Error Management Theory, Signal Detection Theory, and the male sexual overperception effect

by

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B.A., North Dakota State University, 2014

A THESIS

submitted in partial fulfillment of the requirements for the degree

MASTER OF SCIENCE

Department of Psychological Sciences
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2019

Approved by:

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Abstract

Men seem to misperceive women's friendliness as sexual interest, known as male sexual overperception. Behaviors communicating sexual interest and disinterest were collected, evaluated, and combined into vignettes that were used to study male sexual overperception through a Signal Detection Theory (SDT) perspective and an Error Management Theory (EMT) perspective. SDT results revealed that sensitivity to the difference between signals of sexual interest and disinterest drove participants' perceptions, rather than an overall bias to perceive sexual interest. Cues of interest were generally underperceived, but women were slightly more biased to perceive interest than men, who tended to perceive no interest. Sensitivity and accuracy were extremely high and did not differ between the sexes. Individual differences such as life history strategy, mating strategy, and mate value did not affect sensitivity or bias. EMT analysis also found an overall underperception of sexual interest, but contradictory to the SDT results, found that men were perceiving nearly the same amount of sexual interest as women. Further examination revealed that these different results were due to EMT using difference scores that did not accurately reflect the average levels of perception for men and women due to their calculation. While the previously researched "male sexual overperception effect" was not found, these studies show that sexual communication may be more nuanced than previously thought. Additionally, these studies establish SDT as a viable methodology for exploring sexual communication and show that SDT methods can be used on biases typically studied with EMT. SDT analyses were more reflective of the raw data, provided more information in standardized, comparable measurements, incorporated individual differences, and did not lose information to aggregation. Future research on biases examined with EMT should incorporate SDT analyses to explore topics more deeply.

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Acknowledgements

I would like to thank everyone who has helped on these projects: my advisor, Dr. Gary Brase, for his support, time, guidance, and feedback throughout this and the rest of my graduate school career; my committee members, Dr. Michael Young for his statistical expertise and advice and Dr. Donald Saucier for his input and instruction; my friends and fellow graduate students, Maverick Smith, Kevin Kenney, Nora Balboa, Chase Hood, Kimberly Newberry, and Nathaniel Voss for their unwavering encouragement, coding skills, and editing expertise; my friend Sydni Huxman for her assistance, editing, and optimism; my amazing previous and current undergraduate collaborators, Taylor Beashore, Katherine Kolze, Doris Ma, Cade Graber, Jamie Yearout, and Lindsay Chassay for their help sorting and cleaning data; my family and friends for believing in me; and finally, my fiancé Theodore Moser for supporting me, cheering me on, and keeping my life balanced.

Chapter 1 - Introduction

Sexual communication has always been difficult; however, this difficulty may be at least in part due to men misperceiving a woman's mere friendliness as sexual interest, known as the male sexual overperception effect. This effect was first shown empirically in a study that had a man and woman talk for five minutes while an additional man and woman observed. Both the man in the conversation and the man observing the conversation rated the woman in the conversation as behaving more seductively than either the woman in the conversation or the woman observer ranked her (Abbey, 1982). Moreover, this effect translates to still photographs as well; men judge women photographed speaking to men as more sexy, seductive, and promiscuous than women do (Abbey & Melby, 1986).

Numerous studies have also shown men overperceiving women's sexual interest. In 1989, Saal, Johnson, and Weber replicated the initial face-to-face interaction method, with men perceiving more sexiness in the women's actions than women. Additionally, they extended the method to include videotaped interactions of a male manager and female cashier and a male professor and a female student. Once again, the effect replicated, with male viewers perceiving more sexual intent than female viewers (Saal, et al., 1989). This methodology was then altered to include 12 videos of professors with opposite-sex students behaving in varying levels of sexual ways, from non-sexually offering textbooks to help the student to inviting the student to their house to discuss assignments, listen to music, and drink wine (Johnson, Stockdale, & Saal, 1991). Once again, results showed male viewers perceiving women as behaving sexier than female viewers did, regardless of her position (i.e. professor/student), the level of sexual behavior, or how the other person responded.

Another study videotaped, audiotaped, and photographed two opposite sex partners engaging in conversation (Edmondson & Conger, 1995). Ratings from observers of all presentation forms (i.e. in-person, video, audio, and photo) were recorded. Once again, male participants and observers perceived more sexuality from the women in the interaction than female participants and observers did. Men also indicated that the women wanted to have future interactions with their partner more than women did. Interestingly, the less information an observer had, for example through a photo rather than an in-person observation, the more likely they were to rate the woman as behaving sexually and desiring future interactions. However, additional face-to-face studies continue to replicate men overperceiving women's sexual interest (e.g. Henningsen & Henningsen, 2010; Perilloux, Easton, & Buss, 2012).

Male sexual overperception has also been shown using described behaviors, with men perceiving 25 of 27 female behaviors more sexually than women perceive them, whereas for men's behaviors there were only sex differences in perceptions for about half of the behaviors (Kowalski, 1993). More recent research found men rating behaviors such as approaching a coworker and smiling, reducing the distance between people to a few inches, prolonged eye contact, and dancing provocatively, amongst others as more indicative of sexual interest than women (Haselton & Buss, 2000).

When these behaviors are combined to form vignettes, the effect persists. DeSouza, Pierce, Zanelli, & Hutz (1992) used four vignettes of undergraduates meeting at a party to compare Brazilian and American perceptions. Participants were asked to what degree each person had communicated a willingness to have sex and each person's expectation of having sex, which was combined into a sexual intent index. The results showed that American men perceived more sexual intent than American women and that while non-significant, Brazilian

men similarly had higher ratings of sexual intent than Brazilian women. Abbey and Harnish (1995) found that when viewing four vignettes describing opposite sex individuals meeting in a variety of scenarios, men rated the women in the vignettes as being more sexual than women rated the same woman. More recently, 17 male and 17 female vignettes were rated for how interested in sex the portrayed individual was in sex (Fisher & Walters, 2003). Results indicated that men were perceiving sexual interest more often than women, although that was not significantly dependent on the target's sex.

Additional studies have replicated the sexual overperception effect beyond lab conditions. Abbey (1987) showed that more women than men indicated their friendliness had been misinterpreted as sexual interest in past interactions. Additional survey methods indicate that women report more men overperceiving their interest than underperceiving it, while men reported about equal numbers of women overperceiving and underperceiving their sexual interest, in the US (Haselton, 2003) as well as Norway (Bendixen, 2014) and Japan (Hiraishi, Murasaki, Okuda, & Yamate, 2016). Moreover, even in situations of opposite sex friendship, men perceive their female friend's sexual interest as higher than she actually indicated (Koenig, Kirkpatrick, & Ketelaar, 2007)

Finally, a recent meta-analysis found that men are more likely than women to perceive higher levels of flirtatiousness, seductiveness, and promiscuousness, albeit with small effect sizes and excluding studies that used perceptions of sexual intent (La France, Henningsen, Oates, & Shaw, 2009). However, there is evidence for a *lack* of a male sexual overperception effect as well. While DeSouza et al. (1992) found that overall, Brazilian and American men were perceiving more sexual intent than Brazilian and American women, when divided by location, Brazilian men and women did not show a significant sex difference in perceptions of sexual

intent. Additionally, a recent study found that men in romantic relationships underperceive, rather than overperceive their partner's sexual desire (Muise, Stanton, Kim, & Impett, 2016). Moreover, Tomich and Schuster (1996) found that the mode of stimuli determined whether male sexual overperception occurred; conditions that involved participants seeing and hearing a dyad interacting (as opposed to only seeing or only hearing) showed no sex differences in perceptions of sexuality, as measured by perceptions of flirtatiousness, promiscuousness, seductiveness, and sexiness. More recently, Bendixen, Kennair, Biegler, and Haselton (2019) found support for male sexual overperception in one study, but did not find the typical sex difference in another. Other studies have also failed to find the effect, although this may be due to methodological concerns (see Lindgren, Parkhill, George, & Hendershot, 2008 for review). Despite this, research in this area is collectively known as male overperception research, including those that do not find evidence of male sexual overperception.

Theoretical Explanations for the Male Sexual Overperception Effect

Various explanations for this male overperception effect exist. For instance, the general oversexualization hypothesis states that men have an overperception of sex in all domains (including when rating other men), due to general socialization of men to be more sexual (Abbey, 1982; 1991). This results in overperception of a woman's sexual intent simply through generalization. Another explanation, the media hypothesis, states that popular media forges sexual scripts that depict women as initially resisting sexual advances, then overcome with desire for their partner (Abbey, 1991). This results in incongruent thoughts and behaviors, with men overestimating sexual interest to compensate for women's concealment of desire. Yet another hypothesis states that men use their own desires as an anchor when evaluating women (Shotland & Craig, 1988). This default-model hypothesis rests on the fact than men's desires are often

higher than women, and that men fail to adjust accordingly. More recently, Error Management Theory has become a widely used theory for explaining male sexual overperception.

Error Management Theory

Recently, error management theory (EMT) has been proposed as an explanation for the male overperception effect (Haselton & Buss, 2000). This theory states that decisions made under uncertainty result in evolutionarily biased patterns that either reduce the costs of the decision, maximize the benefits of the decision, or both, even as it allows for more errors to occur overall. This theory has been used to explain a variety of human and animal behaviors, including auditory looming, fear of dangerous animals/people, food aversions, disease avoidance, adaptive gullibility, amongst others (see Haselton & Nettle, 2006; Johnson, Blumstein, Fowler, & Haselton, 2013 for review), stating that in cases of unequal costs, there is a bias that favors high rates of lower-cost errors and low rates of higher-cost errors and that in cases of unequal benefits, the bias will favor greater benefits over lesser benefits.

In the case of male overperception of female sexual intent, it is more costly to the male to have a Type II error (e.g. assuming female sexual disinterest when the female is truly interested) than it is to have a Type I error (e.g. assuming sexual interest when the female is truly disinterested). A Type II error would result in a missed mating opportunity, which would be more costly to the male's reproductive fitness, especially if the potential mate was highly desirable. Meanwhile a Type I error would result in a less costly outcome of wasted energy through courtship behaviors. This leads to a bias that favors Type I errors over Type II errors to reduce potential fitness costs.

In addition to this bias, it is also more beneficial for males to have a hit (e.g. assuming female sexual interest when the female is truly interested) than it is to have a correct rejection

(e.g. assuming female sexual disinterest when the female is truly disinterested). A hit would result in a mating opportunity, greatly increasing the male's reproductive fitness, while a correct rejection should result in amicability. The relationships between male perceptions of sexual interest and reality, as well as the four decision outcomes are visualized in Figure 1 below.

		Male Perception	
		Interest 	Disinterest 
Reality	Interest 	**Hit** Higher benefit to male • Mating opportunity	**Type II Error (False Negative)** Higher cost to male • Missed mating opportunity
	Disinterest 	**Type I Error (False Positive)** Lower cost to male • Wasted energy through courtship	**Correct Rejection** Lower benefit to male • Amicability

Figure 1. Relationships between perception of sexual interest, reality of sexual interest, and decision outcomes using EMT. Green text indicates correct responses whereas red text indicates incorrect responses.

EMT predicts a bias if there is either a cost reduction or a benefit maximization. In the case of male perception of sexual interest, there is both a cost reduction through a bias favoring Type I errors and a benefit maximization through a bias favoring hits. In this specific case, both Type I errors and hits have the male making the same assumption: female sexual interest.

Although both men and women would have similar outcomes and costs/benefits, they should prioritize these outcomes differently. Differential parental investment (Trivers, 1972) predicts that men should primarily pursue short-term mating strategies and women should primarily pursue long-term mating strategies due to different levels of required biological investment in offspring. Because women biologically must invest energy in offspring through

costly creation of fewer egg cells, gestation, birth, and lactation, they should invest energy in finding a committed mate who can help them make up that energy deficit. However, men do not have the same level of required biological investment in offspring, as sperm cells are abundant and relatively easier to create than egg cells and they cannot gestate, birth, or feed their offspring through lactation. Therefore, it is more advantageous for men to have a greater number of offspring by securing more mates. For men, it is relatively more important to secure interested mates, whereas for women it is relatively more important to secure invested mates. This leads to sex-specific differences in the importance assigned to the costs and benefits while perceiving sexual interest. Therefore, while both men and women have similar cost and benefit outcomes (e.g. securing an interested mate, missing a mating opportunity, etc.), the relative importance for each of these outcomes is different for each sex, such that men prioritize the outcomes of interest perception more than women and women prioritize the outcomes of investment perception more than men. This leads to a greater bias for men than women when interpreting sexual interest cues, providing an explanation for the male sexual overperception effect.

Evidence for EMT and sexual overperception. Since the development of EMT, some of the hypotheses generated have been tested. Not only did Haselton (2003) show that women were reporting that their intents had been overperceived more, the occurrences of the specific types of errors (e.g. false positives and false negatives) were consistent with EMT. Survey replication of Haselton (2003) in Norway shows the same pattern of women reporting more overperception rather than underperception of sexual interest and no difference in mistakes reported for men, despite being a more gender-equal culture (Bendixen, 2014). This is contradictory to the media hypothesis, which would have predicted sex differences to be less strong due to the more gender-equal culture and more gender-equal sexual scripts. Moreover,

replications in a less gender-equal country, Japan, found the same trend (Hiraishi, et al., 2016). This is once again contradictory to the media hypothesis, which would have predicted even greater sex differences.

Moreover, EMT has generated hypotheses on specific instances where the male overperception bias should *not* occur. Haselton and Buss (2000) predicted and showed that asking men about their sister's sexual interest in another man eliminated the sexual overperception bias, whereas they still show the same bias for an unrelated woman. This was hypothesized to be due to men's bias being specifically tuned to minimize missed sexual opportunities; since kin is an inappropriate target of that bias (due to concerns of inbreeding), the bias does not apply to sisters. Additionally, men who protected their kin's ability to choose a suitable mate would increase their own genetic fitness. This is contradictory to the general oversexualization hypothesis and the media hypothesis, which would have predicted overperceiving a sister's interest in a different man.

Finally, research not associated with the male sexual overperception bias has also shown consistencies with EMT explanations. Individuals are more likely to regret hypothetical missed opportunities (i.e. a false negative) than hypothetical rejection (i.e. a false positive; Joel, Plaks, & MacDonald, 2017). The same study also showed that participants perceived missed opportunities to be more consequential to their lives than rejections and were more willing to risk rejection than risk missing opportunities. Despite not analyzing sex differences, this is consistent with EMT; in mating contexts, people are more concerned generally with avoiding false negatives than false positives. While this research is still relatively new, EMT has been shown to be a compelling framework for examining biases, both in the field of male sexual overperception and others.

Evidence for EMT in other biases. Because EMT is a framework for examining biases, other biases have been evaluated through the lens of EMT. The paper that introduced EMT did so using both the male sexual overperception effect, as well as the female commitment underperception effect (also known as commitment skepticism; Haselton & Buss, 2000). The EMT prediction of the commitment skepticism bias was generated by the analysis of the different costs associated with a woman perceiving commitment from a man. It would be more costly to perceive commitment when it was not there (possibly resulting in an unsupported pregnancy) than it would be to not perceive commitment where it truly existed (possibly encouraging the man to continuously display commitment). Additionally, men would likely not have these same costs, as female commitment to her partner is less necessary for survival and reproduction for men. This effect has also been replicated, although much less often than the male sexual overperception effect. Studies have shown that, consistent with the commitment skepticism bias, in face-to-face interactions women underperceived men's interest in a committed relationship (Henningsen & Henningsen, 2010) and that younger women showed the bias whereas postmenopausal women did not (Cyrus, Schwarz, & Hassebrauck, 2011).

The EMT framework has also been applied to perceptions of attractiveness. Hill (2007) predicted and showed that men and women overestimate their same-sex mate competition to be more attractive and desirable to the opposite sex (the mate competition overestimation bias). This hypothesis was generated through EMT; the error of underestimating a rival's desirability is associated with failure to attract and/or retain mates, wasted effort competing for mates who will not find you as attractive as others, and for men, a risk that you will be investing resources into offspring that are not biologically yours. However, the error of overestimating a rival's desirability results in wasted effort attracting or retaining a mate who is already interested or

committed, or possibly settling for lower-quality mates. Since the costs of underestimating are more evolutionarily expensive than those of overestimating, overestimating is favored. Additionally, the benefits of underestimating rival desirability are relatively weak, as it prevents wasted effort on mate attraction and retention and inspires self-confidence, whereas the benefits of overestimating rival desirability are relatively strong, as it inspires mate attraction and retention behaviors and increases cheater-detection vigilance.

Finally, the EMT framework has also been used to retroactively analyze different biases for both humans and animals with the goal of generating new hypotheses. Haselton & Nettle, (2006) reframed many human behaviors using EMT. Auditory looming, or the bias to perceive rising intensity as moving more quickly than the same rate of lowering intensity, can be explained as a more costly error to not react to intense sounds (with the possibility of something dangerous approaching) than it is to prepare too early. Similarly, allergies and food aversions can be analyzed using EMT; it is less costly to avoid a harmless stimulus (e.g. food, pollen, etc.) than it is to fail to avoid a harmful stimulus (e.g. poison, rotten food, smoke, etc.). They also used similar logic to explain aversions to dangerous animals and people, anxiety, disease avoidance, inferences of intention rather than chance, the fundamental attribution error, social exchange, positive illusions about the self, and illusions of control. Johnson, et al. (2013) once again applied EMT to human and animal biases, pointing out that numerous scientific arguments also implicitly apply EMT, for example, belief in God/the supernatural, psychophysical biases, adaptive gullibility, pursuit of pleasure/avoidance of punishment, superstitious behaviors, overconfidence, and economic decision-making. This abundance of fields and areas that EMT can be applied to is indicative of its generalizability, something many other explanations of male sexual overperception lack.

Signal Detection Theory

While EMT is a well-established evolutionary theory of biases, it is not as established as other theories of bias, such as Signal Detection Theory (SDT; Green & Swets, 1966; Macmillan & Creelman, 2005). Those familiar with SDT will notice that some of the terminology in EMT is borrowed from SDT. In fact, it has been stated that EMT is essentially an applied instance of SDT (Nettle, 2012, p. 70-73).

SDT is a way to describe how humans make categorical decisions when confronted with ambiguous stimuli (cues). Observers judge the presence or absence of a signal when the environment includes noise. According to SDT, there are four possible outcomes when deciding if a signal is present or not. The first possible outcome, a correct detection (also known as a hit), occurs when the observer classifies a stimulus as a signal and there is, in fact, a signal. The second possible outcome is a missed detection (also known as a miss), or when the observer classifies a stimulus as noise when it was a signal. The third possible outcome is a false alarm, where the observer classifies a stimulus as a signal when it was noise. Finally, the fourth possible outcome is a correct rejection, when the observer classifies a stimulus as noise when the stimulus is truly noise. Each of these four possible outcomes is associated with a cost or benefit to the observer, as in EMT. Figure 2 shows the relationships between perceptions of sexual interest and reality, as well as SDT decision outcomes.

		Male Perception	
		Interest 	Disinterest 
Reality	Interest 	**Hit**	**Miss**
	Disinterest 	**False Alarm**	**Correct Rejection**

Figure 2. Relationships between perception of sexual interest, reality of sexual interest, and decision outcomes using SDT. Green text indicates correct responses whereas red text indicates incorrect responses.

Sensitivity. One of the ways in which SDT is differentiated from EMT is that SDT provides a measure of sensitivity (Green & Swets, 1966; Macmillan & Creelman, 2005). This measure of sensitivity gives a quantifiable measure of how distinct signals are from noise for an individual. If an individual's sensitivity is high, signals and noise are very distinct from one another, with very little overlapping cues, and thus are easier to correctly classify as signal or noise. If an individual's sensitivity is low, signals and noise are not very distinct and cues for signals and cues for noise often are the same, making it more difficult to correctly classify the cues. It is important to note that sensitivity is both a measure of the cues themselves as well as the individual's ability to determine if a cue is signal or noise. In the context of sexual communication, the behaviors used to cue sexual interest could be very distinct, such as nodding "yes" as a signal of sexual interest or shaking their head "no" as noise, or they could be very similar, such as smiling, which could be a cue of either interest or disinterest. An individual's interpretation also affects the sensitivity measure, for example, if the perceiver can distinguish

fake smiles from true smiles, they would be more likely to correctly classify the cue of smiling more often.

Sensitivity is often measured as *d'* which is a unitless measure ranging from -∞ to +∞, where 0 indicates chance responding, or a complete inability to distinguish signals from noise, and greater positive numbers indicate more ability to distinguish signal from noise. Negative *d'* values are rare and often indicate an error in experimental coding or instructions, as participants would be responding below chance and would need to be responding "no" to "yes" items and vice versa (Stanislaw & Todorov, 1999).

To visualize differences in sensitivity, cue distribution curves are often used[1] (Lynn & Barrett, 2014 Supplemental Material). Figure 3 below shows these cue distributions. The dashed red curves are the noise distributions, while the solid green curves are the signal distributions. The orange horizontal lines show the difference from the peaks of the noise and signal curves for each graph. A *d'* of 1 would indicate that the means of the noise curve and the signal curve are one standard deviation apart. Similarly, a *d'* of 0.5 would indicate half of a standard deviation apart, and a *d'* of 3 would indicate three standard deviations apart (Stanislaw & Todorov, 1999). A low sensitivity of 0.5 is shown in Figure 3a and a high sensitivity of 3 is shown in Figure 3b. In the low sensitivity graph, the signal and noise curves overlap heavily, with many cues having similar likelihoods of being signal or noise. In the high sensitivity graph, the signal and noise curves are more distinct, and many more cues are associated with either signals or noise, but rarely both.

[1] While cue distributions can be non-normal, they are typically visualized using normal curves and SDT applies to other distribution shapes as well (Lynn & Barrett, 2014 Supplemental Material).

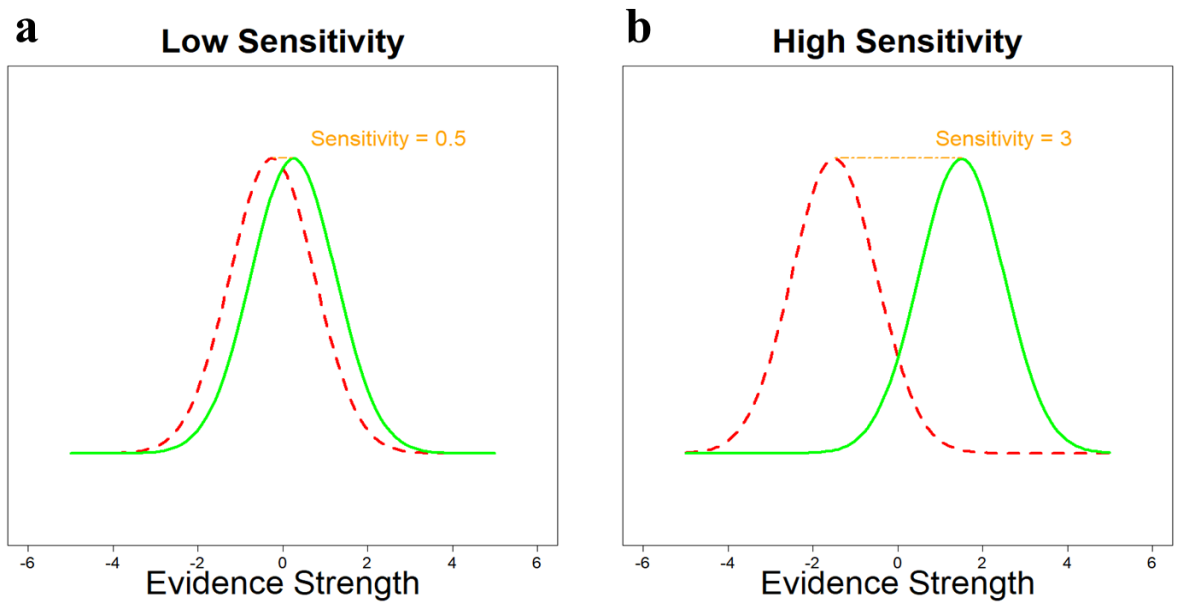

Figure 3. Visualization of sensitivity using SDT. Dashed red curves are noise distributions. Solid green curves are signal distributions. Orange horizontal lines show the distance between the peaks of the signal and noise curves, indicating sensitivity.

Decision criteria. SDT analyses also provide an estimate of the decision criterion each participant uses to determine if a cue is a signal or noise, known as *c* (Green & Swets, 1966; Macmillan & Creelman, 2005). The decision criterion is the point at which a participant switches from responding "no" to responding "yes". A neutral decision criterion would correspond to a *c* of 0, where the cue is equally likely to be a signal or noise. Positive *c* values indicate a conservative tendency to respond "no", whereas negative *c* values indicate a liberal tendency to respond "yes", and thus the decision criterion is often referred to as the bias of the participant. A *c* of 1 is a conservative "no"-bias and would indicate that the participant's switch-point is one standard deviation higher than the point at which a cue is equally likely to be a signal or noise (Lynn & Barrett, 2014 Supplemental Material). Similarly, a *c* of -0.75 is a liberal "yes"-bias and would indicate that the participant's switch point is ¾ of a standard deviation lower than the point of equal likelihood of a cue being signal or noise.

Bias is often visualized on the same graphs as sensitivity. For clarity, sensitivity in Figure 4 is set to a *d'* of one. The blue vertical lines show the criterion points, and the point of equal likelihood of a cue being a signal or noise is where the dashed red curve intersects with the solid green curve. Figure 4a shows a neutral bias of 0, Figure 4b shows a conservative bias of 1, and Figure 4c shows a liberal bias of -0.75. Cues with evidence strengths to the left of the blue line would be classified by the participant as "no", while cues with evidence strengths to the right of the blue line would be classified as "yes".

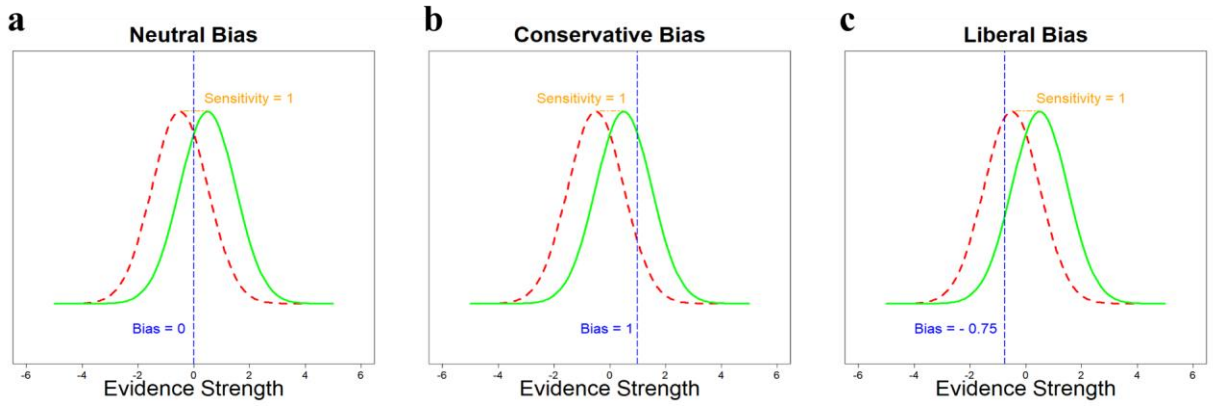

Figure 4. Visualization of bias using SDT. Dashed red curves are noise distributions and solid green curves are signal distributions. Blue vertical lines show the decision criterion for each graph.

Factors that can change sensitivity. The most common factor that alters sensitivity is the similarity of the signal and noise cues. The more similar the cues are, the more ambiguity exists when the observer tries to classify the incoming information. If the cues are nothing like each other (i.e., highly dissimilar), correct classifications will occur more often overall (hits and correct rejections). If the cues are similar, errors will occur more often overall (false alarms and missed detections). Related to the similarity of cues, the strength of the evidence for one choice or another should adjust sensitivity as well – cues that strongly indicate signals should be associated with higher sensitivity, while less strong, more ambiguous cues should be associated

with lower sensitivity (Wickens, Hollands, Banbury, & Parasuraman, 2015). Sensitivity can also be trained through practice that offers feedback (Wickens, et al., 2015). This training is thought to reduce the cognitive load of processing cues and allows signals to be easily distinguished from noise.

Since sensitivity is partially determined by the participant, individual differences could also affect sensitivity. However, it is unclear which individual differences may affect sensitivity, and how those effects may manifest. For example, with sexual communication, it is possible women might have higher sensitivity than men, as they have been shown to have less bias. While the decision outcomes are less important to women, securing a mate is still an important task for women, and thus they need to be maximizing their benefits and minimizing their costs as well, which may occur through high sensitivity. However, it is also possible for men to maximize their benefits through high sensitivity, and since their decision outcomes are stronger than women's, they may be maximizing in both sensitivity and bias.

Factors that can change bias. Based on the values assigned to the costs and benefits of outcomes, the observer may consequently adjust the detection decision criteria to maximize benefits and limit costs, similar to EMT. In the case of sexual communication, this process is the same as EMT. However, SDT goes beyond EMT by incorporating the ratio of signals to noise that the participant encounters (Green & Swets, 1966; Macmillan & Creelman, 2005; Lynn & Barret, 2014). Frequently encountered true signals (e.g. interested potential partners) will, all else equal, lead an observer to alter his judgments when the signal is more ambiguous, categorizing the cue as a signal more often. Conversely, the more often the observer encounters noise (e.g. uninterested potential partners), the more likely he is to classify a stimulus as noise. In other words, base rates can also create liberal and conservative biases.

As with similarity, individual differences may also affect bias. Any individual difference that could adjust the decision outcomes or the signal-to-noise ratio could affect bias. For example, one would expect men to have a stronger liberal bias than women, as the outcomes of their decisions strongly affect their fitness, whereas women's outcomes only moderately affect their fitness. Mate value, or how desirable an individual is as a potential mate, could also affect the base rate of signals; people who have high mate values should receive more signals of sexual intent than those with lower mate values. In other words, those who are attractive should have more individuals attracted to them, and thus should lean towards perceiving sexual interest.

Optimality. Sensitivity and bias, while independent measures, interact to affect the choices individuals make through optimality. Optimality is the point which balances the outcomes and errors in a way that best fits the environment (Lynn & Barret, 2014). Since decisions under uncertainty will likely never generate 100% accurate responses, some errors are expected. In the case of evolutionary fitness, optimality is the balance of correct to incorrect responses and misses to false alarms that maximize the individual's chances of passing on their genes. EMT addresses this only through adjustments to bias, or the balance of misses to false alarms. SDT incorporates sensitivity into this balance and allows for a maximization of benefits as well as costs as something that could improve and individual's fitness.

Optimality can be achieved by compensating for low sensitivity with a strong bias, or vice versa, depending on the environmental parameters (Lynn & Barret, 2014). In the specific case of male sexual communication, if a man has low sensitivity, meaning he cannot distinguish between behaviors communicating friendliness and behaviors communicating sexual intent, he can compensate for that by becoming more liberal in bias, similar to what EMT suggests. However, if a man has high sensitivity, he could also maximize his likelihood to pass on his

genes with almost any bias (including no bias). Therefore, optimality in sexual perception could be increased by an increase in sensitivity. This increase in sensitivity would increase accuracy and therefore bias could be reduced without affecting the outcome optimality.

EMT as a special case of SDT

At its core, EMT is SDT applied to intersexual relationships using evolutionary theory to explain the costs and benefits of relationship decisions. However, SDT can address some limitations of EMT, while providing a more specific, quantifiable analysis of behavior. Specifically, SDT provides a measure of sensitivity, provides standardized metrics for both sensitivity and bias, and addresses base rates of signals to noise.

SDT provides a measure of sensitivity

A crucial benefit an SDT analysis provides that and EMT analysis does not is the measure of sensitivity. SDT goes further than simply determining if a participant is correct or not, and even further than what type of correct or incorrect answer resulted. Simple measures of performance, including hit rates and false alarm rates, confound bias and sensitivity (Stanislaw & Todorov, 1999). These measures cannot determine whether a behavior is primarily due to a tendency to answer in one specific way or if the ability to distinguish cues is primarily driving the behavior. This is particularly important when examining sexual communication from an evolutionary standpoint, as the cause of the behavior needs to be examined directly. Without knowing if the errors are due to a tendency to respond in a particular way or from an inability to distinguish cues, evolutionary predictions cannot be fully developed. SDT provides a direct way to measure these two factors, allowing for more precise evolutionary hypotheses to be developed.

SDT provides standardized measures

Not only does SDT provide a measure of sensitivity in addition to bias, but it provides standardized metrics on which behaviors can be evaluated. The addition of standardized metrics allows studies to be compared to each other more accurately and allows for comparisons outside specific topics. For example, *d'* typically ranges from 0.5 to 2.5, corresponding to 60% and 90% accuracy, and *c* typically ranges from -2.33 to 2.33 (Macmillan & Creelman, 2005). This typical range allows scientists to determine if the sensitivity or bias of a set of participants is particularly large or small and allows the effects of predictors on these metrics to be evaluated against one another.

SDT addresses base rates of signals to noise

While EMT does use the decision outcomes similarly to SDT, SDT's long history in the behavioral sciences has shown other factors that may affect bias. EMT focuses primarily on the value of the decision outcomes, however it neglects the base rate and the similarity of the stimuli, restricting the specific hypotheses that could be generated. For example, SDT's consideration of the base rates of signals suggest that common true signals with rare non-signals will encourage a signal-present judgment in ambiguous situations. Conversely, a low signal rate with common non-signals will encourage a no-signal judgment. Additionally, this base rate is naturally manipulated by individual differences, such as mate value (see below for details).

Previous SDT analyses of EMT-typical topics

Some previous research has examined the male sexual overperception effect using SDT (see Farris, Treat, Viken, & McFall, 2008a for review). This research has concluded that there is no bias difference between men and women, but instead that men are less sensitive to cues of sexual intent than women are (Farris, Treat, Viken, & McFall, 2008b). This research is difficult

to clearly interpret, however. The paradigm used in this work involved classifying still photos of women in a variety of poses and outfits as friendly, sexually interested, sad, and rejecting. First, this paradigm is limited, because still photos do not provide many cues to differentiate between communicating sexual intent and communicating sexual interest. Adding to this issue is the fact that the photos also varied in poses, outfits, and attractiveness, and thus sensitivity measures could be picking up on any of those cues rather than the woman's sexual intent. Lastly, there are questions about how to analyze and interpret the results even if the stimuli were not ambiguous and confounded, because participants were asked to select from four possible interpretations whereas a standard signal detection paradigm would involve a judgement regarding one interpretation (i.e. signal present/absent). Additional studies by this lab have also examined the effects of alcohol (Farris, Treat, & Viken, 2010) and sexually degrading music (Treat, Farris, Viken, & Smith, 2015) on men's perceptions of women's sexual intent using the same photos as described earlier and with similar analyses. These are fascinating and important directions in which this research topic should eventually go, but a sound method and basic understanding of the underlying psychological processes must be developed first.

Pilot Study

It is expected that both EMT and SDT will indicate that men have a greater bias than women, but that the SDT analysis will clarify the magnitude of the bias difference, as well as indicate if there is a sex difference in sensitivity. To ensure that SDT finds similar results as EMT, but with added information, data from Perilloux et al. (2012) were re-analyzed using SDT. In this study, sexual overperception was analyzed (in addition to other dimensions) via a speed-dating paradigm. Each participant had up to 5 conversations with opposite sex partners over a 3-minute span, then rated their partner on a variety of aspects. The data for this study were

collected for an EMT analysis and was not collected for this type of SDT analysis, so interpretations of these results should be cautious and true significance testing was not included. Despite this, these results can indicate if this present study is worth completing and the results are therefore included.

Sexual interest was collected as the response to a single-item interest rating (*I am sexually interested in him/her*) on a scale of 1 (*well below average*) to 7 (*well above average*). Participants also rated the degree to which their conversation partner was interested in them (*He/She is sexually interested in me*) on the same scale. Responses of 5 or above were coded as "yes" responses, and 4 and lower were coded as "no" responses, to be more conservative in interpretations of these results (e.g. uncertain answers were coded as "no"), as SDT analyses require a binary outcome variable. Overall hit rates (i.e. the rate at which an individual perceived interest when the conversation partner indicated interest) and false alarm rates (i.e. the rate at which an individual perceived interest when the conversation partner indicated no interest) were calculated to determine a rough estimate of *c* (bias) and *d'* (sensitivity) for both men and women.

Due to the relatively few interactions each participant had (n=5), individual hit and false alarm rates could not be calculated, as many participants were missing at least one of the possible decision outcomes, and that calculation would therefore necessitate dividing by 0. Therefore, the total hits, misses, correct rejections, and false alarms were calculated for men and women respectively. Following this, cumulative hit and false alarm rates were calculated, and from that, *d'* and *c* were calculated. The hit rate was calculated as the sum of the total hits, divided by the total of hits and misses. The false alarm rate was similarly calculated as the number of total false alarms, divided by the total of false alarms and correct rejections. This resulted with women having a hit rate of 0.095 and a false alarm rate of 0.052, while men had a

hit rate of 0.205 and a false alarm rate of 0.167. While no significance testing has been done on these differences (due to the contrived nature of the analysis), this begins to suggest that men have a higher hit rate than women, in addition to the higher false alarm rate, as previously shown.

Sensitivity was calculated by taking the hit rate and finding its corresponding z-score (assuming a standard normal distribution with a mean of 0 and standard deviation of 1), and from it subtracting the corresponding z-score for the false alarm rate. This resulted with a *d'* of 0.320 for women, and a *d'* of 0.142 for men. These results suggest that women are more sensitive than men; however, neither men nor women are particularly sensitive to the cues of sexual interest in this study.

Bias was calculated by taking the sensitivity for both men and women and multiplying each by -0.5. This resulted in a bias of 1.469 for women, and a bias of 0.896 for men. This confirms the original study's results, that men are more liberally biased than women in perceiving the difference between sexual interest versus non-interest. This analysis also, however, indicates that both men and women are ***conservatively*** biased in these perceptions.

Although these results should be interpreted cautiously, they may provide evidence that there is a sensitivity difference in perceptions of sexual intent between men and women in addition to the previously established bias difference. Differential parental investment (Trivers, 1972) may predict the sensitivity difference between men and women, as women may conceal their signals of sexual interest, making it more difficult for men to differentiate signal from noise. This may also explain why men are more liberally biased than women, since they need to compensate for their lower sensitivity to maintain the same level of optimality as women at detecting sexual interest.

It is unclear whether the conservative biases found in both men and women are due to true conservative biases, the conservative nature in which the sexual interest measures were coded, or something else entirely, such as attractiveness of the participants. Additionally, these results are hindered by the relatively few experiences each participant had. This prevents individualized sensitivities and biases from being calculated, and instead these results depend on overall totals of hits, false alarms, misses, and correct rejections for all men and for all women. Finally, it is possible that such few interactions may have resulted in either people who no one found attractive, or who may have not found any of their conversation partners attractive. For these reasons, additional studies that are designed for both SDT and EMT analyses need to occur. These studies need to include more stimuli, and for true SDT analyses to be conducted, these stimuli must objectively communicate sexual interest or disinterest.

Individual Differences

In addition to developing the theoretical and analytical framework for this research, there are also several predictions that can be made about individual differences in sexual intent perception that move beyond just sex differences. Individual differences, such as life history strategy, mating strategy, and mate value have been found to affect mating decisions. Therefore, it is also expected that these individual differences will similarly affect the male overperception bias.

Life history strategy

Life history theory (Figueredo, et al., 2006; Del Guidice, 2009) recognizes that every biological organism faces a fundamental tradeoff between different possible ways to allocate energy (e.g. growth, survival, reproduction, and parenting). This tradeoff allows for many different ways to maximize evolutionary fitness, including but not limited to prioritizing current

or future reproduction, prioritizing quality or quantity of offspring, and prioritizing efforts to mate or efforts to parent their offspring. Life history strategy is thus the continuum of strategies used by an individual to maximize their evolutionary fitness. Those with slower life history strategies tend to live longer, have fewer offspring (but invest heavily in them), and invest more energy in finding the best possible mate. Those with faster life history strategies tend to live shorter lives, have more offspring (with relatively lower parental investment), and invest more energy in finding more mates.

Life history strategy is influenced by evolutionary history as well as an individual's development. Species that evolve in unstable environments are more likely to have offspring earlier, have more offspring overall, invest less in their offspring, and have high rates of mortality. This is partially due to the costs and benefits of investing in themselves and their offspring; it is more beneficial for these species to invest less in their growth as they are in an unstable environment and the likelihood of long-term survival is low. Similarly, it is more advantageous to invest little in more offspring rather than investing heavily in fewer offspring, as all the offspring face low likelihoods of survival. Thus, these species tend to invest most of their efforts into mating and survival rather than growth and parenting, also known as fast life history strategy. Species that evolve in stable environments have a greater chance of long-term survival, and thus it is advantageous to invest more in themselves and their offspring, rather than investing in mating effort and higher numbers of offspring. Thus, these species tend to invest most of their efforts into growth and parenting rather than mating and survival, also known as slow life history strategy (Figueredo, et al., 2006).

Humans are generally slow life history strategists, however there is within-species variability (Ellis, Figueredo, Brumbach, & Schlomer, 2009). It is hypothesized that early

childhood developmental environments are partially what drives this within-species variation for humans (Belsky, Steinberg, & Draper, 1991). Presence of fathers, close interpersonal relationships, and stability of resources during the first 7 years of life are associated with delayed pubertal onset, consistent with slower life history strategies. Meanwhile, early childhood instability is associated with earlier pubertal onset, consistent with faster life history strategies (Belsky, et al., 1991). This early developmental influence has been found to pass through generations, as those who experienced shared parenting were more likely to have a slow life history strategy as adults in Mexico, Costa Rica, and the US (Sotomayor-Peterson, De Baca, Figueredo, & Smith-Castro, 2013).

Life history strategies are hypothesized to manifest through thoughts and behaviors. People with faster life history strategies are more likely to be talkative, socially skilled, dominant, and charming (all traits that would assist with finding more mates) whereas people with slower life history strategies are more likely to be considerate, kind, hard-working, and reliable (all traits that would assist with parenting; Sherman, Figueredo, & Funder, 2013). Moreover, those with fast life history strategies are more likely to have histories of coercive sexual activity (Gladden, Sisco, & Figueredo, 2008) and break-ups (Olderbak & Figueredo, 2010) than those with slow life history strategies.

In the context of the sexual overperception effect, individuals with faster life history strategies should prioritize hits over correct rejections and avoid misses over false alarms, since they maximize mating opportunities over quality of mates. This should lead to a more liberal bias (i.e. perceiving sexual intent more often) when compared with individuals with slower life history strategies. Individuals with slower life history strategies may prioritize hits and correct rejections equally, as hits are beneficial, but less so if the potential mate is not of high quality and

correct rejections will prevent unnecessary expenditure of energy. Those with slower life history strategies may also avoid false alarms over misses as pursuing an uninterested potential partner expends energy and signals promiscuity, decreasing the individual's own mate value in the process. Together, these could lead to fairly balanced responding, or no bias.

Since this study will use Signal Detection Theory methods to evaluate male sexual overperception, it can be determined whether life history strategy is affecting bias, sensitivity, both, or neither. It is predicted that life history theory will affect bias, such that those with faster life history strategies will have a more liberal bias than those with slower life history strategies. It is unclear how life history strategy may affect sensitivity. Those with faster life history strategies may have more experience evaluating potential partners than those with slower life history strategies, such that they may have higher sensitivities. However, those with slower life history strategies are also evaluating potential partners, possibly as often (although with stricter criteria) and therefore they may be no effect of life history strategy on sensitivity.

Sociosexual orientation and mating strategies

Sociosexual orientation is the degree to which a person is comfortable and willing to engage in sexual acts outside of a committed relationship (Simpson & Gangestad, 1991). Those with more restricted sociosexual orientations are less comfortable with uncommitted sexual activity, less willing to engage in sexual activity without commitment, and tend to have long-term mating strategies, whereas those with more unrestricted sociosexual orientations often have more short-term mating strategies and are more comfortable and more willing to engage in casual sexual activity.

Modern theories of sociosexual orientation are often derived from Sexual Strategies Theory (Buss & Schmitt, 1993). Sexual Strategies Theory predicts that, although there may be

evolutionary benefits for men to seek short-term relationships and women to seek long-term relationships, there are also evolutionary benefits for men to seek long-term relationships and women to seek short-term relationships, leading to both sex differences in aggregate and within-sex variability.

Sexual Strategies Theory pulls from parental investment theory (Trivers, 1972), which predicts that men should primarily pursue short-term mating strategies and women should primarily pursue long-term mating strategies due to different levels of required biological investment in offspring. Because women biologically must invest more energy in offspring, they often need to make up that energy deficit through accumulated resources of themselves/their families, or through investment from a mate. Therefore, it is advantageous for a woman to invest heavily in fewer offspring and secure a mate who is willing to invest in her and her offspring for long periods of time. However, men do not have the same level of required biological investment in their offspring. Due to this, it is more advantageous for men to have greater numbers of offspring with lower levels of investment for each, and thus secure more mates more often.

However, as stated in Sexual Strategies Theory, it can be advantageous for the reverse to occur as well; women seeking short-term relationships and men seeking long-term relationships. For example, if a woman can secure enough resources quickly, it could be advantageous for her to pursue short-term partners, as there will likely be more men seeking short-term partners and she will be able to select a higher quality mate while still securing resources for herself and her offspring. For men, if they can identify women with high reproductive value who will be good parents and have higher-quality offspring, it can be beneficial for men to seek long-term partners. With a long-term partner, men can still pass on their genes, possibly more effectively through

offspring that are more likely to survive, and benefit from the resources the woman can also provide.

It has been suggested that sociosexual orientations are the psychological manifestation of these sexual strategies (Gangestad & Simpson, 1990). Sociosexual orientation drives human behavior through willingness to have sex without commitment, and thus leads human beings to pursuing evolutionarily beneficial sexual strategies. Often, sociosexual orientation shows similar sex differences as predicted by Sexual Strategies Theory (Simpson & Gangestad, 1991), and common measures of sociosexual orientation (e.g. Multidimensional Model of Sociosexual Orientation Inventory; Jackson & Kirkpatrick, 2007) have specific subscales measuring short-term mating orientation and long-term mating orientation.

Empirically, those with more unrestricted sociosexual orientations are more likely to highly value attractiveness in a potential mate, whereas those with more restricted sociosexual orientations are more likely to highly value personality, loyalty, responsibility, and affection (Simpson & Gangestad, 1992). Additionally, those with more restricted sociosexual orientations prefer commitment and emotional closeness before engaging in sexual activity (Simpson & Gangestad, 1991). These are consistent with Sexual Strategies Theory, which hypothesizes that those seeking short-term mating strategies should seek out high quality genetics (a cue of which is often physical attractiveness), whereas those seeking long-term mating strategies should seek out high-quality partners (e.g. having desirable personalities) and evaluate commitment cues.

As mentioned previously, there is typically a strong sex difference in sociosexual orientation, such that men are more likely to have more unrestricted sociosexual orientations, whereas women are more likely to have more restricted sociosexual orientations (Simpson & Gangestad, 1991). Roughly 8 - 20% of variance in sociosexual orientation can be attributed to

sex (Gangestad & Simpson, 2000). However, other research has also found high variability within the sexes (Schmitt, 2005), indicating that both men and women can have more restricted or more unrestricted sociosexual orientations.

In the context of the male sexual overperception effect, individuals with more short-term mating strategies/more unrestricted sociosexual orientations should desire to maximize the quantity of mating opportunities, rather than the quality. This should result in a prioritization of hits rather than correct rejections, and an avoidance of misses rather than false alarms, creating a liberal bias. Individuals with more long-term mating strategies/more restricted sociosexual orientations should desire higher quality mates rather than larger quantities of mates. This should result in similar prioritization of hits and correct rejections as hits are less valuable if they are not from high quality mates, and since correct rejections prevent unnecessary expenditure of energy. Additionally, false alarms should be more strongly avoided than misses as false alarms can result in pursing someone not interested, which communicates promiscuity and can therefore lower the individual's mate value. This should lead to a fairly balanced or possibly conservative bias.

Previous research has somewhat confirmed this, showing those with more unrestricted sociosexual orientations being more likely to perceive faces as more flirtatious, above and beyond simple sex differences (Howell, Etchells, & Penton-Voak, 2012). Additionally, Perilloux, et al. (2012) found that scores on one subscale measuring sociosexual orientation were significantly positively correlated with men's misperception scores, with other subscales trending in the same direction, indicating that men with more unrestricted sociosexual orientations may be more likely to overperceive sexual interest. However, in the same study, women's sociosexual orientation scores were not correlated with misperception, contrary to the analysis of decision costs and benefits.

Using Signal Detection Theory methods, it is predicted that sociosexual orientation will affect bias, such that those with more unrestricted sociosexual orientations, and thus shorter-term mating strategies, will show more liberal SDT biases. It is unclear how or whether sociosexual orientation will affect sensitivity. It is possible that those with more unrestricted sociosexual orientations will have higher sensitivity, as they should be practiced in determining if potential partners are interested in them, as they should be evaluating potential partners often to secure more mates. However, it is also possible that sociosexual orientation will not affect sensitivity at all, as it can be argued that potential mates are consistently being evaluated by all individuals, regardless of their willingness to engage in uncommitted sex, due to the evolutionary importance of securing mates.

Mate value

Mate value is the overall evaluation of a potential mate, incorporating assessments of mating-relevant physical, psychological, and personality traits (e.g. facial attractiveness, bodily attractiveness, health, good financial prospects, kindness, understanding, intelligence; Buss, 1989), which also predicts the quality of mates an individual can attract in a mating market (Buss & Barnes, 1986). Those with higher mate values are more attractive as potential mating partners to others and have a higher overall mate quality. Those with lower mate values are less attractive as potential mating partners to others and have lower overall mate quality.

An individual's mate value can be measured in one of two ways: through others' assessments of the individual or through self-ratings. Other-assessments are often based on one or more evaluations of the components of mate value, such as bodily attractiveness, facial attractiveness, masculinity/femininity, or specific traits (Edlund & Sagarin, 2014). These types of judgments can take time and effort, for example, for one person to rate another person's

intelligence would take time to get to know that person before an accurate rating can be achieved. Self-assessments can be more complete evaluations, as the individual has extensive experience with themselves and should be tracking their current condition as compared to others in the environment (Brase & Guy, 2004). Moreover, previous research has found that measures of the self-rated attractiveness of an individual correlate with measures of significant other-rated attractiveness of that individual in both the US (Dillon, Adair, Wang, & Johnson, 2013) and South American countries (Figueredo & Wolf, 2009).

Regarding male sexual overperception, since those with higher mate values are attractive to others, they should experience more instances where others are communicating sexual intent to them, raising the base rate of signal to noise. High signal/noise ratios tend to generate liberal biases, as more common signals results in answering that the signal is present more often, so simply answering that the signal is present becomes a heuristic in these environments. Therefore, those with higher mate values, and thus more signals of sexual interest, should have more liberal biases. Conversely, those with lower mate values should have relatively fewer instances where others communicate sexual intent, as fewer people should be attracted to them, lowering the base rate of signal to noise. Low signal/noise ratios tend to generate conservative biases through the same process of adjusting the criterion, and thus those with lower mate values should have more conservative biases, which EMT cannot predict, as it does not take into account relative ratios of signal to noise.

Previous research has examined mate value with regard to male sexual overperception. Perilloux, et al. (2012) found that men's self-ratings of attractiveness were positively correlated with overperceiving women's interest, although this was hypothesized as more attractive people being more likely to have short-term mating strategies and thus having lower costs to false

alarms since they can find another mate easily. However, this logic does not make sense; not everyone who is attractive pursues a short-term mating strategy and therefore they do not all have lower costs to false alarms. Meanwhile, the SDT analysis of base rates of signals to noise is accounted for and predicted in Signal Detection Theory (Macmillan & Creelman, 2005; Wickens, et al., 2015). Moreover, this effect only held for self-ratings of attractiveness, as the same study showed that men who were rated as attractive by women were more likely to underestimate sexual intent, contrary to their hypothesis and cost/benefit analysis. If the process of higher mate value leading to shorter-term strategies leading to fewer costs associated with false alarms held true, this effect should hold with both self-ratings and other-ratings of attractiveness.

Kohl and Robertson (2014) also analyzed sexual overperception and attractiveness through EMT, predicting that individuals with higher mate values would be less likely to overperceive sexual interest, as misses would be more consequential for those with lower mate values than for those with higher mate values. Their results ran contrary to their hypothesis, but aligned with the previous Perilloux, et al. (2012) research and the SDT prediction; those with high mate values were more likely to have high levels of overperception. This provides an example where simple cost/benefit analysis of decision outcomes can come to two different predictions, despite examining similar behaviors.

The present research using SDT allows an opportunity to replicate these findings while extending it to determine if mate value affects sensitivity as well. However, the present research does not provide an opportunity to determine whether the effect is due to the cost/benefit analysis as predicted by Perilloux et al. (2012) or due to relative abundance of signals to noise. It is predicted that mate value will affect bias, such that those with higher mate values will be more

likely to have liberal biases. It is unclear how mate value may affect sensitivity. It is possible that those with lower mate values have relatively less experience with signals, and thus may not be able to distinguish signals from noise, leading to lower mate values being associated with lower sensitivities.

Present Studies

The present studies aim to address some of the methodological limitations of previous EMT research through examination of the male sexual overperception effect. While SDT reanalysis of previous EMT-based literature is possible, the design constraints of the studies prevent strong conclusions from being drawn. It is necessary to design independent studies with the purpose of SDT testing. Numerous trials are needed, as is the development of an objective binary answer to whether a signal is present from a cue. The present SDT analyses will address some of the limitations of EMT, including clarification of the primary cause of errors (whether errors occur from a tendency to respond in a specific way or due to an inability to distinguish cues), introduction of standardized metrics through *c* and *d'*, addressing base rate neglect, and avoidance of error scores. Additionally, the incorporation of individual differences can help elucidate if these individual differences are affecting sensitivity, bias, both, or neither. Finally, new hypotheses generated from preexisting SDT and individual differences literature are tested in the present studies.

Hypotheses[2]

Based on the prior literature, it is expected that both EMT and SDT will indicate that men have a greater bias than will women, but that the SDT analysis will clarify the scale of the bias

[2] One hypothesis in the initial proposal was removed, please see Appendix A for details.

difference (**Bias Hypothesis**), as well as indicate whether there may be a sex difference in sensitivity (**Sensitivity Hypothesis**).

In addition, as outlined above, it is expected that individual differences will affect biases, resulting in the following hypotheses:

Life History Strategy Hypothesis. Individuals with faster life history strategies will show more liberal SDT biases.

Mating Strategy Hypothesis. Individuals with shorter-term mating strategies will show more liberal biases.

Mate Value Hypothesis. Individuals with higher mate values will show more liberal SDT biases.

It is unclear how individual differences should affect sensitivity, resulting in more exploratory analyses of these relationships.

Chapter 2 - Stimuli Development

Step 1

Step 1 of the stimuli development involved soliciting behaviors from participants to ensure that the final behaviors would be representative of what typical people would do while communicating either sexual interest or disinterest.

Procedure

Using an act-frequency approach (e.g. Buss & Craik, 1983), descriptions of non-verbal behaviors that communicated sexual interest and sexual disinterest were solicited from participants. Each participant indicated informed consent and completed a Qualtrics questionnaire in which they were asked to answer demographic questions and provide ten behaviors indicating sexual disinterest for men, ten behaviors indicating sexual disinterest for women, ten behaviors indicating sexual interest for men, and ten behaviors indicating sexual interest for women. Instructions stated:

> *In each of the spaces below, please provide 1 non-verbal behavior that communicates **sexual disinterest [interest]** on the part of a man [woman] towards a sexually interested person. In other words, something non-verbal a man [woman] might do to reject [accept] a person's sexual advances.*

Participants then were able to enter each behavior in its own free-response window, and finally received debriefing information.

Participants

One hundred fourteen participants were recruited from the General Psychology participant pool. Seven participants were excluded due to not answering any questions, resulting in 107 participants. There were 58 women, 44 men, two participants who identified as other, and

three who chose not to answer. Participants had an average age of 19.66 (n = 104, SE = 0.20, SD = 2.03, range: 18 – 31, n = 104) and were primarily heterosexual (n = 97), followed by bisexual/other (n = 6) and homosexual (n = 1), with three who chose not to disclose their sexual orientation.

Results

A total of 3,482 behaviors were provided (860 male disinterest entries, 870 female disinterest entries, 890 male interest entries, and 862 female interest entries). From this, 1048 were exact duplicates of other answers that were removed, resulting in 623 male disinterest entries, 619 female disinterest entries, 616 male interest entries, and 576 female interest entries. Finally, behaviors were grouped into similar behaviors (e.g. "winking" and "winking at the person") and inappropriate answers or answers that violated the instructions (e.g. "grab his dick" and "tell them I am not interested," respectively) were removed, which resulted in 826 male behaviors and 721 female behaviors total, some of which were suggested as both interest and disinterest behaviors (e.g. "wave").

Step 2

Step 2 of the stimuli development involved recruiting new participations over two iterations to pare down the total number of interest and disinterest behaviors. This was done to ensure that the behaviors that were used in the final study were common behaviors used to communicate sexual interest and disinterest.

Procedure

First, participants indicated informed consent and answered demographics questions. Participants were then asked to imagine seeing *a person who was sexually interested in them*, then select the top 5 behaviors the participant would use to communicate sexual interest and the

top five behaviors the participant would use to communicate sexual disinterest from a group of 20 behaviors from Step 1. In other words, they were asked how *they* would communicate interest or disinterest. Participants viewed randomly arranged groups of 20 behaviors from Step 1 and rated the behaviors that matched their sex (e.g. if a participant identified as male, they viewed behaviors that had been entered for male interest or disinterest in the previous study). Participants repeated this a total of 12 times. Instructions stated:

> *In the following section, you will see a series of behaviors. Imagine that you see someone who is sexually interested in you. Then, indicate which of the following behaviors would be the 5 best ways for you to communicate to them that you are sexually interested in them, and which would be the 5 best ways for communicating that you are not sexually interested in them.*

Following this, participants were instructed to imagine seeing *a person they were sexually interested in*, then they selected the top 5 behaviors that person could use to best communicate that they were sexually interested in the participant and the top 5 behaviors that would best communicate their sexual disinterest. In other words, they were asked how *a different person* might communicate interest or disinterest. Participants saw the behaviors that corresponded to the sex they were primarily attracted to (e.g. a straight man saw female behaviors; if participants selected bisexual, they were randomly assigned to see either male or female behaviors; if participants selected "other" as their biological sex, or "other" for their sexual orientation, they did not complete this portion of the study). Participants repeated this a total of 12 times. Instructions stated:

> *In the following section, you will see a series of behaviors. Imagine that you see a woman [man] who you are sexually interested in. Then, indicate which of the*

following behaviors would be the 5 best for her [him] to communicate to you that she[he] is sexually interested in you, and which would be the 5 best for her[him] to communicate to you that she [he] is not sexually interested in you.

Finally, participants received debriefing information.

Participants

One hundred fifty-three participants were recruited from the General Psychology participant pool. Three participants' data were excluded either for not completing the study (n = 2) or for identifying as a gender other than man or woman (n = 1), resulting in 150 participants. There were 82 women and 68 men with an average age of 19.30 (n = 149, SE = 0.15, SD = 1.86 range: 18 – 32), and participants were primarily heterosexual (n = 134), followed by homosexual (n = 9), bisexual (n = 5), and other (n = 2).

Results

The elimination criteria for this study were adjusted (see Appendix B) so that behaviors had to be selected at least 5 times within a category (interest or disinterest) in order to be retained for the next step, and only the behaviors participants said they would engage in (i.e. the "self" behaviors) were used. Finally, behaviors that either did not make logical sense (e.g. "Showing intimate behavior"), were not specific (e.g. "Making a body gesture"), or were verbal behaviors (e.g. "Telling the other person to go away") were removed by researchers. This resulted in 484 behaviors for men (250 disinterest behaviors; 234 interest behaviors; 32 behaviors removed by researchers) and 474 behaviors for women (246 disinterest behaviors; 228 interest behaviors; 26 behaviors removed by researchers).

Repetition procedure

The methodology for the repetition was altered slightly to ask participants only to select behaviors they would use to communicate interest or disinterest (i.e. self-behaviors), to have participants only select their top four interest and top four disinterest behaviors, to add a mobile device check (due to display issues for mobile devices), and to add an attention check question. Otherwise, all methods and instructions were the same from the first iteration of this step (see Appendix B for detailed explanation of changes).

Repetition participants

One-hundred four participants were recruited in 50-person batches without resampling from Amazon Mechanical Turk and paid $0.50 to complete the survey. Due to high rates of attention check failure, participants were recruited until the final sample size was suitably close to the 50-participant goal. Five participants' data were removed for using a mobile device, as recorded by Qualtrics, and 51 participants' data were removed for failing the attention check[3]. Remaining participants (n = 48) had completed the survey and were retained for the analyses. There were 20 men and 28 women with an average age of 35.58 (SE = 1.92, SD = 13.30, range: 19 – 72), and were primarily heterosexual (n = 40), followed by bisexual (n = 8).

Repetition results

Men selected 472 behaviors as either interest or disinterest, and women selected 473. In the first iteration of this step, behaviors were removed if they had received fewer than five selections within a category of interest or disinterest. In this repetition, this removal process would have resulted in 204 behaviors removed for men and 75 behaviors removed for women.

[3] See Appendix C for possible reasons for high rates of participant exclusion.

Since the goal of this portion was to reduce the number of behaviors to ~150 for men and ~150 for women, behaviors were instead ordered from most to least selected (summed across interest/disinterest categories), and the top 30% of the selected behaviors were retained for the next portion of the study, resulting in 141 behaviors for men and 153 behaviors for women[4], some of which were selected as both interest and disinterest behaviors (e.g. "nonsexual touching").

Step 3

Step 3 of stimuli development involved participants rating behaviors on how well they communicate sexual interest or disinterest and their realism. This was done to ensure that the final behaviors would be realistic for each sex and to provide a quantifiable measure of communication for vignette creation.

Procedure

First, participants indicated informed consent and answered demographics questions. Then, participants were sorted by the sex they indicated in the demographics section and asked to rate every behavior for their sex on realism from 0 (definitely not realistic) to 100 (definitely realistic; realism score), and on how well it communicates sexual interest or disinterest, from 0 (definitely sexually disinterested) to 100 (definitely sexually interested; sexual communication score). Participants were randomly assigned to either view the realism questions first, or the sexual communication questions first. Ratings were measured on slider bars which did not have

[4] There were not exactly 150 behaviors for men and 150 behaviors for women due to some behaviors being selected the same amount of times. Criterion were adjusted to be the closest to the goal of 150 as possible, while ensuring that all behaviors that were selected the same number of times were either included or excluded as a group.

numerical endpoints; however, ratings were recorded numerically. For the realism scores, instructions stated (emphasis original):

> *For the next section, please use the slider bars to indicate how **realistic** it is for **males** [**females**] (people of the same sex as you) to engage in the following behaviors for communicating sexual interest or disinterest. In other words, are these behaviors that men [women] **actually engage in**, regardless of how effective they might be.*

For the sexual communication scores, instructions stated (emphasis original):

> *For the next section, please use the slider bars to indicate how **strongly** the following behaviors communicate sexual interest or disinterest, when **males [females] engage in these behaviors**. That is, how clear is the intent of these behaviors, regardless of how common they might be.*

At the time of this study, concerns were being raised about the quality of Amazon Mechanical Turk data (e.g. Moss & Litman, 2018), so multiple checks were implemented to all following Mechanical Turk studies to ensure high quality data (see Appendix C). These checks automatically removed participants after informed consent but before they completed any other measures.

Prior to receiving debriefing information, participants were asked two attention check questions that asked participants how much they agreed with two statements on a seven-point scale from *Strongly disagree* to *Strongly agree*. The first statement was *I have been in an accident that has resulted in my death*, and the second statement was *I have never been in an accident that has resulted in my death*. Participants who failed to answer *Strongly disagree* to the

first, and/or participants who failed to answer *Strongly agree* to the second were removed from analysis.

Participants

Sixty-six participants were recruited without resampling from previous studies from Amazon Mechanical Turk and paid $0.50 to complete the survey. Eighteen participants' data were removed due to failure of one or both attention check questions, resulting in 48 participants. There were 32 women and 16 men with an average age of 39.85 (*SE* = 1.95, *SD* = 13.52, range: 22 – 78), and they were primarily heterosexual (*n* = 46), followed by bisexual (*n* = 2).

Results

Initially, behaviors were to be eliminated if their average realism score was below 50. However, due to high correlations between sexual communication scores and realism scores (*r* = .92 for women and *r* = .96 for men), behaviors that had low sexual communication were more likely to be eliminated than those with high sexual communication using this cutoff. If this criterion were used to eliminate behaviors, there would be far fewer behaviors with low sexual communication and would thus skew the vignettes to be more likely to communicate sexual interest rather than including both sexual interest and disinterest. Since there was the possibility that participants did not notice the instruction change (either from rating realism to rating sexual communication or vice versa depending on randomization of question blocks) and the extremely high correlations between the two measures, only the sexual communication scores were retained from these data.

Realism procedure

To obtain realism scores for each behavior without possible carry-over effects, a second survey was required. This survey included the same materials as the previous survey but did not include the sexual communication questions.

Realism participants

Sixty-four participants were recruited without resampling from previous studies from Amazon Mechanical Turk and paid $0.50 to complete this survey. Eighteen participants' data were excluded due to failure of one or both attention check questions, resulting in 46 participants. There were 30 women and 16 men with an average age of 37.85 (*SE* = 1.64, *SD* = 11.14, range: 22 – 67), and were primarily heterosexual (*n* = 42), followed by homosexual (*n* = 1), bisexual (*n* = 1), and other (*n* = 2).

Realism results

The sexual communication scores from the first data collection of Step 3 and the realism scores from the second data collection of Step 3 were used to help determine excluded behaviors. However, once again, the scores were highly correlated at *r* = .84 for women and *r* = .77 for men, suggesting that participants may find behaviors that communicate sexual disinterest to be unrealistic, possibly due to social influences that inhibit direct rejection. Since this would still eliminate far more behaviors communicating sexual disinterest than communicating sexual interest, a different behavioral elimination process was used.

Behaviors were ranked from least communicative of sexual intent to most communicative of sexual intent for both men and women. The lowest third of behaviors were classified as being disinterest behaviors, the middle third were classified as being neutral behaviors, and the top third were classified as being interest behaviors to ensure that even proportions of behaviors

communicating sexual interest, disinterest, and neutral behaviors would be included in the final vignettes. Then, within these classifications, the ten lowest behaviors for realism were removed from each category, resulting in 30 total behaviors removed for women and 30 behaviors removed for men. After elimination, there were 113 remaining behaviors for women (38 disinterest, 37 neutral, and 38 interest behaviors) and 111 remaining behaviors for men (38 disinterest, 37 neutral, and 37 interest behaviors), each with an associated average sexual communication score.

Chapter 3 - Vignette Creation and Assessment

Vignette Creation

Sex-specific vignettes were created from random combinations of the sexual interest and sexual disinterest behaviors evaluated through stimuli development. Male vignettes were created from male-suggested and -rated behaviors and female vignettes were made from female-suggested and -rated behaviors. Each vignette included a sentence for each behavior and had a sexual communication score based on the sum of the average sexual communication rating for each behavior. Behaviors were recombined (without repetition within the same vignette, although behaviors were repeated between vignettes) until the number of vignettes was close to the goal of 300 vignettes for each sex.

Since this was a random recombination of behaviors, some vignettes were removed by researchers for repetitive behaviors (e.g. “He avoids situations with you. He actively avoids you. He is not responsive in conversation with you.”) or contradictory sequences of behaviors (e.g. “She makes frequent eye contact with you. She leaves. She makes good eye contact with you.”). This resulted in 289 male vignettes and 292 female vignettes with a roughly even distribution of scores (Figure 5). Male vignettes had a range of summed communication scores from 30.13 to 223.81 and female vignettes had a range of summed communication scores from 16.47 to 239.72 (possible distribution range of 0 – 300).

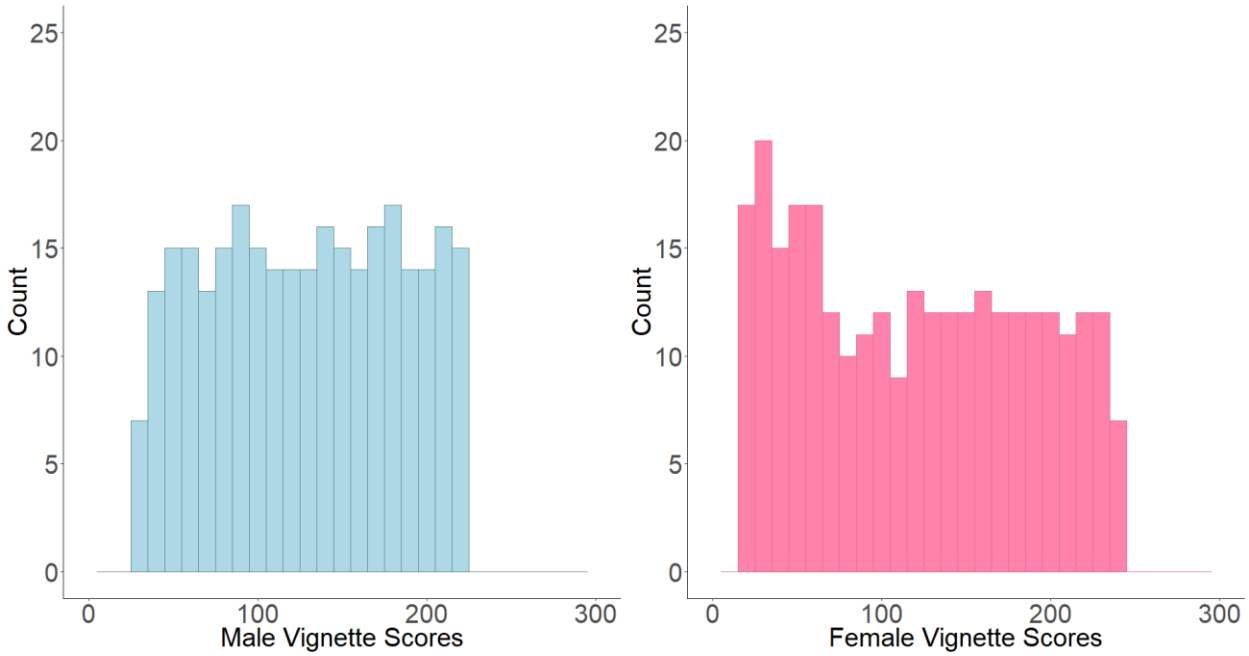

Figure 5. Distribution of male and female vignette communication scores based on summed behavior scores.

To ensure that both traditional Error Management Theory (EMT) analyses and Signal Detection Theory (SDT) analyses could be conducted, each vignette needed objective, pre-rated values for how communicative each vignette was of sexual interest (i.e. rating score), as well as a binary yes/no "truth" for whether the vignette communicated sexual interest or not (i.e. binary score). Therefore, Study 1 aimed to obtain these baseline values for each vignette.

Vignette Assessment

Procedure

Participants first indicated informed consent, then answered the same Amazon Mechanical Turk quality checks as in previous studies (see Appendix C for details), then answered demographic questions. Based on the biological sex they selected, participants read and rated 50 randomly selected, sex-specific vignettes. Instructions stated: "Imagine you see a man and a woman interacting in a social situation and the woman [man] behaves in the following

ways:" followed by the three-sentence vignette. Vignettes were reworded to suggest that they were viewing a stranger of the same sex as the participant acting in the way the vignette said to another person of the opposite sex. For example, a man who is interested in women would see a vignette such as, "He does not invite her to his home. He looks stiff around her. He ends a conversation with her.". Participants were then asked if the woman [man] was sexually interested in the man [woman] with binary yes/no options, then were asked how sexually interested the woman [man] was in the man [woman] on a scale of 1 (Definitely not sexually interested at all) to 7 (Definitely sexually interested). This procedure repeated until they had seen and rated 50 vignettes. Following vignette ratings, participants answered two attention check questions and received debriefing information.

Participants

Three hundred forty-six participants were recruited without resampling from previous studies from Amazon Mechanical Turk and paid $0.50 to complete the survey. Fifty-seven participants' data were removed due to failure of one or both attention check questions[5], resulting in 289 participants. There was no a priori power analysis because there was little precedent for a study of this nature, so sample size was informed by general statistical guidelines that favor greater numbers of participants. There were 169 women, 118 men, and two people who identified as something other than women or men with an average age of 39.34 (SE = 0.76, SD = 12.99, range: 18 – 82), and participants were primarily heterosexual (n = 262), followed by bisexual (n = 17), homosexual (n = 8) and other (n = 2).

[5] See Appendix C for possible reasons for high rates of participant exclusion.

Results

Two scores were calculated for each vignette: a rating score and a binary score. The rating score was calculated as the average of the 1 – 7 scale sexual interest answers and indicates how communicative each vignette was of sexual interest. The binary score was calculated as the average of the binary sexual interest answers (with "Yes" responses coded as 1 and "No" responses coded as zero) and indicates whether a vignette communicated sexual interest. Higher numbers indicate more sexual interest on both the rating and binary scores.

Female vignettes had an average binary score of 0.49 (*SE* = 0.02, *SD* = 0.41) and an average rating score of 3.57 (*SE* = 0.12, *SD* = 1.87). Male vignettes had an average binary score of 0.63 (*SE* = 0.02, *SD* = 0.38) and an average rating score of 4.38 (*SE* = 0.11, *SD* = 1.84). To ensure consistency between samples, correlations with the sexual communication scores (i.e. the sum of the average score for each behavior in the vignette) and both the binary scores and rating scores of each vignette were calculated. Female vignette binary scores were highly correlated with the sexual communication scores (r = .95), as were the rating scores (r = .97). Similarly, male vignette binary scores and rating scores were both highly correlated with the sexual communication scores for each vignette (r = .92 and r = .96, respectively). Finally, to ensure consistency between the binary and rating scores, correlations were once again run. For the female vignettes, the binary and rating scores were highly correlated (r = .98), as were the binary and rating scores for the male vignettes (r = .97).

Next, vignettes were ordered by binary score from low to high. Then, the middle third of the vignettes were eliminated to ensure objective "Yes" and "No" responses for whether or not the vignette communicated sexual interest for the following SDT analyses (the first third of the vignettes were assigned to have "No" as the objective SDT response and the remaining vignettes

were assigned to have "Yes" as the objective SDT response). Ninety-eight female vignettes were eliminated, with an average binary score of 0.47 (*SE* = 0.02, *SD* = 0.23, range: 0.08 – 0.85) and an average rating score of 3.47 (*SE* = 0.08, *SD* = 0.81, range: 1.58 – 4.32). Ninety-six male vignettes were eliminated, with an average binary score of 0.75 (*SE* = 0.01, *SD* = 0.16, range: 0.43 – 0.95) and an average rating score of 4.66 (*SE* = 0.09, *SD* = 0.89, range: 3.52 – 6.55). Retained female vignettes (*N* = 194) had an average binary score of 0.49 (*SE* = 0.03, *SD* = 0.48, range: 0 – 1) and an average rating score of 3.63 (*SE* = 0.16, *SD* = 2.22, range: 1.11 – 6.26). Retained male vignettes (*N* = 193) had an average binary score of 0.57 (*SE* = 0.03, *SD* = 0.43, range: 0 – 1) and an average rating score of 4.24 (*SE* = 0.16, *SD* = 2.16, range: 1.14 – 6.82). For visualization purposes, Figure 6 shows the vignette ratings and binary categorizations of the male and female vignettes. Retained vignettes can be found in Appendices D and E.

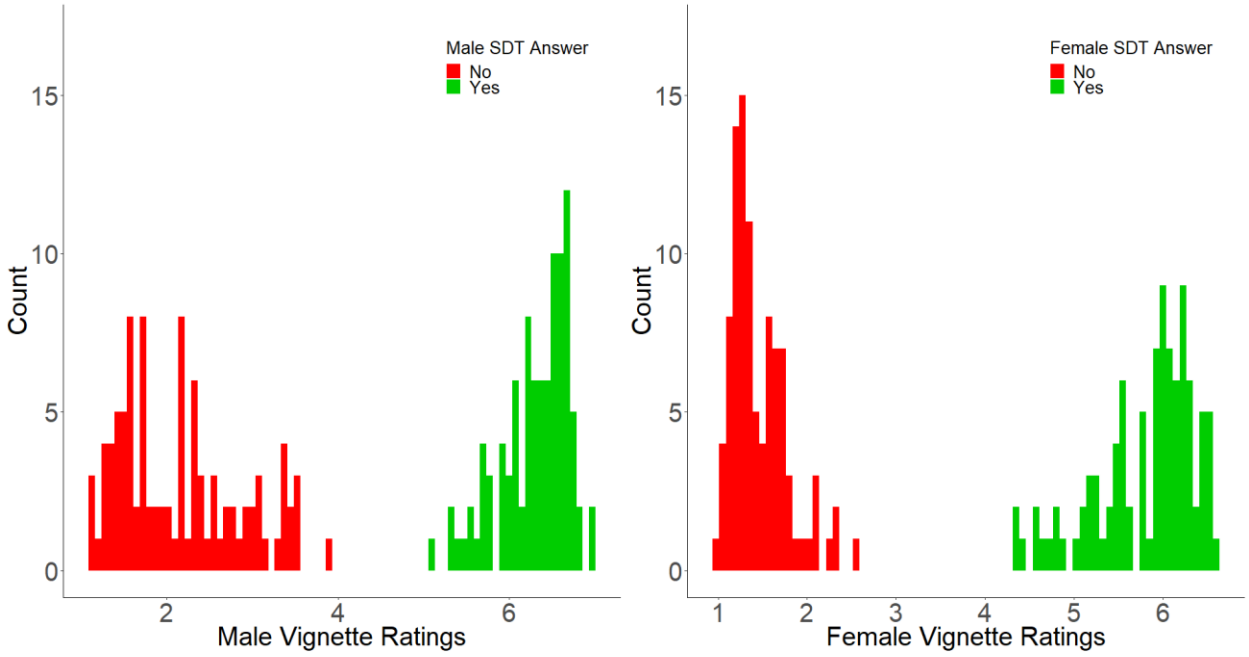

Figure 6. Vignette ratings and binary categorizations after ambiguous vignettes were removed.

Chapter 4 - Signal Detection Theory and Error Management Theory Analyses

Hypothesis Testing

To test hypotheses, vignettes were reworded to suggest that the person in the vignette was acting in that way to the participants (rather than the participant acting in that way to someone else). As a reminder, summaries of the hypotheses are as follows:

1. Bias hypothesis – EMT and SDT analyses will indicate that men have a greater bias than women; SDT analyses will clarify the scale of the bias difference.
2. Sensitivity hypothesis – SDT analysis will indicate if there is a sex difference in sensitivity.
3. Life History Strategy hypothesis – individuals with faster life history strategies will show more liberal SDT biases
4. Mating Strategy hypothesis – individuals with shorter-term mating strategies will show more liberal SDT biases
5. Mate Value hypothesis – individuals with higher mate values will show more liberal SDT biases

Procedure

Participants first indicated informed consent then answered demographic questions. Based on the gender participants indicated they were primarily interested in, participants read and rated 75 randomly selected vignettes. In this study, participants viewed the vignettes sex-specific to those of the gender they were interested in (i.e. if a participant indicated sexual interest in men, they viewed male vignettes). Instructions stated: “Imagine you see a woman [man] you are sexually interested in and the woman [man] behaves in the following ways:”

followed by the vignette. Participants were then asked if the woman [man] was sexually interested in them with binary yes/no options, then were asked how sexually interested the woman [man] was in them on a scale of 1 (Definitely not sexually interested at all) to 7 (Definitely sexually interested). This procedure repeated until they had seen and rated 75 vignettes. Following the vignette ratings, participants answered a life history strategy measure, a mating strategy measure, and a mate value measure. Measures were presented in random order.

Life History. Life history strategy was measured using the K-SF-42 Life History Scale (Figueredo et al., 2017). This scale was developed as a medium-length version of the Arizona Life History Battery (ALHB; Figueredo, Vasquez, Brumbach, & Schneider, 2007), a comprehensive 199-item measure of life history strategy (referred to as *K*). Unlike other short forms of the ALHB, the K-SF-42 is formed from items on the ALHB, retains the subscales of the ALHB, and has higher reliability (Figueredo et al., 2017). Using this scale, low K-values indicate faster life history strategies whereas high K-values indicate slower life history strategies.

There are 7 sub-scales in the K-SF-42, each with six items. The Insight, Planning, and Control subscale measures agreement/disagreement on a scale of -3 (Disagree strongly) to 3 (Agree strongly) with items such as “When I encounter problems, I don’t give up until I solve them.” This subscale had acceptable reliability with a Cronbach’s alpha of 0.84.

The General Altruism subscale also measures agreement/disagreement on a scale of -3 (Disagree strongly) to 3 (Agree strongly). An example item from this scale is “I spend a great deal of time per month giving informal emotional support to my blood relatives.” This subscale had lower, but still acceptable reliability with a Cronbach’s alpha of 0.71.

The Religiosity subscale is measured on the same -3 to 3 scale and include items such as "I'm a very religious person" and "I closely identify with being a member of my religious group." This subscale had high reliability with a Cronbach's alpha of 0.96.

The Romantic Partner Attachment subscale once again had the same -3 – 3 scale and included items such as "I don't feel comfortable opening up to romantic partners" and "I am nervous when partners get too close to me." All items on this subscale are reverse coded. This subscale had an acceptable reliability with a Cronbach's alpha of 0.71.

The Parental Relationship Quality subscale measured how much parents invested in the individual while they were growing up on a scale of 0 (Not at all) to 3 (A lot). An example item from this subscale is "How much did your biological mother teach you about life?" This subscale had good reliability with a Cronbach's alpha of 0.89.

Due to a survey entry error, two subscales were unintentionally not collected (Family Social Contact and Support and Friends Social Contact and Support). Since the K-SF-42 uses a mean of the z-scores for each subscale to calculate a participant's life history strategy (i.e. *K*), analyses were still run using participants' k-score, despite not including two of the subscales. Therefore, all analyses of life history strategy should be considered preliminary and necessitating follow-up studies. This issue only affects the Life History Strategy hypothesis, however, this error is somewhat mitigated by the z-score usage.

Mating Strategy. Mating strategy was measured using the Multidimensional Model of Sociosexual Orientation Inventory (Jackson & Kirkpatrick, 2007). This scale measures long-term mating orientation (LTMO), short-term mating orientation (STMO), and a behavioral measure that was not used for these hypotheses, as it is not relevant to this research. All items for LTMO and STMO are measured on a 1 (Strongly disagree) to 7 (Strongly agree) Likert-type scale with

seven items corresponding to LTMO (e.g. “I hope to have a romantic relationship that lasts the rest of my life.”) and ten items corresponding to STMO (e.g. “I could enjoy sex with someone I find highly desirable even if that person does not have long-term potential.”). Reliability for both the LTMO and STMO subscales were acceptable for analyses (Cronbach’s alphas were 0.74 and 0.95, respectively).

Mate Value. Mate value was measured using the Self-Rated Mate Value Scale (Edlund & Sagarin, 2014). This four-item scale asks participants to rate their desirability as a partner using a 1 to 7 scale with endpoints corresponding to each question. Example questions include “Overall, how would you rate your level of desirability as a partner on the following scale?” with endpoints of 1 (Extremely undesirable) to 7 (Extremely desirable) and “Overall, how do you believe you compare to other people in desirability as a partner on the following scale?” with endpoints of 1 (Very much lower than average) to 7 (Very much higher than average). Reliability for this scale was acceptable for analysis (Cronbach’s alpha = 0.82).

Finally, participants answered the same two attention check questions as the previous study and received debriefing information.

Participants

One hundred seven participants were recruited from the General Psychology participant pool. Eighteen participants’ data were excluded due to failure of one or both attention check questions, and four participants’ data were excluded due to missing survey items necessary for subsequent analyses, resulting in 85 participants, a sufficient sample size for the repeated-measures nature of this study. There was no a priori power analysis because there is little precedent for a study of this nature and so sample size was informed by general statistical guidelines. There were 51 women and 34 men with an average age of 19.05 (*SE* = 0.15, *SD* =

1.41, range: 18 – 26), and were primarily heterosexual (*n* = 81), followed by bisexual (*n* = 3) and homosexual (*n* = 1).

Results

For clarity, results will be separated for each hypothesis. For the EMT analyses, a misperception score was calculated for each participant as the average of the difference between vignette rating scores and participants' ratings of sexual interest (i.e. participant perception – vignette truth), such that a positive value indicated overperception and a negative value indicated underperception, as in previous research (e.g. Perilloux et al., 2012). Then, a general linear model was run to predict these misperception scores using participant sex, mate value, short-term mating orientation, long-term mating orientation, and life history strategy (*K*) as predictors. Since no interactions between predictors were hypothesized, no interaction effects were calculated to prevent overfitting the data.

For SDT analyses, a multilevel probit regression was run to determine bias (*c*) and sensitivity (*d'*; DeCarlo, 1998; Wright & London, 2009). This model predicted participants' binary perception of sexual interest for each vignette they saw using the binary categorization for that vignette (i.e. interest/disinterest), participant sex, mate value, short-term mating orientation, long-term mating orientation, and life history strategy (*K*) as predictors. Additionally, the interaction effect of each predictor with the binary categorization for each vignette were also included as predictors to determine the effect of the individual differences on sensitivity. Finally, bias and sensitivity were allowed to vary for each participant and the intercept was allowed to vary for each vignette. Model specifications, including effect structure, for all analyses can be found in the R code in Appendix F.

Bias Hypothesis. The Bias Hypothesis stated that both EMT and SDT analyses will show men being more yes-biased than women, but that the SDT analysis, which outputs bias as c, will show how large or small the bias difference is, using a standard metric. The EMT analysis showed that overall, participants were underperceiving sexual interest (b = -0.52, SE = 0.04, p <.001). Men's misperception scores (M = -0.43, SE = 0.07) were slightly higher than women's (M = -0.61, SE = 0.06), indicating that men are perceiving interest slightly more often than women are, although the effect was not significant ($t(79)$ = -1.87, p = .066) and qualified by the overall underperception of sexual interest. While this is nearing significance, the difference was only 0.18 units on a scale of 1 to 7, and thus likely has a negligible impact on behavior. This indicates that men and women are not perceiving sexual interest differently, and moreover, men are not overperceiving sexual interest, contrary to previous literature.

The SDT analysis also showed that overall, participants were slightly biased to say vignettes were not communicating sexual interest, but importantly, the SDT analysis showed that bias was not significantly driving participants' responses (c = 0.15, SE = 0.09, p = .097). The SDT analysis also showed a main effect of sex on bias (b = 0.27, SE = 0.08, p = .001)[6], indicating a sex difference. Marginal means showed that men had a bias of 0.42 (SE = 0.13), indicating a *conservative* no-bias. Meanwhile, women had a bias of -0.12 (SE = 0.11), indicating a *liberal* yes-bias. This is opposite what was initially predicted, as well as conflicting with the EMT results of this same data.

[6] Because multilevel probit regression outputs -c (DeCarlo, 1998), the estimates for each effect on bias must be inverted. For the purposes of this study, when c or bias is reported it will have already been inverted, but parameter estimates when reporting effects are left in their original state.

Further examination showed that the different bias results from EMT and SDT were due to the EMT analysis' reliance on difference scores. The baseline truth was different for men and for women, with women's vignettes communicating more sexual interest than men's (M_{Women} = 4.21, SE_{Women} = 0.03, M_{Men} = 3.67, SE_{Men} = 0.04). Since both men and women generally underperceived interest compared to the interest scores (M_{Women} = 3.57, SE_{Women} = 0.04, M_{Men} = 3.29, SE_{Men} = 0.04), the resulting misperception scores were negative. However, since difference scores are calculated as the difference between vignette rating scores and the participants ratings of interest, this resulted in negative difference scores. The difference between the women's vignette scores and the women's perceptions was greater. After being entered into the calculation, this became a more negative number than men's, resulting in men's misperception scores being slightly larger (i.e. closer to zero) than women's, despite mean perceptions indicating lower perception. Due to this, it is more likely that the SDT analysis is a better description of the data than the EMT analysis, despite conflicting with previous research. This effect is shown below in Figure 7.

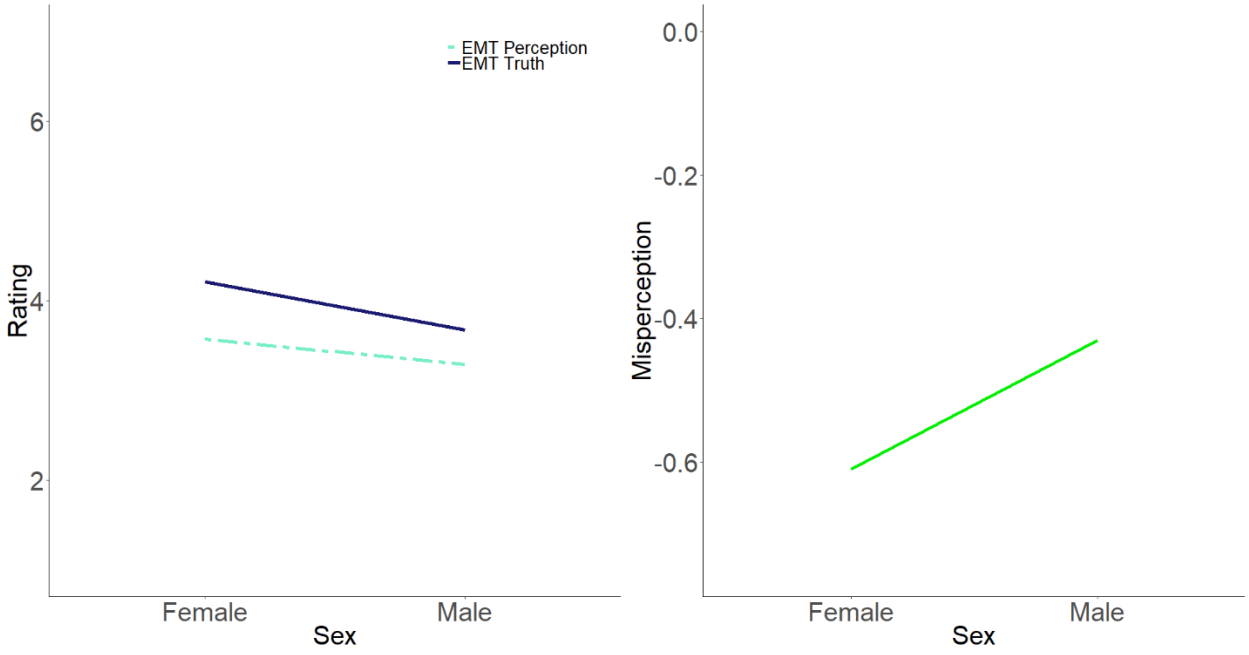

Figure 7. Visualization of vignettes' average pre-rated communication scores (i.e. EMT Truth), participants' average perceived communication scores (i.e. EMT Perception), and average misperception scores broken down by sex of the participant.

Sensitivity Hypothesis. The Sensitivity Hypothesis stated that an SDT analysis will indicate if there is a sex difference in sensitivity. The SDT analysis showed that overall, participants were highly sensitive to sexual interest, and that sensitivity (rather than bias) was significantly driving participant's responses (d' = 4.91, SE = 0.21, $p < .001$). There was no main effect of sex on sensitivity (b = -0.08, SE = 0.15, p = .609), suggesting that men and women did not differ in their sensitivity to cues of sexual interest. However, this lack of a sex difference could be driven by a ceiling effect of sensitivity, as both men and women are highly accurate. Despite the lack of a significant sex difference, sensitivities for men and women were both calculated, showing that men had a slightly higher sensitivity than women (M_{Women} = 4.84, SE_{Women} = 0.24, M_{Men} = 4.99, SE_{Men} = 0.27). This overall high sensitivity is reflected in the rates of hits, correct rejections, misses, and false alarms (Table 1).

Table 1. Rates and percentages of hits, correct rejections, misses, and false alarms by sex.

Rates and percentages of hits, correct rejections, misses, and false alarms by sex.

Gender	Hits	Correct Rejections	Misses	False Alarms
Men	1186 (46.5%)	1232 (48.3%)	98 (3.8%)	34 (1.3%)
Women	1847 (48.3%)	1785 (46.7%)	75 (2.0%)	118 (3.1%)
Overall	3033 (47.6%)	3017 (47.3%)	173 (2.7%)	152 (2.4%)

Examined together, the results of the Bias and Sensitivity Hypotheses indicate that in regard to perception of sexual interest, both men and women are reaching optimality through a very high sensitivity (and therefore accuracy) rather than an increased bias, conflicting with the conclusions of the male sexual overperception effect. Both men and women were very accurate in their responses, with few misses or false alarms, and while men's and women's biases were significantly different, their biases had little effect on their responses. Figure 8 below visualizes women's and men's SDT output. Figure 9 below visualizes the distributions of *c* and *d'*, collapsed across sexes.

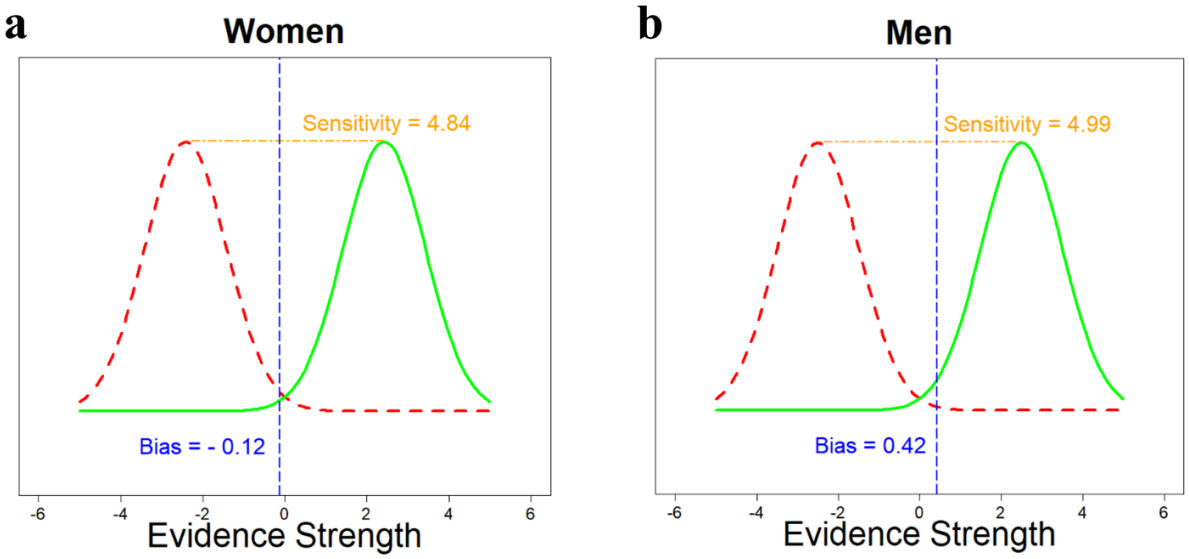

Figure 8. Visualization of women's and men's SDT results. Figure 8a shows women's SDT results of a *c* of -0.12 and a *d'* of 4.84. Figure 8b shows men's SDT results of a *c* of 0.42 and a *d'* of 4.99.

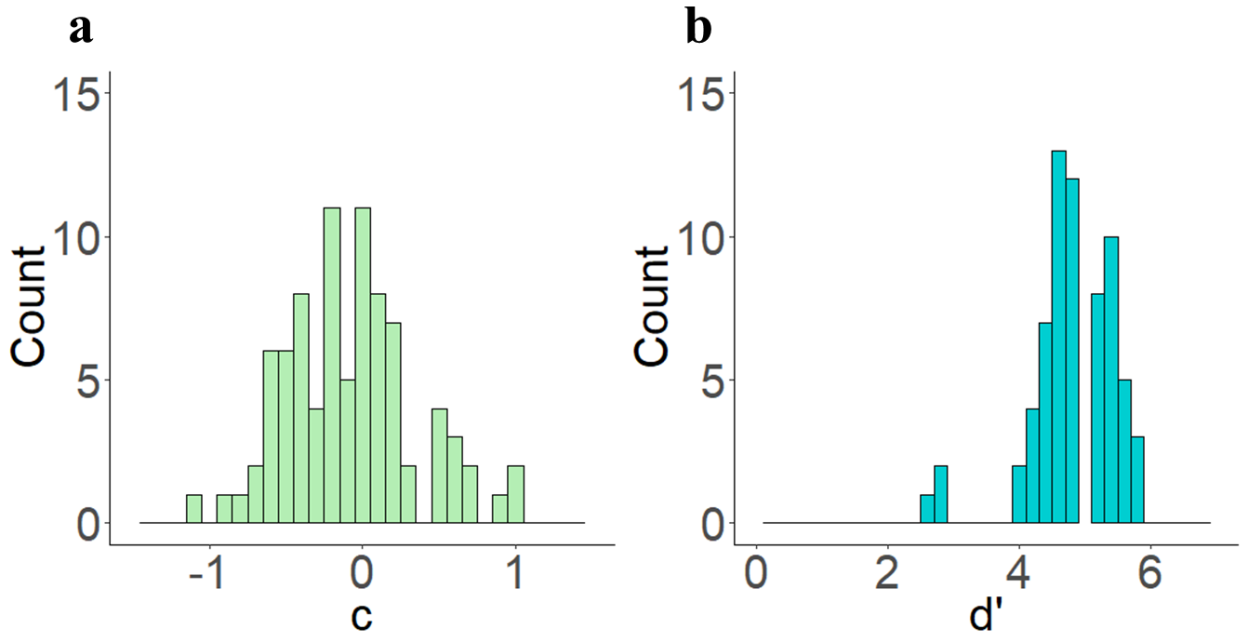

Figure 9. Visualization of *c* and *d'* collapsed across sexes. Figure 9a shows *c* or bias. Figure 9b shows *d'* or sensitivity.

Life History Strategy Hypothesis. The Life History Strategy Hypothesis stated that individuals with faster life history strategies would show more liberal SDT biases. The SDT analysis showed that life history strategy did not significantly change biases (b = 0.08, SE = 0.14, p = 0.569). Because there was no main effect of bias on the results, but there was a main effect of sensitivity, the relationship between life history strategy and sensitivity was also examined. Similarly to bias, there was no relationship between life history strategy and sensitivity (b = 0.09, SE = 0.23, p = 0.699). As mentioned previously, due to the error in collection these results are preliminary and need additional analyses to draw conclusions about the relationships between life history strategy, sensitivity, and bias.

Mating Strategy Hypothesis. The Mating Strategy Hypothesis stated that individuals with shorter-term mating strategies would show more liberal SDT biases. The SDT analysis showed no significant relationship between short-term mating strategy and biases (b = 0.05, SE = 0.05, p = 0.280), or long-term mating strategy and biases (b = -0.08, SE = 0.12, p = 0.484). Once

again, the relationship with sensitivity was also examined, and similarly showed no relationship with either short-term mating strategy (b = -0.07, SE = 0.08, p = 0.380) or long-term mating strategy (b = 0.10, SE = 0.20, p = 0.622).

Mate Value Hypothesis. The Mate Value Hypothesis stated that individuals with higher mate value will show more liberal SDT biases. The SDT analysis once again did not show an effect of mate value on bias (b = 0.07, SE = 0.07, p = 0.340) or sensitivity (b = 0.02, SE = 0.13, p = 0.873).

The three individual differences examined in these studies (i.e. life history strategy, sociosexual orientation, and mate value) have previously shown to be correlated (Strouts, Brase, & Dillon, 2017). However, VIF scores were all under three (VIF_{LHS} = 1.46, VIF_{LTMO} = 1.35, VIF_{STMO} = 1.41, VIF_{MV} = 1.25), suggesting minimal multicollinearity was present and no adjustments to these predictors were needed.

Chapter 5 - Discussion

Behaviors communicating sexual interest and disinterest were collected, evaluated, and combined into vignettes that were used to explore male sexual overperception through an Error Management Theory perspective and a Signal Detection Theory perspective. SDT results showed that sensitivity to the differences between signals of sexual interest and disinterest drove participants' perceptions of sexual interest, rather than an overall bias to perceive sexual interest. Men and women did not significantly differ in sensitivity, which was extremely high. Generally, cues of sexual interest were underperceived, but women were slightly more biased to perceive interest than men, who tended to perceive no interest. Other individual differences, such as life history strategy, mating strategy, and mate value did not affect sensitivity or bias. Similarly, EMT analysis found an overall underperception of sexual interest, but contradictory to the SDT results, found that men were perceiving nearly the same amount of sexual interest as women. Further examination found that these different results were due to EMT using difference scores that did not accurately reflect the average levels of perception between men and women due to overall underperception resulting in negative difference scores and different baselines for men and women. While the previously researched "male sexual overperception effect" was not found, these studies show that sexual communication may be more nuanced than previously thought.

Implications

The potential implications of these studies are numerous. First, these studies establish that SDT is a viable methodology for exploring the male sexual overperception effect and other biases explained through EMT. EMT analyses of the evolutionary costs and benefits of a decision outcome can be integrated with SDT to evaluate optimal decisions under uncertainty

from an evolutionary standpoint. This integration is particularly important, as an SDT analysis provides more information than typical EMT analyses do on their own.

SDT provides measures of both bias and sensitivity, whereas EMT can only provide a measure of bias. The separation of bias, or a tendency to respond in one particular way, from sensitivity, or how distinct signals and noise are from each other, allows for a better understanding of the cognitive mechanisms underlying a behavior. In the case of this research, the finding that responses were not significantly driven by bias but instead by sensitivity indicates that evolutionary optimality in sexual communication may be attained through the ability to separate signals of sexual interest from signals of sexual disinterest. Moreover, this high level of separation in perceiving cues more closely matched the patterns of high participant accuracy than did the EMT analysis, which found general underperception of interest, with men perceiving slightly more interest than women. Notably, the EMT analysis has no measure of overall accuracy or cue discriminability, leading to a conclusion of men perceiving more interest. This contrasts with the more accurate SDT conclusion of high discrimination of interest from disinterest, resulting in high accuracy when perceiving sexual communication.

Further, the standardized measures of sensitivity and bias provided by SDT are an improvement from the non-standardized measure of bias from EMT. Measures of *c* and *d'* are comparable to other research using SDT, whereas EMT measures of bias are only comparable to other measures of bias on the same scales. While this can be accounted for by standardizing, such as through a z-score calculation, EMT measures of bias can still be problematic due to their reliance on mean difference scores. As demonstrated in this research, difference scores can result in misleading conclusions (Cronbach & Furby, 1970; Griffin, Murray, & Gonzalez, 1999). Women's vignettes communicated more sexual interest than men's vignettes and after these

baselines were subtracted from average perceptions, women showed a larger absolute difference between perception and truth despite men and women having similar average levels of perceived interest. Moreover, because this difference was negative, men's misperception scores were greater (i.e. closer to zero) resulting in misperception scores that indicated that men perceived *more* interest than women, despite having a lower average perception than women. Additionally, EMT typically aggregates across trials and within sex, losing valuable information and statistical power, whereas SDT analyses can use a within-subjects multilevel approach that can account for individual and stimuli variation.

SDT analysis also allows for more precise exploration of the effects of individual differences. While previous EMT research has correlated individuals' personality measures with their average difference scores (e.g. Perilloux et al., 2012) or used regression to predict average difference scores using personality measures (e.g. Howell et al., 2012; Kohl & Robertson, 2014), SDT analysis can examine the effect of individual differences on sensitivity and/or bias, depending on the hypothesis. While correlation and regression are valid tools, the average difference scores used by EMT can be problematic due to the issues raised above.

Limitations

As in all scientific research, there are some limitations to the present studies. One specific limitation to these studies is the error with the entry of the K-SF-42, which unintentionally eliminated two subscales (Family Social Contact and Support & Friends Social Contact and Support). While life history strategy was still explored using the average z-scores of the remaining subscales, results must be interpreted cautiously and conclusions regarding the effects of life history strategy on bias or sensitivity are preliminary. Although there was no indication of an effect, future studies should re-examine life history strategy, as well as other individual

differences that may affect sexual communication. However, due to the calculation of average z-scores for life history strategy, it is not expected that this error should strongly be affecting the results.

Perhaps the biggest limitation to these studies is the possibly unrealistic stimuli. These studies used descriptions of actions rather than real actions. While somewhat typical for research in male sexual overperception (e.g. Edmondson & Conger, 1995; Kowalski, 1993; Haselton & Buss, 2000; DeSouza et al., 1992; Abbey & Harnish, 1995; Fisher & Walters, 2003), this could be affecting the results and conclusions of this study. Moreover, unlike true sexual communication, ambiguity was removed as much as possible to conduct the SDT analysis. While an objective truth was necessary for the analysis, ambiguity surely plays a role in sexual communication and thus this purposeful reduction of ambiguity could be driving the extremely high sensitivity.

Nevertheless, it is clear that sensitivity is playing a role as bias was not significantly affecting responses, and thus EMT topics such as male sexual overperception should be examined with sensitivity in mind. On a larger scale, it is possible that sexual communication could have evolved to be ambiguous, particularly sexual communication from women, who may benefit from concealment of sexual interest while they evaluate potential partners (e.g. parental investment theory; Trivers, 1972). However, future studies could address this limitation through the development of live or videoed stimuli that includes individuals interacting, then soliciting whether they were attracted to their conversation partner. This would eliminate the need for descriptions of behaviors rather than real behaviors, preserve ambiguity, and still maintain the binary objective truth necessary for SDT analyses. Alternatively, future studies could use different cut off points to ensure that ambiguity is reintroduced, for example, instead of

eliminating the middle third of vignettes, eliminating the middle 25% of vignettes to allow for more ambiguity.

Another possible limitation to these studies is the fairly restricted sample for the main SDT analysis. While the behavior elimination and vignette assessments reached a more general sample through Amazon Mechanical Turk, the primary SDT study used a convenience sample of general psychology students. This restricted the ages, ethnicities, sexual orientations and cultural backgrounds to those that can be found at a large midwestern university. Future studies need to incorporate a more general population, and potentially replicate these findings in cross-cultural studies, including hunter-gatherers.

More broadly, these studies do not directly address other theories that may explain the possibility of male sexual overperception. However, none of those theories would be consistent with the results shown here or in other studies that do not find evidence for male sexual overperception, as they do not explain any situations where men would fail to overperceive interest. EMT, however, can be incorporated into the idea of optimality as addressed in SDT through cost and benefit analysis, despite the results not demonstrating a bias difference. While this does not directly provide evidence for or against any possible theoretical explanation, the SDT structure and results are generally more consistent with EMT than with the general oversexualization hypothesis (Abbey, 1982; 1991), the media hypothesis (Abbey, 1991), or the default-model hypothesis (Shotland & Craig, 1988). Future studies should strive to include competing hypotheses that can help provide evidence for or against specific theories that may explain male sexual overperception.

A case could be made that not finding the established male sexual overperception effect is a limitation of these studies. However, as demonstrated with the EMT analysis, traditional

studies of male sexual overperception rely on difference scores that can be unrepresentative of the patterns in the raw data, potentially leading to other cases where male sexual overperception was concluded but not supported by the data. Additionally, the variety of methods used in male sexual overperception research (e.g. comparing men's and women's perceptions of the opposite sex's behaviors vs. comparing men's and women's perceptions of one sex's behaviors) makes it difficult to determine when and under what situations the male sexual overperception effect should or would appear. Future studies should examine if male sexual overperception is more likely to occur when comparing both sexes' perceptions on one sex's behaviors. Moreover, other recent research in this area occasionally fails to find male sexual overperception (e.g. Study 2 in Bendixen et al., 2019). Finally, data collection occurred during the fall/winter of 2018, closely following the confirmation hearings of Brett Kavanaugh and Dr. Christine Blasey Ford's testimony as well as the Me Too movement, which may have influenced participants in this study to underestimate sexual interest in a precautionary manner. This could partially be addressed by reanalyzing previous research, similar to the pilot study, or using datasets that are repeated measures and can be integrated with SDT methods to determine the influence of collection timing on the results.

Future Directions

SDT analyses of EMT topics

One of the largest benefits of these studies is that they show that EMT topics can be studied through SDT methodology. Other EMT topics, such as commitment skepticism (Haselton & Buss, 2000), perceptions of attractiveness (Hill, 2007), and other biases (e.g. Haselton & Nettle, 2006; Johnson, et al., 2013) can be examined using SDT methods to achieve the benefits of more information through measures of sensitivity and bias, standardized and

comparable metrics, no loss of information through aggregation, and easy integration of individual differences. Not only will SDT analyses of these biases have the same benefits as in this study (i.e. avoiding difference scores, standardized measures of both sensitivity and bias, etc.), but SDT can generate new predictions for these biases through the decades of previous research using SDT.

For example, SDT predicts that experimentally manipulating the signal to noise ratio in the stimuli will alter biases, such that more signals will result in more liberal biases and fewer signals will result in more conservative biases (e.g. Loeb & Binford, 1968, Baddeley & Colquhoun, 1969). This can be applied to sexual communication as well as other biases to determine if evolutionarily adaptive biases are sensitive to environmental conditions. Another hypothesis SDT generates is that manipulating costs and benefits will adjust bias, such that responses with greater benefits and fewer costs will result in biases that favor those responses (e.g. Davenport, 1968). This could be particularly useful for evolutionary psychology research, as it will help determine if the evolutionary pressures creating these biases are more influential than environmental pressures to alter behavior. Additional hypotheses that SDT can generate are that training should increase sensitivity (e.g. Fisk & Schneider, 1981), increasing target salience should increase sensitivity (Wickens et al., 2015), greater memory load should reduce sensitivity (Wickens et al., 2015), and giving the participant control of the rate at which they encounter stimuli should increase sensitivity (Scerbo, Greenwald, & Sawin, 1993), amongst others. These hypotheses are particularly important because they incorporate multiple levels of analysis and examine both the proximal and distal causes of a behavior, which is currently not incorporated in EMT alone.

Biased cognitions vs biased behaviors

One area these studies do not address is if male sexual overperception is a biased cognitive mechanism or a biased behavioral outcome. Much discussion of the male sexual overperception effect in recent years has been about whether men truly believe women are more sexually interested in them, or if they just behave as if women are sexually interested in them (e.g. Perilloux & Kurzban, 2015; Murray, Murphy, von Hippel, Trivers, & Haselton, 2017; Perilloux & Kurzban, 2017). These studies found no effect of bias on responses and instead found that sensitivity was driving responses, and thus it may not be a case of either biased cognitions or biased actions, but instead sensitivity to cues. Moreover, if an effect of bias had been found, this study would not be able to examine if the bias was caused by a belief pattern or a behavioral pattern. Future studies should consider including measures of confidence in the belief that a woman is communicating sexual interest to help clarify this issue.

Indirect measures of sexual interest

Like all studies on male sexual overperception, these studies rely on indirect measures of sexual interest. No truly objective measures of sexual intent exist, resulting in methods that rely on self-report and 3rd-party observers. Self-ratings may be understated compared to true intent, especially for women, as concealment of sexual interest and disinterest can be advantageous for gathering additional information about potential mates (Trivers, 1972). However, same sex 3rd-party observers might overstate a woman's sexual interest, either as a misperception or as a tactic to reduce the mate value of the observed women. These studies strived to reduce this problem by using an act-frequency approach to solicit initial behaviors and multiple different samples for the 3rd-party evaluations of interest and disinterest. These approaches should ensure that the behaviors are typical indicators of sexual interest and disinterest and should be less altered by

self-concealment and 3rd-party competition. Future research in this area should examine the differences between self and 3rd-party evaluations of interest, as well as include evaluations of interest from others who are close to the individual and may know them better, such as close family or friends.

Conclusions

This set of studies establish that SDT is a viable methodology for exploring sexual communication and that SDT methods can be used on biases typically studied with EMT. Moreover, SDT analyses were more reflective of the raw data, provided more information in standardized measurements, incorporated individual differences, and did not lose additional information to aggregation. Therefore, future research on biases traditionally examined through EMT should incorporate SDT analyses to explore both sensitivity and bias to ensure that research on biases, including male sexual overperception, provides the best possible description of human behavior and nature.

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Appendix A - Removed Hypothesis

One hypothesis was eliminated from these studies. Previously, the Overt Cueing Hypothesis stated that as sexual interest cues become more overt, participants' SDT sensitivity will increase. This hypothesis was eliminated due to the stimuli creation process not providing equal numbers and strengths of vignettes communicating sexual interest versus vignettes communicating sexual disinterest.

To operationalize overtness, an overtness score for each vignette was calculated as the absolute difference between the vignette's summed behavior cues and 150 (i.e. the midpoint of the range of possible values). This was done to ensure that a higher value would indicate more overtly positive or overtly negative cues of sexual interest. However, the final set of vignettes had fewer vignettes that strongly communicated interest than vignettes that strongly communicated disinterest (see Figure 6). When the middle third of vignettes were removed (see Study 1), the vignette scores were a bimodal distribution, which should have been centered around 150. However, when 150 was subtracted, the resulting vignettes in the center of the unimodal distribution did not correspond to the vignettes in the centers on the bimodal distribution, but instead were more communicative of sexual interest (Figure A1). When overtness was entered into the SDT model, this essentially functioned as a linear liberal shift on bias, resulting in no changes with significance, but incorrectly altering the bias to be more liberal for both men and women.

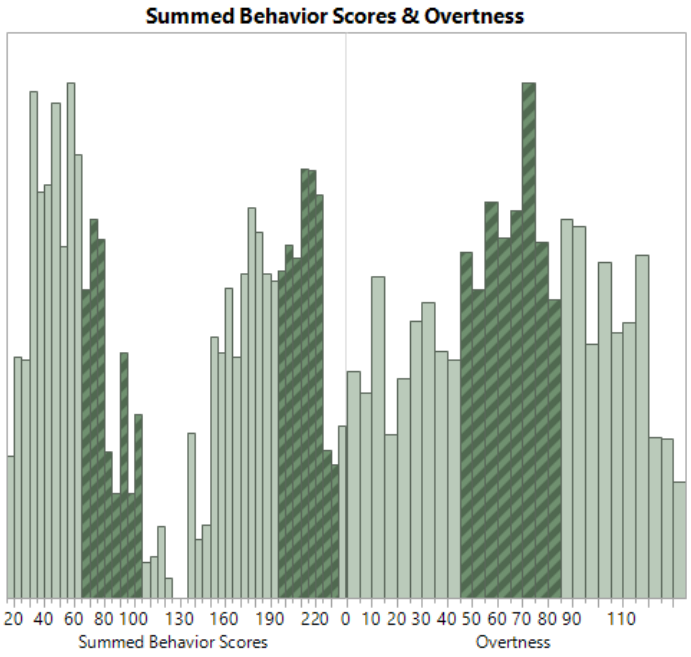

Figure A10. Visualization of the bimodal and unimodal vignette score distributions. Dark striped columns indicate the same vignettes in the bimodal distribution and the unimodal distribution. In the bimodal distribution, vignettes represented in the left mode are communicating disinterest and vignettes represented in the right mode are communicating interest. As can be seen here, the vignettes in the center of the unimodal distribution are not the vignettes in the centers of the bimodal distributions. The centers in the bimodal distribution should be equidistant from ambivalence and should communicate average overtness. However, as can be seen in this image, average overtness was actually made up of vignettes that weakly communicated disinterest and strongly communicated interest, resulting in shifted biases.

While this issue could have been avoided by using the true statistical midpoint of the vignettes, this would not have made theoretical sense. The midpoint of 150 was selected because it would have been the point of ambivalence. Anything greater than 150 indicates interest and anything less than 150 indicates disinterest. Using the statistical midpoint, which is less than 150, would essentially mean vignettes that weakly communicate disinterest would now be ambivalent vignettes. Since that did not reflect the pretesting of the vignettes, that solution was eliminated from consideration. Therefore, this predictor was removed from the analysis.

That said, the shift on bias did not affect the calculation of sensitivity. The analysis including overtness as a predictor showed that overtness strongly affected sensitivity (b = 0.61, SE = 0.04, $p < .001$), preliminarily confirming the hypothesis that as overtness increases,

sensitivity increases. Future research needs to specifically select vignettes for stimuli that are evenly distributed around the point of ambivalence to truly test this overtness hypothesis.

Appendix B - Stimuli Development Step 2 Procedure Changes

Initially, selected behaviors for either self- or other-behaviors and either as interest or disinterest behaviors were planned to be included for subsequent repetitions of Step 2, with unselected behaviors removed. However, due to the high number of behaviors selected as either self- or other-behaviors and due to the high number of behaviors selected as both interest and disinterest behaviors (see Table 2), the elimination criteria were adjusted so that behaviors had to be selected at least five times to be retained for the next step, and only the self-behaviors were used.

Table 2. Breakdown of selected behaviors.

Behaviors selected by men and women, for themselves and others.

Type of Behavior	Number of behaviors selected	Number of behaviors selected as both Interest and Disinterest
Women (Self-selected)	636	154
Men (Self-selected)	722	227
Women (Other-selected)	634	189
Men (Other-selected)	713	192

To prevent the same issue of elimination from occurring again, the methodology for the repetition was altered slightly. Since only self-selected behaviors were retained, participants only selected behaviors they would use to communicate either interest or disinterest (rather than also selecting behaviors they believed would be best for another person to use to communicate to them). Additionally, participants selected their top four interest behaviors and their top four disinterest behaviors (rather than top 5 for each category), in an effort to reduce the number of behaviors faster. A mobile device check was added, as the survey was not able to be optimized to display correctly on mobile devices. This check was performed through Qualtrics detection of device type. Finally, an attention check question was added due to the study taking place on an

online recruitment software. The attention check question included fruits and vegetables with the behaviors they had to select from, and in the instructions, participants were asked to drag four fruits into the sexual interest box and four fruits into the sexual disinterest box. Participants were removed if they dragged fruit into the sexual disinterest box or if they dragged vegetables into the sexual interest box. Two other attention checks were added that asked participants how attentive they were when answering the previous questions using a Likert-type scale with five options from *Not attentive at all* to *Extremely attentive* and one that asked how honest they were when answering the previous questions (also using a 5-point Likert-type scale from *Not honest at all* to *Extremely honest*). However, due to an experimenter error, only women in the sample were asked these questions and thus these questions were subsequently removed from any analysis. Otherwise, all method and instructions were the same from the first iteration of this step.

Appendix C - Stimuli Development Step 3 Procedure Changes

At the time of this study, concerns were being raised about the quality of Amazon Mechanical Turk data (e.g. Moss & Litman, 2018) so multiple checks were implemented to all subsequent Mechanical Turk studies. First, after giving informed consent, participants answered a captcha question to ensure that bot-provided answers were not included in the data. Following this, participants identified by the Qualtrics survey platform as using mobile devices were prevented from continuing to the next portions, as the survey questions were not optimized for mobile devices (this was also stated in the Amazon Mechanical Turk Hit). Next, participants were asked to answer an English comprehension question. This question was a sample test question from the TOEFL-ITP test that asked participants to read a short passage and select the option that best describes the passage. The passage stated:

> *The railroad was not the first institution to impose regularity on society, or to draw attention to the importance of precise timekeeping. For as long as merchants have set out their wares at daybreak and communal festivities have been celebrated, people have been in rough agreement with their neighbors as to the time of day. The value of this tradition is today more apparent than ever. Were it not for public acceptance of a single yardstick of time, social life would be unbearably chaotic: the massive daily transfer of goods, services, and information would proceed in fits and starts; the very fabric of modern society would begin to unravel.*

Participants were asked to identify the main idea from the passage from four random-ordered options, including: *In modern society we must make more time for our neighbors, The traditions of society are timeless, An accepted way of measuring time is essential for the smooth*

functioning of society (correct response), and *Society judges people by the times at which they conduct certain activities*. If participants selected anything other than the correct response, they were informed that they did not pass the English proficiency test, and the study ended for them, as English competency was an exclusion criteria in the informed consent and it was listed as a requirement for participation on the Mechanical Turk Hit.

Appendix D - Retained Female Vignettes

Vignette #	Vignettes	Rating Score	Binary Score	Objective SDT
1	She rejects a kiss from you. She acts bored. She gives you a nasty look.	1.115	0	N
2	She acts bored. She gives you a nasty look. She shoves you away.	1.607	0.036	N
3	She gives you a nasty look. She orients herself away from you. She acts bored.	1.424	0.061	N
4	She doesn't reciprocate. She acts bored. She shoves you away.	1.25	0	N
5	She shows you a look of disgust. She rejects a kiss from you. She shoves you away.	1.129	0.032	N
6	She moves your hand away. She gives you a nasty look. She acts bored.	1.065	0	N
7	She removes your hand after you place it on her. She shows you a look of disgust. She rejects a kiss from you.	1.063	0	N
8	She rejects a kiss from you. She has a disinterested facial expression towards you. She acts bored.	1.355	0	N
9	She retracts from your physical contact. She rejects a kiss from you. She removes herself from the situation.	1.156	0	N
10	She leans away from you. She shows you a lack of interest. She shoves you away.	1.071	0	N
11	She fakes being sick. She acts bored. She leaves.	1.04	0	N
12	She looks bored or annoyed with you. She rejects a kiss from you. She ignores you.	1.448	0	N
13	She avoids you. She gives you a nasty look. She walks away from you.	1	0	N
14	She rejects a kiss from you. She doesn't make eye contact with you. She walks away from you.	1.222	0	N
15	She has a disinterested facial expression towards you. She looks bored or annoyed with you. She shoves you away.	1.379	0.034	N
16	She rejects a kiss from you. She turns away from you. She avoids you.	1.28	0	N
17	She does not give you her full attention. She doesn't make eye contact with you. She shows you a lack of interest.	1.355	0	N
18	She looks for friends to leave with. She does not give you her full attention. She maintains her distance from you.	1.265	0.029	N

19	She doesn't flirt with you. She removes your hand after you place it on her. She avoids you.	1.206	0	N
20	She lets your conversation end on purpose. She avoids initiating sexual behavior with you. She removes herself from the situation.	1.185	0	N
21	She talks to someone else. She ignores you. She doesn't make eye contact with you.	1.7	0.033	N
22	She doesn't reciprocate. She gives you the cold shoulder. She doesn’t accept your invitation.	1.194	0	N
23	She avoids initiating sexual behavior with you. She leaves. She does not give you her full attention.	1.385	0	N
24	She shows her annoyance at you. She avoids initiating sexual behavior with you. She maintains her distance from you.	1.296	0.037	N
25	She has a disinterested facial expression towards you. She turns away from you. She walks away from you.	1.3	0	N
26	She leans away from you. She expresses discomfort towards you. She doesn’t accept your invitation.	1.121	0	N
27	She doesn't flirt with you. She shows her annoyance at you. She talks to someone else.	1.344	0.031	N
28	She doesn’t engage in conversation with you. She lets your conversation end on purpose. She doesn’t call you back.	1.214	0	N
29	She avoids initiating sexual behavior with you. She avoids you. She doesn’t engage in conversation with you.	1.185	0	N
30	She avoids initiating sexual behavior with you. She doesn’t accept your invitation. She maintains her distance from you.	1.172	0	N
31	She doesn’t engage in conversation with you. She avoids initiating sexual behavior with you. She walks away from you.	1.111	0	N
32	She doesn’t accept your invitation. She avoids kissing you. She looks around for a friend.	1.103	0	N
33	She is on her phone. She doesn’t accept your invitation. She shoves you away.	1.161	0	N
34	She ends eye contact with you. She removes your hand after you place it on her. She fakes being sick.	1.219	0	N
35	She retracts from your physical contact. She avoids being alone with you. She is on her phone.	1.345	0	N
36	She is on her phone. She avoids kissing you. She avoids being alone with you.	1.231	0	N
37	She lets your conversation end on purpose. She ends eye contact with you. She fakes being sick.	1.3	0	N

38	She lets your conversation end on purpose. She ends eye contact with you. She avoids you.	1.519	0	N
39	She ends eye contact with you. She avoids initiating sexual behavior with you. She shows you a lack of interest.	1.241	0	N
40	She ends eye contact with you. She expresses discomfort towards you. She acts busy.	1.393	0.036	N
41	She talks to someone else. She avoids being alone with you. She is on her phone.	1.194	0	N
42	She doesn’t accept your invitation. She ends eye contact with you. She looks for friends to leave with.	1.147	0	N
43	She ends eye contact with you. She avoids initiating sexual behavior with you. She maintains her distance from you.	1.375	0.031	N
44	She ends eye contact with you. She doesn’t accept your invitation. She fakes being sick.	1.296	0	N
45	She is on her phone. She doesn’t engage in conversation with you. She looks around for a friend.	1.167	0	N
46	She has a disinterested facial expression towards you. She ends eye contact with you. She doesn’t engage in conversation with you.	1.308	0.038	N
47	She shoves you away. She gives you a nasty look. She touches you nonsexually.	1.281	0	N
48	She touches you nonsexually. She shows you a look of disgust. She gives you a nasty look.	1.633	0.067	N
49	She rejects a kiss from you. She touches you nonsexually. She orients herself away from you.	1.29	0	N
50	She is on her phone. She maintains her distance from you. She ends eye contact with you.	1.586	0	N
51	She touches you nonsexually. She rejects a kiss from you. She avoids you.	1.313	0	N
53	She touches you nonsexually. She expresses discomfort towards you. She orients herself away from you.	1.438	0.031	N
54	She touches you nonsexually. She moves your hand away. She removes herself from the situation.	1.286	0.036	N
55	She shows her annoyance at you. She touches you nonsexually. She avoids kissing you.	1.6	0.033	N
56	She fakes being sick. She touches you nonsexually. She doesn’t call you back.	1.323	0	N
57	She touches you nonsexually. She turns away from you. She removes herself from the situation.	1.75	0.071	N
58	She leans away from you. She doesn't flirt with you. She touches you nonsexually.	1.643	0	N

59	She touches you nonsexually. She removes your hand after you place it on her. She doesn’t accept your invitation.	1.567	0.067	N
60	She touches you nonsexually. She shows her annoyance at you. She talks to someone else.	1.357	0	N
61	She touches you nonsexually. She puts her hands out to stop an advance from you. She doesn't flirt with you.	1.185	0	N
62	She shows you a lack of interest. She rejects a kiss from you. She leaves with you to go to a personal place.	2.3	0.067	N
63	She touches you nonsexually. She puts her hands out to stop an advance from you. She looks around for a friend.	1.241	0	N
64	She expresses discomfort towards you. She gives you a nasty look. She leaves with you to go to a personal place.	1.643	0.036	N
65	She leaves with you to go to a personal place. She shows you a look of disgust. She removes herself from the situation.	1.593	0.074	N
70	She leaves with you to go to a personal place. She has a disinterested facial expression towards you. She leans away from you.	2.107	0.071	N
71	She leaves with you to go to a personal place. She doesn't flirt with you. She retracts from your physical contact.	1.806	0.032	N
72	She leaves with you to go to a personal place. She shows her annoyance at you. She maintains her distance from you.	1.656	0.063	N
73	She is nice to you. She lets your conversation end on purpose. She does not answer you.	1.688	0	N
74	She is nice to you. She has a disinterested facial expression towards you. She removes your hand after you place it on her.	1.679	0.036	N
75	She retracts from your physical contact. She runs her hands through her hair. She acts bored.	1.621	0.069	N
76	She retracts from your physical contact. She shoves you away. She runs her hands through her hair.	1.613	0.032	N
77	She is nice to you. She expresses discomfort towards you. She lets your conversation end on purpose.	1.567	0	N
78	She is nice to you. She avoids initiating sexual behavior with you. She avoids kissing you.	1.742	0.032	N
79	She has a pleasant appearance towards you. She retracts from your physical contact. She looks for friends to leave with.	1.31	0	N

80	She sits next to you. She gives you a nasty look. She doesn't make eye contact with you.	1.214	0	N
81	She acts bored. She is honest with you. She puts her hands out to stop an advance from you.	1.552	0.069	N
82	She runs her hands through her hair. She doesn’t call you back. She looks for friends to leave with.	1.625	0.063	N
84	She tries to be nice to you. She shows you a lack of interest. She leaves.	1.371	0	N
85	She doesn't flirt with you. She runs her hands through her hair. She removes herself from the situation.	1.483	0.034	N
86	She runs her hands through her hair. She avoids initiating sexual behavior with you. She leaves.	1.96	0.04	N
87	She sits next to you. She shows her annoyance at you. She fakes being sick.	1.433	0.067	N
88	She listens to you attentively. She doesn't reciprocate. She rejects a kiss from you.	1.714	0.036	N
89	She sits next to you. She avoids initiating sexual behavior with you. She gives you the cold shoulder.	1.8	0.067	N
90	She frequently smiles at you. She lets your conversation end on purpose. She shoves you away.	1.909	0.061	N
91	She is honest with you. She doesn’t accept your invitation. She turns away from you.	1.233	0	N
93	She maintains her distance from you. She is open to you. She walks away from you.	2.069	0.034	N
95	She is playful with you. She rejects a kiss from you. She leaves.	2.344	0.063	N
97	She frequently talks to you. She doesn’t accept your invitation. She puts her hands out to stop an advance from you.	1.531	0.031	N
98	She listens to you attentively. She doesn’t accept your invitation. She removes herself from the situation.	1.379	0	N
99	She focuses her attention on you. She does not answer you. She puts her hands out to stop an advance from you.	1.5	0.033	N
100	She laughs at all of your jokes. She turns away from you. She removes herself from the situation.	1.742	0.032	N
102	She engages in subtle physical contact with you. She retracts from your physical contact. She doesn’t call you back.	2.069	0.069	N
104	She does not give you her full attention. She does not answer you. She avoids leaving you.	1.8	0.04	N
105	She has open body language. She doesn’t accept your invitation. She removes herself from the situation.	1.704	0.037	N

134	She doesn't accept your invitation. She is nice to you. She smiles big at you.	2.516	0.065	N
135	She sits next to you. She frequently talks to you. She looks bored or annoyed with you.	2.25	0.036	N
156	She puts her hands out to stop an advance from you. She makes long eye contact with you. She is honest with you.	2	0.065	N
172	She sits next to you. She looks around for a friend. She intimately holds you.	4.393	0.857	Y
174	She has a disinterested facial expression towards you. She plays with your hands. She shows desire for you.	4.367	0.9	Y
183	She talks to someone else. She is soft and inviting to you. She kisses you.	4.345	0.897	Y
191	She shows you positive body language. She plays with your hands. She is honest with you.	4.536	0.929	Y
192	She lets your conversation end on purpose. She increases physical contact with you. She engages in touching and kissing with you.	5.64	0.96	Y
193	She leaves with you to go to a personal place. She makes body contact with you. She gives you her full attention.	5.8	0.933	Y
194	She ends eye contact with you. She makes frequent physical contact with you. She invites you to go home with her.	5.387	0.968	Y
195	She kisses you for a prolonged time. She makes frequent physical contact with you. She leaves.	5.069	0.862	Y
200	She has a disinterested facial expression towards you. She touches you a lot. She makes out with you.	4.6	0.88	Y
202	She gives you her full attention. She is honest with you. She makes body contact with you.	4.633	0.867	Y
204	She leaves with you to go to a personal place. She gives you hints. She makes body contact with you.	5.929	1	Y
206	She listens to you attentively. She gives you hints. She plays with your hands.	5.276	0.897	Y
208	She is playful with you. She engages in subtle physical contact with you. She makes eye contact with you.	4.8	0.9	Y
209	She cuddles with you. She touches you a lot. She touches you nonsexually.	4.724	0.897	Y
211	She tries to be alone with you. She sits next to you. She is playful with you.	5	0.857	Y
212	She laughs at all of your jokes. She runs her hands through her hair. She touches you a lot.	5.267	0.933	Y
213	She is soft and inviting to you. She whispers in your ear. She shows interest in the conversation with you.	5.094	0.875	Y

215	She laughs at all of your jokes. She is open to you. She tries to be alone with you.	4.808	0.923	Y
219	She touches your arm. She invites you to go home with her. She leans in to listen to your conversation.	5.452	0.935	Y
220	She makes eye contact with you. She engages in touching and kissing with you. She runs her hands through her hair.	6.037	1	Y
221	She plays with your hands. She engages in physical contact with you. She asks you intimate questions.	5.423	0.962	Y
222	She makes body contact with you. She engages in subtle physical contact with you. She shows you positive body language.	4.867	0.933	Y
223	She puts her hand on your thigh. She shows her cleavage to you. She shows interest in the conversation with you.	5.931	0.966	Y
224	She is open to you. She has open body language. She invites you to go home with her.	5.774	0.968	Y
225	She is playful with you. She is honest with you. She moves her hands along your body.	5.517	1	Y
226	She cuddles with you. She focuses her attention on you. She is playful with you.	5.357	0.929	Y
227	She flirts with you. She leans in to listen to your conversation. She shows you positive body language.	5.138	0.931	Y
228	She initiates an advance with you. She is soft and inviting to you. She shows interest in the conversation with you.	5.143	0.929	Y
230	She pays attention to you. She stays within eye sight of you. She kisses you for a prolonged time.	5.75	1	Y
231	She frequently smiles at you. She cuddles with you. She increases physical contact with you.	5.5	1	Y
232	She plays with your hands. She initiates an advance with you. She avoids leaving you.	5.483	0.931	Y
233	She invites you to go home with her. She asks you intimate questions. She laughs at all of your jokes.	5.969	0.969	Y
234	She leaves with you to go to a personal place. She is intimate with you. She flirts with you.	5.967	1	Y
235	She makes long eye contact with you. She smiles big at you. She invites you to go home with her.	6.069	1	Y
236	She tries to be alone with you. She touches you a lot. She leans in to listen to your conversation.	5.533	0.933	Y
237	She makes eye contact with you. She engages in touching and kissing with you. She engages in subtle physical contact with you.	5.258	1	Y

238	She makes constant physical contact with you. She leans in to listen to your conversation. She increases physical contact with you.	5.538	1	Y
239	She takes you somewhere private. She touches your arm. She intimately holds you.	6	1	Y
240	She has a happy or pleased facial expression. She shows desire for you. She avoids leaving you.	5.161	0.903	Y
241	She moves her hands along your body. She engages in subtle physical contact with you. She shows you positive body language.	5.481	1	Y
242	She asks you intimate questions. She is around you constantly. She is intimate with you.	6	1	Y
243	She stays within eye sight of you. She puts a hand on your thigh. She makes constant physical contact with you.	5.516	0.968	Y
244	She puts a hand on your thigh. She increases physical contact with you. She shows her cleavage to you.	6.133	1	Y
245	She tries to be alone with you. She puts a hand on your thigh. She shows her cleavage to you.	6.111	1	Y
246	She gives you her full attention. She has an intimate interaction with you. She invites you to go home with her.	6.433	1	Y
247	She is soft and inviting to you. She whispers in your ear. She is intimate with you.	5.9	1	Y
248	She shows desire for you. She is inviting toward you. She puts her hand on your thigh.	5.893	0.964	Y
249	She makes out with you. She gives you hints. She laughs at all of your jokes.	5.621	0.966	Y
250	She has open body language. She engages in subtle physical contact with you. She makes out with you.	5.517	0.966	Y
251	She has flirty eyes with you. She moves her hands along your body. She engages in subtle physical contact with you.	5.759	1	Y
252	She leans in to listen to your conversation. She flirts with you. She intimately holds you.	5.786	0.964	Y
253	She makes out with you. She stays within eye sight of you. She touches you a lot.	6.167	1	Y
254	She has an intimate interaction with you. She intimately holds you. She smiles big at you.	5.517	0.897	Y
255	She flirts with you. She initiates an advance with you. She shows her cleavage to you.	5.969	0.969	Y
256	She kisses you. She pays attention to you. She shows desire for you.	5.867	0.933	Y
257	She gives you hints. She has an intimate interaction with you. She invites you to go home with her.	6.212	1	Y

258	She is soft and inviting to you. She moves her hands along your body. She puts a hand on your thigh.	5.963	1	Y
260	She tries to be alone with you. She engages in physical contact with you. She engages in touching and kissing with you.	6.25	1	Y
261	She shows interest in the conversation with you. She makes out with you. She intimately holds you.	5.926	1	Y
262	She frequently smiles at you. She kisses you for a prolonged time. She shows desire for you.	6.276	1	Y
263	She engages in physical contact with you. She makes constant physical contact with you. She has an intimate interaction with you.	6.038	0.962	Y
264	She makes body contact with you. She is intimate with you. She flirts with you.	6	0.966	Y
265	She increases physical contact with you. She engages in touching and kissing with you. She flirts with you.	6	1	Y
266	She kisses you for a prolonged time. She puts her hand on your thigh. She makes long eye contact with you.	6.036	0.964	Y
267	She makes out with you. She engages in touching and kissing with you. She shows positive facial expressions towards you.	6.033	1	Y
268	She kisses you for a prolonged time. She has flirty eyes with you. She puts a hand on your thigh.	6.115	1	Y
269	She has an intimate interaction with you. She makes constant physical contact with you. She flirts with you.	5.97	1	Y
270	She leans in to listen to your conversation. She moves her hands along your body. She makes out with you.	6.069	1	Y
271	She makes body contact with you. She engages in touching and kissing with you. She has an intimate interaction with you.	6.258	1	Y
272	She makes out with you. She kisses you. She engages in subtle physical contact with you.	5.889	1	Y
273	She makes constant physical contact with you. She cuddles with you. She is intimate with you.	6.517	1	Y
274	She intimately holds you. She shows her cleavage to you. She makes out with you.	6.5	1	Y
275	She tries to be alone with you. She engages in touching and kissing with you. She intimately holds you.	6.148	1	Y
276	She moves her hands along your body. She makes frequent physical contact with you. She kisses you.	6.419	1	Y

277	She flirts with you. She kisses you. She has an intimate interaction with you.	6.233	1	Y
278	She invites you to go home with her. She engages in touching and kissing with you. She initiates an advance with you.	6.633	1	Y
279	She avoids leaving you. She makes out with you. She kisses you for a prolonged time.	6.037	1	Y
280	She makes constant physical contact with you. She moves her hands along your body. She has an intimate interaction with you.	6.433	0.967	Y
281	She touches you a lot. She makes out with you. She has an intimate interaction with you.	6.4	1	Y
282	She invites you to go home with her. She engages in touching and kissing with you. She shows desire for you.	6.5	0.962	Y
283	She puts her hand on your thigh. She engages in touching and kissing with you. She kisses you for a prolonged time.	6.387	1	Y
284	She kisses you for a prolonged time. She invites you to go home with her. She moves her hands along your body.	6.241	0.966	Y
285	She flirts with you. She intimately holds you. She makes out with you.	6.242	1	Y
286	She makes out with you. She engages in touching and kissing with you. She reciprocates your touch.	6.286	0.964	Y
287	She engages in touching and kissing with you. She cuddles with you. She makes out with you.	6.296	1	Y
288	She makes out with you. She kisses you for a prolonged time. She invites you to go home with her.	6.226	0.968	Y
289	She kisses you. She kisses you for a prolonged time. She has an intimate interaction with you.	6.306	1	Y
290	She shows desire for you. She engages in touching and kissing with you. She has an intimate interaction with you.	6.5	1	Y
291	She moves her hands along your body. She initiates an advance with you. She kisses you for a prolonged time.	6.533	0.967	Y
292	She initiates an advance with you. She shows desire for you. She makes out with you.	6.194	1	Y
294	She kisses you. She kisses you for a prolonged time. She moves her hands along your body.	6.481	1	Y
295	She engages in touching and kissing with you. She shows desire for you. She is intimate with you.	6.172	0.966	Y
296	She shows desire for you. She kisses you. She makes out with you.	6.152	1	Y

297	She engages in touching and kissing with you. She makes out with you. She has an intimate interaction with you.	6.273	0.97	Y
298	She engages in touching and kissing with you. She moves her hands along your body. She kisses you for a prolonged time.	6.484	1	Y
299	She kisses you for a prolonged time. She intimately holds you. She makes out with you.	6.28	1	Y
300	She shows desire for you. She makes out with you. She engages in touching and kissing with you.	6.258	1	Y

Appendix E - Retained Male Vignettes

Vignette #	Vignettes	Rating Score	Binary Score	Objective SDT
1	He gives you a nasty look. He pushes you away. He walks away or creates distance from you.	1.263	0.053	N
2	He actively avoids you. He gives you a nasty look. He walks away or creates distance from you.	1.136	0	N
3	He actively avoids you. He pushes you away. He walks away or creates distance from you.	1.3	0	N
4	He shows little emotion towards you. He gives you a nasty look. He actively avoids you.	1.19	0	N
5	He gives you a nasty look. He walks away or creates distance from you. He does not hug you.	1.588	0	N
7	He does not hug you. He shows little emotion towards you. He gives you a nasty look.	1.762	0.095	N
8	He does not hug you. He walks away or creates distance from you. He is rude to you.	1.158	0	N
10	He ends a conversation with you. He pushes you away. He uses body language to create distance from you.	1.529	0.118	N
11	He shows little emotion towards you. He gives you a nasty look. He does not reciprocate texting with you.	1.318	0	N
12	He has an unpleasant facial expression towards you. He shows little emotion towards you. He looks bored with you.	1.429	0.048	N
13	He pretends he has other commitments when with you. He is weirded out by you. He pushes you away.	1.381	0.048	N
15	He shows little emotion towards you. He looks bored with you. He ends a conversation with you.	1.579	0	N
16	He actively avoids you. He looks bored with you. He does not reciprocate smiling with you.	1.273	0	N
18	He does not engage in the conversation with you. He walks away or creates distance from you. He does not hug you.	1.571	0.048	N
19	He shows annoyance towards you. He looks stiff around you. He has an unpleasant facial expression towards you.	1.545	0.045	N
20	He does not respond to physical contact from you. He uses body language to create distance from you. He pretends he has other commitments when with you.	1.8	0.1	N

21	He pretends he has other commitments when with you. He actively avoids you. He looks stiff around you.	2.353	0.118	N
22	He pushes you away. He does not reciprocate texting with you. He does not smile or laugh with you.	1.478	0.043	N
24	He does not engage in the conversation with you. He pushes you away. He does not smile at you.	1.318	0	N
25	He is emotionless to you. He has an unpleasant facial expression towards you. He avoids situations with you.	1.571	0.048	N
26	He does not reciprocate texting with you. He does not communicate with you. He looks bored with you.	1.522	0.087	N
27	He is weirded out by you. He ends a conversation with you. He is emotionless to you.	1.111	0	N
28	He does not engage in the conversation with you. He uses body language to show his discomfort with you. He shows little emotion towards you.	1.35	0.05	N
29	He frequently checks his phone. He shows little emotion towards you. He does not reciprocate smiling with you.	1.421	0	N
30	He is weirded out by you. He feels like a stranger to you. He limits physical contact with you.	1.556	0.056	N
31	He does not invite you to his home. He looks stiff around you. He ends a conversation with you.	1.421	0.053	N
32	He avoids situations with you. He does not invite you to his home. He does not smile or laugh with you.	1.737	0.105	N
33	He feels like a stranger to you. He does not communicate with you. He looks stiff around you.	2.143	0.143	N
34	He shows anger towards you. He avoids eye contact with you. He frequently checks his phone.	1.72	0.08	N
35	He checks his phone around you. He uses body language to create distance from you. He does not reciprocate texting with you.	1.762	0.048	N
36	He does not invite you to his home. He looks for a friend to escape the situation with you. He shows interest in someone else instead of you.	1.3	0.05	N
37	He is not being as nice to you as he previously was. He shows little emotion towards you. He does not reciprocate texting with you.	1.722	0.056	N
38	He does not smile at you. He has awkward body language toward you. He avoids situations with you.	2.222	0.111	N

39	He looks for a friend to escape the situation with you. He frequently checks his phone. He shows interest in someone else instead of you.	1.438	0.125	N
40	He shows anger towards you. He has awkward body language toward you. He avoids eye contact with you.	2.19	0.095	N
41	He looks stiff around you. He avoids eye contact with you. He checks his phone around you.	1.905	0.048	N
42	He shows interest in someone else instead of you. He is emotionless to you. He looks stiff around you.	1.45	0.05	N
43	He does not invite you to his home. He checks his phone around you. He does not reciprocate smiling with you.	1.476	0	N
44	He looks stiff around you. He checks his phone around you. He feels like a stranger to you.	2.333	0.133	N
45	He looks stiff around you. He has awkward body language toward you. He avoids eye contact with you.	3.111	0.389	N
46	He looks bored with you. He checks his phone around you. He frequently checks his phone.	1.684	0.053	N
47	He pretends he has other commitments when with you. He is not being as nice to you as he previously was. He uses body language to show his discomfort with you.	2.316	0.211	N
48	He looks stiff around you. He is not being as nice to you as he previously was. He retracts from physical contact with you.	1.938	0.125	N
49	He limits physical contact with you. He uses body language to show his discomfort with you. He has awkward body language toward you.	1.739	0	N
50	He does not invite you to his home. He looks stiff around you. He is not being as nice to you as he previously was.	1.611	0.111	N
51	He gives you a nasty look. He acts cool in front of you. He has an unpleasant facial expression towards you.	2.429	0.143	N
52	He appears approachable to you. He pushes you away. He walks away or creates distance from you.	2.316	0	N
53	He talks to you. He avoids situations with you. He is weirded out by you.	1.5	0.056	N
54	He shows little emotion towards you. He shows annoyance towards you. He engages in nonsexual touching with you.	1.625	0.125	N
55	He engages in nonsexual touching with you. He ignores your messages. He pushes you away.	1.727	0.136	N

57	He does not reciprocate smiling with you. He gives you a nasty look. He appears approachable to you.	2.167	0.056	N
58	He encourages you. He uses body language to create distance from you. He pushes you away.	2.591	0.136	N
59	He has an unpleasant facial expression towards you. He shows interest in your conversation. He walks away or creates distance from you.	1.867	0.133	N
61	He encourages you. He looks bored with you. He walks away or creates distance from you.	2.12	0.08	N
62	He does not invite you to his home. He appears approachable to you. He gives you a nasty look.	2.053	0.158	N
64	He does not reciprocate smiling with you. He acts cool in front of you. He looks for a friend to escape the situation with you.	1.579	0.053	N
65	He encourages you. He pushes you away. He uses body language to show his discomfort with you.	2.353	0.059	N
66	He is weirded out by you. He leans towards you. He shows annoyance towards you.	2.136	0.136	N
67	He creates excuses to run into you. He looks for a friend to escape the situation with you. He is rude to you.	2.938	0.188	N
68	He has open body language towards you. He does not invite you to his home. He ends a conversation with you.	2.957	0.217	N
69	He is distracted from you. He uses body language to create distance from you. He has soft facial expressions towards you.	2.882	0.176	N
70	He walks or drives you home. He does not hug you. He looks for a friend to escape the situation with you.	2.158	0.105	N
71	He shows little emotion towards you. He uses body language to create distance from you. He maintains eye contact with you.	2.526	0.211	N
72	He talks to you. He has awkward body language toward you. He uses body language to create distance from you.	2.176	0.118	N
73	He shows interest in your conversation. He does not invite you to his home. He is weirded out by you.	2.429	0.19	N
74	He is weirded out by you. He leans towards you. He shows interest in someone else instead of you.	1.722	0.056	N
75	He creates excuses to run into you. He avoids eye contact with you. He shows anger towards you.	2	0.1	N
76	He leans towards you. He shows interest in someone else instead of you. He uses body language to create distance from you.	2.15	0.1	N

77	He gives you a nasty look. He is not responsive in conversation with you. He asks for your number.	3.55	0.35	N
78	He focuses on you. He retracts from physical contact with you. He does not smile at you.	2.476	0.238	N
79	He grins at you. He avoids eye contact with you. He shows interest in someone else instead of you.	1.944	0.111	N
81	He looks stiff around you. He limits his smiling around you. He seems approachable to you.	2.81	0.333	N
84	He uses body language to show his discomfort with you. He closes the distance between you and him. He avoids situations with you.	1.778	0.056	N
85	He is weirded out by you. He engages with you. He limits his smiling around you.	2.529	0.118	N
86	He checks his phone around you. He looks stiff around you. He allows physical contact from you.	2.737	0.263	N
88	He maintains eye contact with you. He uses body language to show his discomfort with you. He does not invite you to his home.	2.333	0.143	N
91	He limits physical contact with you. He checks his phone around you. He focuses on you.	3.5	0.409	N
92	He winks at you with flirty facial expressions. He shows little emotion towards you. He ignores your messages.	3.882	0.353	N
95	He does not invite you to his home. He is close to you. He is emotionless to you.	2.182	0.091	N
98	He does not hug you. He softly touches your arm waist or neck. He does not reciprocate texting with you.	3.063	0.25	N
99	He does not reciprocate smiling with you. He puts his hands on your legs. He pushes you away.	2.409	0.227	N
100	He engages in a lot of physical contact with you. He uses body language to show his discomfort with you. He walks away or creates distance from you.	3.455	0.409	N
102	He does not invite you to his home. He looks distracted around you. He engages in physical contact with you.	3.368	0.368	N
103	He shows little emotion towards you. He engages in physical contact with you. He checks his phone around you.	3.524	0.381	N
104	He limits his smiling around you. He engages in physical contact with you. He retracts from physical contact with you.	3.182	0.318	N
105	He kisses you back. He is not responsive in conversation with you. He actively avoids you.	2.55	0.3	N
106	He does not hug you. He hangs out with you. He talks to you.	3.421	0.368	N

107	He does not reciprocate smiling with you. He has awkward body language toward you. He engages in casual physical contact with you.	3	0.409	N
113	He talks to you. He ignores your messages. He walks or drives you home.	3	0.381	N
114	He kisses your neck. He avoids situations with you. He finds an excuse to get away from you.	3.087	0.261	N
115	He checks his phone around you. He puts his hands on your legs. He actively avoids you.	3.357	0.214	N
116	He avoids eye contact with you. He runs his hands along your body. He walks away or creates distance from you.	2.727	0.409	N
123	He engages in nonsexual touching with you. He shows annoyance towards you. He smiles at you more.	3.304	0.348	N
133	He smiles at you more. He walks or drives you home. He finds an excuse to get away from you.	3.368	0.421	N
136	He initiates contact with you. He acts cool in front of you. He shows interest in someone else instead of you.	2.7	0.35	N
139	He makes accidental physical contact with you. He engages in a lot of physical contact with you. He actively avoids you.	3.375	0.292	N
163	He teases you in a flirty way. He initiates contact with you. He is distracted from you.	5.095	0.952	Y
170	He checks you out. He softly touches your arm waist or neck. He looks stiff around you.	5.476	0.952	Y
171	He looks stiff around you. He puts his hands on your legs. He initiates contact with you.	5.591	1	Y
176	He looks stiff around you. He puts his hands on your legs. He winks at you with flirty facial expressions.	5.429	0.952	Y
184	He smiles at you more. He allows physical contact from you. He maintains eye contact with you.	5.316	1	Y
185	He teases you in a flirty way. He acts cool in front of you. He leans towards you.	5.545	0.955	Y
188	He allows physical contact from you. He seems approachable to you. He winks at you with flirty facial expressions.	5.7	1	Y
191	He puts his arm around your back. He looks stiff around you. He kisses you for a long time.	6	1	Y
192	He focuses on you. He checks you out. He gives you attention.	5.696	0.957	Y
193	He softly touches your arm waist or neck. He allows physical contact from you. He hangs out with you.	5.95	1	Y

194	He kisses you for a long time. He looks stiff around you. He goes home with you.	6.048	0.952	Y
195	He kisses you. He has awkward body language toward you. He winks at you with flirty facial expressions.	5.524	0.952	Y
197	He winks at you with flirty facial expressions. He gives you his full attention. He uses body language with you.	5.789	1	Y
198	He encourages you. He gives you his full attention. He puts his hands on your legs.	6.318	0.955	Y
199	He uses body language with you. He initiates some flirting with you. He shows interest in your conversation.	5.364	1	Y
200	He gives you his number. He teases you in a flirty way. He engages in nonsexual touching with you.	5.741	1	Y
202	He winks at you with flirty facial expressions. He uses body language with you. He is close to you.	5.7	1	Y
203	He closes the distance between you and him. He leans towards you. He goes home with you.	6.19	0.952	Y
204	He has awkward body language toward you. He runs his hands along your body. He goes home with you.	5.909	0.955	Y
205	He puts his hands on your legs. He goes out of his way to make you laugh. He leans towards you.	6.429	1	Y
206	He winks at you with flirty facial expressions. He hangs out with you. He engages in physical contact with you.	6.105	1	Y
207	He leans towards you. He checks you out. He winks at you with flirty facial expressions.	6.435	1	Y
208	He engages with you. He constantly tries to hang out with you. He winks at you with flirty facial expressions.	6.105	1	Y
210	He hangs out with you. He asks for your number. He puts his hands on your legs.	5.905	0.952	Y
212	He engages in casual physical contact with you. He grins at you. He goes home with you.	6.263	1	Y
214	He kisses your neck. He has open body language towards you. He asks for your number.	6.471	1	Y
216	He initiates contact with you. He softly touches your arm waist or neck. He maintains eye contact with you.	5.727	1	Y
217	He is close to you. He shows excitement towards you. He kisses you back.	6.059	1	Y
218	He is close to you. He kisses you for a long time. He allows physical contact from you.	6.565	1	Y

219	He allows physical contact from you. He grabs your hand. He touches your neck or shoulders.	6.19	1	Y
220	He appears approachable to you. He initiates some flirting with you. He cuddles with you.	6	1	Y
221	He winks at you with flirty facial expressions. He lies in bed with you. He hangs out with you.	6.333	1	Y
222	He runs his hands along your body. He asks for your number. He hangs out with you.	6.235	1	Y
224	He gets your number. He engages with you. He lies in bed with you.	6.538	1	Y
225	He buys you something. He winks at you with flirty facial expressions. He lies in bed with you.	6.571	1	Y
226	He winks at you with flirty facial expressions. He shows excitement towards you. He cuddles with you.	6.263	1	Y
227	He winks at you with flirty facial expressions. He runs his hands along your body. He appears approachable to you.	6	1	Y
228	He winks at you with flirty facial expressions. He kisses your neck. He has soft facial expressions towards you.	6.474	1	Y
231	He gives you his number. He closes the distance between you and him. He puts his hands on your legs.	6.05	1	Y
232	He touches your thigh. He winks at you with flirty facial expressions. He constantly tries to hang out with you.	6.5	1	Y
233	He creates excuses to run into you. He winks at you with flirty facial expressions. He initiates kissing you.	6.143	1	Y
234	He grabs your hand. He touches your thigh. He smiles at you more.	6.304	0.957	Y
235	He goes home with you. He engages in casual physical contact with you. He winks at you with flirty facial expressions.	6.19	1	Y
236	He kisses your neck. He lies in bed with you. He has open body language towards you.	6.727	1	Y
238	He is close to you. He touches your thigh. He initiates some flirting with you.	6.333	1	Y
239	He winks at you with flirty facial expressions. He buys you something. He runs his hands along your body.	6.444	1	Y
240	He lies in bed with you. He checks you out. He engages in physical contact with you.	6.667	1	Y

241	He lies in bed with you. He makes accidental physical contact with you. He kisses you for a long time.	6.2	1	Y
244	He puts his hands on your legs. He walks or drives you home. He kisses your neck.	6.5	1	Y
245	He kisses you. He engages with you. He engages in a lot of physical contact with you.	6.35	1	Y
246	He initiates some flirting with you. He runs his hands along your body. He maintains eye contact with you.	5.952	0.952	Y
247	He grabs your hand. He cuddles with you. He puts his arm around your back.	5.813	1	Y
248	He initiates contact with you. He kisses you back. He goes home with you.	6.565	1	Y
249	He initiates kissing you. He seems approachable to you. He kisses you.	6.263	1	Y
251	He touches your neck or shoulders. He kisses you for a long time. He maintains eye contact with you.	6.591	0.955	Y
253	He kisses you. He makes physical contact with you. He touches your thigh.	6.583	1	Y
254	He winks at you with flirty facial expressions. He kisses you back. He initiates some flirting with you.	6.083	1	Y
255	He lies in bed with you. He makes physical contact with you. He kisses your neck.	6.789	1	Y
256	He initiates kissing you. He touches your thigh. He makes physical contact with you.	6.619	1	Y
257	He cuddles with you. He engages in physical contact with you. He kisses you.	6.55	1	Y
258	He initiates kissing you. He softly touches your arm waist or neck. He engages in physical contact with you.	6.474	1	Y
260	He puts his hands on your legs. He kisses your neck. He gives you his number.	6.35	1	Y
262	He runs his hands along your body. He puts his hands on your legs. He checks you out.	6.526	1	Y
263	He smiles at you more. He initiates kissing you. He runs his hands along your body.	6.708	1	Y
264	He kisses you. He cuddles with you. He initiates some flirting with you.	6.278	1	Y
266	He kisses you for a long time. He puts his hands on your legs. He winks at you with flirty facial expressions.	6.667	1	Y
267	He kisses you back. He initiates kissing you. He checks you out.	6.364	1	Y
268	He lies in bed with you. He kisses you. He cuddles with you.	6.381	1	Y

269	He initiates some flirting with you. He runs his hands along your body. He lies in bed with you.	6.778	1	Y
270	He kisses you back. He kisses your neck. He puts his arm around your back.	6.5	1	Y
272	He kisses your neck. He runs his hands along your body. He engages in physical contact with you.	6.182	0.955	Y
273	He cuddles with you. He puts his hands on your legs. He initiates kissing you.	6.522	1	Y
274	He engages in physical contact with you. He runs his hands along your body. He kisses you for a long time.	6.65	1	Y
275	He winks at you with flirty facial expressions. He kisses you for a long time. He initiates kissing you.	6.682	1	Y
276	He kisses you back. He cuddles with you. He kisses your neck.	6.55	1	Y
277	He puts his arm around your back. He kisses you for a long time. He kisses your neck.	6.391	1	Y
278	He initiates kissing you. He puts his hands on your legs. He kisses you back.	6.941	1	Y
279	He kisses you. He puts his hands on your legs. He kisses your neck.	6.619	1	Y
280	He initiates kissing you. He runs his hands along your body. He engages in a lot of physical contact with you.	6.75	1	Y
281	He puts his hands on your legs. He kisses you for a long time. He kisses you back.	6.652	1	Y
282	He goes home with you. He kisses you for a long time. He runs his hands along your body.	6.955	1	Y
283	He puts his hands on your legs. He initiates kissing you. He kisses your neck.	6.6	1	Y
285	He touches your thigh. He runs his hands along your body. He initiates kissing you.	6.722	1	Y
286	He puts his hands on your legs. He initiates kissing you. He runs his hands along your body.	6.409	1	Y
287	He touches your thigh. He initiates kissing you. He kisses you for a long time.	6.611	1	Y
288	He runs his hands along your body. He kisses you for a long time. He lies in bed with you.	6.579	1	Y
289	He runs his hands along your body. He kisses you back. He kisses your neck.	6.636	0.955	Y
290	He initiates kissing you. He runs his hands along your body. He kisses you back.	6.708	1	Y
291	He kisses you. He runs his hands along your body. He kisses your neck.	6.64	1	Y
292	He runs his hands along your body. He initiates kissing you. He kisses you.	6.647	1	Y

294	He kisses you. He kisses your neck. He kisses you for a long time.	6.682	1	Y
295	He kisses you back. He kisses you for a long time. He runs his hands along your body.	6.5	0.958	Y
296	He initiates kissing you. He kisses you. He kisses you for a long time.	6.5	1	Y
297	He runs his hands along your body. He initiates kissing you. He kisses your neck.	6.313	1	Y
298	He initiates kissing you. He kisses you for a long time. He kisses your neck.	6.636	0.955	Y
299	He kisses your neck. He kisses you for a long time. He runs his hands along your body.	6.778	1	Y
300	He initiates kissing you. He kisses you for a long time. He runs his hands along your body.	6.818	1	Y

Appendix F - Analysis R Code

```
library(readxl)
library(lme4)
library(nlme)
library(psych)
library(emmeans)
library(car)
library(ggplot2)
library(gridExtra)

#SDT analysis
dat <- read_excel("C:/Users/user/Desktop/Masters SDT Stacked.xlsx")
View(dat)
dat$Truth<- dat$`Truth (-.5=no)`
dat$Answer<- dat$`Answer (0=no)`
dat$Sex<-as.factor(dat$Sex)
dat$Sex<- C(dat$Sex, sum) #sets to effect coding rather than dummy coding
print(attributes(dat$Sex))
dat$c.MV<-scale(dat$`Overall Mate Value`, scale=FALSE)
dat$c.STMO<-scale(dat$STMO, scale=FALSE)
dat$c.LTMO<-scale(dat$LTMO, scale=FALSE)
dat$c.K<-scale(dat$K, scale=FALSE)
summary(dat)

SDT<-glmer(Answer~Truth*Sex +Truth*c.MV +Truth*c.STMO +Truth*c.LTMO +Truth*c.K
+(Truth|`Participant #`)+(1|Vignette), data= dat, family=binomial(link="probit"))
summary(SDT)
ranef(SDT)
emmeans(SDT, ~Sex, at=list(Truth=0)) #this gives us -c
emtrends(SDT, ~Sex, var="Truth")  #this gives us d'

vif(SDT)
hist(resid(SDT),main=" ")

#EMT analysis
datemt <- read_excel("C:/Users/user/Desktop/EMT for analysis.xlsx")
View(datemt)
datemt$Sex<-as.factor(datemt$Sex)
datemt$Sex<- C(datemt$Sex, sum) #sets to effect coding rather than dummy coding
print(attributes(datemt$Sex))
datemt$c.MV<-scale(datemt$`Overall Mate Value`, scale=FALSE)
datemt$c.STMO<-scale(datemt$STMO, scale=FALSE)
datemt$c.LTMO<-scale(datemt$LTMO, scale=FALSE)
datemt$c.K<-scale(datemt$K, scale=FALSE)
```

```
EMT<-lm(Misperception~Sex +c.MV +c.STMO +c.LTMO +c.K, data=datemt)
summary(EMT)
hist(resid(EMT))
vif(EMT)
emmeans(EMT, ~Sex) #gives model estimated misperceptions by sex


#Graphs

#Figure 3a
sensiE1x<-c(-0.25,0.25)
sensiE1y<-c(0.4,0.4)
dprimeE1 = .5
plot(function(x) dnorm(x, mean=-dprimeE1/2), -5,5, lty="dashed", lwd=4, col="red",
xlab="Evidence Strength", ylab="",yaxt="n", main="Low Sensitivity", xlim=c(-6,6), ylim=c(-.1,
0.5), cex.main=3, cex.lab=3, cex.axis=1.5)
plot(function(x) dnorm(x, mean=dprimeE1/2), -5,5, add=T, col="green", lwd=4)
lines(sensiE1x, sensiE1y, col="orange", lwd=2, lty="twodash")
text(2.5,0.425,"Sensitivity = 0.5", col="orange",cex=2)

#Figure 3b
sensiE2x<-c(-1.5,1.5)
sensiE2y<-c(0.4,0.4)
dprimeE2 = 3
plot(function(x) dnorm(x, mean=-dprimeE2/2), -5,5, lty="dashed", lwd=4, col="red",
xlab="Evidence Strength", ylab="",yaxt="n", main="High Sensitivity", xlim=c(-6,6), ylim=c(-.1,
0.5), cex.main=3, cex.lab=3, cex.axis=1.5)
plot(function(x) dnorm(x, mean=dprimeE2/2), -5,5, add=T, col="green", lwd=4)
lines(sensiE2x, sensiE2y, col="orange", lwd=2, lty="twodash")
text(2.5,0.425,"Sensitivity = 3", col="orange",cex=2)

#Figure 4a
sensiE3x<-c(-.5,.5)
sensiE3y<-c(0.4,0.4)
dprimeE3 = 1
cE3 = 0
plot(function(x) dnorm(x, mean=-dprimeE3/2), -5,5, lty="dashed", lwd=4, col="red",
xlab="Evidence Strength", ylab="",yaxt="n", main="Neutral Bias", xlim=c(-6,6), ylim=c(-.1,
0.5), cex.main=3, cex.lab=3, cex.axis=1.5)
plot(function(x) dnorm(x, mean=dprimeE3/2), -5,5, add=T, col="green", lwd=4)
lines(sensiE3x, sensiE3y, col="orange", lwd=2, lty="twodash")
abline(v=cE3, col="blue", lwd=2, lty="longdash")
text(-1.25,-0.05,"Bias = 0", col="blue",cex=2)
text(2,0.425,"Sensitivity = 1", col="orange",cex=2)
```

```
#Figure 4b
cE4 = 1
plot(function(x) dnorm(x, mean=-dprimeE3/2), -5,5, lty="dashed", lwd=4, col="red",
xlab="Evidence Strength", ylab="",yaxt="n", main="Conservative Bias", xlim=c(-6,6), ylim=c(-
.1, 0.5), cex.main=3, cex.lab=3, cex.axis=1.5)
plot(function(x) dnorm(x, mean=dprimeE3/2), -5,5, add=T, col="green", lwd=4)
lines(sensiE3x, sensiE3y, col="orange", lwd=2, lty="twodash")
abline(v=cE4, col="blue", lwd=2, lty="longdash")
text(-0.10,-0.05,"Bias = 1", col="blue",cex=2)
text(-1,0.425,"Sensitivity = 1", col="orange",cex=2)

#Figure 4c
cE5 = -0.75
plot(function(x) dnorm(x, mean=-dprimeE3/2), -5,5, lty="dashed", lwd=4, col="red",
xlab="Evidence Strength", ylab="",yaxt="n", main="Liberal Bias", xlim=c(-6,6), ylim=c(-.1,
0.5), cex.main=3, cex.lab=3, cex.axis=1.5)
plot(function(x) dnorm(x, mean=dprimeE3/2), -5,5, add=T, col="green", lwd=4)
lines(sensiE3x, sensiE3y, col="orange", lwd=2, lty="twodash")
abline(v=cE5, col="blue", lwd=2, lty="longdash")
text(-2.5,-0.05,"Bias = - 0.75", col="blue",cex=2)
text(2,0.425,"Sensitivity = 1", col="orange",cex=2)

#Figure 5
vignhist <- read_excel("Vignette score distributions.xlsx")
View(vignhist)

Fhist<-ggplot(vignhist, aes(x=Fscores))+
  geom_histogram(binwidth=10, color="palevioletred", fill="palevioletred1")+
  xlim(0,300)+
  ylim(0,25)+
  theme_classic()+
  xlab("Female Vignette Scores")+
  ylab("Count")+
  theme(axis.title.x=element_text(size=30),
        axis.text.x=element_text(size=30),
        axis.title.y=element_text(size=30),
        axis.text.y=element_text(size=30))
Fhist

Mhist<-ggplot(vignhist, aes(x=Mscores))+
  geom_histogram(binwidth=10, color="lightblue4", fill="lightblue")+
  xlim(0,300)+
  ylim(0,25)+
  theme_classic()+
```

```
  xlab("Male Vignette Scores")+
  ylab("Count")+
  theme(axis.title.x=element_text(size=30),
        axis.text.x=element_text(size=30),
        axis.title.y=element_text(size=30),
        axis.text.y=element_text(size=30))
Mhist
grid.arrange(Mhist,Fhist,nrow=1)

#Figure 6
finalFhist<-ggplot(vignhist, aes(x=FinalFRatingR, fill=FinalFSDT))+
  geom_histogram(binwidth=.075)+
  ylim(0,17)+
  theme_classic()+
  xlab("Female Vignette Ratings")+
  scale_fill_manual(values=c("red","green3"), name="Female SDT Answer", breaks=c("N","Y"),
labels=c("No","Yes"))+
  ylab("Count")+
  theme(axis.title.x=element_text(size=30),
        axis.text.x=element_text(size=30),
        axis.title.y=element_text(size=30),
        axis.text.y=element_text(size=30),
        legend.title=element_text(size=20),
        legend.text=element_text(size=20),
        legend.position=c(0.95,0.95),
        legend.justification=c("right","top")
        )
finalFhist

finalMhist<-ggplot(vignhist, aes(x=FinalMRatingR, fill=FinalMSDT))+
  geom_histogram(binwidth=.075)+
  ylim(0,17)+
  theme_classic()+
  xlab("Male Vignette Ratings")+
  scale_fill_manual(values=c("red","green3"), name="Male SDT Answer", breaks=c("N","Y"),
labels=c("No","Yes"))+
  ylab("Count")+
  theme(axis.title.x=element_text(size=30),
        axis.text.x=element_text(size=30),
        axis.title.y=element_text(size=30),
        axis.text.y=element_text(size=30),
        legend.title=element_text(size=20),
        legend.text=element_text(size=20),
        legend.position=c(0.95,0.95),
        legend.justification=c("right","top")
        )
```

```
finalMhist
grid.arrange(finalMhist,finalFhist,nrow=1)

#Figure 7
mispercep<-read_excel("Misperception difference graph.xlsx")
View(mispercep)

diffscore1 <- ggplot(data=mispercep, aes(x=mispercep$Sex, y=mispercep$EMT,
group=mispercep$Type))+
  geom_line(aes(color=mispercep$Type, linetype=mispercep$Type, size=mispercep$Type))+
  ylim(1,7)+
  theme_classic()+
  xlab("Sex")+
  ylab("Rating")+
  scale_color_manual(values=c("aquamarine2","midnightblue"))+
  scale_linetype_manual(values=c("twodash","solid"))+
  scale_size_manual(values=c(2,2))+
  theme(axis.title.x=element_text(size=30),
        axis.text.x=element_text(size=30),
        axis.title.y=element_text(size=30),
        axis.text.y=element_text(size=30),
        legend.title=element_blank(),
        legend.text=element_text(size=20),
        legend.position=c(0.95,0.95),
        legend.justification=c("right","top")
        )
diffscore1

df<-data.frame(Sex=c("Male","Female"),
               Misperception=c(-0.43,-0.61))
head(df)
diffscore2 <- ggplot(data=df, aes(x=Sex, y=Misperception, group=1))+
  geom_line(color="green2", linetype="solid", size=2)+
  ylim(-.75,0)+
  theme_classic()+
  xlab("Sex")+
  ylab("Misperception")+
  theme(axis.title.x=element_text(size=30),
        axis.text.x=element_text(size=30),
        axis.title.y=element_text(size=30),
        axis.text.y=element_text(size=30),
        legend.title=element_blank(),
        legend.text=element_text(size=20),
        legend.position="right"
        )
diffscore2
```

```
grid.arrange(diffscore1,diffscore2,nrow=1)


#Figure 8
sensiWx<-c(-2.42,2.42)
sensiWy<-c(0.4,0.4)
dprimeW = 4.84
cW = -.12
plot(function(x) dnorm(x, mean=-dprimeW/2), -5,5, lty="dashed", lwd=4, col="red",
xlab="Evidence Strength", ylab="",yaxt="n", main="Women", xlim=c(-6,6), ylim=c(-.1, 0.5),
cex.main=3, cex.lab=3, cex.axis=1.5)
plot(function(x) dnorm(x, mean=dprimeW/2), -5,5, add=T, col="green", lwd=4)
lines(sensiWx, sensiWy, col="orange", lwd=2, lty="twodash")
abline(v=cW, col="blue", lwd=2, lty="longdash")
text(-2,-0.05,"Bias = - 0.12", col="blue",cex=2)
text(2.5,0.425,"Sensitivity = 4.84", col="orange",cex=2)

sensiMx<-c(-2.495, 2.495)
sensiMy<-c(0.4,0.4)
dprimeM = 4.99
cM = .42
plot(function(x) dnorm(x, mean=-dprimeM/2), -5,5, lty="dashed", lwd=4, col="red",
xlab="Evidence Strength", ylab="", yaxt="n", main="Men", xlim=c(-6,6), ylim=c(-.1,0.5),
cex.main=3, cex.lab=3, cex.axis=1.5)
plot(function(x) dnorm(x, mean=dprimeM/2), -5,5, add=T, col="green", lwd=4)
lines(sensiMx, sensiMy, col="orange", lwd=2, lty="twodash")
abline(v=cM, col="blue", lwd=2, lty="longdash")
text(-1.2,-0.05,"Bias = 0.42", col="blue", cex=2)
text(2.65,0.425,"Sensitivity = 4.99", col="orange", cex=(2))
```