

## Evolutionary Psychology

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### Original Article

## Evidence of Systematic Bias in Sexual Over- and Underperception of Naturally Occurring Events: A direct Replication of Haselton (2003) in a more Gender-Equal Culture

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**Abstract:** Error Management Theory (Haselton and Buss, 2000; Haselton and Nettle, 2006) maintains that natural selection has engineered adaptations for judgment under uncertainty to minimize the overall cost of making errors, leading to universal biases in judgments of sexual interest in men and women. This study, using a sample of heterosexual Norwegian students ( $n = 308$ ), was carried out as a direct replication of Haselton's (2003) original study of naturally occurring events of sexual misperception. The results strongly supported the main hypotheses in the original study, showing that women reported being subject to opposite-sex sexual overperception far more often relative to underperception, and that this difference was small for men. In support of Error Management Theory, and in contrast to Social Role / Structure Theory expectations, the pattern of misperception for women and men was largely invariant across studies and across demographic groups within a culture. The findings suggest that cross-national differences in the level of gender inequality do not influence reports of sexual over- and underperception in women and men. Beyond sex, factors associated with more sexual overperception relative to underperception were being single, young, and having attitudes condoning casual sex.

**Keywords:** error management, bias, sex differences, sociosexuality, relationships

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### Introduction

The degree to which gender inequality at the cultural level is associated with sex differences in psychology has been heavily debated for two decades. Social Role / Structure Theory (Eagly and Wood, 1999; Wood and Eagly, 2002, 2007) hypothesizes that men and women should converge in their psychological attributes and related behaviors in societies with little or no traditional sexual division between wage labor and domestic labor. In contrast to this view, evolutionary psychology (Buss, 2012; Neuberg, Kenrick, and Schaller, 2010) suggest that current psychological attributes are formed by recurring

problems our ancestors faced over deep evolutionary time. In most domains, men and women faced the same environmental challenges and evolved similar adaptations (e.g., food preferences). In other domains, men and women faced different problems and, hence, evolved different adaptations (e.g., mate preferences). Eagly and Wood (1999) claim that the division of labor between the sexes is “the engine of sex-differentiated behavior, because it summarizes the social constraints under which men and women carry out their lives” (p. 409). Following this logic, the psychologies of men and women should become more similar as men and women are similarly distributed into paid occupations. Evolutionary psychology is not dismissive of cultural influences on behavior (Gangestad, Haselton, and Buss, 2006). On the contrary, the concept of evoked culture offers partial understanding of cultural diversity, for example, with regard to mate preferences that are adaptively contingent upon particular environmental features.

Making inferences about other people’s intentions is part of our psychology and an important task that helps to guide social interactions. In opposite-sex communication, nonverbal cues to sexual interest such as smiles, head nodding, eye contact, and open postures may be hard to separate from those conveying mere friendliness (Haselton and Galperin, 2013). Typically, two types of erroneous inferences can be made: The other person’s true sexual intent can be either underestimated or overestimated. In several studies conducted in the United States, men appear to be biased toward making the latter error—believing that women are sexually interested when, in fact, they are not (Abbey, 1987; Haselton, 2003). Making such an error can potentially intensify conflicts between the sexes if they are acted upon, and the potential costs of having one’s friendly intentions misinterpreted as sexual interest can be quite high. Previous research has linked overperception of sexual and romantic interest by men to sexual harassment of women (unwanted sexual advances, stalking, comments, inappropriate touching, come-ons), assaults, and even rape (Abbey, Jacques-Tiura, and LeBreton, 2011; Abbey, McAuslan, and Ross, 1998; Haselton, 2003; Koenig, Kirkpatrick, and Ketelaar, 2007).

#### *Early empirical findings on sexual overperception*

Sexual overperception was first studied experimentally in the laboratory by Abbey (1982). Male and female participants took part in a 5-minute opposite-sex face-to-face conversation on a topic related to their experiences at the university; half serving as actors, and half as observers of the interaction. Based on judgments made after each conversation, male actors and male observers rated the female actor as more promiscuous and seductive (but not more flirtatious) than female actors and female observers did. Male actors also reported being more sexually attracted to their conversation partners than females reported, and they perceived themselves as being more flirtatious and seductive than the female actors rated them. After the conversation, male observers were also more willing to date the female actor than the reverse. Male observers also rated female actors to be more sexually attracted to and willing to date their partners than female observers did.

#### *Possible explanations of men’s sexual overperception*

Abbey (1982) interpreted these results as a general tendency for men to perceive the world in sexual terms and to make sexual judgments more than women. She suggested that men, but not women, perceive the world through a “sexualized lens” (Harnish, Abbey, and DeBono, 1990) and that this sex difference is assumed to be causally linked to cultural

influences (e.g., how the media portray men and women). Alternative explanations of men's sexual overperception bias have been put forward, suggesting that men are less skilled than women at decoding nonverbal cues (Farris, Treat, Viken, and McFall, 2008; Treat, Viken, Kruschke, and McFall, 2010) (Farris et al., 2008; Treat et al., 2010), or that women's signals of sexual interest are more difficult to discern than men's (Grammer, Kruck, Juette, and Fink, 2000; Place, Todd, Asendorpf, and Penke, 2009) (Grammer et al., 2000; Place et al., 2009). However, this would result in men making more errors overall—overperception as well as underperception. A third perspective suggests that men, more than women, project their own sexual desires onto opposite-sex individuals (Henningsen and Henningsen, 2010; Koenig et al., 2007). Finally, from an evolutionary psychological perspective (Error Management Theory), men's tendency to interpret ambiguous signals from women as sexual interest is an outcome of an adaptation formed over deep evolutionary time to minimize the costs of erroneously judging women's sexual interest (Haselton and Buss, 2000). Because the explanations given by the error management perspective—rather than the alternative perspectives—is most consistent with empirical findings to date, the current paper will focus primarily on the error management perspective.

According to Error Management Theory (EMT), natural selection has engineered adaptations for judgment under uncertainty to minimize the overall cost of making errors (Haselton, 2003; Haselton and Buss, 2000; Haselton and Nettle, 2006). With respect to actions, two types of errors may occur: A person may do something that does not produce the anticipated benefit (false positive), or a person may fail to do something that, if done, would have provided a benefit (false negative). Within domains where the costs of errors are asymmetrical, engineered systems should be biased toward making the less costly error, such as falsely anticipating danger when there is none (e.g., perceiving a long object in a dusky trail as a harmful snake) rather than ignoring danger when it is present. Nesse (2001) suggests that this is typical for human anxiety systems (but see Kennair's (2007) critique of this explanation for all forms of anxiety). This produces more errors overall, but by minimizing the more costly error, overall costs in the long run are reduced (Green and Swets, 1966; Swets, Dawes, and Monahan, 2000). EMT proposes that over deep evolutionary time, the costs of a missed sexual opportunity for men (potentially a missed reproductive opportunity) were greater than the costs of pursuing a disinterested woman (wasted investment of time and energy, loss of opportunities for mating, or social embarrassment). In comparison, the costs for women have been low due to the abundance of males willing to mate (Buss, 2012; Buss and Schmitt, 1993). Therefore, the same cost asymmetry does not characterize women's inferences about men's sexual interest. Given this hypothesized asymmetry, men may have evolved a mind-reading bias that errs toward overperception of sexual interest in women (false positive), minimizing costly errors linked to missed mating opportunities (false negative). A behavioral bias or a cognitive bias would accomplish the same outcome, but the evidence indicates that the bias is a psychological one (Haselton and Galperin, 2013). This sex-specific bias should produce predictable errors in sexual misperceptions of opposite-sex encounters, such that men—but not women—overperceive signals of sexual interest from the opposite sex. If such a bias is universal, it would be possible to document this male bias across cultures and “across different demographic groups, including among men varying in age, ethnicity, and education level” within cultures (Haselton, 2003; p.45).

*Further empirical support for sexual overperception in men*

Since the seminal work by Abbey (1982), a number of studies on American samples—using a variety of measures and methods—have been applied in the study of sexual overperception. La France, Henningsen, Oates, and Shaw (2009) performed a meta-analysis of 28 studies on sexual perception that included studies on face-to-face interactions, photographs, and videotaped segments. Findings from the meta-analysis suggested that male raters tend to find women—as well as men in opposite-sex interactions—significantly more seductive and promiscuous, and somewhat more flirtatious (all indicators of sexual interest) than female raters. Further, in a recent study of dyadic interactions using speed-dating methodology, Perilloux and colleagues found that male participants' estimates of their female conversation partner's sexual interest was moderately ( $d = .57$ ) higher than the women's self-reported interest (Perilloux, Easton, and Buss, 2012).

Other studies have used self-reported judgments of short vignettes (short, impressionistic scenes), scenarios (a synoptical collage of an event or series of actions and events) and statements, all supporting the above findings that men over-infer the sexual interest of women (Abbey and Harnish, 1995; DeSouza, Pierce, Zanelli, and Hutz, 1992; Haselton and Buss, 2000; Kowalski, 1993). Of these, Haselton and Buss's (2000) findings in particular added important information on the generality of these findings. They performed two studies on sexual overperception bias using a variety of measures and controls. In Study 1, the researchers used an eight-item list of behaviors potentially indicative of sexual interest (e.g., talking to, touching, dancing). When judging a woman performing these behaviors, men rated them as indicators of sexual intention. Women showed no tendency to overperceive male targets' sexual interest. However, when imagining their sister performing the same behaviors, no indication of sexual overperception was evident (i.e., men's perception of their sister's sexual intentions fell between women's perception of other women's sexual intentions and women's self-perceptions). Similar findings were reported in a second study using alternative measurements. The results suggested that women's inferences about men's sexual intent were accurate, and that men's perceptions of their sisters' sexual intent (unlike perceptions of non-related women) were fairly accurate.

Sexual overperception in men has also been found in a study using experimental priming. After inducing a romantic mood and encouraging participants to search for potential mates, Maner et al. (2005) found that men, but not women, perceived more sexual arousal in opposite sex attractive targets' neutral facial expressions.

Finally, four papers (covering six studies) have been published on naturally occurring events of sexual misperception. In the first of these, Abbey (1987) asked participants if they had ever “been friendly to someone of the opposite sex only to discover that she/he had misperceived your friendliness as a sexual come-on, you were just trying to be nice but she/he assumed you were sexually attracted to her/him?” (p. 176). Significantly more women (72%) than men (60%) reported this occurring at some time during their lives, but lifetime frequency was similar (4.8) for both sexes.

Haselton (2003) replicated and extended Abbey's first study, measuring lifetime prevalence and last year frequency of misperception separately. Furthermore, Haselton split the original statement into two less complex statements, and added two items measuring underperception. In addition, several predictors were included for predicting errors overall

as well as the proportion of false alarms. In line with Abbey's (1987) results, a larger proportion of women reported at least one occurrence of sexual overperception by the opposite sex. Furthermore, women reported a higher average frequency of sexual overperception events within the last year than men.

In two online studies of opposite-sex friendship pairs, Koenig and colleagues (Koenig et al., 2007) compared perceived sexual interest with self-reported actual interest in casual sex with the opposite-sex friend among young American males and females. Only male participants significantly overperceived their friends' sexual interest, but the effect was small (Study 1:  $d = .22$ ; Study 2:  $d = .28$ ). Male participants' actual interest in casual sex was much higher than females' actual interest. This sex difference was markedly stronger than the sex difference in *perceived* opposite-sex interest in both studies (women reported higher scores). To the extent that opposite-sex friendships are comparable to judgments of other types of opposite-sex experiences with regard to judgments of sexual interest, Koenig et al.'s (2007) findings are supportive of a sexual overperception bias in men.

#### *Empirical support for sexual underperception in women*

Compared to sexual overperception, sexual underperception has received much less empirical and theoretical attention. Although male actors in Abbey's (1982) experiment reported more sexual interest than either female actors or female observers, underperception by women was not discussed explicitly. However, La France et al.'s (2009) meta-analysis suggests some underperception of sexual interest by women evaluating male targets. Furthermore, in their study of dyadic interactions using speed-meeting methodology, Perilloux et al. (2012) found that women's estimates of their male speed-meeting partner's sexual interest was markedly lower ( $d = .61$ ) than men's self-reported interest. For naturally occurring events, Koenig et al. (2007) found evidence that women underperceived sexual interest in opposite-sex friendships in both of their studies (Study 1:  $d = .25$ ; Study 2:  $d = .31$ ). Finally, in Haselton's (2003) study of natural occurring events suggests that men—markedly more frequently than women—report having been subject to sexual underperception, but no statistical test for sex differences in underperception was provided.

#### *The current study*

Although several studies have reported on sexual misperception from naturally occurring events using a variety of methods, to date no direct replication of Haselton (2003) has been performed on frequency of opposite-sex misperceptions. Norway is one of the world's most gender egalitarian cultures (Bendixen and Kennair, in press; Grøntvedt and Kennair, 2013). Using a sample of Norwegian undergraduate students, this study was carried out to test several predictions informed by Error Management Theory. Of particular interest was to examine the extent that cross-sex mind-reading adaptations vary across cultures, and if the patterns of sexual misperception bias documented in prior research hold up across different demographic groups within a culture.

The following three hypotheses originally from Haselton (2003) are tested:

(H1) The percentage of women who report having at least one lifetime experience in which a man overperceived their sexual intent will be larger than the percentage who report an experience in which a man underperceived their sexual intent.

(H2) Women will report more instances within the last year in which their sexual intent was overperceived by a man than in which it was underperceived.

(H3) Differences between men's sexual overperception and underperception experiences should be non-existent or markedly smaller than the differences between women's experiences.

In its current form, Error Management Theory does not provide an explanation for sexual underperception bias in women, nor is it incorporated in the theory, but prior research suggests that women more than men underperceive opposite-sex signals of sexual interest (Koenig et al., 2007; Perilloux et al., 2012). The following additional hypothesis regarding sex differences in sexual underperception is tested:

(H4) Men will report more instances than women within the last year in which their sexual intent was underperceived.

Despite its long history of women's rights movements, the United States is currently ranked 42<sup>nd</sup> on the UN Gender inequality index, down from 37<sup>th</sup> in 2008. In comparison, Norway is regularly ranked among the five most gender egalitarian nations in the world (see Human Development Reports available at: <http://hdr.undp.org/en/reports/global/hdr2010/> and at: [http://issuu.com/undp/docs/hdr\\_2013\\_en](http://issuu.com/undp/docs/hdr_2013_en)). Both female labor force participation rates and proportion of seats in parliament are markedly higher in Scandinavia than in the USA (ibid). Furthermore, on the broader Inequality index measuring health, education and income inequalities, the United States is currently ranked 16<sup>th</sup> whereas Norway is ranked on top with the other Scandinavian countries. This does not mean that Norway and the other Scandinavian countries are truly egalitarian, or that women hold social positions equal to men in every respect, but that the relative differences between rich and poor and between women and men are markedly smaller in Scandinavia than in North America.

Social Role Theory (SRT) predicts the demise of many sex differences with increasing gender equality within a society. Whether this prediction covers sex differences (i.e., male bias) in perceptions of signals of sexual interest in the opposite sex is not explicitly stated, but it may be inferred from the theory that sex differences in sexual misperception reflect unequal opportunities for women and men manifested in a culture's societal structures (i.e., gender inequality). Conversely, Error Management Theory (EMT) posits a bias in men that will not depend on a culture's level of gender inequality, and adding to the universality of this bias, Haselton (2003) suggests that patterns of sex differences in misperception should hold up across different demographic groups within a culture.

The following competing hypotheses are tested regarding the universality of sex differences in misperception:

(H5\_SRT) Social Roles/Structure Theory predicts that men's reports of (being subject to) opposite-sex misperception will be more similar to women's in a culture ranked higher in gender egalitarianism (Norway) compared to a culture ranked lower in gender egalitarianism (USA). SRT also predicts that the patterns of opposite-sex misperception for men should be more similar to those of women across demographic groups within a gender equal culture.

(H5\_EMT) Error Management Theory predicts that men's reports of opposite-sex misperceptions will not be more similar to women's in a culture ranked higher in gender egalitarianism (Norway) compared to a culture ranked lower in gender egalitarianism (USA) and that these patterns will not vary across demographic groups within a culture.

Prior studies on individual differences in misperception have shown that self-reported attractiveness (e.g., youth and mate value) is positively associated with reports of being subject to sexual overperception (Haselton, 2003; Perilloux et al., 2012). Furthermore, Perilloux et al. (2012) found that men's attitudes towards unrestricted sex (as measured with the SOI-R; Penke and Asendorpf, 2008) was positively correlated with overperceiving speed-dating partners' sexual intentions. Adding to this, unrestricted sociosexuality (behavior and attitudes) is reported to predict being subject to sexual harassment (Kennair and Bendixen, 2012). Although neither Haselton (2003) nor Henningsen and Henningsen (2010) found any effect of number of relationship experiences or current dating status on men's and women's perceptions of sexual interest, being single—a cue to sexual availability—could increase young men and women's likelihood of being subject to opposite-sex sexual overperception.

The following hypothesis regarding the relationship between individual differences and misperception is tested:

(H6) We would expect higher levels of being subject to sexual overperception relative to underperception among attractive (i.e., young, single, or high mate value) participants as opposed to less attractive participants, and among participants with unrestricted relative to restricted sociosexual orientation.

## **Materials and Methods**

### *Participants*

Participants were undergraduate students attending lectures in Social and Natural sciences at the Norwegian University of Science and Technology. Response rate was 86% (344 out of 400 questionnaires returned). Inspection of the data with various statistical procedures identified eight statistical extreme and improbable cases. These cases were removed prior to analysis. The final sample eligible for analysis of sexual misperception consisted of 181 heterosexual women and 127 heterosexual men aged between 18 and 30 years. The average age of the women and men was 22.4 ( $SD = 1.9$ ) and 22.9 ( $SD = 2.1$ ), respectively.

### *Procedure*

Two research assistants, one male and one female, informed briefly on the study "Sexually interested or just friendly? A study of misperception of signals" during lecture breaks. Instructions read: "The purpose of this study is to examine experiences of misperceptions among Norwegian students with regard to signals of friendliness and sexual interest toward the opposite sex. Our findings will be subject to cross-national comparisons." Students were then invited to participate. Participation was voluntary and the students were assured that their responses would remain completely anonymous. No personal identification was to be written on the questionnaire. Completed questionnaires were folded and returned to a box at the podium. No course credit was given for

participation.

### *Measurements*

*Biographical and personality information.* Two questions regarding *relationship experiences* were posted: (1) “Are you currently in a serious relationship?” (No/Yes), and (2) “In how many serious relationships have you been?” (open response alternative). Forty-three percent of the sample was in a current relationship (48% women and 37% men). The average number of total serious relationships was 1.5 for both sexes. *Mate attractiveness* was measured with the two global items used by Haselton (2003): (1) “Compared with other women [men] you know who are about your age, how desirable do men [women] find you as a long-term mate or marriage partner?” and (2) “Compared with other women [men] you know who are about your age, how desirable do men [women] find you as a short-term or casual sex partner?” Participants rated their attractiveness on a 7-point response scale with the anchors “Well below average” (1) and “Well above average” (7) for each mate value question. Scores were aggregated to form a Mate value scale. Participants completed the Attitude and the Desire components of the *Sociosexuality Orientation inventory* (SOI-R; Penke and Asendorpf, 2008). Internal consistency for each component was good ( $\alpha = .84$  and  $\alpha = .88$  for the three-items Attitude and Desire components, respectively). The two components were treated as separate variables throughout the analysis.

*Sexual misperception questionnaire.* Instructions and wording of questions on sexual overperception (SOP) and sexual underperception (SUP) were identical to those used by Haselton (2003): (SOP\_1) “Have you ever been *friendly* to someone of the opposite sex only to discover that he [she] had misperceived your friendliness as a sexual come-on?”; (SOP\_2) “Have you ever been in a situation with a member of the opposite sex in which you were *just trying to be nice* but he [she] assumed you were sexually attracted to him [her]?”; (SUP\_1) “Have you ever attempted to *sexually ‘come-on’* to someone of the opposite sex only to discover that he [she] had misperceived your sexual interest as friendliness?”; and (SUP\_2) “Have you ever been in a situation with a member of the opposite sex in which you were *sexually attracted* to him [her] but he [she] assumed you were just trying to be nice?” Response alternatives were No/Yes, and “if yes, how many times in the past 12 months” (open response alternative). To enhance comparison with the original study, computations of ever prevalence and last year frequency scales scores were identical to those used by Haselton (2003).<sup>1</sup>

### *Analyses*

For measures of lifetime prevalence (No/Yes), and for last year’s frequency, a two-way (2 x 2) mixed design ANOVA was conducted with type of error (SOP versus SUP) as a within-subject factor and sex of participant (women = 1, men = 2) as a between-subjects factor. This analysis provides three effects: within-subjects effects (“profiles” for SOP versus SUP), sex by type of error interaction effects, and between-subjects (sex) effects (Tabachnick and Fidell, 2001). A three-way (2 x 2 x 2) mixed design ANCOVA was applied for predicting last year’s frequency of misperception over and beyond the effects of

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<sup>1</sup> Imputation (mean substitution) of missing data (5%) for the last year frequency items.



sex of participant. Current Relationship Status (single vs. going steady) was added as a between factor, and the continuous variables Age, Mate Value, SOI-Attitudes, and SOI-Desire were added as covariates.<sup>2</sup> This analysis provides information on (1) whether the additional variables *interact* with sexual misperception (i.e., altering the profiles of sexual misperception, as well as the profiles for women and men) and (2) whether the additional variables affect the overall *level* of sexual misperception (i.e., main between subjects effect). This analytical strategy diverges from Haselton's (2003), who used regression analysis of the total number of errors (OER = SOP + SUP) and False alarm rates (SOP/OER), but has the advantage of retaining all cases. Assumptions for performing repeated measures ANOVA/ANCOVA were checked (Normality of distribution and Sphericity). No problems were identified. Effect sizes reported are Partial Eta Squared ( $\eta^2$ ) and Cohen's *d*.<sup>3</sup>

## **Results**

### *Replicating Haselton's (2003) findings on level of misperception*

Descriptive statistics suggest that type of error was strongly related to the participant's sex. As shown in Figure 1, a higher proportion of women reported sexual overperception at some time in their life than men (88.3% vs. 70.6%), and a lower proportion of women reported sexual underperception than men (39.4% vs. 74.6%). Overperception was more common than underperception,  $F(1,304) = 50.64, p < .001, \eta^2 = .143, d = 0.82$ . Type of error was qualified by an interaction between sex of participant and type of error,  $F(1,304) = 70.12, p < .001, \eta^2 = .187, d = 0.96$ . More men than women reported being subject to sexual misperception of some kind from members of the opposite sex,  $F(1,304) = 5.15, p < .05$ , but the sex difference amounted to only a quarter of a standard deviation unit ( $d = 0.26$ ).

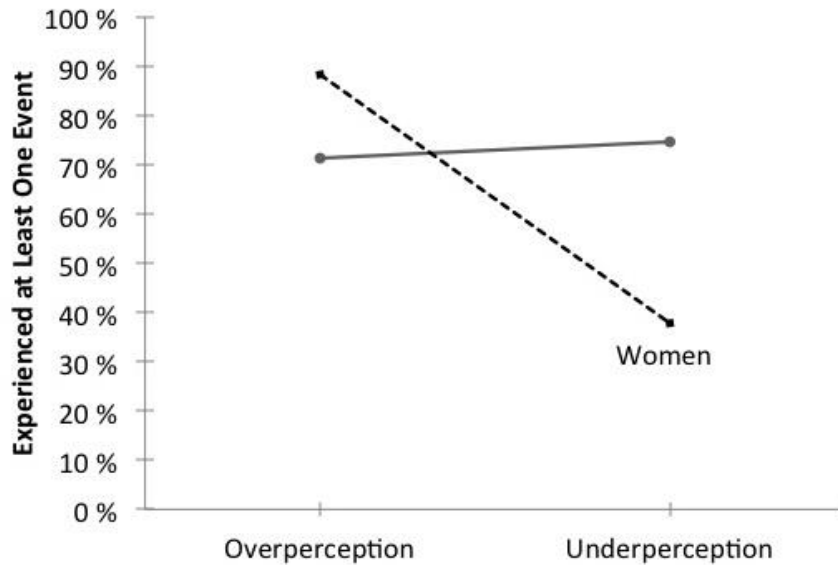
Reporting on the last year only, overperception was more frequent than underperception,  $F(1,306) = 101.08, p < .001, \eta^2 = .248, d = 1.15$ . This effect was qualified by an interaction between sex of participant and type of error,  $F(1,306) = 41.04, p < .001, \eta^2 = .118, d = 0.73$ . As evident from Figure 2, women reported a moderately higher frequency of opposite-sex overperception than men,  $t(306) = -3.99, p < .001, d = -.46$ , whereas men reported a moderately higher frequency of underperception than women,  $t(306) = 4.58, p < .001, d = .53$ . When the data were split by sex of participant, women reported being subject to SOP far more frequently than SUP,  $t(180) = 10.76, r = .30, p < .001, d = 0.94$ . For men, this difference was markedly smaller,  $t(126) = 3.76, r = .62, p < .001, d = 0.29$ . The overall level of misperception did not differ significantly for women and men,  $F(1,306) = 2.92, ns. (d = -.20)$ .

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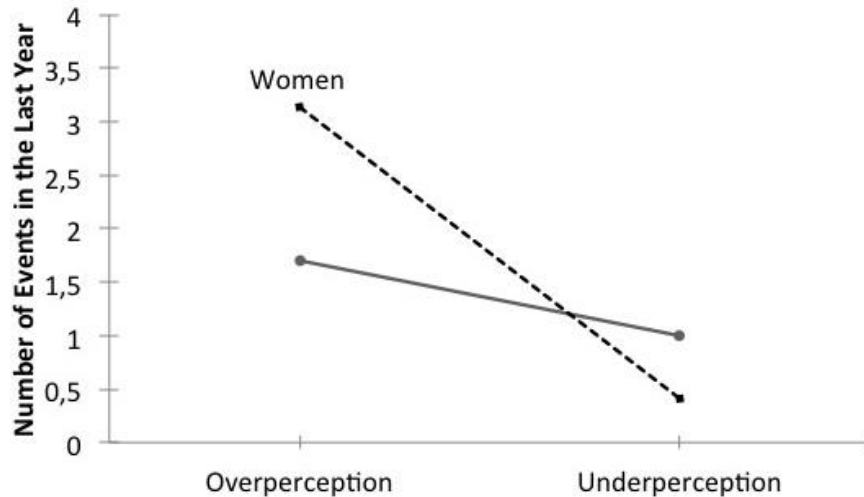
<sup>2</sup> Prior to running the ANCOVA, Delaney and Maxwell (1981) suggest that all continuous covariates should be standardized to prevent changes in the main effects.

<sup>3</sup> Cohen's (1988) guidelines for interpreting  $\eta^2$  effects are; Small: 0.01, medium: 0.059, and large: 0.138. The corresponding *d*-values for these effects are 0.20, 0.50, and 0.80.

**Figure 1.** Proportion of participants reporting that a member of the opposite sex misperceived their sexual intent



**Figure 2.** Mean number of reported misperceptions of sexual intent by members of the opposite sex within the last year



*Predicting last year frequency of misperception*

Associations among the predictors showed that women reported significantly higher levels of sociosexual restrictedness than men on both measures of sociosexuality (bi-serial correlations, SOI-attitudes:  $r = .28$ ; SOI-desire:  $r = .39$ ). Partnered participants reported higher mate value than singles (bi-serial  $r = .25$ ) and had markedly lower scores on SOI-desire (bi-serial  $r = -.47$ ). SOI-attitudes and SOI-desire showed considerable overlap ( $r = .45$ ). The correlations among the predictors did not differ significantly for men and women, but the correlation between sexual overperception and sexual underperception was stronger for men ( $r = .62$ ) than for women ( $r = .30$ ),  $Z = 3.55$ ,  $p < .001$ .

The ANCOVA showed that the sexual misperception profiles for women and men were marginally affected by the inclusion of the following predictors in the analysis:

participant's age, relationship status, mate value, and sociosexuality. As evident from Table 1, when controlling for the effect of these variables, women—relative to men—still reported being subject to sexual overperception far more frequent than to underperception ( $\eta^2 = .126$ ,  $d = .76$ ). Next, looking at the effect of each of the predictors on the type of errors reported showed that relationship status did not interact with type of error. This suggests that the profiles for singles and those going steady were parallel. The three-way sex by relationship status by type of error interaction was also not significant, suggesting that the sexual misperception profiles for men and women were similar for single and partnered participants. Women reported far more SOP over SUP regardless of being single or partnered, whereas the number of SOP instances was only marginally higher than SUP for single and partnered men.

**Table 1.** Repeated measures Analysis of Covariance with frequency of being misperceived (sexual overperceived vs. sexual underperceived) as within-subject factor

Within-Subjects Effects	<i>MS</i>	<i>df</i>	<i>F</i>	<i>p</i>	$\eta^2$
Misperceived (SOP vs. SUP)	364.78	1	99.28	***	.253
Misperceived x Sex	154.75	1	42.12	***	.126
Misperceived x Rel. Status	7.04	1	1.92	ns	.006
Misperceived x Sex x Rel.Status	7.37	1	2.01	ns	.007
Misperceived x Age	49.67	1	13.52	***	.044
Misperceived x Mate value	4.53	1	1.23	ns	.004
Misperceived x SOI-Attitudes	43.55	1	11.85	***	.039
Misperceived x SOI-Desire	0.22	1	0.06	ns	.000
Error	3.67	293			
Between-Subjects Effects (Overall Misperception)					
Sex	70.41	1	11.35	***	.037
Relationship Status	68.93	1	11.11	***	.037
Sex x Relationship Status	0.12	1	0.02	ns	.000
Age	33.90	1	5.46	*	.018
Mate Value	1.76	1	0.28	ns	.001
SOI-Attitudes	28.95	1	4.67	*	.016
SOI-Desire	37.03	1	5.97	*	.020
Error	6.20	293			

Note. ns = Not significant, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , *MS* = Mean Square, Rel. Status = Relationship Status, SOI = Sociosexuality Orientation Index, SOP = Sexual overperception, SUP = Sexual underperception.

The sexual misperception profiles were qualified by some covariate interactions. The misperception profiles for participants in the lower age range of the distribution differed significantly from those older,  $\eta^2 = .044$ ,  $d = .43$ . Evidently, compared to older participants, younger participants reported being subject to more sexual overperception than to underperception. Post-hoc analysis suggests that this effect was qualified by a sex by age by Type of error interaction, showing that age interacted significantly with type of

error for women,  $F(1,170) = 12.04$ ,  $p < .001$ , but not for men,  $F(1,119) = 1.99$ . The sexual misperception profiles were not qualified by mate value. Further, controlling for the effect of the other predictors, the profiles for sexually unrestricted participants (scoring high on SOI-attitudes) differed from those who were more restricted in such a way that unrestricted participants reported more SOP over SUP (false alarms) than restricted participants. The desire component did not affect the misperception profiles over and above the effect of the other predictors.

In addition to the above interaction effects, several main (between-subjects) misperception effects were significant. When the effect of the other predictors was accounted for, women reported being subject to more overall misperception than men ( $\eta^2 = .037$ ,  $d = .39$ ). This was due to relatively higher frequency of sexual overperception than underperception (false alarms). Further, slightly more overall misperception was reported for singles than for those partnered ( $\eta^2 = .037$ ,  $d = .39$ ). Also, young participants reported being subject to higher levels of overall misperception than older ( $\eta^2 = .018$ ,  $d = .27$ ). Finally, both SOI components were significantly related to overall misperception, with unrestricted participants reporting higher frequencies. None of these overall misperception effects were strong.

## **Discussion**

All three original EMT generated hypotheses were strongly supported. More women reported being subject to sexual overperception than to sexual underperception at least once during their life (Hypothesis 1), and women reported higher frequencies of being sexually overperceived than sexually underperceived within the last year (Hypothesis 2). Further, relative to women, the difference between men's experiences of overperception and underperception was markedly smaller (Hypothesis 3). In addition, Hypothesis 4 was also supported, as men reported being subject to more instances of sexual underperception than women. The results show strong similarities between the patterns of opposite-sex misperception in Haselton (2003) and this study.<sup>4</sup> In addition, the pattern of misperception of men and women held up across demographic groups differing in relationship status (singles versus partnered participants). Hence, Hypothesis 5 was supportive of Error Management Theory. The results did not support the Social Role/Structure informed hypothesis that men's reports of opposite-sex misperception would be more similar to women's in a culture ranked higher in gender egalitarianism. In support of Hypothesis 6, being subject to sexual overperception relative to underperception was reported more frequently among younger participants, among singles, and among participants with an unrestricted sociosexual orientation. However, self-reported mate value did not produce the expected positive association with being subject to sexual overperception relative to underperception. Sex differences in misperception profiles were robust and only slightly affected by participant age and sociosexuality.

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<sup>4</sup> Formula 5.2 in Cortina and Nouri (2000) for dependent samples was applied using the square root of  $F$ -values,  $ns$ , and the correlation from the original paper. Differences in sexual overperception over underperception in Haselton's (2003) study were estimated to  $d = 0.80$  for women and  $d = .16$  for men.

In addition to replicating the main findings in Haselton (2003), the current study also supports the prior finding that unrestricted sociosexuality is associated with more overall frequency of misperception. However, the remaining predictors of overall frequency of misperception showed some deviations from those reported in Haselton's final regression model. In contrast to findings reported by Haselton (2003), the current study found that women reported more overall misperception when the effects of the other variables were accounted for. The same held true for young participants and singles. The analyses of interactions in this study are largely comparable to the regression analysis of false alarm bias reported in Haselton (2003). Similar to the original study, women reported far more sexual overperception relative to underperception in this study, and relationship status was not associated with false alarms. However, several of the factors related to false alarms diverged between the two studies. In the current study, being in the lower end of the age range (particularly for women) and having unrestricted sociosexual attitudes were associated with reports of more overperception relative to underperception, whereas no effect was reported in the original study. As men generally prioritize youth and good looks higher than women when seeking a mate (Buss, 1989; Grøntvedt and Kennair, 2013; Lippa, 2007), we would expect participants holding these qualities to be more subject to sexual overperception. In addition, because people in the lower end of this age distribution tend to go to bars and parties more often than those who are older, and as it is more common for men to approach women in these settings than vice versa, young women may be disproportionately subject to sexual overperception by men. Hence, this effect may partly stem from base-rate opportunities that differ across the age span and between sexes.

Students going steady reported significantly lower frequencies of both over- and underperception, but the pattern of misperception remained unaffected by relationship status. One of the few studies that have compared relationship status with regard to sexual overperception did not find any effect in face-to-face dyadic conversations (Henningsen and Henningsen, 2010). When reporting on naturally occurring events, however, the relationship group effect could be due to lesser opportunities for misreading signals of sexual interest and friendliness among those partnered. In addition, people with whom they interact would often have knowledge of their relationship status, and thus give partnered men and women the benefit of the doubt, assuming that ambiguous signals are not sexual. Finally, the effect may simply be due to participants discounting their current partner when reporting on misperception.

In contrast to Haselton's (2003) findings, the analysis of self-reported mate value in this study suggests that participants who consider themselves attractive partners are not subject to sexual overperception more than less attractive partners. Some caution to this finding is warranted for two reasons: (1) The use of two single-item global measures of mate value (rather than the 9-item Mate Value Index used by Haselton) may not have discriminated well enough between respondents' levels of mate attractiveness; and (2) the effects of self-reported mate value on perception of sexual interest may diverge markedly from the effects of actual mate value as perceived by others. Perilloux et al. (2012) reported that men's self-ratings of their attractiveness correlated positively with overestimation of sexual interest from their dating partners, whereas the more physically attractive men actually were to women in a speed dating situation, the more likely the men were to underperceive sexual interest from their dating partners.

Sociosexuality affected over- and underperception in such a way that participants with unrestricted *attitudes* reported more frequent sexual overperception relative to underperception than restricted participants. However, the misperception profiles were not affected by individual differences in desire over and above the effects of the other predictors in the study. However, since the two SOI dimensions are strongly correlated this finding may be a spurious one undermining the effect of desire. Evidently, SOI-desire affects the profiles of misperception when SOI-attitudes are removed from the ANCOVA in such a way that those who fantasize and are easily aroused by someone they are not in a relationship with feel that others tend to underperceive rather than overperceive their sexual interest. This finding suggests that there may be some value in examining the effect of SOI dimensions separately. Sociosexuality did not predict false alarm bias (overperception relative to overall misperception) in Haselton's (2003) original study, but the finding from the current study corresponds well with that of Perilloux et al. (2012). Endorsing and being more open to casual sex may have evoked more sexual interest from members of the opposite sex, leading to more frequent reports of sexual overperception. In a recent paper, socially unrestricted male and female high school students were found to report being more subject to sexual harassment as well as sexually harassing others (Kennair and Bendixen, 2012). From the above, it is possible that being subject to sexual overperception may explain the link between sociosexuality and being subject to sexual harassment.

#### *Methodological limitations and future directions*

Information and instructions on the questionnaire explicitly referred to judgment of misperception of signals, without revealing the purpose examining sex differences. Still, this may have affected the participant's report of sexual misperception as suggested by Abbey (1987). On the other hand, the prevalence, frequency, and pattern of sex differences regarding misperception in this study were equal to those reported by Haselton (2003), suggesting that this information need not significantly influence the students' reports of naturally occurring event of sexual misperception.

Further, the instructions on the questionnaire did not specify what social events or relationships to include or disregard when reporting on misperceptions. As suggested above, the lower overall levels of misperception reported among participants currently in a relationship compared to singles could be an effect of discounting their relationship partner when considering potential events of sexual over- and underperception. A possible resolution to the issue of different interpretations for those in relationships vs. single could be to ask participants to specify whether opposite-sex misperceptions were performed by a partner or not. This would, however, complicate responding considerably and should not be carried out without careful consideration and pretesting. Alternatively, one could instruct participants to consider occurrences that do not involve their relationship partner. Future studies will show if such instructions influence the level of misperception leaving the sex-typical pattern of over- and underperception unaffected.

Future studies could also benefit from establishing some kind of baseline to measure the proportion rather than the rate (frequency) of misperception. By having participants first estimate the number of instances they signaled friendliness (being nice) or sexual interest (being attracted to), and then separately estimate the number of opposite-sex misperceptions, one can establish a baseline of such encounters and calculate the proportion of sexual over- and underperception. For longer recall periods this would be

very hard to do, and future studies would benefit from more regular and repeated measurement of misperceptions over a short specified period of time (i.e., a repeated measures design) to provide better control for potential memory effects.

Detecting and recalling false-positive errors may be easier than detecting false-negative errors because overt behavior marks the error. This may partially account for the higher reported prevalence and frequency of overperception relative to underperception. Possibly, men may be more overt in expressing their sexual interest than women. Still, detecting cues to sexual behavior (invitation, touching) and friendly behavior (attention, smile) is unlikely to be systematically different for men and women. Similarly, it is unlikely that men recall misperception occurrences systematically different from women. However, future experimental studies should examine if men convey signals of sexual interest in a more overt way than women do, and if men and women differ in their detection of these signals.

### *Conclusion*

The general pattern of findings suggests that this study of Norwegian students—using identical methodology—closely replicates Haselton's (2003) original findings of sex biases in sexual misperception of naturally occurring events. Of considerable theoretical importance is that these sex differences in opposite-sex misperception do not seem to reflect differential social roles or unequal opportunities for women and men manifested in a culture's societal structures. Similar findings across cultures (cultures that diverge in level of gender equality) and across demographic groups within a culture attest to the robustness of (1) the sexual overperception bias in men and (2) the sexual underperception in women in naturally occurring events. Although men report slightly more sexual overperception than underperception from members of the opposite sex, the relative difference is markedly smaller than for women, as predicted by Error Management Theory.

Buss (2003) hypothesized that women possess a sexual underperception bias, and there is accumulating evidence that women more than men tend to underestimate signals of sexual interest from members of the opposite sex to minimize costly errors associated with mating. If these findings reflect a true evolved cognitive bias, sexual underperception could be contained within Error Management Theory. Buss suggested that sexual underperception bias may have benefitted women by discouraging unwanted sexual advances, by encouraging interested men to try harder, and by avoiding a reputation as promiscuous. The latter could possibly have guarded against sexual coercion.

However, any strategy comes with a cost, and outcomes are uncertain. Potential costs for underperceiving sexual interest could have been harassment, hostility, or even sexual coercion. Also, a reputation as being sexually unapproachable or inaccessible could be costly. If our ancestral mothers who perceived men's sexual interest as mere friendliness had a net benefit from applying such a strategy, a cognitive bias may have evolved. Other possible explanations for the underperception bias could be that these findings reflect reporting bias (Perilloux et al., 2012) or some projective process making false beliefs come true (Koenig et al., 2007). The question of whether these findings reflect a true cognitive bias, reporting bias, or projective processes should be subject to future studies.

Prior cross-sectional research has found that sexual overperception bias in men may be a risk factor for sexually harassing or coercing others (Abbey et al., 2011). Similar outcomes may follow for women who overperceive sexual interest in men, but to date this

has not been subject to study. However, reporting on one's judgments of misperceptions of other's intentions is far more difficult than reporting on one's own intentions on being misread, leaving considerable uncertainty as to which type of sexual overperception is causally linked to sexual harassment and coerciveness. A possible avenue to resolve this issue could be to study the association between being misperceived and being sexually harassed (or coerced), controlling for individual levels of sociosexuality. Also, the association between being subject to sexual underperception and sexually harassing or coercing others should be studied. Given the extent to which opposite-sex underperception is interpreted as a form of sexual rejection, this possibly may translate into sexual harassment or sexually coercive behavior.

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