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Trade-offs in a dangerous world: women's fear of crime predicts preferences for aggressive and formidable mates

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Abstract

Women's mate selection criteria can be expected to include a preference for men who can protect them and their offspring. However, aggressive dominance and physical formidability are not an unalloyed good in a partner; as such, men are likely to be coercive toward their mates. Accordingly, because of the potential costs of living with an aggressively dominant and physically formidable mate, a woman's preferences in this regard can be expected to vary as a function of the appraisal of her vulnerability to aggression — the more that a woman sees herself as potentially benefiting from protection, the more that she can be expected to favor aggressive dominance and physical formidability in a mate. Across three Internet-based studies of US women, we found evidence consistent with this perspective, such that women's fear of crime predicted her preference for long-term mates who are aggressively dominant and physically formidable.
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1. Introduction

1.1. Women's mate preferences for men who offer protection

Diverse evidence suggests that violence was a significant determinant of female fitness in ancestral populations. Compared to men, women are generally more vulnerable to male violence due to sexual dimorphism in stature, muscle size and composition (Frayer & Wolpoff, 1985) and aggressivity (Daly & Wilson, 1988). In the past, this greater vulnerability would have been compounded by obligatory female care of infants (Geary & Flinn, 2001, 2002; Taylor et al., 2000). Sexual assault in particular would likely have been a source of selective pressure acting on the psychology of women (Smuts, 1992), as rape decreases female fitness via the costs of physical trauma, by reducing female choice and by compromising mate value (Campbell & Soeken, 1999; Duntley, 2005;

Malamuth, Huppin, & Paul, 2005). In addition to dyadic violence, extrapolations from ethnographic, historical and archeological data suggest that both within- and between-group violence in the forms of feuding, raiding and warfare were common throughout evolutionary history (Biocca, 1971; Gat, 1999, 2000a, 200b; Keeley, 1996; LeBlanc, 2003; Morgan, 1980), and that homicide, sexual assault and resource appropriation or destruction are likely to have occurred with sufficient frequency to have recurrently impacted female fitness.

Investigators have theorized that violence was a source of selective pressure shaping the psychology of women's mate selection preferences, as individual men differ in their ability to protect their partners from aggression (Buss & Schmitt, 1993; Buss, 1994; Ellis, 1992; Geary, 2002; Symons, 1979). However, to date, only limited findings speak to the theory that women have preferences for men who can provide protection from violence. A handful of studies have suggested that men's ability and willingness to protect women is among women's criteria for male friends (Bleske-Rechek & Buss, 2001), extra-pair and short-term mating partners (Greiling & Buss, 2000; Li & Kenrick,

2006), and dating partners (Ellis, 1998; Ellis, Simpson, & Campbell, 2002). Existing findings suggest that, some women include men's protective abilities in their short-term mate selection criteria. However, there is little direct evidence that such considerations play an important role in women's evaluations of prospective partners and/or that such considerations play any role in the selection of long-term mates. The dearth of evidence for male protection playing a role in long-term mate selection reflects an empirical gap the present research is intended to address. Central to this enterprise is the recognition that, from the woman's perspective, a male partner's ability and willingness to protect a mate can be a double-edged sword. Specifically, we suggest that the traits that allow men to deter threatening competitors and prevail in agonistic encounters — coerciveness, aggressiveness and physical formidability — can be costly to their female partners.

Although the ability to supplant competitors may reflect ambition, index earning potential and lead to higher status, domineering and aggressive men may nevertheless often be avoided as long-term mates because coordination and cooperation are at a premium in pair bonds (Snyder, Kirkpatrick & Barrett, 2008). While there are reasons to expect convergence between the interests of men and women, there are conflicts of interest as well. As the lower-investing sex (Trivers, 1972/2002), men typically invest less in their offspring than will women and are more likely than women to divert resources toward obtaining additional mating opportunities. The more the investment strategies of the sexes diverge, the greater the conflict of interests between them. Aggressive and domineering men may be more likely to employ coercive tactics in negotiating these conflicts, including violence and abandonment or threats thereof. Moreover, issues of relative investment are not the sole source of conflict, as women will themselves sometimes benefit from relations with extra-pair partners (Pillsworth & Haselton, 2006), a strategy that can result in male fitness-reducing misallocation of paternal investment. While being more domineering and aggressive may or may not be related to higher mate-guarding vigilance, it is plausible that such men are more likely to aggress against their partners in response to the possibility of cuckoldry.

Consistent with the above propositions, evidence suggests that the use of aggression for personal gain outside of the home is one predictor of partner abuse (Lorber & O'Leary, 2004; O'Leary, Malone, & Tyree, 1994). Correspondingly, Figueredo, Gladden, and Beck (2010) recently reported that interpersonal aggression toward same-sex and opposite-sex conspecifics are highly correlated. More broadly, while dominance as a personality trait is not isomorphic with aggressiveness, it is nonetheless frequently characterized by coercion in agentic self-interest (Gurtman, 1992; Trapnell & Wiggins, 1990); similarly, while coerciveness is not isomorphic with aggressiveness, the two are nevertheless strongly associated (e.g., Hawley, 2003). Dominance–coercion–aggression thus form a clear psycho-

behavioral constellation such that, while individuals use different strategies at different times, such men are likely to use similar tactics in dealing with both his male rivals and his female partner. Indeed, the ability to prevail in male–male violence, and hence to also provide protection from it, is a function of both personality and morphology and, importantly, these two facets are linked. Recent findings from Californian undergraduates suggest that men who are physically stronger than average tend to be involved in more fights, endorse coercion more and respond to transgressions with more anger than is true of other men (Sell, Tooby, & Cosmides, 2009). Likewise, results from India indicate that larger, stronger young men report more physical aggression than their smaller counterparts (Archer & Thanzami, 2007; Archer & Thanzami, 2009). This is not to say that we anticipate that all large, formidable men will always have an aggressive self-presentation. Rather, we suggest that a significant fraction of formidable men may resort to the same coercive tactics in the face of conflicts of interest with their romantic partners that they employ in conflicts of interest with same-sex conspecifics.

1.2. Women face trade-offs in violent environments

To summarize the above, conflicts of interest are common within mateships, and aggressively dominant men who are physically formidable (hereafter termed 'aggressive–formidable' men) may be more likely to employ violence and coercion to resolve such conflicts in their favor. Yet, intuition suggests that some women nonetheless appear to be attracted to such men as potential long-term partners, and some women seem to select these men in spite of the availability of alternative partners who are less likely to be coercive. Conventional approaches view women who are attracted to coercive and aggressive men as suffering from deficits in self-esteem, deficits in healthy attachment style, preferences for possessive men, a desire to recreate and renegotiate past negative relationship dynamics, or a desire to confirm negative beliefs and expectations with regard to relationship experiences (Bradley, Schwartz, & Kaslow, 2005; Breitenbecher, 2001; Van Bruggen, Runtz, & Kadlec, 2006; Zayas & Shoda, 2007). In contrast to proximate explanations that are often framed in terms of deficiencies, we argue that women's variable preferences for male aggressive formidability are also understood as the product of evolved psychological mechanisms that respond to a woman's assessment of her circumstances; those preferences that appear puzzling, distressing or even pathological to middle- and upper-class investigators may thus be partly explicable as reflecting reactions to experiences to which the latter are rarely exposed.

Cultural environments vary in the degree to which dominance-based strategies for obtaining status in local intrasexual competitions are effective, as groups differ in the extent to which they recognize aggression as a legitimate means of conflict resolution (e.g., compare Boehm, 1984,

with Briggs, 1970). Paralleling cultural variation, social structural factors can influence the likelihood that aggression will be employed: highly stratified societies can yield unequal opportunities for success in intrasexual competition that, in turn, simultaneously increases the stakes of competition and makes aggressive tactics of competition potentially more effective, or at least more attractive to marginalized individuals excluded from opportunities to compete in high-status competitions (Daly, Wilson, & Vasdev, 2001). More broadly, the frequency of violent intergroup conflict varies dramatically across time and space, with some settings characterized by generations of peace, while others exhibit near-constant cycles of raiding and warfare (e.g., compare Dentan, 1968, with Chagnon, 1983).

In environments characterized by substantial levels of intergroup and intragroup conflict, domineering, coercive, aggressive and even violent strategies can pay off for men competing for access to resources. In these same environments, women and their children will often face an elevated risk of violence. Under these circumstances the costs that aggressive–formidable men may inflict on their long-term partners will frequently be outweighed by the tangible benefits that they provide, in the form of increased access to resources and protection from extra-pair violence. Because ancestral environments will have varied with regard to prevailing levels of violence, with corresponding variation in the cost–benefit ratio of partnering with an aggressive–formidable man, we propose that selection favored the evolution of facultative female preferences for male aggressive formidability, where such preferences are calibrated to the actor's circumstances.

The above hypothesis suggests that the contrast between the results of published studies of mate-selection criteria and the observation that some women seem attracted to aggressive–formidable men likely reflects (a) the nature of the populations sampled in prior research, (b) the nature of the questions asked and (c) the difficulty of coping with ambivalence when examining preferences. First, prior studies have relied on convenience samples of Western university women. Because the vast majority of such women have experienced relatively safe environments, they can be expected to place a low value on male aggressive–formidability — for women far removed from the risk of violence, the costs of an aggressive–formidable partner greatly outweigh the benefits. As for that small minority of university women who have experienced very dangerous environments, they are themselves pursuing social mobility and, hence, consistent with the values of the larger society, can be expected to greatly value prestige-based status over dominance-based status (Henrich & Gil-White, 2001; Snyder et al., 2008). Second, the hypothesis outlined above does not predict that women should ever be blind to the costs that aggressive–formidable men might inflict on them — even women who stand to benefit from the protection offered by such a partner should still be cognizant of the risks that he poses. The current studies therefore

attempt to sample a larger number of women from a broader range of environments.

2. The current studies

If pairing with an aggressive–formidable man has both costs and benefits, the utility of such a relationship depends not simply on prevailing rates of violence, but rather on the woman's ability to cope with such violence absent assistance from a mate. Women likely vary in their own abilities to deter potential assailants, in their access to other social sources of protection and in their attractiveness to potential assailants. In addition, the level of violence in a particular environment will vary. Hence, the benefits offered by an aggressive–formidable partner will vary across individual women. Subjective perceptions of the risk of violence can be understood as the product of assessments that first compile information concerning prevailing rates of violence and then weight this in light of a woman's own vulnerability and the resources that she brings to bear in coping with such hazards. Perceptions of one's vulnerability to crime may thus usefully index the extent to which it should be expected that women will see themselves as benefiting from having aggressive–formidable partners and may be more accurate in this regard than objective measures of prevailing crime rates.

Consonant with the notion that the value of obtaining protection from violence is a product of the combination of prevailing levels of violence and one's own ability to resist violence, a product that can be expected to be subjectively represented, we predicted that (a) the greater a woman's self-perceived vulnerability to violent crime, the stronger her reported preferences would be for aggressive–formidable men as long-term partners. Next, to evaluate how participants' subjective fear of crime may differ from objective measures of crime in explaining women's preferences for dominance-linked traits, we explored the extent to which (b) the prevailing level of crime in a woman's environment predicts her preferences for aggressive–formidable men as long-term partners.

Resource inequality is an important determinant of the extent to which violent aggression is worthwhile (Daly, Wilson, & Vasdev, 2001). Given that, while undoubtedly hypertrophied in many modern societies, some degree of within-group variation in resource inequality likely characterized ancestral societies as well, it is possible that signs of substantial income inequality serve as cues indicating that violence is likely to occur. If so, then (c) the degree of income inequality in a woman's community should predict her preferences for aggressive–formidable men. Lastly, we investigated the notion that (d) preferences for aggressive formidability are independent of major demographic variables and socioeconomic status.

Given that the degree of danger in a given environment can vary across time, and given that people can move from

one area to another, an optimal adaptation would be one in which a woman's mate-selection preferences are periodically updated in light of current circumstances. However, it is possible that plasticity in mate-selection mechanisms may be constrained if these mechanisms are integrally tied to other features of sociosexual psychology. Because some parameters of sociosexuality appear to be set during critical periods prior to sexual maturation (Belsky, Steinberg, & Draper, 1991; Ellis, Jackson, & Boyce, 2006), it is possible that the same is true of preferences with regard to aggressive formidability. To investigate this, we compared the effect on mate-selection preferences of the rate of violent crime rate in a woman's current community with the effect of the rate of violent crime in her childhood community.

3. Study 1

3.1. Participants

In order to capture significant variance in individual exposure to violence, we recruited a relatively large sample of Internet users, from websites used to advertise on-line psychological surveys. Excluded from the analyses were male participants, and female participants who did not complete the questionnaires, those who provided homogeneous responses (for example, entered a value of "1" for all items), were under 18 years of age, entered mutually incompatible responses (for example, claimed to be a doctor at 18 years of age) or did not provide a current US postal code. This left a sample of 1048 women, ranging in age from 18 to 66 (mean±S.D.=30.01±10.35), from 46 US states and Washington D.C. The frequency of races within this sample is 77.6% Caucasian, 7.5% African-American, 5.8% Hispanic, with the remainder reporting as "Asian," "Middle-Eastern," "mixed" or "other." The majority of participants were relatively well educated, with only 8.10% of the participants indicating an education level at the high school level or lower.

3.2. Method

3.2.1. Dependent variable

Women's preferences for aggressive–formidable men were measured using a scale adapted from Poore, Gable and Haselton (2006) in which descriptive traits were rated by their importance in a prospective long-term partner on a range response scale (1=*Not at all Important*, 9=*Extremely Important*). This scale examines attributes associated with aggressive forms of dominance, non-aggressive forms of status, and physical attributes. We used the mean response to the following items, chosen for their high degree of face validity: "dominant," "domineering," "commanding," "overbearing," "tough-guy," "bad-boy," "strong," "powerful," "broad shoulders," "tall" and "could win a fight if necessary" (mean±.S.D=4.28±1.36, n=1026; Cronbach's α=.84).

3.2.2. Independent variables

Perceived vulnerability to crime (PVC) was measured using a modified version of the British Fear of Local Crime Survey (The Crime Reduction Centre, 2000). Participants identified their perceived level of vulnerability on a 1–4 scale from "not at all worried" to "very worried" about being the victim of mugging, violent attack, sexual assault, burglary, vehicle damage/vandalism, theft from one's property, motor vehicle theft and general vandalism (mean±S.D.=2.23±0.62; Cronbach's α=.89).

Objective levels of crime to which participants were likely exposed were determined by participants' current postal zip code and the zip code of the area in which they spent the majority of their childhood. Separate crime indexes for local property crime and violent crime were assigned for current and childhood zip codes using an online real estate/relocation planning website, Sperling's Best Places (2007). This website consolidates multiple sources of crime data, calculates and provides indices of crime rates using a 0–10 (low to high crime) system. All four crime indexes (childhood/current, violent/property) are contemporary, as we did not have access to data from previous decades. Objective crime indexes were mostly characterized by moderate levels of overall crime, with property crime being more common than violent crime: current violent crime (mean±S.D.=4.78±2.33, n=1026); current property crime (mean±S.D.=5.05±2.08, n=1026). Similar patterns were obtained for our indirect assessment of participants' childhood environments: proxy of childhood violent crime (mean±S.D.=3.76±2.44, n=936); proxy of childhood property crime (mean±S.D.=4.09±2.35, n=936).

Local resources were measured as two separate variables: neighborhood median household income (from Census Bureau statistics) and resource inequality (calculated as the neighborhood Gini coefficient, a widely used index of income dispersion; Gini, 1921). Data for these variables was retrieved via participant zip codes entered into the US Census Bureau's Census 2000 electronic database. Median income was $43,617. Gini coefficients were calculated for each current zip code (mean±S.D.=0.40±0.06, n=1026) and childhood zip code (mean±S.D.=0.41±0.07, n=936) using income tables (Census Bureau Table 52) and the calculation algorithm provided in Van Kern (2001).

3.3. Results

We tested the hypotheses that neighborhood crime rates, resource inequality and PVC would be related to a preference for aggressive–formidable mates by inspecting the bivariate correlations among these variables. We also explored the relationships between preference for aggressive–formidable mates and age, education, race and income using the same correlation analysis.

Consistent with expectations, the results revealed a positive correlation between preference for aggressive–formidable men and both PVC and real neighborhood

Table 1
Study 1 — Correlations between predictors

Predictors	1	2	3	4	5	6	7	8	9	10	11	12
1. Aggressive–formidability	–	.15**	.04	.03	.09**	.04	−.13**	.05	−.14**	.05	−.02	−.01
2. Fear of crime		–	<.01	−.03	.02	.01	−.16**	.03.	−.20**	−.06	.07*	.04
3. Violent crime (current)			–	.77**	.28**	.21**	.07*	.10**	.20*	.02	.43**	.12**
4. Property crime (current)				–	.23**	.27**	.04	.06*	.12**	−.05	.36**	.09**
5. Violent crime (childhood)					–	.81**	.18**	.17**	.04	.07*	.06	.43**
6. Property crime (childhood)						–	.15**	.13**	<.01	.04	.01	.36**
7. Age							–	−.22	.29**	.22**	.05	.08*
8. Race								–	.01	−.02	.11**	.11**
9. Education level									–	.24**	.04	−.02
10. Income										–	−.13**	.05
11. Gini (current)											–	.24**
12. Gini (Childhood)												

 * Correlation is significant at the .05 level (two tailed).
 ** Correlation is significant at the .01 level (two tailed).

crime (childhood violent crime). However, contrary to expectations, preference for aggressive–formidable men was not significantly correlated with resource inequality (Gini). The analysis also revealed that preference for aggressive–formidable men was negatively related to age and education, and that these demographic variables were also significantly correlated with PVC and neighborhood crime (see Table 1).

Because age and education were found to covary with preference for aggressive–formidable mates, PVC and local violent crime indexes, we conducted an analysis that examined the extent to which PVC and neighborhood crime independently predicted variance in mate preferences, when the potentially confounding effects of age and education were held constant. To do so, we conducted a multiple regression analysis where aggressive formidability was the dependent variable and PVC, violent crime exposure during childhood, age and education were the independent predictors.

Consistent with expectations, controlling for age, education and exposure to violent crime, PVC was positively related to preferences for aggressive formidability (see Table 2). Our ancillary expectation that exposure to violent crime during childhood would have an independent effect on mate choice was supported (see Table 2), although the effect was very small.

3.4. Discussion

Consistent with our central prediction, PVC predicted a woman's preferences for aggressive formidability in a male

long-term partner. This effect remained significant when correlated measures of socioeconomic status and an objective measure of exposure to childhood crime were held constant. In contrast, mate selection preferences were not predicted by most of the structural environmental measures involving neighborhood crime and income, with only exposure to violent crime in a woman's childhood environment predicting preferences for aggressive formidability in long-term mates. This pattern suggests that subjective perceptions of danger more completely capture both an individual's self-assessed ability to cope with threats and her own past experiences. The latter possibility is reinforced once it is recognized that measures that aggregate events at the community level will only approximate a given individual's particular history of exposure to cues of the presence of danger, and, the larger the geographic and demographic scales of such measures, the greater this discordance is likely to be. We can therefore expect that crime statistics and similar measures will only partially capture the experiences that should contribute to a given woman's assessment of the potential utility of pairing with an aggressive–formidable man. In contrast, because a woman's own perceptions of the dangerousness of her environment are likely to more directly reflect her experiences, such perceptions should correlate more closely with her mate-selection preferences.

Our finding that objective measures of crime in the area in which a woman grew up predict her preferences for dominance/formidability raises the possibility of a critical window in development during which girls assess their local environment and calibrate lifelong mate preferences accordingly. While such a system would likely be inferior to one in which preferences were periodically updated in light of current circumstances, consistent with the apparent need to set some parameters of sociosexuality prior to maturation, it is conceivable that there are constraints on optimality in this regard. However, given the low effect size of all of our findings, replication would lend confidence that this account is accurate. This is particularly important

Table 2
Study 1: Summary of multiple regression analysis for variables predicting preferences for aggressive–formidability (n=948)

Variable	B	S.E.	β	t	p
Fear of crime	0.24	0.07	0.11	3.32	<.01
Childhood violent crime	0.07	0.02	0.11	3.31	<.01
Age	−0.01	0.01	−0.10	−2.78	.01
Education level	−0.10	0.03	−0.12	−3.28	<.01

R^2=0.055.

given that crime rates for a given region vary over time, yet our measures of crime apply to the contemporary characteristics of the region in which a woman grew up, rather than the circumstances that prevailed in that locale during her development. We therefore sought to replicate our findings in a second study.

4. Study 2

4.1. Participants

Again seeking a demographically diverse sample within a nation-state environment, we once more employed an Internet-based survey protocol, this time soliciting participants using postings to the Volunteers section of http://www.Craigslist.org for 38 large- and mid-sized cities in the United States. Exclusion criteria of participants were the same as in Study 1. Women ranging in age from 18 to 61 (mean±S.D.=37.47±8.70, n=490) from 30 US states completed the questionnaire. The frequency of races within this sample is 75.7% Caucasian, 8.4% African-American, 9.2% Hispanic, with the remainder reporting as "Asian," "Middle-Eastern," "mixed" or "other." Only 7.00% of the participants indicated an education level at the high school level or lower. The majority of participants reported having some higher education, with 52.50% reporting that they were currently enrolled in higher education courses and 31.30% reporting that they were currently enrolled in a psychology course.

4.2. Method

The methods for Study 2 were the same as those used in Study 1, with the addition of sequential childhood environment divisions intended to explore the chronological parameters of a possible critical window. Participants were asked to provide the postal code for which they "spent the majority of" their childhood during ages 0–5, ages 6–11 and ages 12–18.

Treatment of the dependent variable and independent variables was the same as in Study 1. The aggressive

formidability aggregate for Study 2 consisted of the same items as in Study 1 for the sake of consistency between the two studies (mean±S.D.=2.17±0.64, n=489; Cronbach's α=0.78). As in Study 1, objective measures of crime rates indicated that, on average, participants' environments were characterized by moderate levels of crime: current violent crime (mean±S.D.=4.47±2.27, n=420); current property crime (M=4.76, SD=2.00, n=420); childhood violent crime, ages 0–5 (mean±S.D.=4.02±2.31, n=466); childhood property crime, ages 0–5 (mean±S.D.=4.34±2.12, n=466); childhood violent crime, ages 6–11 (mean±S.D.=3.86±2.28, n=466); childhood property crime, ages 6–11 (mean±S.D.= 4.20±2.13, n=466); childhood violent crime, ages 12–18 (mean±S.D.=3.80±2.23, n=473); and childhood property crime, ages 12–18 (mean±S.D.=4.13±2.07, n=473). Reliability analysis of the subjective fear of crime aggregate yielded Cronbach's α=.88. The subjective fear of crime aggregate indicated moderate fear of crime among participants (mean±S.D.=2.17±0.64, n=489).

The median income of this sample is \$40,539. Gini coefficients were calculated for each current zip code (mean±S.D.=0.42±0.07, n=420), reported zip code from ages 0–5 (mean±S.D.=0.40±0.06, n=466), ages 6–11 (mean±S.D.=0.39±0.05, n=466) and ages 12–18 (mean± S.D.=0.39±0.05, n=473). Both income and Gini coefficients were retrieved via participant zip codes entered into the US Census Bureau's Census 2000 electronic database.

4.3. Results

Consistent with the results of Study 1, the results revealed a positive correlation between preference for aggressive–formidable men and PVC. Inconsistent with Study 1, exposure to violent crime during childhood was correlated with subjective fear of crime but not preference (see Tables 3 and 4). Resource inequality in women's current neighborhoods, as measured by Gini indices, was slightly but significantly negatively correlated with women's preferences for aggressive–formidable men, but not with subjective fear of crime (see Tables 3 and 4). Bivariate correlation analyses indicate that level of education was negatively related to

Table 3

Study 2 — Correlations between predictors: adult subjective fear of crime, childhood proxy of crime rates and childhood Gini

Predictors	1	2	3	4	5	6	7	8	9	10
1. Fear of crime	–	.11*	.02	.07	.01	.09	.06	.04	−.01	.02
2. Violent crime (ages 0–5)		–	.81*	.87**	.712**	.74**	.60**	.42**	.33**	.27**
3. Property crime (ages 0–5)			–	.71**	.83**	.60**	.69**	.34**	.25**	.26**
4. Violent crime (ages 6–11)				–	.83**	.79**	.64**	.37**	.38**	.28**
5. Property crime (ages 6–11)					–	.65**	.76**	.30**	.31**	.26**
6. Violent crime (ages 12–18)						–	.81**	.32**	.29**	.39**
7. Property crime (ages 12–18)							–	.30**	.26**	.33**
8. Gini (ages 0–5)								–	.85**	.67**
9. Gini (ages 6–11)									–	.73**
10. Gini (ages 12–18)										–

  * Correlation is significant at the .05 level (two tailed).

  ** Correlation is significant at the .01 level (two tailed).

Table 4
Study 2 — Correlations between predictors: preferences, subjective fear of crime, proxy of current crime rates, demographics and current Gini

Predictors	1	2	3	4	5	6	7	8	9
1. Aggressive–formidability	–	.10*	−.02	−.08	−.01	.03	−.17**	.05	−.19**
2. Fear of crime		–	.09	.04	−.19**	.12*	−.11*	−.12	.09
3. Violent crime (current)			–	.74**	.014	.12*	.16**	−.05	.46**
4. Property crime (current)				–	.03	.06	.15**	−.08	.34**
5. Age					–	−.07	.29**	.21**	−.11
6. Race						–	<−.01	−.06	.14**
7. Education level							–	.16**	.15**
8. Income								–	−.22**
9. Gini (current)									–

* Correlation is significant at the .05 level (two tailed).
** Correlation is significant at the .01 level (two tailed).

fear of crime and preferences for aggressive formidability (see Table 4).

Potential confounding factors correlated with aggressive formidability were tested with multiple regression analysis. The results indicated that the predictive value of fear of crime with regard to preferences for aggressive formidability remained significant when level of education and Gini are held constant (see Table 5).

4.4. Discussion

Taken together, Studies 1 and 2 indicate that women's subjective fear of crime predicts their long-term mate preferences such that the higher one's PVC, the greater one's preference for aggressive–formidable men. In contrast, we did not find consistent support that local crime rates or income inequality predicts mate preferences, although there is some support for the notion that such structural variables are related to PVC. With the available evidence, it cannot be determined whether perceived vulnerability is shaped primarily by environmental exposure to crime, some underlying personality variable or predisposition, or an interaction between the two. It is possible that our measures of local and childhood crime rates lacked the temporal and spatial resolution necessary to capture women's true exposure to local crime. Whether dispositional factors, crime exposure, or some mixture or interaction between them determines fear of crime is an unresolved empirical issue. Some scholars claim subjective states determine fear, while others claim that the lack of evidence for a direct link between crime exposure

and fear of crime reflects methodological limitations (Stanko, 1995).

One potential criticism of Studies 1 and 2 is that our aggregates of fear of crime and trait preferences were exclusively theory driven, without proper empirical verification that these variables tapped into distinct psychological dimensions. Although scale reliability analyses indicated a strong degree of internal validity to these measures (as evidenced by high item inter-item covariance), our unreported factor analyses did not support the discriminant validity of these aggregates. We therefore conducted a third study intended to replicate Studies 1 and 2 using measures having greater construct validity. At the same time, given questions concerning the relationship between subjective states and fear of crime, we sought to investigate the extent to which exposure to visual cues associated, respectively, with danger or safety could alter fear of crime and, ex hypothesi, influence women's preferences for aggressive–formidability in a long-term mate.

5. Study 3

5.1. Participants

Again seeking a demographically diverse sample within a nation-state environment, we employed an Internet-based survey protocol, this time soliciting participants using postings to the Volunteers section of http://www.Craigslist.org for 53 large- and mid-sized cities from 35 different states in the United States. We excluded from the sample participants who did not complete the survey, entered homogenous responses, failed to verify their gender or age, reported an age under 18, indicated that they were exclusively homosexual, provided a score of 4 or lower on a 1–9 scale regarding ability to read English or indicated that they did not take the survey seriously. This yielded a sample of 926 women, ranging in age from 18 to 75 (mean±S.D.= 32.55±11.48, *n*=926), drawn from 35 US states. The frequency of races within this sample is 76.0% Caucasian, 3.1% African-American, 8.6% Hispanic, with the remainder reporting as "Asian," "Middle-Eastern," "Native American,"

Table 5
Study 2: Summary of multiple regression analysis for variables predicting preferences for aggressive–formidability (*n*=423)

Variable	B	S.E. B	β	t	p
Fear of crime	0.27	0.12	0.12	2.31	.02
Education level	−0.10	0.05	−0.10	−2.06	.04
Gini index (current)	−4.34	1.12	−0.19	−3.87	.00

R^2=0.07.

"mixed" or "other." The median reported household income of this sample is between \$40,000 and \$49,000 per year. Only 6.2% of the participants indicated an education level at the high school level or lower; the majority of participants reported having some higher education, with 52.5% reporting that they had a bachelor's degree or higher.

5.2. Method

We attempted to manipulate participant's fear of crime by presenting photographs depicting photos of either dangerous scenes — such as a gang member holding a handgun, a war-scarred urban street, etc. — or safe scenes — such as a man mowing the lawn of a suburban home, children playing in a public park, etc. Participants were randomly assigned to view 22 photos of either dangerous or safe scenes, being instructed to "[p]lease study each of the following pictures long enough so you can remember key details." Participants then (i) responded to a fear of crime questionnaire, adapted from the British Fear of Local Crime Survey (The Crime Reduction Centre, 2000); (ii) reported their trait preferences for a long-term partner using a scale adapted from Poore, Gable and Haselton (2006); and (iii) selected the body type of their ideal long-term mate on a matrix of 28 male bodies with muscularity varying on the x-axis and body fat varying on the y-axis (Frederick & Peplau, 2007). The order of presentation of (i), (ii) and (iii) was counterbalanced across participants.

5.3. Results

5.3.1. Treatment of variables and descriptive statistics

Treatment of the variables was similar to Studies 1 and 2. However, to demonstrate that the variables represented unique, relatively independent psychological factors, factor analysis with principal components extraction (unrotated) of the fear of crime items indicated all items loading in one factor with an eigenvalue of 4.95 explaining 54.95% of the variance. Item reliability for the PVC factor was high (Cronbach's α=0.90; mean±S.D.=2.18±0.61, n=926).

Factor analysis of long-term mate preference items using Varimax rotation and principal components extraction indicated the presence of two factors. Factor 1 corresponded to our theoretical construct of trait aggressiveness and

consisted of the following items: competitive (0.60); tough guy (0.78); aggressive (0.85); stands up for self (0.62); and domineering (0.74). The trait aggressiveness factor yielded an eigenvalue of 3.30 explaining 41.26% of the variance. Internal reliability analysis of the trait aggressiveness factor was adequate (Cronbach's α=0.80; mean±S.D. 3.60±1.42, n=926). The rest of the items on the preference scale loaded on Factor 2 and consisted of the following: handsome (0.60); admirable (.808); and ambitious (0.81). Factor 2 yielded an eigenvalue of 1.32 accounting for 16.47% of the variance.

Lastly, body-type preferences were recoded such that the preferred degree of muscularity could be detected independently of the preferred degree of body fat following procedures suggested by Frederick and Peplau (2007). Muscularity, varying on the x-axis, was rated on a 1 (least muscular) to 7 (most muscular) scale yielding a mean preference of 2.65±1.07 (n=926).

5.3.2. Correlations and regression analysis

Assignment to view dangerous or safe photos did not predict fear of crime, indicating that our manipulation had no effect; correspondingly, experimental condition did not predict trait preferences or body-type preferences. We therefore pooled participants across conditions in order to explore our core hypothesis that fear of crime would predict both trait preferences for aggressiveness and aesthetic preferences for more formidable male body types. Results revealed that subjective fear of crime was correlated with preferences for trait aggressiveness and muscularity, as well as age, education level, race and household income (see Table 6).

To test the prediction that PVC predicts preferences for aggressive and formidable mates, we conducted two multiple regression analyses in which trait aggressiveness and muscularity were the dependent variables and PVC was the independent variable.

Consistent with our hypothesis, fear of crime was positively related to preferences for trait aggressiveness and preferences for muscularity. Potential confounding factors that correlated with trait aggressiveness and muscularity were tested with multiple regression. Fear of crime remained a significant predictor of preferences for trait aggressiveness when age and level of education, income and

Table 6
Study 3 — Correlations between predictors: preferences, subjective fear of crime and demographics

Predictors	1	2	3	4	5	6	7
1. Aggressive–formidability	–	.18**	.14**	−.15**	−.15**	.07*	−.16**
2. Muscularity		–	.06*	−.01	−.04	.08*	−.02
3. Fear of crime			–	.14**	.011**	−.15**	−.15**
4. Age				–	.16**	.28**	.17**
5. Education level					–	−.20**	.09**
6. Estimated income						–	.10**
7. Race							–

 * Correlation is significant at the .05 level (two tailed).
 ** Correlation is significant at the .01 level (two tailed).

Table 7
Study 3: Summary of multiple regression analysis for variables predicting preferences for trait aggressiveness (*n*=896)

Variable	*B*	S.E.	*β*	*t*	*p*
Fear of crime	0.22	0.08	0.10	2.90	<.01
Age	−0.01	0.01	−0.10	−2.87	<.01
Education level	−0.10	0.03	−0.11	−3.19	<.01
Estimated income	0.01	0.02	0.01	0.23	.82
Race	−0.39	0.11	−0.11	−3.44	<.01

R^2=0.060.

race were held constant, suggesting relative independence of these variables (see Table 7). Similarly, fear of crime remained a significant predictor of physical formidability when income was held constant (see Table 8).

6. General discussion

Across three studies, we found that women's fear of crime predicted the extent to which they valued aggressive–formidability in a male long-term mate. These findings are consistent with our thesis that, because aggressive–formidable men offer greater potential protection to their partners, yet are also likely to inflict greater costs on them, women profit by selecting such mates only to the extent that their circumstances make obtaining the benefits worth paying the costs. In the first two studies, crime rates in a woman's current environment did not predict mate selection preferences. This is broadly consistent with our assertion that the value of the protection provided by an aggressive formidable mate is dependent on a woman's own self-assessed vulnerability to, and ability to address, violence, rather than on prevailing rates of violence in and of themselves. In addition, Study 3 suggests that subjective vulnerability is a relatively stable trait, not sensitive to state perturbation.

We have suggested that at least some males interact with their romantic partners in ways that are similar to their interactions with other men, being aggressive with all conspecifics across varying contexts. We have also suggested that physically formidable men are quicker to resort to coercive tactics within the context of their romantic relationships. We do not have direct evidence speaking to the latter premise, but are currently conducting a study to directly test this hypothesis. It is important to note that all of the indirect evidence from the three studies described above

is consistent with the notion that at least some physically formidable men are coercive in the context of romantic relationships. First, preferences for aggressiveness and preferences for physical formidability were highly correlated in all three studies. Second, like male aggressiveness, male formidability is preferred by women as a function of a woman's fear of crime. This tight linkage between aggressiveness, formidability and the determinants of female preferences for each suggests that these attributes are only sought to the extent that they are needed, i.e., whether consciously or otherwise, participants appear to presume that these traits are linked and are only desired under conditions of perceived vulnerability.

If, as we suggest, fear of crime is the product of a process that assesses cues of risk in light of attributes of the self and existing social resources, then, when compared to exogenous patterns not specific to a given woman, such subjective representations should more closely track the benefits that a formidable partner can provide. That said, because individual vulnerability will always be linked to prevailing levels of violence, it is somewhat surprising that prevailing crime rates did not consistently predict women's mate selection preferences, nor did resource inequality, another exogenous variable that might be expected to index the risk of violence. It is an open question whether, on the one hand, this lack of correlation is entirely explicable in terms of the divide separating individual experience from data aggregated over large demographic and geographic areas, or, on the other hand, this indicates that there is a problem with our core thesis. One potential complication in this regard is the likely possibility that some components of subjective fear of crime may be genetically transmitted, as neuroticism, a plausible personality correlate, is highly heritable (Lake, Eaves, Maes, Heath, & Martin, 2000). Our core thesis can accommodate such heritability provided that neuroticism or similar traits are (genetically) linked to variation in the ability to cope with hazards, but this remains an open question. Additionally, given the limitations of our methods, the matter of whether levels of violence in a woman's childhood environment exercise an independent influence on her preferences for aggressive formidability should be considered unresolved at present. Ideally, future studies will employ crime rate data that are more localized than that to which we had access and, moreover, will use archival rather than contemporary data in reconstructing the risks to which women were exposed during childhood. Lastly, before it can be definitively determined that subjective fear of crime is a relatively stable trait that, absent dramatic personal experience, is not subject to variation across short time spans, it will be necessary to employ stimuli that are more ecologically valid, and thus presumably more compelling, than still photographs presented on a computer such as those used in our Study 3.

Future studies should explore actual behaviors rather than stated preferences and would address a wider range of sociocultural systems than that tapped through our samples of US women. With regard to the latter, both levels of

Table 8
Study 3: Summary of multiple regression analysis for variables predicting preferences for muscularity (*n*=906)

Variable	*B*	S.E.	*β*	*t*	*p*
Fear of crime	0.12	0.06	0.07	2.09	.37
Estimated income	0.29	0.11	0.91	2.72	<.01

R^2=0.011.

violence and cultural framings thereof vary dramatically across societies; hence it is important to identify the various sources of information that contribute to preferences for aggressive formidability. Specifically, we expect women to be sensitive not only to the direct benefits and costs of selecting an aggressive–formidable mate, but also to the indirect ones that flow from the cultural meanings attached to such behavior, meanings that vary dramatically across cultural groups. Granted, some such variation does exist within the US. However, on the scale of the world's cultures, US women responding to Internet calls for research volunteers may be relatively extreme in their consistent ranking of prestige-linked traits far above dominance-linked traits. That we have nevertheless been able to detect in such samples individual differences in preferences for male aggressive–formidability that correspond with subjective vulnerability to violence underscores the potential explanatory utility of viewing such preferences as the product of evolved mechanisms that evaluate the costs and benefits of different types of partners. This leads us to conclude that it is time to abandon perspectives that pathologize preferences for dominance-linked traits and instead adopt a functionalist approach that views all women as capable strategists, agentic actors who will seek to make the best of a bad situation by choosing aggressively formidable partners when it is profitable to do so.

References

Archer, J., & Thanzami, V. L. (2007). The relation between physical aggression, size and strength, among a sample of young Indian men. *Personality and Individual Differences, 43*(3), 627–633.

Archer, J., & Thanzami, V. L. (2009). The relation between mate value, entitlement, physical aggression, size and strength among a sample of young Indian men. *Evolution and Human Behavior, 30*(5), 315–321.

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62*(4), 647–670.

Biocca, E. (1971). *Yanoáma: The narrative of a white girl kidnapped by Amazonian Indians — As Told to Ettore Biocca (D. Rhodes, Trans.).* New York: Dutton.

Bleske-Rechek, A. L., & Buss, D. M. (2001). Opposite-sex friendship: Sex differences and similarities in initiation, selection, and dissolution. *Personality and Social Psychology Bulletin, 27*(10), 1310.

Boehm, C. (1984). *Blood revenge: The anthropology of feuding in Montenegro and other tribal societies.* Lawrence: University Press of Kansas.

Bradley, R., Schwartz, A. C., & Kaslow, N. J. (2005). Posttraumatic stress disorder symptoms among low-income, African American women with a history of intimate partner violence and suicidal behaviors: Self-esteem, social support, and religious coping. *Journal of traumatic stress, 18*(6), 685–696.

Breitenbecher, K. H. (2001). Sexual revictimization among women: A review of the literature focusing on empirical investigations. *Aggression and Violent Behavior, 6*(4), 415–432.

Briggs, J. (1970). *Never in anger: Portrait of an eskimo family.* Cambridge: Harvard University Press.

Buss, D. M. (1994). *The evolution of desire: Strategies of human mating.* New York: BasicBooks.

Buss, D., & Schmitt, D. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychol Rev, 100*(2), 204–232.

Campbell, J., & Soeken, K. (1999). Forced sex and intimate partner violence: Effects on women's risk and women's health. *Violence Against Women, 5*(9), 1017–1035.

Chagnon, N. A. (1983). *Yanomamö, the fierce people.* 3rd ed. New York: Holt, Rinehart, and Winston.

Daly, M., & Wilson, M. (1988). *Homicide.* New York: Aldine de Gruyter.

Daly, M., Wilson, M., & Vasdev, S. (2001). Income inequality and homicide rates in Canada and the United States. *Canadian Journal of Criminology*, 219–236.

Dentan, R. (1968). *Semai: A nonviolent people of Malaya.* New York: Holt Rinehart Winston.

Duntley, J. D. (2005). Adaptations to dangers from humans. *Handbook of Evolutionary Psychology* , 224–249.

Ellis, B. J. (1992). The evolution of sexual attraction: Evaluative mechanisms in women. In: J. H. Barkow, L. Cosmides, & J. Tooby. (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 267–288). New York: Oxford University Press.

Ellis, B. J. (1998). The partner-specific investment inventory: An evolutionary approach to individual differences in investment. *Journal of Personality, 66*, 383–442.

Ellis, B., Jackson, J., & Boyce, W. (2006). The stress response systems: Universality and adaptive individual divergences. *Developmental Review, 26*, 175–212.

Ellis, B. J., Simpson, J. A., & Campbell, L. (2002). Trait-specific dependence in romantic relationships. *Journal of Personality, 70*(5), 611–660.

Figueredo, A. J., Gladden, P. R., & Beck, C. J. (2010, June). Interpersonal violence, cognitive schemata, and life history strategy. In: *Life History Strategy and Cognitive Functions. Symposium conducted at the 22nd Annual Meeting of The Human Behavior and Evolution Society, Eugene, OR.*

Frayer, D. W., & Wolpoff, M. H. (1985). Sexual dimorphism. *Annual Review of Anthropology, 14*(1), 429–473.

Frederick, D. A., & Peplau, L. A. (2007). The UCLA body matrices: II. Computer-generated images of men and women varying in body fat and muscularity/breast size to assess body satisfaction and preferences. 8th Annual Meeting of the Society for Personality and Social Psychology, Memphis, TN.

Gat, A. (1999). The pattern of fighting in simple, small-scale, prestate societies. *Journal of Anthropological Research, 55*(4), 563–583.

Gat, A. (2000a). The human motivational complex: Evolutionary theory and the causes of hunter-gatherer fighting: Part I. Primary somatic and reproductive causes. *Anthropological Quarterly, 73*(1), 20–34.

Gat, A. (2000b). The human motivational complex: Evolutionary theory and the causes of hunter-gatherer fighting: Part II. Proximate, subordinate, and derivative causes. *Anthropological Quarterly, 73*(2), 74–88.

Geary, D. C. (2002). Sexual selection and human life history. In R. Kail (Ed.), *Advances in child development and behavior, vol. 30* (pp. 41–101). San Diego: Academic Press.

Geary, D., Flinn, M. (2001). Evolution of human parental behavior and the human family. Parenting: Science and Practice, January-June, 5-61.

Geary, D., & Flinn, M. (2002). Sex differences in behavioral and hormonal response to social threat: Commentary on Taylor et al. (2000). *Psychological Review, 109*(4), 745–750.

Gini, C. (1921). Measurement of inequality of incomes. *Economic Journal, 31*(121), 124–126.

Greiling, H., & Buss, D. M. (2000). Women's sexual strategies: The hidden dimension of extra-pair mating. *Personality and Individual Differences, 28*(5), 929–963.

Gurtman, M. B. (1992). Trust, distrust, and interpersonal problems: A circumplex analysis. *Journal of Personality and Social Psychology, 62*(6), 989–1002.

Hawley, P. H. (2003). Prosocial and coercive configurations of resource control in early adolescence: A case for the well-adapted Machiavellian. *Merrill-Palmer Quarterly, 49*, 279–309.

Henrich, J., & Gil-White, F. L. (2001). The evolution of prestige: Freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, *22*, 165–196.

Keeley, L. H. (1996). *War before civilization: The myth of the peaceful savage*. Oxford: Oxford University Press US.

Lake, R. I. E., Eaves, L. J., Maes, H. H. M., Heath, A. C., & Martin, N. G. (2000). Further evidence against the environmental transmission of individual differences in neuroticism from a collaborative study of 45,850 twins and relatives on two continents. *Behavior Genetics*, *30*(3), 223–233.

LeBlanc, S. (2003). *Constant battles: The myth of the peaceful, noble savage*. New York: St. Martins Press.

Li, N. P., & Kenrick, D. T. (2006). Sex similarities and differences in preferences for short-term mates: What, whether, and why. *Journal of Personality and Social Psychology*, *90*(3), 468–489.

Lorber, M. F., & O'Leary, K. D. (2004). Predictors of the persistence of male aggression in early marriage. *Journal of Family Violence*, *19*(6), 329–338.

Malamuth, N. M., Huppin, M., & Paul, B. (2005). Sexual coercion. *Handbook of Evolutionary Psychology*, 394–418.

Morgan, J. (1980). *The life and adventures of William Buckley: Thirty-two years a wanderer amongst the aborigines of the unexplored country round port phillip*. Canberra: Australian National University Press.

O'Leary, K. D., Malone, J., & Tyree, A. (1994). Physical aggression in early marriage: Prerelationship and relationship effects. *Journal of Consulting and Clinical Psychology*, *62*(3), 594–602.

Pillsworth, E. G., & Haselton, M. G. (2006). Male sexual attractiveness predicts differential ovulatory shifts in female extra-pair attraction and male mate retention. *Evolution and Human Behavior*, *27*(4), 247–258.

Poore, J. C., Gable, S. G., & Haselton, M. G. (2006). The content and structure of mate-value. Poster presented at the 7th Annual Meeting of the Society for Personality and Social Psychology, Palm Springs, California.

Sell, A., Tooby, J., & Cosmides, L. (2009). Formidability and the logic of human anger. *Proceedings of the National Academy of Sciences*, *106*(35), 15073–15078.

Smuts, B. (1992). Male aggression against women: An evolutionary perspective. *Human Nature*, *3*(1), 1–44.

Snyder, J. K., Kirkpatrick, L., & Barrett, H. C. (2008). The dominance dilemma: Do women really prefer dominant mates? *Personal Relationships*, *15*(4), 425–444.

Sperling's Best Places. (2007). Crime Rates. Retrieved April 10–20, 2006 & November 30–Dec 15, 2008. http://www.bestplaces.net/crime/.

Stanko, E. (1995). Women, crime, and fear. *Annals of the American Academy of Political and Social Science*, *539*, 46–58.

Symons, D. (1979). *The evolution of human sexuality*. New York: Oxford University Press.

Taylor, S., Klein, L., Lewis, B., Gruenewald, T., Gurung, R., & Updegraff, J. (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review*, *107*(3), 411–429.

The Crime Reduction Centre (2000, July). British Fear of local crime survey. Retrieved May 1, 2005, from Crime Reduction Toolkits online via http://www.crimereduction.gov.uk/toolkits/fc0401.htm.

Trapnell, P. D., & Wiggins, J. S. (1990). Extension of the Interpersonal Adjective Scales to include the Big Five dimensions of personality. *Journal of Personality and Social Psychology*, *59*(4), 781–790.

Trivers, R. (Ed.). (1972/2002). *Parental investment and reproductive success* (pp. 56–110). New York: Oxford University Press.

Van Bruggen, L. K., Runtz, M. G., & Kadlec, H. (2006). Sexual revictimization: The role of sexual self-esteem and dysfunctional sexual behaviors. *Child Maltreatment*, *11*(2), 131.

Van Kern, P. (2001). INEQUAL7: Stata Module to compute measures of inequality. Statistical Software Components S416401, Boston College Department of Economics, revised Dec. 2, 2007.

Zayas, V., & Shoda, Y. (2007). Predicting preferences for dating partners from past experiences of psychological abuse: Identifying the psychological ingredients of situations. *Personality and Social Psychology Bulletin*, *33*(1), 123–128.