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## **Facial scarring enhances men's attractiveness for short-term relationships**

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**Abstract**

It is widely thought in Western societies that facial scarring has a negative impact on attractiveness. However, the specific effects of non-severe facial posttraumatic scarring on third party perceptions of attractiveness are currently unknown. Here we show that non-severe facial scarring can enhance perceptions of attractiveness in men but not in women. We report the results of asking 147 female and 76 male participants to rate the attractiveness of unscarred opposite-sex faces and faces that had been manipulated to exhibit photorealistic scarring, demonstrating that scarring enhances women's ratings of male attractiveness for short-term, but not long-term, relationships. Men's ratings of female attractiveness were unaffected by scarring. Though the reported effect is small, our results suggest that under certain circumstances scars may advertise valued information about their bearers, and that the idea that scarring universally devalues social perceptions can no longer be assumed to be true.

**Keywords**

Disfigurement; Facial attractiveness; Long-term/short-term; Mate-choice; Scarring

## 1. Introduction

Scarring is the inevitable outcome of mammalian skin repair after most types of dermal injury and is hypothesized to be the necessary result of a healing method that is optimized for speed (Bayat, McGrouther, & Ferguson, 2003). Scars therefore provide visible evidence of past trauma or illness, and may also communicate information about the bearer's history and personality, as well as affect their attractiveness. Several studies have investigated this possibility by building upon work on the halo effect, which describes how attractive persons are perceived to possess more socially desirable characteristics than unattractive persons (Dion, Berscheid, & Walster, 1972; Feingold, 1992), the assumption being that the effects of scarring and other forms of facial disfigurement on the way a person is perceived are likely to be of a generally "detrimental nature" (Bull, 1979). It is certainly the case, however, that some forms of scarring are valued in certain contexts. In many non-Western cultures, scars derived from ritual scarification (intentional scarring) are prized (Ludvico & Kurland, 1995; Singh & Bronstad, 1997). Scarification is employed to enhance beauty and symmetry in men and women and its use is positively associated with polygyny (Ludvico & Kurland, 1995), warfare against other cultural groups (Sosis, Kress, & Boster, 2007), and with pathogen prevalence (Singh & Bronstad, 1997). Scarification is also employed to mark rites of passage in men and women, and in particular the passage from childhood to adulthood. It has therefore been suggested that intentional scarring, as well as other forms of visible body modification such as tattooing, may serve to promote solidarity amongst men as well as advertise or simulate genetic quality, signal sexual maturity, and aid in attracting and securing mates.

Posttraumatic scars that are acquired through combat or other heroic behaviors may also serve to advertise valued traits. For example, Yanomamö men often shave their heads and rub red pigment into their scalps to increase the visibility of their scars, thus demonstrating their bravery and ability to withstand and recover from an enemy's blow (Chagnon, 1988). In the West, the now largely defunct practice of academic fencing, in which male adversaries fought with minimal head protection and sought to inflict and withstand wounds to the head and face, often resulted in injuries that were sutured crudely to provoke the development of a *renommierschmiss*, or bragging scar, which were worn like "medals" (Kiernan, 1988, p272). These medals evidenced bravery and were valued by women; in mid 19<sup>th</sup> century Germany, it was considered that "a face disfigured by scars was a passport to a good marriage" (Kiernan, 1988, p201).

Furthermore, posttraumatic scars may signal a risk-taking personality or above average masculinity. Male risk takers are more attractive, particularly for short-term relationships (Kelly & Dunbar, 2001), as are masculine men (Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Scheib, 2001). A mixed strategy in female mate choice has been suggested as an explanation for these preferences (Gangestad & Thornhill, 2008; Little et al., 2002; Penton-Voak & Perrett, 2000). Women may choose long-term partners on the basis of characteristics such as a propensity to cooperate or provide care to offspring, which in men may be associated with a less masculine face shape (Perrett et al., 1998). Posttraumatic scarring may convey similar messages about personality and, if this is the case, women may find men with posttraumatic scarring more attractive for short-term partnerships.

The perceived etiology of the scarring is also likely to be important in shaping perceptions. Scarring that results from surgery or illness probably does not convey the same message as posttraumatic scarring. In turn, many posttraumatic scars can be similar in appearance but be perceived as having dissimilar causes. Given that men are more risk-seeking in most domains than women (Weber, Blais, & Betz, 2002) and more physically aggressive (Archer, 2004), male posttraumatic scarring may be more likely than identical scarring in women to be seen as the result of violence, which would suggest that such scarring is likely to augment perceptions of male, but not female, masculinity. Given that masculinity increases male attractiveness (DeBruine et al., 2006; Rhodes, Chan, Zebrowitz, & Simmons, 2003) XXBut see RhodesXX but decreases female attractiveness (Perrett et al., 1998), we might expect non-severe facial scarring to have only a limited effect on female attractiveness.

Studies of the effects of facial scarring on attractiveness are few in number. Bull (1979) reports a study in which three groups of participants were shown 11 images of faces. Two of these images were of the same man and woman with no scarring, one facial scar, or two facial scars. Scarring was reproduced using make up applied by a professional make up artist. Participants rated individuals with scarring as more dishonest and less attractive (men with scarring were also rated as less warm, less sincere, and as having fewer friends). In a similar study, Bull and David (1986) presented white British and black Nigerian participants with photographs of white and black individuals who were scarred or unscarred, once again with scarring simulated using make up. Irrespective of the ethnic origin of the raters or sitters, scarred images were rated as less attractive than non-scarred images. However, the validity and generalizability of these two studies are questionable for several reasons. Firstly, the

number of stimuli used was small. Bull (1979) used only one male and one female sitter, while Bull and David (1986) used only one black and one white sitter. It is possible that the effects described in these studies are driven by the individual characteristics of these faces. Furthermore, because the sitters were aware of whether they were 'scarred' or 'unscarred' (depending on whether they had been made up or not) it is also possible that they adopted facial expressions that 'matched' a possible stereotype of scarred persons and that these expressions influenced the ratings. The male sitter in Bull's (1979) study, for example, exhibited lateral head tilt in his unscarred photograph; tilting of the head is known to lower ratings of dominance (Mignault & Chaudhuri, 2003).

A more recent study by Rankin and Borah (2003) addressed these issues by digitally retouching ten images of patients with severe facial posttraumatic scarring and congenital cutaneous deformity using computer graphics techniques, thereby ensuring that sitter facial expression as well as identity remained constant across conditions. Participants were presented with either the 'normal' or 'abnormal' images. Deformity globally reduced a person's perceived social worth, functionality, and attractiveness. However, because patients with vastly different types of deformity were included in the pool of patients, it is difficult to ascertain the individual effect of scarring. Of the three patients whose only deformity consisted of scarring, two were rated lower on measures of social worth in the 'abnormal' condition and one was not. In addition, patients' scarring differed in etiology, with one participant described as possessing facial burn scars and the remaining two possessing scars of unspecified origin.

Ogden and Lindridge (2008) kept scar etiology constant in their recent study of the effects of breast scarring on attractiveness. Images of genuine scarring from breast cancer surgery were added to photographs of unfamiliar and familiar (celebrity) women using computer graphics techniques. Male and female participants rated either scarred or unscarred images on attractiveness. Those rating scarred images tended to give lower scores. An interaction between scarring and familiarity was also reported, with celebrities receiving lower scores when scarred than unscarred, while unfamiliar women were no more or less attractive as a function of scarring. Though this finding is important, it is equally important to note that it may not generalize to scars located elsewhere on the body or the face which result from non-surgical trauma.

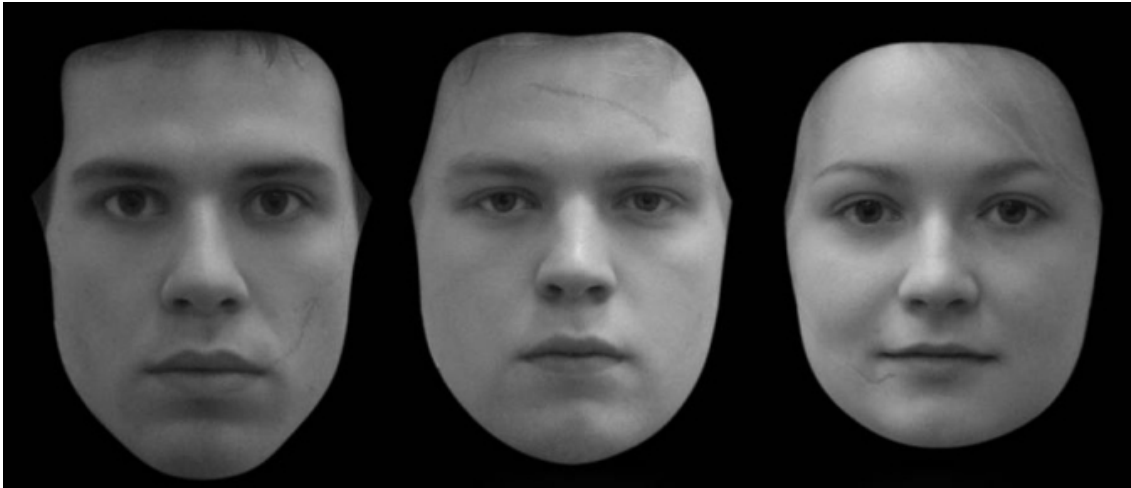
We suggest that it may be fruitful to reconsider whether facial scarring, and in particular posttraumatic scarring, might increase attractiveness, and to investigate for the first time the influence of posttraumatic scarring on men and women as judged by male and female raters separately. We firstly predicted that violence would be perceived to be a more likely cause of male scarring than of female scarring, even when scar patterns were identical. We also predicted that scarred men would be rated by women as more attractive for a short-term relationship but not a long-term relationship, when compared to unscarred men, and that scarring would affect female attractiveness neither in the long- nor the short-term context.

## **2. Method**

### *2.1 Stimuli*



Twenty four male and 24 female students were photographed under standardized conditions of focal distance and lighting. All sitters adopted a neutral expression and were Caucasian in appearance. None had visible facial scars. Photographs were blended using dedicated computer graphics software (Rowland & Perrett, 1995; Tiddeman, Burt, & Perrett, 2001) to give eight male and eight female three-face composites. To improve the realism of composite skin texture, Gaussian noise was added using Corel PhotoPaint 11 (level = 40, density = 25). Composite color mode was converted to 8bit grayscale. Next, images of posttraumatic facial scarring depicted in Crikelair et al. (1977) were scanned to 300dpi 8bit grayscale TIFF files using a Canonscan LiDE 50 scanner. Each image was duplicated and the scarring in the duplicate removed using PhotoPaint's clone tool. Scarring was then added to the composites by transforming their 'color' by +30% of the difference between scarred Crikelair images and the duplicates of those images with scars removed. A similar method has previously been used to manipulate facial masculinity (Little et al., 2002), eye spacing (Little, DeBruine, & Jones, 2005) and apparent health (Jones et al., 2005), amongst others. Though it is more correct to talk of pixel intensity than pixel color when images are grayscale, our method of 'color' transformation was identical to that used in previous studies; the pixel values of the base images (the composites) were transformed by a set percentage of the difference in pixel values between two endpoint images (the scarred and unscarred Crikelair images) (See Tiddeman et al., 2001 for computational details). Each composite exhibited a different pattern of facial posttraumatic scarring, though male and female composites shared the same patterns. All composites were masked to obscure hair, neck, and clothes (Figure 1).



*Figure 1. Example stimuli. Three-face composites transformed +30% of the difference in color between original images of scarred patients and those same images with scars removed.*

## *2.2 Participants*

Twelve female (mean age = 30.08,  $SD = 8.73$ ) and 14 male (mean age = 27.64,  $SD = 6.2$ ) participants were recruited from amongst social contacts for a preliminary study into the perceived etiology of the scarring depicted in the stimuli. All self-identified their ethnicity as white. None of these participants took part in the main study, nor were they rewarded for participating.

One hundred forty seven female (mean age = 20.55,  $SD = 4.06$ ) and 76 male (mean age = 19.98,  $SD = 1.76$ ) heterosexual undergraduates provided attractiveness ratings of the stimuli in the main study. Of these 223 participants, 32 women and 12 men who reported facial scarring were excluded from the analyses, leaving 179 participants; personal experience with scarring or facial trauma may influence participants' ratings (Rankin & Borah, 2003). The greater proportion of women

reporting facial scarring may be a genuine sex difference, or it may reflect a greater female sensitivity to scarring generally or specifically to one's own scarring. Of these participants, 117 self-identified their ethnicity as white, five as black, three as Asian, and one as Chinese. Participants were biological sciences students who were unlikely to have had specialist knowledge of cosmetic surgery or dermatology. There was no reward for participation.

### *2.3 Procedure*

A preliminary study was conducted to determine how the scars were perceived to have been caused, both to confirm that scars were seen as posttraumatic and to ascertain whether the sex of the bearer affected these perceptions. Participants were presented via a laptop with eight male and eight female faces with facial scars and were instructed to state which of seven possible causes of facial scarring seemed the most likely for each face. The alternatives were: (1) an accident; (2) an intentional self-inflicted injury; (3) surgery; (4) a fight; (5) an illness; (6) naturally occurring; and (7) another cause. Example situations were provided for clarification. Approximately half of the participants were provided with the same list but with alternatives 1-6 presented in reverse order. Stimuli remained on screen until an alternative was selected. Participants were also randomly allocated to one of two groups and saw original or vertically mirrored images. This was to control for perceptual asymmetry effects; the majority of scar patterns used here were situated predominantly on one side of the face, and it is known that the left side of visual stimuli receives preferential attention (Nicholls & Roberts, 2002).

From participants' responses, we calculated the proportion of times that accident, fight, and non-traumatic causes (i.e. the remaining five causes) were selected for both male and female faces, giving six dependent variables (proportion of times 'accident' / 'fight' / 'non-traumatic' was selected for male / female faces). Intentional self-inflicted injuries (e.g. scarification or scars from self-harm) were classified as a non-traumatic cause for the purposes of this study. In order to meet the assumption of sphericity, the data were arcsine square root transformed.

Participants in the main study were randomly allocated to one of two conditions. In the Scarred condition, they saw eight male and eight female faces with facial scars. In the Unscarred condition they saw those same faces without facial scars. The decision was taken to employ a between participants design because we were concerned that presenting participants with both scarred and unscarred images would alert them to the fact that images did not represent genuine scarring or that they would infer the aims of the study and respond unnaturally. Previous studies in this area have employed the same design (Bull & David, 1986; Ogden & Lindridge, 2008; Rankin & Borah, 2003). Participants were also randomly allocated to one of two sub-groups and saw original or vertically mirrored images.

Participants rated opposite sex faces presented via a laptop for attractiveness as a long- and short-term partner using a 7-point scale anchored by the descriptors "very unattractive" (1) and "very attractive" (7). Participants were provided with definitions of long- and short-term relationship prior to rating. These definitions have been used in previous studies (Little, Burriss, Jones, DeBruine, & Caldwell, 2008; Little, Cohen, Jones, & Belsky, 2007). Stimuli remained on screen until they were rated. The two

rating tasks were completed in a randomized order. Dependent variables were the mean ratings given by participants during each of the two tasks. After completing the tasks, participants reported whether they had any facial scarring. Data did not meet the parametric assumption of normality and so were log-transformed prior to analysis.

### 3. Results

We used a 2 X 3 repeated measures analysis of variance to compare the proportion of times participants in the preliminary study selected each of the three types of scar cause (accidental, violent, other non-traumatic causes) as a function of stimulus face sex. A significant main effect of 'cause' was evident,  $F(2,50) = 12.87, p < .001$ , see Figure 2. Non-traumatic causes were selected less frequently than traumatic causes for both male and female faces, confirming that the scars were generally perceived as posttraumatic. A significant interaction between 'sex of face' and 'cause' was also evident,  $F(2,50) = 8.35, p = .001$ . This interaction indicates that, while non-traumatic causes were attributed to male and female faces a roughly equal proportion of the time, male scars were seen as being much more likely to have resulted from violence than were female scars. Separate analyses for each of the three scar causes were conducted. Paired sample  $t$  tests showed that accidental causes were attributed more frequently to female than male scars,  $t(25) = 2.28, p = .03, r = .41$  (though this effect would not be considered significant after applying a Bonferroni correction for three comparisons:  $\alpha = .017$ ), while violent causes were attributed more frequently to male than female scars,  $t(25) = -4.07, p < .001, r = .63$ . Other, non-traumatic causes were attributed no more frequently to faces of either sex,  $t(25) = 1.41, p = .17, r = .27$ .

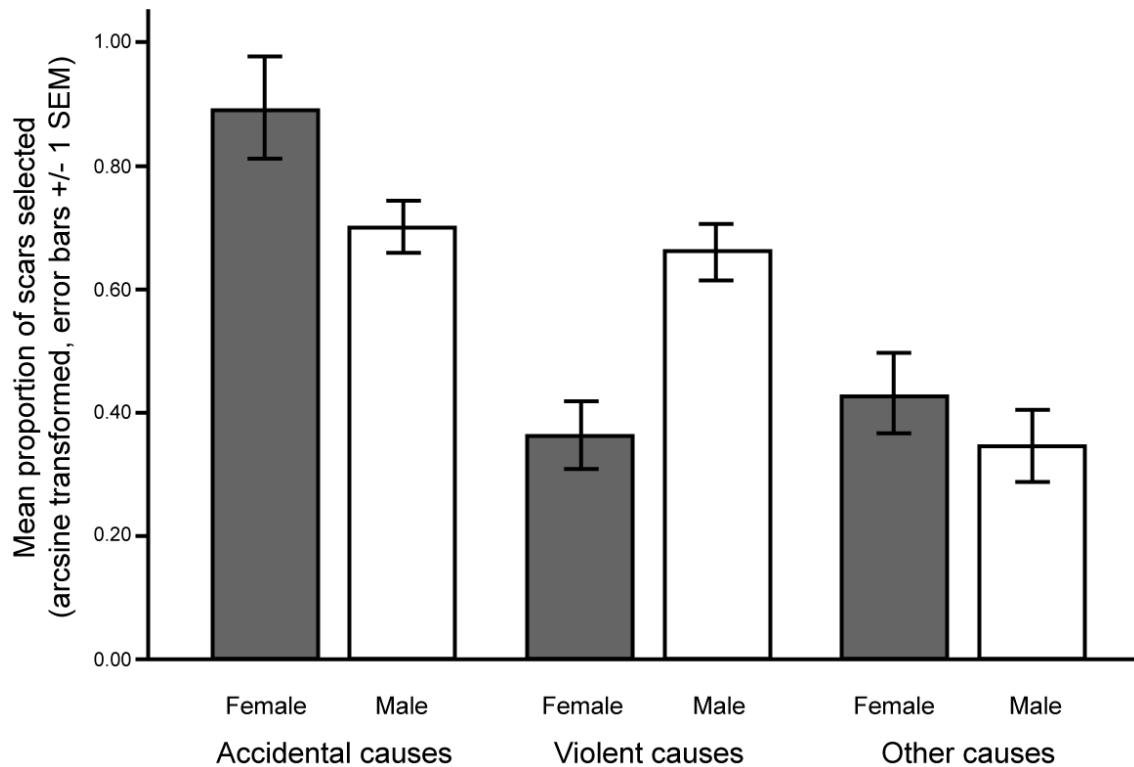


Figure 2. The proportion of times participants in the preliminary study selected each of the three types of causes as the most likely origin of scarring. Male scars were perceived to be more likely the result of violence than were female scars, even though scar patterns were identical.

In the main study, an independent samples *t* test revealed no significant effect of scarring on female-rated male long-term attractiveness,  $t(111.7) = 1.45, p = .15, r = .14$  (Scarred,  $M = 3.49, SD = 0.88$ , Unscarred,  $M = 3.30, SD = 1.12$ ). However, there was a significant effect of scarring on female-rated male short-term attractiveness,  $t(112.7) = 2.33, p = .022, r = .21$ , with scarred faces,  $M = 3.58, SD = 0.84$ , receiving higher ratings than unscarred faces,  $M = 3.24, SD = 1.10$ . Though the effect is significant, it is important to note that it is small in size.

There were no significant effects of scarring on male-rated female short-term attractiveness,  $t(62) = -0.49, p = .63, r = .004$  (Scarred,  $M = 3.81, SD = 1.27$ , Unscarred,  $M = 3.92, SD = 1.13$ ) or long-term attractiveness,  $t(62) = -0.03, p = .98, r = .06$  (Scarred,  $M = 3.79, SD = 1.11$ , Unscarred,  $M = 3.87, SD = 1.21$ ).

#### 4. Discussion

The current study is the first to demonstrate that under certain circumstances posttraumatic scarring may increase a person's perceived social worth. We found support for our hypothesis that men with posttraumatic scarring would be found more attractive for short-term relationships but not for long-term relationships. Though the effect size reported here is small, it should be noted that because 'color' was transformed by a value of only 30%, scarring in our stimuli was very slight in appearance. More severe scarring may have a stronger effect on attributions, though it is probable that very severe scarring would result in lower ratings of attractiveness. We can be confident that the participants in the main study generally perceived the scars present in the stimuli to be the result of posttraumatic injury, given that other causes accounted for a reduced proportion of perceived causes in the preliminary study.

It is undoubtedly the case that many forms of facial disfigurement negatively influence individuals' perceptions of themselves and how they are perceived by others (Kent & Keohane, 2001; Rumsey, Bull, & Gahagan, 1982; Tebble, Adams, Thomas, & Price, 2006; Tebble, Thomas, & Price, 2004). Our findings demonstrate that not all forms of disfigurement and scarring are in a wholly negatively light. They also mirror findings of previous studies which have shown that men who are heroic risk takers

(Kelly & Dunbar, 2001) and masculine (Little et al., 2002; Scheib, 2001) are particularly attractive as short-term partners. Posttraumatic scarring may, therefore, advertise qualities such as good genes or a strong immune system that female judges tend to prefer in men within the context of short-term relationships.

It is unsurprising that relationship context did not have a similar moderating effect on rated female attractiveness; context has not previously been shown to moderate ratings of female attractiveness as a function of masculine appearance, for example, without considering the impact of additional variables. Given that our preliminary study demonstrated that posttraumatic scarring tends to be more often perceived as resulting from violent causes in men than in women, it is also unsurprising that scarring was not seen to generally reduce female attractiveness. More so in men than in women, scarring may be seen as a badge of heightened masculinity, a trait which is known to impact negatively on female attractiveness (Perrett et al., 1998). Additionally, Ogden and Lindridge (2008) found no effect of surgical scarring on the attractiveness of unfamiliar women, and it may be argued that scars from surgery convey potentially less appealing information than do posttraumatic scars which do not connote past illness.

The use of grayscale as opposed to full color stimuli is a limitation of the current study. Some aspects of scarring, such as their vascularity, pigmentation, and contrast with surrounding skin tone, may be more noticeable when color information is preserved. This additional information may influence perceptions; skin topography and color distribution are known to affect judgments of female age, health, and attractiveness (Fink, Grammer, & Matts, 2006; Fink & Matts, 2008). Given that the



images of scarring which we took from Crikelair (1977) were grayscale, it was not possible for us to create stimulus faces in full color. Future research should seek to address this issue.

As this study suggests that the influence of scarring on attractiveness may not be as uniformly negative as previously supposed, further study which incorporates additional variables of interest is appropriate. Environmental harshness (Little et al., 2007) and the social interest of third party persons (Little et al., 2008), which have been shown to have contextual effects on rated male attractiveness similar to that described here, may moderate the influence of scarring on perceptions. We chose not to manipulate severity in the current study, instead using a variety of scar patterns; but severity of scarring, whether measured by scar size, frequency, or location, has been recognized as an important factor by previous authors (e.g. Bull, 1979; Tebble et al., 2004). As we have already suggested, scar etiology is likely to be similarly critical. For example, intentional scarring (such as scarification and tattooing) may be perceived differently than unintentional scarring. Scars that indicate past illness (e.g. chickenpox, acne, or surgery scars), and which therefore suggest a weaker immune system, may be viewed more negatively than other types of scarring. The etiology of posttraumatic scars may be difficult for an onlooker to determine because these can result from a variety of injury types, such as accidental or combat. Furthermore, the appearance of combat scars may be similar regardless of whether their bearer was an aggressor or a victim, or whether they won or lost the contest, all of which will be information relevant to perceivers. Providing participants with information about how scars were caused will add a further dimension to study in this area, mimicking the way in which individuals

trade stories of scar acquisition while comparing the physical evidence of their past trauma.

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