Article

Personality and Social Psychology Bulletin
37(7) 976–984

DOI: 10.1177/0146167211402216
http://pspb.sagepub.com
SAGE

The Face That Launched a Thousand Ships: The Mating–Warring Association in Men

Lei Chang[1], Hui Jing Lu[1], Hongli Li[2], and Tong Li[1]

Abstract

Questions about origins of human warfare continue to generate interesting theories with little empirical evidence. One of the proposed explanations is sexual selection theory. Within and supportive of this theoretical framework, the authors demonstrate a mating–warring association among young heterosexual men in four experiments. Male, but not female, participants exposed to attractive, as compared to unattractive, opposite-sex photographs were significantly more likely to endorse war-supporting statements on a questionnaire. The same mating effect was not found in answering trade conflict questions. Male participants primed by attractive faces or legs of young women were significantly faster in responding to images or words of war than those primed by unattractive faces or national flags. The same mating effect was not found in responding to farming concepts or general aggression expressions. Results underscore the link between mating and war, supporting the view that sexual selection provides an ultimate explanation for the origins of human warfare.

Keywords

sexual selection, mating motives, warring behavior, aggression, weapons, ornaments

Received September 12, 2010; revision accepted February 4, 2011

Throughout human history, men, but few or far fewer women, have fought in wars, and unmarried young men, rather than married or older men, have been more likely to go to war. Explicit sex raids have been observed in our closest relatives, the chimpanzees (Muller, Kahlenberg, & Wrangham, 2009), and in preindustrial tribal groups (Keeley, 1996; Manson & Wrangham, 1991), as well as in contemporary military units (Nikolić-Ristanović, 2000). More prevalent have been implicit mating behaviors on the sidelines of the battle fields, including rape, prostitution, and casual and serious dating of both enemy and civilian females (Anderson, 1981; Chang, 1997; Reynolds, 1995). Warriors continue to enjoy postwar mating advantages, as shown by evidence ranging from tribal Yanomamo *unokai* (Chagnon, 1988) to urban gangsters (Palmer & Tilley, 1995) and World War II veterans (Anderson, 1981; Costello, 1985). Based on data from 20 military occupations during and since World War II, totaling 26,000 days, 16 million occupying troops, and close to 4 million sexually accessible females—rape victims, prostitutes, and dates—we estimated that a warrior has sexual access to 100 mates when extrapolating to a warring and mating life of 50 years (data available from authors) in contrast to an average of 10 to 13 sexual partners, including one-night stands and casual dates, reported for Western men in times of peace (e.g., Davis, Yee, Chetwynd, & McMillan, 1993; Wellings, Field, Johnson, & Wadsworth, 1994). Great warriors in history indeed fought their entire lives and had high reproductive success. Y chromosome analyses suggest that 16 million men worldwide and 8% of Asian men are descended from Genghis Khan (Zerjal et al., 2003). Literature, legends, and history also depict a mating–warring association from either sex's perspective—"The face [of a beautiful woman] that launched a thousand ships [and men into war]" (from *Doctor Faustus* in retelling the legend about Helen and the Trojan War).

With such an extent of sexual dimorphism and mating implications, sexual selection provides an ultimate explanation for the origins of human warfare (see the writings of Betzig, 1986; Buss & Shackelford, 1997; Chagnon, 1988; Cosmides & Tooby, 1993; Keeley, 1996; Low, 1993; Smith, 2007; Wrangham & Peterson, 1996). According to sexual selection theory (Darwin, 1859/1979; Trivers, 1972), driven by differential parental investment of the two sexes, intrasex

[1]Chinese University of Hong Kong, Hong Kong, China
[2]Hebei University, Hebei, China

Corresponding Author:
Lei Chang, Chinese University of Hong Kong, Department of Educational Psychology, Shatin, N.T., Hong Kong Special Administrative Region, China
Email: leichang@cuhk.edu.hk

competition, mainly among the less investing sex, or males, and mate choice, mostly by the more investing sex, or females, leads to wide-ranging sexual dimorphic attributes, which are referred to as weapons and ornaments. The large body size and thick proboscis of male elephant seals and horns and antlers of various ungulate stags are well-known examples of weapons. Intrasex combat using these weapons contributes to a higher male mortality rate, another example of sexual dimorphism. Low frequency calls of the Tungara frog, the vibrant colors of the guppy, and the bright plumage of various birds are examples of ornaments that are favored by conspecific females in part because they showcase the male carriers' bravado. Human males possess similar weapon-like (e.g., aggression; Archer, 2009) and ornament-like (e.g., risk taking; Baker & Maner, 2008, 2009) phenotypes. More importantly, we extend our phenotypes through culture and technology (Miller, 1999)—for example, we attach external weaponry appendages such as swords and missiles, and we decorate ourselves with uniforms, badges, and medals, manifestations of bravery, honor, and heroism. To the extent that weapons and ornaments are also correlated or condition dependent among many species (Andersson, 1994), the mixture of these two kinds of traits is best exemplified in the human military, which, primarily composed of males, aims to fight and conducts itself by the code of honor and bravery.

Despite a seemingly apparent mating–warring association, to date no empirical research has yet been conducted to test this association because of methodological and theoretical difficulties. Methodologically, studying warring behavior from a sexual selection approach is confounded by general intrasex aggression, which is similarly mating motivated (Archer, 2009). Except for field studies, it is difficult to elicit warring behavior that can be fully separated from other intrasex aggression. Perhaps the best one could do would be to emulate a war context and compare it to a similar intrasex competitive but nonwar context to examine and compare men's responses to mating manipulations. Theoretically, multiple factors in addition to sexual selection may account for the utility and origin of war. For example, war has served to solve such adaptive problems as imbalance of power (Wrangham, 1999), resource or territorial acquisition (Durham, 1976), and revenge (Chagnon, 1988). Another ultimate explanation of war is human coalitional psychology (Tooby & Cosmides, 1988), which is also responsible for other complex human social institutions (Cosmides & Tooby, 2010). Finally, the lethality and scale at which humans kill conspecifics are attributable to culture and technology (McEachron & Baer, 1982). However, all of these explanations and theories do not account for the extreme sexual dimorphism of war. Many of these explanations are also human specific, despite the fact that organized aggression has been found in other primates (Muller et al., 2009). Sexual selection, which is species general and addresses sexual dimorphism, also may explain many of these other proximate and ultimate causes of war. For example, resource and especially territorial acquisition has evolved as a sex-dimorphic mammalian behavior driven by mating motives (Andersson, 1994). Sexual selection affects human coalitional psychology (Tooby & Cosmides, 1988), with males showing more enhanced ingroup altruism and outgroup hostility than females (Van Vugt, De Cremer, & Janssen, 2007). Mate choice exerts pressure on the evolution of art and technology (Kanazawa, 2000; Miller, 1999). Thus, sexual selection theory that encompasses other explanations of war warrants an empirical investigation. To provide such empirical evidence supportive of sexual selection as an ultimate explanation of war, the purpose of the present study was to test the mating–warring association by emulating war contexts within which to examine men's and women's response to induced mating motivation.

Recent research has shown that early evolved adaptive processes can be activated by situationally induced motivational states (e.g., Bugental & Beaulieu, 2009; Griskevicius et al., 2007; Griskevicius, Goldstein, Mortensen, Cialdini, & Kenrick, 2006). More specifically, mating motives activated by exposing participants to attractive opposite-sex photographs or sexual or romantic scenarios have been shown to prompt a variety of behaviors from human males but not females. These experimentally induced behaviors include playing risky blackjack hands (Baker & Maner, 2008), acting nonconformingly (Griskevicius et al., 2006), discounting the future (Wilson & Daly, 2004), spending conspicuously (Griskevicius et al., 2007), paying more attention to money (Roney, 2003), donating more generously (Iredale, Van Vugt, & Dunbar, 2008), and exhibiting heroic altruism, all of which were preferred by women (Griskevicius et al., 2007; Kelly & Dunbar, 2001). Real-life observations have also demonstrated that when women were present, men were more likely to engage in risky behaviors such as crossing streets on a red light and catching buses in the last minute (Pawlowski, Atwal, & Dunbar, 2008).

In addition to these risk-taking behaviors, sexual selection accounts for much human male aggression (Archer, 2009). However, only one experimental study has directly investigated male aggression in relation to mating motives. Griskevicius et al. (2009) examined the extent to which male participants would choose aggressive tactics to deal with insults from same-sex individuals. Under mating motives induced by heterosexual romantic scenarios, male participants indicated higher levels of physical or direct aggression than did members of the control group not induced with mating motives. Two other studies not using an evolutionary approach obtained similar findings. In one study, when primed by sex-related words, men were more likely to throw darts at same-sex human face targets than at inanimate object targets (Mussweiler & Förster, 2000). In another study (Zurbriggen, 2000), men showed faster response times in matching sexual words (e.g., *undress*) to power words (e.g., *attack*) than to non-power words (e.g., *live*).

In the current study that includes four experiments, we focused on war-related behavior by investigating attitudes toward war (Experiment 1), visual processing of war scenes (Experiment 2), and lexical processing of war-related words (Experiment 3) in contrast to generic aggression words (Experiment 4). In these experiments, we induced mating motives by exposing heterosexual male participants to female photographs. In line with social cognitive research (e.g., Bargh, 1990), situationally activated motives are expected to facilitate relevant perception and cognition with or without conscious awareness. According to evolutionary psychology, those motives that render direct access to behavioral responses are likely to have been linked to adaptive outcomes either in the past or concurrently (e.g., Low, 1992). Integrating social cognitive and evolutionary psychology, we expect mating motives to facilitate access to war-related cognition and perception.

Experiment 1

Method

The participants were 60 heterosexual male (age $M = 19.40$, $SD = 1.17$) and 51 female college students (age $M = 19.24$, $SD = 0.81$) from a university in China. None were psychology majors.

The mating stimuli used for the male participants were 20 full-body color photographs of either attractive or unattractive Chinese females. The pictures were taken from a Chinese online female attractiveness rating site. The 20 attractive photos had average attractiveness ratings of at least 8 out of 10 points ($M = 8.72$, $SD = 0.42$). The 20 unattractive photos had average attractiveness ratings of less than 5 out of 10 points ($M = 4.51$, $SD = 0.80$). A similar set of 20 attractive and 20 unattractive photographs of Chinese men was assembled from various sources. Rated by an independent group of 15 female judges on a 10-point scale, the attractiveness ratings were $M = 8.28$ ($SD = 1.12$) and $M = 4.53$ ($SD = 1.45$) for the two sets of photos.

The experiment was conducted in two randomly assigned groups, and the male participants were asked to estimate the age of the 20 attractive (experimental group; $n = 30$) or 20 unattractive women in the photographs (control group; $n = 30$). This kind of exposure has been used routinely and shown to induce mating motivation (e.g., Baker & Maner, 2008; Roney, 2003; Wilson & Daly, 2004). The mating manipulation for the female participants was more elaborate than that for the male participants in an effort to guard against Type II error because our hypothesis predicted no mating effects among females who served as comparisons against the male groups. For the experimental group ($n = 26$), the female participants were asked to rate the 20 attractive men in the photographs on masculinity and attractiveness. For the control group ($n = 25$), the female participants were asked to judge the age of the 20 unattractive men in the photographs.

After the mating manipulation, participants responded to 39 questions about having wars or trade conflicts with three foreign countries that have had hostile relationships with China in recent history. On a 6-point Likert-type scale with higher points indicating stronger endorsement, 21 questions ($\alpha = .81$) tapped the willingness to go to war with the hostile country. The remaining 18 questions ($\alpha = .89$) were about peaceful solutions to trade conflicts. Factor analyses yielded two slightly correlated factors ($r = .16$) corresponding to warring attitudes versus trade conflict resolutions. (The questionnaires and factor analysis results are available from the authors.)

Results

A 2 (attractive vs. unattractive opposite sex photos manipulated between participants) × 2 (war vs. trade questions administered to all participants) × 2 (gender of participants) mixed ANOVA showed a significant three-way interaction, $F(1, 107) = 13.96$, $p < .001$, $\eta^2 = .23$. For the warring questions, male participants showed more militant attitudes under the attractive female condition ($M = 4.04$, $SD = 0.69$) than the unattractive condition ($M = 3.58$, $SD = 0.58$), $t(58) = 2.79$, $p < .01$; $d = 0.72$, whereas for the trade questions, there was no difference between the attractive ($M = 4.59$, $SD = 0.80$) and unattractive conditions ($M = 4.68$, $SD = 0.72$), $t(58) = –0.46$, $p = .65$. For the female participants, there was no difference between attractive ($M = 3.09$, $SD = 0.90$) and unattractive male conditions on war questions ($M = 2.98$, $SD = 0.74$), $t(49) = 0.44$, $p = .66$, or on trade questions ($M = 4.69$, $SD = 0.62$ for the attractive and $M = 4.85$, $SD = 0.73$ for the unattractive photos), $t(49) = –0.84$, $p = .41$ (see Figure 1).

We also conducted a pilot study with only male participants prior to the main study reported above to calibrate the war and trade questionnaires. Based on 56 male college students (age $M = 21.07$, $SD = 1.25$) responding to similar war and trade questions, the pilot yielded the same results as the main study. A 2 (attractive vs. unattractive female photographs) × 2 (war vs. trade questions) mixed ANOVA yielded a significant interaction effect, $F(1, 54) = 7.13$, $p < .01$, $\eta^2 = .12$. For the war questions, participants showed more militant attitudes under the attractive ($M = 4.33$, $SD = 0.83$) than the unattractive female condition ($M = 3.65$, $SD = 1.19$), $t(54) = 2.48$, $p < .05$; $d = 0.66$, whereas for the trade questions, there was no difference between the attractive ($M = 4.69$, $SD = 0.87$) and unattractive female conditions ($M = 4.81$, $SD = 0.90$), $t(54) = –0.55$, $p = .58$.

Answering attitude questions represents explicit, self-regulated decision-making processes. If the mating–warring association is adaptively tuned, it should also show up in less controlled perceptual processing. In the next three experiments,

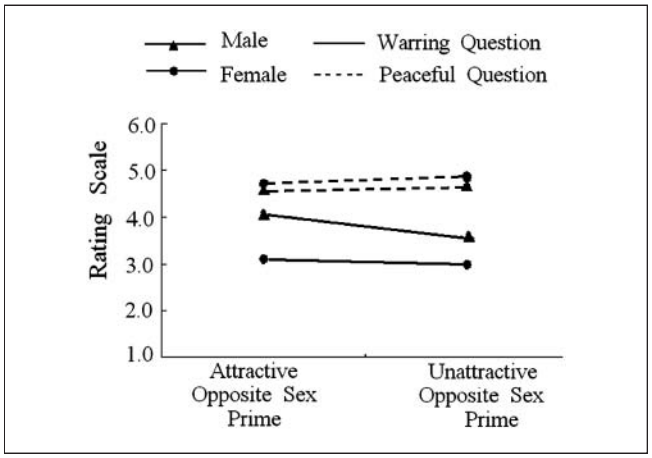

Figure 1. Mean response to warring versus peaceful questions under attractive versus unattractive opposite sex primes from male versus female participants

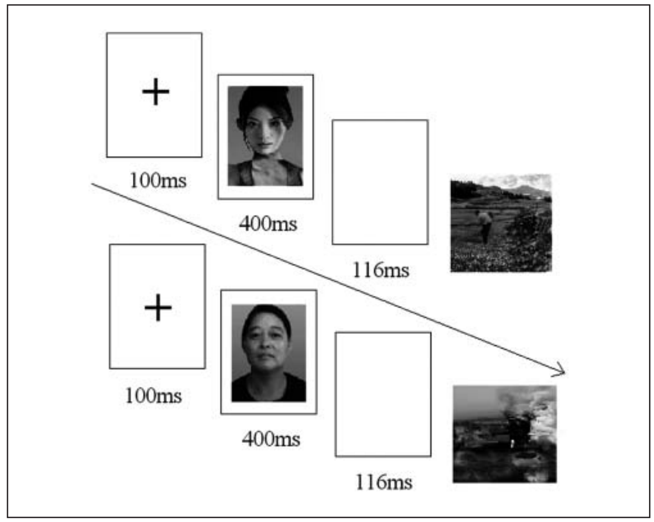

Figure 2. Schematic illustration of the procedures of Experiment 2, where participants were asked to indicate whether the person appeared in the left or right of a war- or farm-depicting picture

we examined the association between mating and war within the priming paradigm. Response time was measured for recognition of either war-related words or war scenes. Faster responses represent lower use of cognitive resources, indicating stronger access to war-related cognition as a function of the mating prime.

Experiment 2

Method

The participants were 31 heterosexual male (age $M = 20.35$, $SD = 1.28$) and 25 female Chinese college students (age $M = 21.28$, $SD = 1.14$). They were right-handed and were not psychology majors.

The two primes were photographs of 20 attractive and 20 unattractive Chinese female or male faces. The pictures were taken from a Google picture pool and were processed by Photoshop to achieve same size and decolorization. Rated by an independent group of male judges ($n = 8$), the average attractiveness ratings were 8.21 out of 10 for the attractive female faces and 4.16 for the unattractive female faces. The average attractiveness ratings by 8 female judges were 7.35 and 3.77 out of 10 for the attractive and unattractive male faces, respectively.

The targets were 20 pictures depicting war scenes and 20 pictures depicting farm scenes. Farm scenes were used as controls to match the outdoor landscape of the war scenes. The pictures were synthesized using Photoshop. With a background of a war scene or a farm scene, each picture had a male soldier carrying a weapon or a male farmer carrying a farming tool standing in a forward position. An independent group of judges ($n = 10$) rated these pictures for affective arousal and valance and picture complexity on a 5-point scale. These ratings were not significantly correlated with response time ($r = –.06$ for complexity, .20 for arousal, and –.18 for valance).

The participants' task was to identify whether the male figure appeared in the left or right of the picture by pressing one of two keys (K or L) on the keyboard using the index and middle fingers of the right hand. Response time was used as the dependent variable. All conditions were manipulated within participants with each administered 40 trials after 8 practice trials. In each trial, after a 100-ms orienting stimulus (+), a prime picture appeared for 400 ms and was followed by a 116-ms blank screen, and a target picture appeared on the screen until the participant gave a response (see Figure 2). All materials were presented on a 13.3-inch computer screen. Response times exceeding 1,000 ms (1%) and incorrect responses by pressing the wrong key (3.08%) were excluded from analyses.

Results

We conducted a 2 (gender of participant) × 2 (prime: attractive vs. unattractive opposite sex face) × 2 (target: war vs. farm scene) ANOVA with gender as a between-subjects factor and the prime and target both as within-subjects factors. Results showed a marginal three-way interaction, $F(1, 54) = 3.09$, $p = .08$, $\eta^2 = .05$. For male participants, there was a significant interaction effect between prime and target, $F(1, 30) = 10.18$, $p < .01$, $\eta^2 = .25$, and a significant main effect of target. Male participants responded faster to war scenes when primed by attractive female faces ($M = 431.30$, $SD = 59.49$ ms) than by unattractive female faces ($M = 445.89$, $SD = 53.28$ ms), $t(30) = –3.74$, $p < .001$; $d = 0.66$, whereas there was no statistical difference between the attractive ($M = 455.82$,

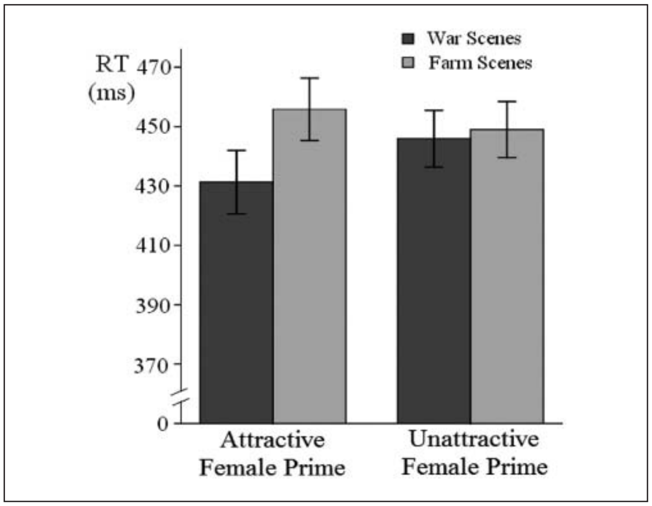

Figure 3. Male participant mean response time for war versus farm scenes under attractive versus unattractive female priming (error bars indicate ± *SE*)

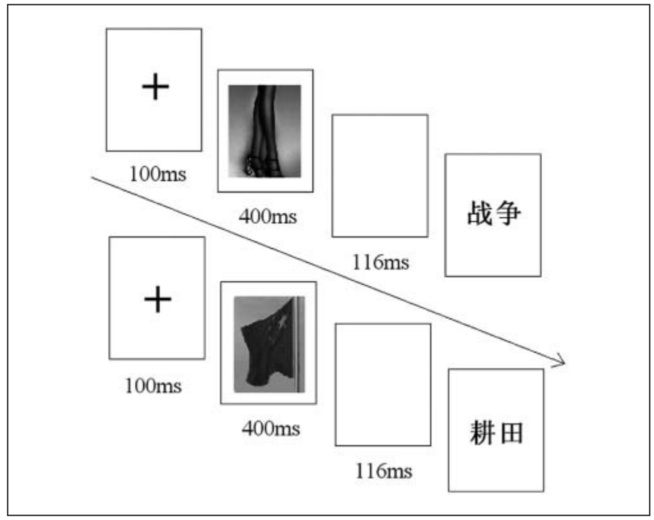

Figure 4. Schematic illustration of the procedures of Experiment 3, where participants were asked to indicate the position of two key characters (战 and 耕) in a two-character war or farm word

SD = 58.30) and unattractive face priming (*M* = 449.00, *SD* = 52.35), $t(30) = 1.23$, $p = .23$, in processing farm scenes (see Figure 3). For female participants, there was neither the interaction nor the main effect. Female participants responded equally in speed to war scenes when primed by attractive (*M* = 473.03, *SD* = 85.79 ms) or unattractive male faces (*M* = 470.77, *SD* = 78.28), $t(24) = -0.30$, $p = .77$, and there was also no difference in processing farm scenes between attractive (*M* = 477.18, *SD* = 81.22) and unattractive male face priming (*M* = 475.69, *SD* = 84.73), $t(24) = 0.21$, $p = .84$. Although, as expected, the mating–warring association was found in men's but not women's perceptual processing, there is the possibility that merely being exposed to attractive opposite sex pictures might not have activated mating motives in women as it did in men. In the next experiment, we asked female participants to rate the attractiveness of the male pictures to enhance mating motivation. We also changed the targets from imagistic to lexicon processing.

Experiment 3

Method

The participants were 23 heterosexual male (age *M* = 20.26, *SD* = 1.18) and 44 female students (age *M* = 21.20, *SD* = 1.15) from a university in China. All participants were right-handed and were not psychology majors. The experimental designs were slightly different for the male and female participants and are presented below separately.

For the male participants, the primes consisted of 16 pictures of female legs as mating primes and 16 pictures of the Chinese national flags of different shapes as controls. National flags were chosen to show that the hypothesized mating–warring association was stronger than the semantic association between the related concepts of patriotism and war. The leg and flag pictures were processed using Photoshop to achieve the same size (7 cm × 9 cm) and decolorization with balanced luminosity and grayscale. They were judged by an independent group of 10 male student judges to be similar in design complexity, $t(30) = 0.32$, $p = .75$.

The targets consisted of 64 two-character Chinese words with 32 connoting wars and the other half connoting farms. The two sets of words have similar usage frequencies according to an online Chinese word frequency dictionary (http://www.zhongguosou.com/education_graduate_course_tools/word_frequency.aspx). They were presented to the participants in four blocks of 32 words each (16 war and 16 farm words). Within each block, there were two target characters, each appearing either as the first or second character of a two-character war or farm word.

The participants' task was to identify the position of the two target characters (first or second) by pressing one of two keys (K or L) on the computer keyboard using the index and middle fingers of the right hand. This response time was measured as the dependent variable. In a 2 (prime: leg vs. flag) × 2 (target: war vs. farm) within-subjects design, each participant was administered four blocks of 32 trials after 8 practice trials. The order of trials was random within participants, and the order of the four blocks was counterbalanced across participants. On a 13.3-inch computer screen, after a 100-ms orienting stimulus (+), a prime picture was presented for 400 ms, followed by a 116-ms blank screen, and a target word appeared on the screen until the participant gave a response by pressing one of the two keys (see Figure 4).

For female participants, whom we hypothesized to have null mating effects, a between-subjects design was used to enhance the mating manipulation. Specifically, 23 of the

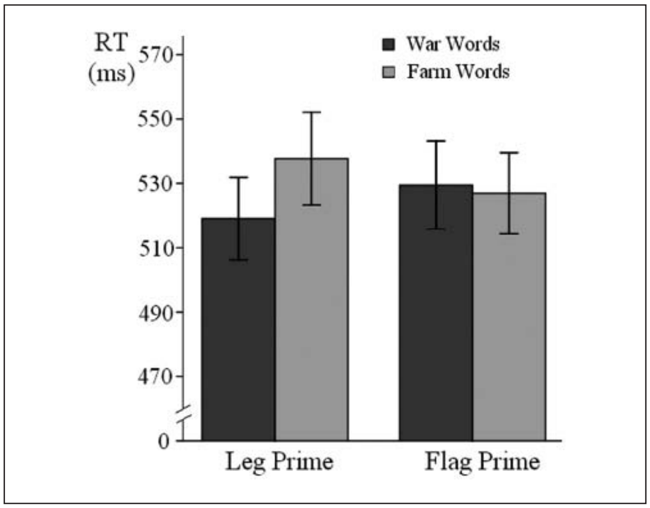

Figure 5. Male participant mean response time for war versus farm words under leg versus flag priming (error bars indicate ± *SE*)

44 participants were exposed to 20 attractive male photos and were asked to rate each on masculinity and attractiveness. The other 21 participants were shown merely 20 photos of unattractive males. After the exposure, participants performed the same word recognition task (within subjects), as described above, without the leg or flag priming.

Results

Male participants. Because the task of determining whether a character was the first or second of two characters was easy, any response time beyond 1,000 ms (2.20%) was deemed irresponsive to the task and was discarded. Incorrect responses from pressing the wrong key were also eliminated (3.26%). A 2 (prime: leg vs. flag) × 2 (target: war vs. farm) within-subjects ANOVA showed a significant interaction effect, $F(1, 22) = 7.92$, $p < .01$, $\eta^2 = .27$. There was also a marginally significant main effect of target. Participants responded faster to war words when primed by female legs ($M = 519.09$ ms, $SD = 61.38$ ms) than by national flags ($M = 529.45$ ms, $SD = 65.50$ ms), $t(22) = –2.56$, $p < .05$; $d = 0.56$, whereas there was no statistical difference between the leg ($M = 537.68$, $SD = 69.38$) and the flag priming ($M = 526.92$, $SD = 60.51$), $t(22) = 1.70$, $p = .10$, in processing farm words (see Figure 5).

Female participants. A 2 (war vs. farm manipulated within participants) × 2 (attractive vs. unattractive photos manipulated between participants) mixed ANOVA yielded no statistically significant effects. There was no difference in war word response time between attractive ($M = 616.86$, $SD = 86.78$) and unattractive male photos ($M = 610.80$, $SD = 107.66$), $t(42) = 0.21$, $p = .83$, or in farm word response time between attractive ($M = 630.87$, $SD = 76.30$) and unattractive conditions ($M = 627.38$, $SD = 97.03$), $t(42) = 0.13$, $p = .89$. The emulated war contexts in these experiments are inseparable from general aggression sentiment. The next experiment controls this confounding by comparing war words to general aggression words. Because a null effect was found with female participants in all three experiments as expected, they were not included in Experiment 4.

Experiment 4

Method

The participants were 34 Chinese heterosexual male, right-handed, nonpsychology undergraduate students (age $M = 20.26$, $SD = 0.79$).

The experimental design was identical to that of Experiment 3 with three exceptions. First, the target words were war (e.g., *fight wars*) versus general aggression words (e.g., *push* and *shovel*). Second, participants' task was to judge whether each two-character word was a true or pseudo word, instead of identifying the position of a target character. Third, the prime was presented for 100 ms instead of 400 ms. The two sets of words had similar usage frequencies according to the same online Chinese dictionary reported in the third experiment.

Incorrect responses from pressing the wrong keys were excluded from the analysis (8.54%). The participants were more prone to making mistakes because they had to identify two-character pseudo words that were created by reversing the order of two otherwise correct characters.

Results

A 2 (prime: leg vs. flag) × 2 (target: war vs. aggression word) within-subjects ANOVA showed a significant interaction effect, $F(1, 33) = 14.06$, $p < .001$, $\eta^2 = .30$, and a marginally significant main effect of target word, $F(1, 33) = 4.03$, $p = .05$, $\eta^2 = .11$. Participants responded faster to war words when primed by female legs ($M = 1057.37$ ms, $SD = 195.84$ ms) than by national flags ($M = 1143.45$, $SD = 221.81$), $t(33) = –3.54$, $p < .001$; $d = 0.61$, whereas there was no significant difference between the leg ($M = 1162.56$, $SD = 271.80$) and flag primes ($M = 1132.39$, $SD = 225.37$), $t(33) = 1.07$, $p = .29$, when responding to general aggression words (see Figure 6).

Discussion

The four experiments and a pilot study showed an association between mating motives and war-related responses in the form of faster perceptual processing of war scenes or recognition of war-related words and more militant attitudes toward hostile countries. Motives and need states serve as proximate cues that drive our perceptions, cognitions, and behavior, either consciously or unconsciously (e.g., Bargh, 1990). Those motives that have the strongest impact on

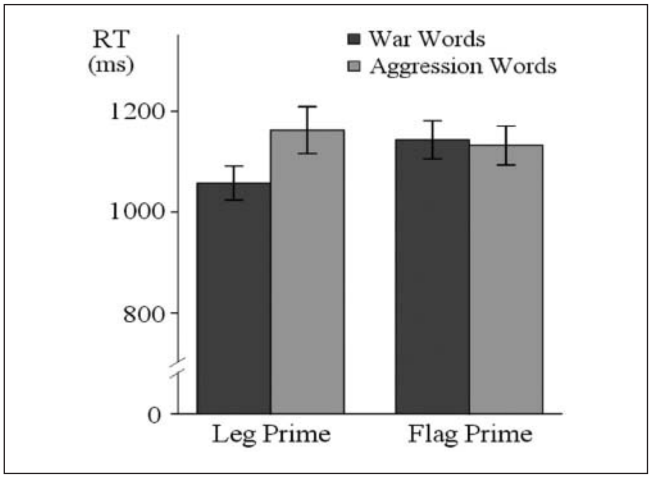

Figure 6. Male participant mean response time for war versus aggression words under leg versus flag priming (error bars indicate ± *SE*)

behavior are likely to have been linked to adaptive outcomes in the course of human evolution (e.g., Tooby & Cosmides, 1992). As ecological conditions change, behavior may also be driven by proximate cues that were once linked to, but are currently removed from, adaptive outcomes (Low, 1993). Driven by such cues, individuals may act without knowing the ultimate motive of their action. The mating–warring association, as shown in these experiments, is the result of such proximate cuing, which presumably unconsciously propels warring behavior because of the behavior's past, but not necessarily current, link to reproductive success. Social perceptions and cognitions may also be facilitated by previous activation of relevant knowledge associations (e.g., Higgins, Rholes, & Jones, 1977). Yet, as shown in the experiments, war- but not farm-related perceptual and cognitive processing was associated with mating but not with other cues such as national flags.

These findings should shed light on the long-standing question about the origins of human warfare. One widely accepted evolutionary theory states that, unique to the human species, war is the result of another largely unique human adaptation, the human coalitional psychology (Tooby & Cosmides, 1988) and social and political intelligence (Alexander, 1979; Harcourt, 1988). Others suggest cultural and technological adaptation as the driving force of human warfare (McEachron & Baer, 1982). These rather unique human adaptations may present independent and more direct causes but not necessarily an ultimate or the only ultimate cause of war (Low, 1993) because they evolved relatively later in time and because they are themselves subject to sexual selection (Tooby & Cosmides, 1988) and show sex differences (e.g., Bugental & Beaulieu, 2009). The more species-general force of sexual selection may be an ultimate drive propelling one but not both sexes, or one sex much more than the other, to engage in organized lethal aggression by co-opting other human adaptations including our unique cognitive and social mind. Whatever the ultimate cause of a phenomenon, there must be an individually selected mechanism that makes organisms behave consistently in the same direction to form the phenomenon. The evidence presented in this study demonstrates links in men but not in women between mating motives and war-related cognition and perception.

There were several limitations of the present study. The experiments did not narrow down the specific mechanisms responsible for the observed mating–warring association. For example, potential emotional and hormonal influences relevant to mating motivation were not examined. Although our hypothesized mating–warring association was male specific and females were included as controls only to show a null effect, design differences between the two genders in Experiment 3, mating manipulation inconsistencies in Experiment 1, and potential concerns about mating manipulation valence in Experiment 2 cast doubt on conclusive gender comparisons. Another limitation lies in our drawing inferences from individual-based experiments to war as a collective phenomenon, which is more than the sum of individual behaviors (Tooby & Cosmides, 1988). However, our discussion of this psychological study also focuses on mating and warring motives, which, although individual based, contribute to form collective behavior. We speculate that a mating motive drives other specific adaptive functions, such as underestimating enemies and danger and overestimating oneself and luck (e.g., "a veil of ignorance about who will live and who will die" [Buss, 1999], "inaccurate assessment" or "military incompetence" [Wrangham, 1999], "overconfidence" about wars [Johnson, 2004]) and enhanced ingroup and outgroup behaviors of "the male warriors" (Van Vugt et al., 2007). When activated in unison among like-minded heterosexual men, these and other mating-contingent mental functions facilitate coalitional and group strategies constituting the human coalitional cognitive architecture (Tooby & Cosmides, 1988). Future research should more directly explore this and other related hypotheses.

Finally, because war and aggression are intercorrelated or inseparable, the war-specific claims we made in this article are confounded by intrasex aggression in general, which may be equally responsible for the obtained results. We made an effort to include general aggression words, male farmers, and trade conflicts as controls. The absence of a similar effect associated with processing male farmers (as opposed to male soldiers), in assessing trade conflict resolutions (as opposed to going to war), and in responding to aggression (as opposed to war) words helped to reduce the confound of general intrasex aggression. We also exerted efforts to emulate the war context within which to study various reactions of heterosexual male participants. Our conclusions are thus aided by rather diverse designs and results, including perceptual processing of war scenes and war-related words and explicit attitudes toward war. However, it is still difficult to completely separate out "war" from "aggression." Despite these limitations, this is among the first empirical studies to examine the potential mating–warring association. As such, this study adds to the diversities of evidence on the effects of mating motives in human males as well as motivating further discussions of the origins of human warfare.

Acknowledgments

We thank Todd Shackelford, William von Hippel, and Jon Maner for their comments on an earlier version of this article.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

Financial Disclosure/Funding

The author(s) received no financial support for the research and/or authorship of this article.

References

Alexander, R. D. (1979). *Darwinism and human affairs*. Seattle: University of Washington Press.

Anderson, K. (1981). *Wartime women: Sex roles, family relations, and the status of women during World War II*. Westport, CT: Greenwood.

Andersson, M. (1994). *Sexual selection*. Princeton, NJ: Princeton University Press.

Archer, J. (2009). Does sexual selection explain human sex differences in aggression? *Behavioral and Brain Sciences*, *32*, 249-311.

Baker, M. D., & Maner, J. K. (2008). Risk-taking as a situationally sensitive male mating strategy. *Evolution and Human Behavior*, *29*, 391-395.

Baker, M. D., & Maner, J. K. (2009). Male risk-taking as a context-sensitive signaling device. *Journal of Experimental Social Psychology*, *45*, 1136-1139.

Bargh, J. A. (1990). Auto-motives: Preconscious determinant of social interaction. In E. T. Higgins & M. Sorrentino (Eds.), *Handbook of motivation and social cognition: Foundations of social behavior* (Vol. 2, pp. 93-130). New York, NY: Guilford.

Betzig, L. (1986). *Despotism and differential reproduction: A Darwinian view of history.* Hawthorne, NY: Aldine.

Bugental, D. B., & Beaulieu, D. A. (2009). Sex differences in response to coalitional threat. *Evolution and Human Behavior*, *30*, 238-243.

Buss, D. M. (1999). *Evolutionary psychology: The new science of the mind.* Boston, MA: Allyn & Bacon.

Buss, D. M., & Shackelford, T. K. (1997). Human aggression in evolutionary psychological perspective. *Clinical Psychology Review*, *17*, 605-619.

Chagnon, N. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science*, *239*, 985-992.

Chang, I. (1997). *The rape of Nanking: The forgotten holocaust of World War II*. New York, NY: Basic Books.

Cosmides, L., & Tooby, J. (1993, August). *Cognitive adaptations for threat, cooperation, and war*. Paper presented at the meeting of the Human Behavior and Evolution Society, Binghamton, NY.

Cosmides, L., & Tooby, J. (2010). *Interview with evolutionary psychologists Leda Cosmides and John Tooby, Reason TV* [Video]. Retrieved from http://www.5min.com/Video/Interview-with-Evolutionary-Psychologists-Leda-Cosmides-and-John-Tooby-374419416

Costello, J. (1985). *Virtue under fire: How World War II changed our social and sexual attitudes*. Boston, MA: Little, Brown.

Darwin, C. R. (1979). *The origin of species*. New York, NY: Random House. (Original work published 1859)

Davis, P. B., Yee, R. L., Chetwynd, J., & McMillan, N. (1993). The New Zealand Partner Relations Survey: Methodological results of a national telephone survey. *AIDS*, *7*, 1509-1516.

Durham, W. H. (1976). Resource competition and human aggression, part I: A review of primitive war. *Quarterly Review of Biology*, *51*, 385-415.

Griskevicius, V., Goldstein, N. J., Mortensen, C. R., Cialdini, R. B., & Kenrick, D. T. (2006). Going along versus going alone: When fundamental motives facilitate strategic (non)conformity. *Journal of Personality and Social Psychology*, *91*, 281-294.

Griskevicius, V., Tybur, J. M., Gangestad, S. W., Perea, E. F., Shapiro, J. R., & Kenrick, D. T. (2009). Aggress to impress: Hostility as an evolved context-dependent strategy. *Journal of Personality and Social Psychology*, *96*, 980-994.

Griskevicius, V., Tybur, J. M., Sundie, J. M., Cialdini, R. B., Miller, G. F., & Kenrick, D. T. (2007). Blatant benevolence and conspicuous consumption: When romantic motives elicit strategic costly signals. *Journal of Personality and Social Psychology*, *93*, 85-102.

Harcourt, A. H. (1988). Alliance in contests and social intelligence. In R. Byrne & A. Whiten (Eds.), *Machiavellian intelligence: Social expertise and the evolution of intellect in monkeys, apes, and humans* (pp. 132-152). Oxford, UK: Clarendon.

Higgins, E. T., Rholes, W. S., & Jones, C. R. (1977). Category accessibility and impression formation. *Journal of Experimental Social Psychology*, *13*, 141-154.

Iredale, W., Van Vugt, M., & Dunbar, R. (2008). Showing off in humans: Male generosity as a mating signal. *Evolutionary Psychology*, *6*, 386-392.

Johnson, D. D. P. (2004). Overconfidence and war: The havoc and glory of positive illusions. Cambridge, MA: Harvard University Press.

Kanazawa, S. (2000). Scientific discoveries as cultural displays: A further test of Miller's courtship model. *Evolution and Human Behavior*, *21*, 317-321.

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

Kelly, S., & Dunbar, R. I. M. (2001). Who dares, wins: Heroism versus altruism in women's mate choice. *Human Nature*, *12*, 89-105.

Low, B. S. (1992). Sex, coalitions, and politics in pre-industrial societies. *Politics and the Life Sciences*, *11*, 63-80.

Low, B. S. (1993). An evolutionary perspective on war. In H. Jacobson & W. Zimmerman (Eds.), *Behavior*, *culture*, *and conflict in world politics* (pp. 13-56). Ann Arbor: University of Michigan Press.

Manson, J., & Wrangham, R. W. (1991). Intergroup aggression in chimpanzees and humans. *Current Anthropology*, *32*, 369-390.

McEachron, D. L., & Baer, D. (1982). A review of selected sociobiological principles: Application to hominid evolution: II. The effects of intergroup conflict. *Journal of Social and Biological Structures*, *5*, 121-139.

Miller, G. F. (1999). Sexual selection for cultural displays. In R. Dunbar, C. Knight, & C. Power (Eds.), *The evolution of culture* (pp. 71-91). Edinburgh, UK: Edinburgh University Press.

Muller, M. N., Kahlenberg, S. M., & Wrangham, R. W. (2009). Male aggression against females and sexual coercion in chimpanzees. In M. N. Muller & R. W. Wrangham (Eds.), *Sexual coercion in primates and humans: An evolutionary perspective on male aggression against females* (pp. 184-217). Cambridge, MA: Harvard University Press.

Mussweiler, T., & Förster, J. (2000). The sex-aggression link: A perception-behavior dissociation. *Journal of Personality and Social Psychology*, *79*, 507-520.

Nikolić-Ristanović, V. (2000). *Women*, *violence and war: Wartime victimization of refugees in the Balkans.* Budapest, Hungary: Central European University Press.

Palmer, C. T., & Tilley, C. F. (1995). Sexual access to females as a motivation for joining gangs: An evolutionary approach. *Journal of Sex Research*, *32*, 213-217.

Pawlowski, B., Atwal, R., & Dunbar, R. I. M. (2008). Sex differences in everyday risk-taking behavior in humans. *Evolutionary Psychology*, *6*, 29-42.

Reynolds, D. (1995). *Rich relations. The American occupation of Britain*, *1942–1945.* New York, NY: Random House.

Roney, J. R. (2003). Effects of visual exposure to the opposite sex: Cognitive aspects of mate attraction in human males. *Personality and Social Psychology Bulletin*, *29*, 393-404.

Smith, D. L. (2007). *The most dangerous animal: Human nature and origins of war*. New York, NY: St. Martin's.

Tooby, J., & Cosmides, L. (1988). *The evolution of war and its cognitive foundations* (Tech. Rep. 88-1). Santa Barbara, CA: Institute for Evolutionary Studies.

Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19-136). Oxford, UK: Oxford University Press.

Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man 1871–1971* (pp. 136-179). Chicago, IL: Aldine.

Van Vugt, M., De Cremer, D., & Janssen, D. (2007). Gender differences in competition and cooperation: The male warrior hypothesis. *Psychological Science*, *18*, 19-23.

Wellings, K., Field, J., Johnson, A. M., & Wadsworth, J. (1994). *Sexual behavior in Britain: The national survey of sexual attitudes and lifestyles.* New York, NY: Penguin.

Wilson, M., & Daly, M. (2004). Do pretty women inspire men to discount the future? *Proceedings of the Royal Society of London, Series B (Supplement)*, *271*, 177-179.

Wrangham, R. (1999). Is military incompetence adaptive? *Evolution and Human Behavior*, *20*, 3-17.

Wrangham, R., & Peterson, D. (1996). *Demonic males: Apes and the origins of human violence.* Boston, MA: Houghton Mifflin.

Zerjal, T., Xue, Y., Bertorelle, G., Wells, R. S., Bao, W., Zhu, S., . . . Tyler-Smith, C. (2003). The genetic legacy of the Mongols. *American Journal of Human Genetics*, *23*, 717-721.

Zurbriggen, E. L. (2000). Social motives and cognitive power-sex associations: Predictors of aggressive sexual behavior. *Journal of Personality and Social Psychology*, *78*, 559-581.