden, 2014 for discussion of data in men), our results thus support the argument that both sexes may be subject to reductions in factors which promote risk taking and aggression following parenthood.

Our data set do not allow us to identify a causal mechanisms; however the patterns of our results mirrors those studies discussed previously, showing that parenthood is associated with a reduction in testosterone levels. Our main effect of partnership status on rates of violent theft among men is likewise consistent with a large literature on the links between marriage or pair-bonding and men's testosterone levels (e.g. Burnham et al., 2003; Gray et al., 2002, 2007; van Anders & Watson, 2006). Our interaction effect, however, requires further attention; among single men, there was no effect of parenthood on theft type. What in fact appeared to be the case was that marriage reduced violence in men, and then facilitated a further reduction with fatherhood. There are a number of candidate explanations for parenthood having no effect on violence in single men. First, it could be that men who have children but are not partnered do not have lowered testosterone: if the lowering of testosterone in partnered men is a function of reduced interest

in seeking new mates, rather than a result of an increased need for parenting effort (as McIntyre et al., 2006, suggest), then we might expect the testosterone levels of single men to remain high irrespective of whether or not they have offspring. What this would suggest is that pair-bonding is a necessary condition for a reduction in testosterone irrespective of whether or not a man has fathered offspring. This is consistent with Mazur & Michalek's (1998) study which used samples taken from Vietnam veterans over ten years and showed that just being *married* significantly reduces a man's T levels, but that these levels can then return to pre-marriage levels in the event of marital separation. Our data are also consistent with those studies, cited previously, which generally found that married/partnered men had lower testosterone than single men, but higher than partnered fathers.

Studies of male testosterone including both married and unmarried fathers are, however, rare; Gray et al. (2006) found that resident-fathers had non-significantly *higher* T levels than 'visiting', non-resident, fathers in Jamaica, although this may in part reflect self-selecting participants who were willing and able to bring their child and the child's mother to the hospital for testing. Contrastingly, other data suggest that co-sleeping with offspring can significantly reduce testosterone, suggesting that while pair-bonding itself may not be a necessary precondition for an effect of parenthood on testosterone, close interaction and activities likely to induce increases in oxytocin and prolactin may be (Gettler et al., 2012). Indeed a number of studies have suggested that interactions with infants may affect testosterone in contexts other than parenting (van Anders et al., 2014). As such, greater levels of involvement with offspring might account for the low levels of violent crime among partnered fathers.

A complementary hypothesis not based on partnership-related testosterone reductions would be that men who are likely to be violent also have more volatile relationships even as parents, and that the high levels of violence in the Single/Parent group might reflect this common causation rather than group membership underlying violence. Indeed, a key caveat regarding our results is that our data are not longitudinal and the partnered parents in this study could be less aggressive because it is the less aggressive individuals who are more likely to settle with a family. While previous studies have correlated hormone levels with changes in personality and behaviour longitudinally, and thus suggest that the present study has picked up on causal effects of partnership and parenthood on aggression, other models in which partnership, parenthood, and low aggression share a common cause remain viable. Importantly, some previous data on testosterone and partnership has found that longitudinal changes in partnership status are better predicted by trait levels of T at baseline, rather than any changes in T over time (van Anders & Watson, 2006). Future work should thus use long term police records, or recruit respondents who could be tracked longitudinally using laboratory or questionnaire based measures of physical aggression to assess the effects of partner status and parenthood on non-criminal aggression levels. It would also be useful to further assess the 'signal' that changes hormone levels and behaviour with parenthood or partnership, particularly given the complexity of data regarding testosterone, prolactin and fatherhood (see e.g. Gray & Campbell, 2009 for discussion).

An additional point for caution regarding the methodology of this study is that the variable used to determine parenthood, 'Number of Dependants', is not clearly defined and so not restricted to offspring only. For example, it could include step-children, who might be treated differently to biological children (Daly & Wilson, 1988b, 2005) and may include both young dependants, and those nearing adulthood who may have rather differing effects on their father's time, energy and interest in mate competition. Furthermore, dependants – whether offspring or not – might not be co-resident and people with non-resident offspring are unlikely to be equally represented between our different groups. As such, however, we would anticipate that our data under- rather than over-estimates the association between parenthood and the tendency to engage in risky aggressive encounters.

In conclusion, this study showed that parents exhibit significantly lower relative levels of violent theft than other individuals and that, amongst men at least, this effect may be dependent upon partnership status. To our knowledge these data are the first direct evidence that parental status moderates tendencies towards physical aggression and contribute to our understanding of the biopsychosocial nature of parenthood.



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