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Men's Perception of Raped Women: Test of the Sexually Transmitted Disease Hypothesis and the Cuckoldry Hypothesis

Pavol Prokop[1,2], Ladislav Pekárik[1,3]

[1] *Department of Biology, Faculty of Education, Trnava University, Priemyselná 4, 918 43 Trnava, Slovakia, tel/fax: +421 33 55 14618, Corresponding author, E-mail: pavol.prokop@savba.sk*

[2] *Institute of Zoology, Slovak Academy of Sciences, Dúbravská cesta 9, 845 06 Bratislava, Slovakia*

[3] *Institute of Botany, Slovak Academy of Sciences, Dúbravská cesta 9, 845 23 Bratislava, Slovakia*

ABSTRACT

Rape is a recurrent adaptive problem of female humans and females of a number of non-human animals. Rape has various physiological and reproductive costs to the victim. The costs of rape are furthermore exaggerated by social rejection and blaming of a victim, particularly by men. The negative perception of raped women by men has received little attention from an evolutionary perspective. Across two independent studies, we investigated whether the risk of sexually transmitted diseases (the STD hypothesis, Hypothesis 1) or paternity uncertainty (the cuckoldry hypothesis, Hypothesis 2) influence the negative perception of raped women by men. Raped women received lower attractiveness score than non-raped women, especially in long-term mate attractiveness score. The perceived attractiveness of raped women was not influenced by the presence of experimentally manipulated STD cues on faces of putative rapists. Women raped by three men received lower attractiveness score than women raped by one man. These results provide stronger support for the cuckoldry hypothesis (Hypothesis 2) than for the STD hypothesis (Hypothesis 1). Single men perceived raped women as more attractive than men in a committed relationship (Hypothesis 3), suggesting that the mating opportunities mediate men's perception of victims of rape. Overall, our results suggest that the risk of cuckoldry underlie the negative perception of victims of rape by men rather than the fear of disease transmission.

KEYWORDS

cuckoldry, sexually transmitted disease, rape, STD

INTRODUCTION

Human rape, defined as the use of force or the threat of force to obtain copulation without woman's consent (Camilleri 2012), is a classical conflict between the reproductive interests of the sexes (Thornhill & Palmer 2000). A similar sexual conflict is widespread in animals, beginning with arachnids and ending with non-human primates and humans (for review, see McKibbin & Shackelford 2011). Historical and ethnographic studies suggest that rape occurs in all known human cultures (Lalumière et al. 2005). Recent estimates indicate that between 12% and 18% women were raped (Kilpatrick et al. 1992, 2007; Tjaden & Thoennes 2006; Wolitzky–Taylor et al. 2011; Zinzow et al. 2012). It is likely that rapes are more prevalent, because only 15% to 23% of the rape victims report the incident to legal authorities (Gharoro et al. 2011; Kilpatrick et al. 1992; Tjaden & Thoennes 2006; Walby & Allen 2004).

Rape has negative consequences for women's health and future life (Campbell & Wasco 2005; Faravelli et al. 2004; Perilloux et al. 2012; Thornhill & Palmer 2000). In particular, victims of rape may suffer from depression and post-traumatic stress disorders (Baugher et al. 2010; Zinzow et al. 2010), physical injury (Sommers et al. 2006), STDs (Beck-Sagué & Solomon 1999; Estreich et al. 1990; Jenny et al. 1990; Jo et al. 2011), risk of unwanted pregnancy (Gottschall & Gottschall 2003; Holmes et al. 1996), and blaming by relatives (Grubb & Turner 2012; Perilloux et al. 2014), particularly by men (Lonsway & Fitzgerald 1994). However, women's reproductive costs are highly associated with their main partner's reproductive success (Jokela et al. 2010), thus rape should bring costs not only to women, but also to their male partners.

Although human rape from the female's perspective is unwanted vaginal intercourse, its consequences for men pair-bonded to a rape victim are similar to that of promiscuity. Indeed, both rape by someone else and extra-marital affairs are the most common causes of divorce (Clarke–Stewart & Brentano, 2006). A survey in the eastern Democratic Republic of

the Congo showed that nearly one-third of raped women were rejected subsequently by their husbands (Kelly et al. 2011). The rates of rejections were three times higher for women who experienced gang-rape compared with the women who were not gang-raped and five times higher for women who reported to have a child from rape. Husband's fear of STD and disease transmission from their wives may be one explanation for a woman's rejection (Kelly et al. 2011). On the other hand, men reduce their paternal investment to genetically unrelated children or when they suspect that they have been cuckolded by their partner (e.g., Daly & Wilson 1985; Flinn 1992; Apicella & Marlowe 2004; Geary 2006). Indeed, cuckoldry has more negative impact on host fitness than offspring predation or a deadly STD because of the protracted investment it entails and the concomitant reduction of further reproduction (Lack 1968, Rothstein 1990). Cuckolded individuals, however, continue in parental investment to unrelated genes that dramatically reduce their reproductive success (Davies 2000). For example, after detaining females during the fertile phase, males of the Lesser grey shrike (*Lanius minor*) physically retaliated their partners, thereby increasing the costs related to female extra-pair behaviour (Valera et al. 2003). This has important implications for the understanding of rape's effects on pair-bond partners of victims from an evolutionary perspective: rape both increases the risk of being infected by STDs and decreases paternity certainty. Testing these hypotheses may result in more understanding of the persistence of men's negative perception of raped women.

Men who are more vulnerable to disease transmission (Duncan et al. 2009) are expected to show less interest in raped women. Indeed, people who feel especially vulnerable to disease have greater aversive responses against objects or subjects that would be contaminated (e.g., Park et al. 2003; Prokop et al. 2014).

Promiscuity increases the transmission of STD (Aral 1999; Johnson et al. 2001; Kyriakis & Hadjivassiliou 2000; Lockhart et al. 1996; Poiani 2000; Rosario et al. 1999; Thrall et al. 2000), thus males do not prefer promiscuous females, which can be infected by pathogens (Jones et al. 2001). Alternatively, once mated, males may desert a brood or a female to avoid the cost of being infected (Mukiza–Gapere & Ntozi 1995; Schepard 1989; Smith & Watkins 2005). We hypothesise that men will perceive raped women more negatively when the risk of being infected is higher.

Female partner promiscuity would lead to paternity uncertainty in both humans and non-human animals (Anderson 2006; Baker & Bellis 1995; Birkhead & Møller 1998; Clarke et al. 2009; Neel & Weiss 1975; Scelza 2011; Wolff & Macdonald 2004). Natural selection, therefore, favours behavioural strategies and preferences of males that correctly identify the risk of being cuckolded (Buss 2000; Shackelford et al. 2005, 2006). If the risk of cuckoldry is high, a male may desert brood or a female, as it was shown in some non-human animals (Birkhead 1991; Houston & Davies 1985; Neff & Gross 2001; Sheldon & Ellegren 1998) as well as in humans (Anderson et al. 2007; Shackelford et al. 2002a). We hypothesise that men will perceive raped women more negatively when the risk of being cuckolded is higher.

Men's preferences for women are mediated by commitment in a romantic relationship. For example, single men are more willing to engage in short-term sexual intercourse with any woman (Prokop & Fedor 2013) and are more sensitive to cues of fertility (Miller & Maner 2010) than a man involved in a romantic relationship. Moreover, highly committed people rate mating alternatives as less attractive and spend less time looking at attractive alternatives (Maner et al. 2008, 2009). We hypothesise that single men will perceive raped women less negatively than men involved in a romantic relationship (Hypothesis 3).

Men are invariably found to be more likely to derogate and blame rape victims than women do (Burt 1980, Ewoldt, Monson, & Langhinrichsen–Rohling, 2000; Hayes, Lorenz, & Bell, 2013; Lonsway & Fitzgerald, 1994; Newcombe et al., 2008) suggesting that according to men's views, women 'ask for rape' (Schwendinger & Schwendinger 1974). In other words, men minimise the seriousness of rape for women (for reviews, see Anderson, Cooper, & Okamura 1997; Flores & Hautlaub 1998; Lonsway & Fitzgerald 1994). Researchers have suggested that for example, rape is an extension of traditional gender roles that assume male superiority (Burt 1980; Simonson & Subich 1999) and that men with less supportive attitudes towards the rape victim's welfare have greater acceptance of interpersonal violence (Burt 1980; Forbes, Adams–Curtis, & White 2004) and sexual aggression (Nunes, Hermann, & Ratcliffe 2013). Men are more involved during a rape than the victim suggests (Selby, Calhoun, & Brock 1977), but viewing oneself as similar to the victim reduces the blame (Amacker & Littleton 2013). Thus, sexual coercion in romantic relationships is considered to be different from those of a stranger (Bridges 1991). However, research investigating reasons for men's rejection and derogation of rape victims from an evolutionary perspective is missing.

1. OVERVIEW OF THE CURRENT RESEARCH

In this paper, we tested whether the perceived risk of being infected by an STD (Hypothesis 1) and/or the risk of being cuckolded (the cuckoldry hypothesis, Hypothesis 2) influences the perception of victims of rape. Although these hypotheses suggest different costs for men (i.e., mortality/morbidity in an STD hypothesis scenario and paternal investment to unrelated offspring in cuckoldry scenario), some predictions derived from these hypotheses are identical (Table 1). Specifically, we employed Study 1 to test the Prediction 1 that raped women are perceived to be less attractive for a long-term compared with a short-term relationship to support the cuckoldry hypothesis (Hypothesis 2), because a long-term relationship prolongs paternal care. In contrast, the STD hypothesis (Hypothesis 1) predicts a reduction in attractiveness of raped women for both short- and long-term relationships (Prediction 2).

Study 2 also tested the predictions from both the STD (Hypothesis 1) and cuckoldry (Hypothesis 2) hypotheses (Table 1). In particular, we compared the attractiveness of assaulted and raped versus not raped women. If assaulted and raped women will receive a lower attractiveness score than assaulted, but not raped women, both hypotheses will be supported (Prediction 3). We also compared the attractiveness of women raped by one or by three men to test both hypotheses in terms of increased likelihood of disease transmission and pregnancy. Lower sexual interest in women raped by three men compared with the women raped by one man provides support for the STD (Hypothesis 1) and the cuckoldry hypothesis (Hypothesis 2) (Prediction 4). We also digitally manipulated faces of the would-be rapists to explicitly increase disease cues to test the STD hypothesis. If the STD hypothesis is true, we predict that men will show less sexual interest in women raped by an ill-looking man or men than the same women raped by a healthy-looking man or men (Prediction 5). Raters' scores on the scale measuring perceived vulnerability to diseases were included to see whether there is any association with the perception of STD cues. If men more vulnerable to infectious diseases will show less sexual interest in raped women, then the STD hypothesis (Hypothesis 1) will be supported (Prediction 6). Finally, this study asked whether involvement in a romantic relationship mediates the perception of raped women. It can be suggested that being single will be associated with a more positive perception of raped women than being involved in a romantic relationship (Hypothesis 3).

2. STUDY 1

Study 1 was designed to investigate the prediction derived from the cuckoldry hypothesis (Hypothesis 2) that raped women will score lower in perceived attractiveness for long-term relationships. The prediction from the STD hypothesis (Hypothesis 1) is that the raped women will score lower in perceived attractiveness for both short- and long-term relationships. The predictions are outlined in Table 1.

2.1. Method

2.2.2 Participants

The survey was conducted in May 2013. The participants were 73 white heterosexual men attending Trnava University in Trnava, Slovakia. The age of the remaining participants ranged from 18 to 46 years (M = 23.41, SD = 4.58). All participants agreed with participation before they started with the online questionnaire and received extra credit for an ethology course.

2.3.3 Measures

Stimuli

Stimuli were 20 faces of Caucasian women photographed in a neutral emotional expression between the ages of 19 and 45 (M = 24.85, SD = 6.04). All these facial stimuli were obtained from the publicly available Center for Vital Longevity database (Minear & Park 2004) and can be freely used by other researchers.

Procedure

The present study was conducted online, which affords a high degree of anonymity, allowing more candid responses to questions about socially undesirable behaviour and emotions than do paper and pencil methods or interview methods (Locke & Gilbert 1995; Musch et al. 2001). Internet surveys are a convenient, user-friendly, comfortable, and secure data gathering method (e.g., Campos et al. 2011). Before the web page with the online survey was available, each participant received a unique numerical code to secure individual identity. Numerical codes were then used to check the participation of each man in the research and an extra credit was subsequently conferred. All pictures were accompanied with a brief description of a woman placed above the photograph (i.e., The name of this woman is Maria [name in each picture was different]. She is 26 years old). Half of the randomly selected facial stimuli were selected for a rape scenario treatment and half served as controls. In the rape scenario treatment, information about rape was included in the brief description (i.e., ... She is 24 years old and she was BRUTALLY RAPED 3 days ago – she is a victim of unwanted vaginal sexual intercourse). There were no significant differences in the mean age of women who were shown as raped and non-raped (M = 24.7, SD = 7.78 and M = 25, SD = 4.08, respectively, both n = 10, t = 0.11, df = 18, P = 0.92). We have chosen a 3-day period since rape because human sperm are still viable in the female reproductive tract (Gould, Overstreet, & Hanson 1984), thus, a real risk of sperm competition exists. Participants were instructed to look at the picture (no time limit was given) and then rate women's sexual attractiveness. Each participant rated women's sexual attractiveness for a short-term (How sexually attractive do you think this person is for a possible *short-term* relationship?) and long-term relationship (How sexually attractive do you think this person is for a possible *long-term* relationship?) in a 10-point scale (1 = totally unattractive, 10 = extremely attractive). Short-term and long-term attractiveness ratings were used throughout this study, because men significantly lower their standards for short-term partners, probably because they invest less in reproduction than women (e.g., Kenrick et al. 1990; Li & Kenrick 2006). The summed scores of women presented as raped and scores from women not presented as being raped were used in statistical analyses. After the research was completed, the participants were debriefed regarding the research goals.

To identify the possible pre-existing differences between facial stimuli from this sample, all 20 female faces were rated by 10 Caucasian men between the ages of 19 and 24 years (M=20.4, SD=1.27) who did not participate in further research. Photographs were not labelled by any information about the woman (i.e., age, name, being raped or not). The images were rated for sexual attractiveness on a scale of 1 (low) to10 (high). There were no significant differences in the attractiveness between women presented as being raped and non-

raped for both short-term (M = 45, SD = 21.81 and M = 39.4, SD = 21.54) and long-term relationship (M = 32.9, SD = 15.68 and M = 24.1, SD = 13.49) (*t*-test, *t* = 0.58 and 1.35, df = 18, *P* = 0.58 and 0.2, respectively).

2.4. Results

Women presented as being raped received significantly lower attractiveness score for long-term relationship than the women who were not presented as being raped (Fig. 1). Comparison within groups showed that women presented as being raped received significantly higher mean score in attractiveness for short-term relationship than long-term relationship (paired *t*-test, *t* = 3.6, df = 72, *P* < 0.001), but no similar differences were revealed for women who were not presented as being raped (*t* = 1.02, df = 72, *P* = 0.31). Prediction 1 was supported, but Prediction 2 did not receive statistical support. This provides support for the cuckoldry hypothesis (Hypothesis 2), but not for the STD hypothesis (Hypothesis 1).

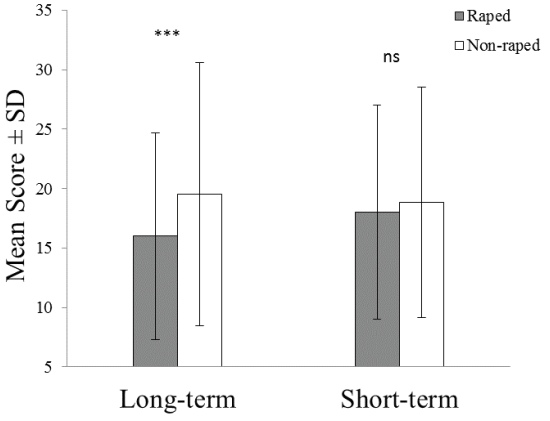

*Figure 1. Differences in the perceived long-term attractiveness of women presented as raped and non-raped. Asterisks denote the significant differences between groups based on paired t-tests (*** P < 0.001, ns = not significant).*

3. STUDY 2

This study tested the predictions derived from the STD and the cuckoldry hypotheses (Hypothesis 1 and 2, respectively). The predictions are outlined in Table 1. Furthermore, it tested also Hypothesis 3, which posits that single men will perceive raped women less negatively than men involved in a romantic relationship.

3.1. Method

3.2.2 Participants

The participants were 124 heterosexual men (three homosexuals were removed) attending St. Elisabeth University in Bratislava, Slovakia. The mean age of the participants ranged from 18 to 46 years (M = 23.59, SD = 5.26). All the participants received an extra credit from a Comparative Psychology course. All the participants agreed with participation before they started with the online questionnaire. None of these participants joined Study 1.

3.3.3 Stimuli

Stimuli were 16 faces of Caucasian women and 32 Caucasian men photographed in a neutral emotional expression between the ages of 18 and 38 (M = 25.0, SD = 5.54) and 23 and 45 (M = 32.2 yrs, SD = 6.2), respectively. All these facial stimuli were obtained from the publicly available Center for Vital Longevity database (Minear and Park, 2004).

3.4.4 Perceived vulnerability to disease scale

This questionnaire (PVD) (Duncan et al. 2009) was used to assess the respondents' self-perceived vulnerability to disease. This scale consisted of 15 items (α = 0.75); one subscale assessed beliefs about one's own susceptibility to infectious diseases (Perceived Infectability [PI] with seven items, α = 0.79); the second subscale assessed emotional discomfort in contexts that suggest an especially high potential for pathogen transmission (Germ Aversion [GA] with eight items, α = 0.55). An example item of the PI subscale is: 'In general, I am very susceptible to colds, flu, and other infectious diseases' and an example of the GA subscale is: 'I prefer to wash my hands soon after shaking someone's hand'. Items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). We calculated individual scores for these dimensions by summing the responses to the constituent items. Negatively worded items were scored in reverse order.

3.5.5 Procedure

The present study was conducted online in the same way as Study 1. The 16 women's pictures were accompanied with a brief description of each woman placed above the photograph varying in complete rape (i.e., The man (or men) in the pictures BRUTALLY RAPED the woman on the picture – She was a victim of unprotected sexual intercourse) or incomplete rape. (i.e., The man (or men) on the pictures UNSUCCESSFULLY tried to rape the woman on the picture – there was NO vaginal sexual intercourse). No other descriptions except for these two were presented to the participants. Thus, all stimuli were presented in standard conditions (i.e., all women were presented as targets of male-directed violence), but only half of them were presented as raped. In order to find whether there is any specific effect of an STD threat on the perception of a rape victim, we used the Adobe Photoshop CS 5 software to change the presence of STD cues of all 32 photographs of males (Fig. 2).

Disease pictures were manipulated by digitally copied visible skin lesions and rash of some sexually STDs (syphilis, HIV, *Herpes simplex*, *H. Zoster*, and *Chlamydia* sp.) that are known to be transmitted to women during rape (Estreich et al. 1990; Jenny et al. 1990; Beck–Sagué & Solomon 1999; Jo et al. 2011). All these diseases make visible signs in faces of their carriers (e.g., Chapel 1980; Penneys 1995; Lucchina et al. 1997; Whitley et al. 1998). The original photographs of people who

had visible signs of these diseases on skin were downloaded from Google.

To assess perceived health, participants (n = 10) in a pilot study were shown pairs of men pictures and were asked to choose the face in each pair that looked more ill. Stimulus pairs were healthy (intact) and ill (faces with signs of an STD) versions of the same man, presented in a two-alternative forced choice paradigm. The presentation of pictures was fully randomised for side of the screen. Pilot data indicated that 100% of male viewers perceived manipulated photographs as having disease cues compared with the intact photographs. Participants need not be necessarily aware that signs of disease are associated with sexual transmission, because any contact with disease-looking subject is potentially risky. Therefore, people show similar avoidance to infectious and non-infectious disease (Ryan et al. 2012).

The set of women's pictures was selected so that there would be equal numbers of women successfully and unsuccessfully raped, women assaulted by one or three men (in order to show cues of low and high risk of sperm competition), and each group of participants viewed women both in healthy (i.e., faces of man or men were intact) and ill conditions (i.e., faces of man or men were treated with skin lesions and rash). All women in this study were presented as 'assaulted', because a preference for a woman who is targeted by a dangerous rapist(s) places themselves in danger from sexually aggressive men. Thus, the risk of potential danger was uniform across treatments. Women's faces were left intact. One woman's face and one or three men's faces were always presented together on each slide.

The mean age of women was M = 25 yrs (range: 18–34, SD = 5.54). There were no differences in the mean age of women with respect to the complete and incomplete rape scenarios, nor between the women assaulted by one or three men or women both in healthy and ill conditions (ANOVA, $F_{1,8}$ = 4.38, 0.05, and 0.59, all $P > 0.07$, respectively). Similarly, there were no differences in the mean age of men with respect to the rape scenario, number of men in trial (when there were three men in trial, their age was averaged to avoid pseudoreplication), and healthy/ill conditions ($F_{1,8}$ = 3.26, 0.97, and 0.17, all $P > 0.1$, respectively).

Participants were randomly treated to two experimental groups, ensuring that each woman was rated by the participants from group A in healthy conditions and by the participants from group B in ill conditions. Each participant rated women's sexual attractiveness for a short-term and long-term relationship in a 10-point scale (1 = totally unattractive, 10 = extremely attractive). Wording of these questions was the same as in Study 1. After the research was completed, the participants were debriefed regarding the research goals.

3.6.6 Statistical analysis

Women's sexual attractiveness as a response variable and six explanatory variables (see Table 2) were modelled using generalized estimating equation (GEE). All responses (women's attractiveness ratings) were treated as individual subjects. As a result, there were 127 × 16 (2032) women's attractiveness ratings. The response variable meets the characteristics of Gamma distribution, thus a Gamma distribution with inverse link was selected. The identity of the participants was used as a grouping factor to deal with correlation within the participant ratings. Modelling followed the standards described by Zuur et al. (2009) using the step-wise backward selection. As a first step, we fitted the full model where each explanatory variable and all two-way interaction were present. The statistical significance of the modelled variables was assessed by chi square statistics. As the second step, the least significant variable or interaction was removed from the model and the new (reduced) model was refitted to the data. The two models (the full one and the reduced one) were then compared. For the graphical presentation of the results, the predicted values were fitted against the response variables and confidence intervals (95%) were expressed as well. We avoided interpretation of interaction terms that were not directly related with the hypotheses. All statistical analyses were processed by core packages of R Statistical Environment (R Core Team 2013) and geepack package Højsgaard (2006).

3.7. Results

In line with Prediction 1, the attractiveness ratings were higher for a short-term than a long-term relationship for the women who had been raped (Table 2). The results from Study 1 had been successfully replicated and additional support for Hypothesis 2 was received.

In line with Prediction 3, GEE showed that men showed less sexual interest in women who had been assaulted and raped compared with the assaulted, but non-raped women (Table 2), supporting both the STD and cuckoldry hypotheses (Hypotheses 1 and 2, Table 1). This result successfully replicates the findings from Study 1.

Prediction 4 received mixed support, because an interaction term between rape/non-rape and the number of rapists (1 versus 3) showed that sexual interest in women raped by three men was unexpectedly higher than for the non-raped women assaulted by three men. This goes against both the STD (Hypothesis 1) and cuckoldry hypotheses (Hypothesis 2). Men show, however, less sexual interest in women raped by three rapists than women raped by one rapist, supporting both cuckoldry (Hypothesis 2) and the STD hypotheses (Hypothesis 1).

Prediction 5 was not supported. Women assaulted or raped by an ill-looking man or men received similar sexual attractiveness score than the women assaulted or raped by a healthy-looking man or men, which rejects the STD hypothesis (Hypothesis 1).

Prediction 6 was not supported. A significant interaction terms GA × Rape and GA × The number of men suggest that men with higher GA scores tended to show higher ratings of non-raped women than the ratings of raped women. Furthermore, women raped by three men were perceived as less attractive than the women raped by a single man. These trends were, however, weak. Moreover, the PI subscale did not cor-

Figure 2. An example of intact (a) and digitally manipulated (b) stimuli of a healthy- and ill-looking man used in Study 2. The face of the male target was intact in the experiment, but is blurred here to protect privacy.

Table 1. An outline of predictions tested in Study 1 and Study 2.

	Support for the hypothesis	
	STD	Cuckoldry
P 1: Men will show less sexual interest in raped women, particularly for a long-term relationship	No	Yes
P 2: Men will show less sexual interest in raped women, both for a short- and long-term relationship	Yes	No
P 3: Men will show less sexual interest in women assaulted and raped than in women assaulted, but not raped	Yes	Yes
P 4: Men will show greater sexual interest in women raped by a single man than in women raped by multiple men	Yes	Yes
P 5: Men will show less sexual interest in women raped by an ill-looking man or men than in women raped by a healthy-looking man or men	Yes	No
P 6: Men with high PVD will show less sexual interest in raped women than in non-raped women	Yes	No

relate with any of these variables. The STD hypothesis (Hypothesis 1) was, therefore, not unequivocally supported.

3.8. Partnership status as a mediator of women's attractiveness

As hypothesised, women's attractiveness was mediated by men's partnership status. Single men rated women as more attractive for both short-term and long-term relationship than the men who were involved in committed relationships (Table 2). This provides support for Hypothesis 3. Moreover, the latter group of men, compared with the single men, rated women less attractive especially for a long-term relationship.

4. DISCUSSION

Most of the research has investigated the costs of rape from women's perspective (McKibbin & Shackelford 2011; Perilloux et al. 2012). The evolutionary approach to study the possible costs of rape for men is almost missing. Although a number of researchers in the field of social sciences investigated men's attitudes toward rape (e.g., Lonsway & Fitzgerald 1994; Anderson et al. 1997; Flores & Hautlaub 1998), their consistency (blaming of victims of rape) and pervasiveness across cultures imply that the evolved psychological mechanisms that are activated in men when their female partner was raped exist. We investigated two different costs of rape for men and found some support for the evolutionary explanations of men's negative perception of victims of rape.

The likelihood of contamination by an STD in women is increased after rape by a man (Beck–Sagué & Solomon 1999; Jenny et al. 1990; Jo et al. 2011), suggesting that regular sexual partners of these raped women are also at risk of being contaminated. Indeed, one of the most commonly cited reasons for rejection of a raped wife in Kelly et al.'s (2011) study in Democratic Republic of Congo was husbands' fear of an STD and disease transmission from their wives. However, our research showed weak support for the STD hypothesis (Hypothesis 1). Study 2, where cues of an STD were digitally manipulated on faces of putative rapists, yielded non-significant differences in the perceived attractiveness of women presented as victims of healthy-looking or ill-looking men. Collectively, these results suggest that an STD threat is *not* an ultimate reason of negative perception of raped women. One explanation may be that men are significantly less vulnerable to STDs than women (Eng & Butler 1997; Wang et al. 2007). Thus, men need not be too much cautious with the STDs, perhaps, because the reproductive benefits outweigh the risk of disease transmission. Indeed, research showed that the risk of disease transmission needs not to be associated with any behavioural change in humans (NdinyaAchola et al. 1997; Satterwhite et al. 2007).

Our second hypothesis dealt with the risk of being cuckolded (Hypothesis 2). Men possess several psychological adaptations how to minimise the risk of a partner's infidelity (Goetz et al. 2005; Shackelford et al. 2005), and rejection of victims of rape would be an additional evolved anti-cuckoldry tactic for how to prevent the risk of investment in an unrelated offspring. Our research found some support for the cuckoldry hypothesis. First, in Study 1 and Study 2, men preferred raped women for a short-term relationship more than for a long-term relationship. These differences would be explained as avoidance of a long-term investment associated with raising the offspring.

Second, women presented as raped by three men were perceived as less attractive than women raped by a single man. Ejaculates of rapists could have increased the ejaculate volume (Thornhill & Palmer 2000) and/or would contain higher levels luteinising hormone that triggers ovulation in humans (Gallup et al. 2012). If so, ejaculates of three rapists may be associated with higher likelihood of pregnancy, and this would explain why victims of gang rape are more frequently abandoned by husbands than victims of regular rape (Kelly et al. 2011). Alternatively, the participant might see the women raped three times too weak to protect herself, and thus, to protect his fu-

Table 2. Analysis of Wald statistics table for GEE.

Factor	Df	X2	P(>|Chi|)
1. Age of a rater	1	2.766	0.096
2. Relationship status of a rater	1	5.055	0.025
3. GA subscale	1	2.129	0.145
4. Number of rapists	1	37.112	< 0.001
5. Rape-non-rape scenario	1	8.894	0.003
6. Attractiveness (Long-term versus short-term)	1	9.062	0.003
Interaction terms			
2 × 3	1	4.431	0.034
2 × 5	1	3.978	0.046
2 × 6	1	7.598	0.006
2 × 4	1	7.533	0.006
3 × 5	1	6.766	0.009
4 × 5	1	143.185	< 0.001
4 × 2	1	20.869	< 0.001

ture kids. This possibility can be examined by comparing the physical strength of females who overcame sexual attacks by men with those who were raped.

Some research has shown that the depictions of greater sperm competition risk lead to greater arousal for men (Pound 2002; Shackelford et al. 2002b; McKibbin et al. 2013). It may be that higher rating for raped women for short versus long term, and higher ratings to women assaulted and raped by three men compared with the non-raped women assaulted by three men may be a result of high sexual arousal with cues of sperm competition, and therefore, increasing sexual motivation. The participants in our study, however, did not rate sexually explicit visual material, suggesting that the methods used here are not complementary with the methods of the cited authors. Furthermore, cues associated with high intensity of sperm competition (i.e., the presence of rival men) need not to be always arousing for men (Prokop 2015). Perhaps, more importantly, third-parties perceive perpetrators also as power-motivated (Perilloux et al. 2014), not only sex-motivated, and this is also different compared with the perception of sexually explicit material.

Third, as Study 2 showed, raped women were perceived as less attractive than assaulted, but non-raped women; however, these results were not influenced by the presence of cues of an STD on the faces of the rapists. In line with this reasoning, Shackelford et al. (2004) found that the risk of sperm competition influences the perceived women's attractiveness more than the risk of being contaminated by an STD. Another study also showed that the perceived risk of transmission of an STD is lower than the risk of unwanted pregnancy (Abel & Burton 2005). One example from magpies, socially monogamous birds, nicely supports the idea that risk of paternity loss is a stronger motivator of female abandonment than the risk of being contaminated. Birkhead (1991) reported an observation of a female magpie who was raped by neighbouring male, but the female's primary partner was the beholder of this incident. The primary partner abandoned the original nest where the raped female laid eggs, and instead of carrying over his original nest, he started to build a new one. Because female magpies are unable to raise an offspring without male assistance (Birkhead 1991), she also abandoned the eggs laid after rape and returned back to the primary partner. Then, she copulated with the primary male again and produced new eggs. This example of *temporary* abandonment clearly suggests that paternity uncertainty was primarily responsible for the initial male rejection of a female, because *definite* abandonment could be expected if the STD hypothesis is true. In humans, women raped by a stranger also *temporarily* broke sexual relationship with their husbands (Foa & Rothbaum 1998).

Finally, the likelihood of unwanted conception from rape is about two times higher than conceptions from consensual sex (Gottschall & Gottschall 2003), and having a child from rape (Holmes et al. 1996) is associated with five times higher likelihood of being rejected by a husband (Kelly et al. 2011). Collectively, the cuckoldry avoidance (Hypothesis 2) seems to be a more reasonable explanation for men's perception of raped women than the STD hypothesis (Hypothesis 1).

According to surveys and crime statistics, between 75% and 90% of the perpetrators are known to the victims (e.g., Cowan 2000; Perilloux et al. 2012). The present research did not address the question whether women presented on the pictures were raped by strangers or by familiar persons. In any

case, however, rape by strangers can be very significant and frequent, particularly during wartime (e.g., Cohen 2013). Perpetrator – victim familiarity would, of course, bring some interesting results, because rape by a familiar person is perceived to be less psychologically harmful than rape by a stranger (Bridges 1991).

The perceived sexual attractiveness of women was mediated by the relationship status of men. As expected, single men perceived women (both raped and non-raped) more positively than those who were involved in a romantic relationship (Hypothesis 3). This is in agreement with Prokop and Fedor (2013) who showed that single individuals are more prone to engage in a casual short-term sexual relationship than non-single individuals. Although some authors did not find any associations between the men's relationship status and perceived attractiveness of photos of opposite-sex faces (Rupp et al. 2009, Brody et al. 2012), none of them investigated attractiveness in the context of the potential costs of mating (i.e., rape). Considering that not *each* husband rejects his raped wife (Kelly et al. 2011), it is possible that men with low mating opportunities may show greater acceptance of victims of rape. Alternatively, single men are more interested in other women in general.

5. LIMITATIONS

Although demand characteristics cannot be eliminated from experiments (e.g., McCambridge et al. 2012), our discussions with students after the experiments finished showed that students were not aware of the research goals of the experiments. Furthermore, the participants were unaware about the existence of the experimental groups, thus they could not predict our true intentions. The second limitation is that there are many reasons beyond disease transmission and pregnancy risk why rape or attempted rape might lower the attractiveness ratings. For example, men could avoid sexually assaulted women because the psychological trauma of sexual assault might lower women's sexual interest and/or ability to form and maintain close romantic relationships. Perhaps, victimisation also shows a lack of male protection, which may have been associated with lower mate quality over human evolution. Third, a more disease-vulnerable male could be less powerful and/or have poor financial condition, and thus have fewer options of sexual partners, which may affect their scoring of the attractiveness of the stimuli. Further research should take these variables into account. Fourth, the male participates might see the victims less attractive as a potential partner because the victims are likely to be very emotional, vulnerable, and highly likely to refuse any kind of relationship when the raping or assaulting just happened. This is a viable alternative against the risk of sperm competition. Manipulations with the period since rape would be helpful in disentangling these two competing alternatives. Fifth, some names can be associated with stereotypes in particular groups (Harari & McDavid 1973), and consequently, it could influence the attractiveness ratings (Erwin & Calev 1984). The random selection of names makes this possibility less likely, but it still remains to be a possible confounding factor.

To conclude, pervasive negative attitudes of men towards the victims of rape may be products of evolved psychological mechanisms activated in men, when the risk of cuckoldry is high. Prejudice towards the rape victims in men's preference for non-raped women (ancestral cues of low risk of cuckoldry) is proposed to reflect the psychological mechanisms that initially evolved because they increased ancestral men's likelihood of investment to their own genes, thereby increasing their own reproductive success. It would be adaptive at least for those men who had high mating opportunities to avoid long-term commitment with a victim of rape to avoid future reproductive costs. Future research is required to investigate relationships between men's mating opportunities, reproductive success, and negative attitudes toward the victims of rape.

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