THE EFFECTS OF TARGET SEX, PRESENCE OF OTHERS, AND ATTRACTIVENESS ON DESIRE FOR TARGETS: A RE-EXAMINATION OF HILL AND BUSS (2008)

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ABSTRACT

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Research on sexual selection has argued that males' and females' mate choice strategies differ due to different biological reproductive pressures demanded of each. Hill and Buss (2008) argue that due to these differing pressures and the subsequent difference in mate choice strategies used by males and females, the two sexes additionally differ in their use of social information when deciding upon a mate. Hill and Buss (2008) propose that when a male target is in the presence of opposite sex others, female subjects will desire him more than if the same male target were presented with same sex others or alone (*desirability enhancing effect*); alternatively, a female target presented with opposite sex others is desired more by male subjects than the same female target presented with same sex others or alone (*desirability diminishing effect*). Additionally, Hill and Buss (2008) provide testable reasons for why the *desirability effects* exert a sex difference, but do not actually test such propositions. The present paper utilized a 2 X 2 X 3 (target sex, attractiveness, presence of others) design in order to replicate Hill & Buss' (2008) findings. Furthermore, the present paper proposed an alternative explanation for their findings (*attractiveness effect*) and examined this proposed alternative explanation. Finally, the present paper developed testable models derived from the *desirability* and *attractiveness effects*. The pattern of means obtained in this study is inconsistent with Hill and Buss' (2008) previous findings and the models derived from their work. The data were also inconsistent with the hypothesized *attractiveness effect* and model, however, upon closer examination a post-hoc

revised attractiveness model was proposed, and the data were consistent with it. Finally, this paper argues for a reconceptualization of desirability and mate choice.

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INTRODUCTION

In 1859 Darwin proposed a theory of natural selection that changed forever how researchers and lay people alike ruminate about human behavior. More recently, Darwin's (1859) theory of natural selection has been used to understand how psychological traits might have evolved—spawning the field of evolutionary psychology. Evolutionary psychologists have begun to elucidate the ultimate level processes (i.e., why a behavior or trait exists) of sexual selection that affect mate choice (e.g., Hill & Buss, 2008). Communication scholars, on the other hand, are able to clarify the proximate level, interpersonal processes (e.g., social proof) of sexual selection that affect mate choice and the behaviors that indicate such choice. This paper will take a communicative perspective to investigate an alternative explanation for Hill and Buss' (2008) *desirability enhancing* and *diminishing* effects. Additionally, this paper will make a case for why communication behaviors should be used to measure mate choice, an approach currently not utilized in mate choice research.

Darwin's Theory of Evolution

An evolutionary perspective attempts to provide process explanations for why there exists variation in the frequency of a behavior or trait between members of a single species — natural selection is one such process. The process of natural selection starts when a particular genetic mutation[1] is adaptive to an organism's survival allowing the organism to increase its fitness[2] (i.e., likelihood of reproduction). If the genetic mutation increases survival for conspecifics, then conspecifics may benefit from mating with those carrying the genetic mutation; therefore, the genetic mutation will increase the likelihood of reproduction for those possessing the genetic mutation. The process of natural selection results in the increased probability that the genetic mutation will perpetuate to subsequent generations. Because genes of any individual member of a species are subject to random mutations and have differential

adaptations, in order to say that the process of natural selection has occurred it is necessary that a critical number of conspecifics possess the same mutation. The process of increased survival and reproductive selection[3] of the genetic mutation increases the probability that the mutation becomes more common among conspecifics and, thus, the genetic characteristics of a species changes, or evolves[4].

Sexual Selection

Sexual selection includes two processes that result in increased fitness of an organism. Similar to natural selection, in which environmental pressures exert influence on survival and fitness, selection pressures during sexual selection are exerted by conspecifics either through competition or through choosing a mate based on particular behaviors or traits. Because individuals vary in their quality as a potential mate (e.g., resources they hold or potentially will/can hold, parental ability, genotype, etc.), sexual selection functions as a mechanism that encourages species members to choose the highest quality mate. In order to choose the highest quality mate, the competing sex may "fight" for the right to mate (a form of intrasexual selection) or the selecting sex may "choose" a mate with the most desirable trait (intersexual selection).

Intrasexual Selection. Intrasexual selection occurs when members of the chosen sex (i.e., the one who wants to gain access) must compete against one another in order to gain access to the choosing sex (i.e., the one who controls access; Buss, 1996). This competition can occur prior to copulation, in the form of tête-à-tête combat, or post copulation, in the form of sperm competition. Sperm competition refers to the process by which spermatozoa (i.e., sperm) of two or more males compete to fertilize the egg of a single female. Typically the spermatozoa that wins either is the most motile or from a male with the largest ejaculate or with the greatest

number of copulatory emissions. This type of intrasexual selection occurs when a female takes on multiple male partners and has little to do with interpersonal communication processes; therefore, sperm competition will not be examined further in this manuscript.

Tête-à-tête competition prior to copulation allows the chosen sex to demonstrate his reproductive fitness by competing for the opportunity to mate. For example, walruses and many species of elk have a well-established hierarchy in which older males have access to a harem of females. In order to gain access to females, younger males must challenge older males to a fight. In some cases, younger adult males may win these fights gaining control and access to females for mating purposes. Among other species, there may not exist a dominant male that necessarily has access to a female or group of females, therefore, reproductively undifferentiated males compete to demonstrate their fitness. If a male wins, he is able to reproduce, therefore his fitness increases (i.e., likelihood of reproduction), and his fitness over that of their competitors. If the genes responsible for their success are inherited by their offspring, then selection has occurred.

If humans were to engage in tête-à-tête competition, it would be necessary to possess weaponry in order to fight, such as antlers or tusks. Given that direct combat is potentially hazardous to both the competing males, possessing weaponry simply to threaten potential opponents, but never using weaponry for combat would be sufficient. Puts (2010) suggests that males possess particular traits in order to threaten their male rivals, but those traits are the result of intrasexual (i.e., in the form of competition) selection. For example, in comparison to females, males are larger (8% stature, Gaulin & Boster, 1985; 15-20% in body mass, Mayhew & Salm, 1990), stronger (90% greater upper body strength and the average man is stronger than 99.9% of all females, Lassek & Gaulin, 2009), faster (22% faster sprint times, Mayhew & Salm, 1990), and more aggressive (Archer, 2004), presumably the result of intrasexual selection (Puts, 2010).

Others have found that raters' judgments of the masculinity of male faces are related to dominance (Mazur, Halpern & Udry, 1994), dominance displays (e.g., voice pitch, Puts, Gaulin & Verdolini, 2006; Puts, Hodges, Cardenas & Gaulin, 2007), aggression (Carre & McCormick, 2008), and salivary testosterone concentrations (Penton-Voak & Chen, 2004). Thus, it is possible that many physical traits possessed by males are not necessarily for direct competition, but instead are used as nonverbal cues of dominance.

Intersexual Selection. Intersexual selection refers to the process that the choosing sex undergoes when making a decision regarding which member of the chosen sex with whom to mate. This process is outlined by Dunbar's (1983) *reproductive strategies model* (see Figure 1). All organisms need to make decisions regarding survival, whether or not to mate, and how to raise their offspring, and these decisions are not mutually exclusive. Furthermore, each of these more macroscopic decisions involves additional microscopic decisions. When an organism makes the decision to mate, it must additionally decide how much to invest in the rearing of their offspring, how many offspring to have, whom to choose as their partner, etc. Dunbar's (1983) model pictorially demonstrates that reproductive strategies (i.e., plans used to optimize decision criteria) would differ based on the decision making process. This difference appears as early as the first decision point; if a person chooses to invest in *kin*, then the outcome is to not mate. Alternatively, if one chooses to invest in *self*, then this individual continues through a series of other decisions that could result in 32 different reproductive strategies, or outcomes[5].

Choosing Sex vs. Chosen Sex. Although Dunbar's (1983) model may be interpreted as a deliberate decision on the part of the actor, biology demands that, at least for humans, males and females have different investments into offspring. Females are required to make a larger investment in their offspring, because they are the sex that carries the ovum (i.e., egg). The ovum

requires a greater amount of nutrients provided from the bearer and once fertilized the female must carry the fetus during a gestation period. Males, alternatively, are required to make a much smaller investment. Although males provide the spermatozoa during copulation, spermatozoa require little nutrients from the bearer and after fertilization males are not required to contribute to the gestation of the fetus. The difference between males and females in their investment toward their offspring requires that they have differing decision making processes and thus different reproductive strategies (see Johnstone, Reynolds & Deutsch, 1996; Geary, Vigil & Byrd-Craven, 2004). The length of gestation and the amount of parental investment required of a female increases the cost associated with making an erroneous mating decision. However, because males have fewer restrictions on their parental investment than females, there is a lower cost associated with making an erroneous mating decision. Given this scenario, one would expect that, at least in humans, females would be the choosier sex because of the greater investment biology requires of them (Darwin, 1871), and males would be the chosen sex (i.e., the female chooses with which male she would like to mate).

***Mate Choice Strategies*.** Given high parental investment, adoption of a long-term mating strategy (i.e., females choosing a mate that will invest in his offspring over time) would be beneficial to females. More specifically, females would benefit from selecting a mate who will provide benefits (e.g., economic resources, parental investment), as opposed to costs (e.g., desire for extra-marital copulation), to their offspring in order to ensure reproductive success (i.e., the number of offspring to live to reproductive age, Clutton-Brock, 1990). In fact, there is evidence to suggest that many females adopt such a strategy and choose mates with reproductively beneficial traits. Buss has demonstrated that males who are rated as more economically capable and have higher status, as well as being highly dependable, being stable, and have a high degree

of commitment are seen as more attractive by females than males who are rated low on these traits (Buss & Barnes, 1986; Buss, 1994).

Males, however, do not need to choose a long-term mating strategy. Males, generally, invest less in the rearing of their offspring, because, at minimum, males are not required for gestation. Males do not need to be as selective in their choice of a mate and can mate frequently, because there are fewer demands on male parental investment and because the cost associated with making an erroneous mating decision is lower for males than females (Bateman, 1948). Because males have the freedom to be less selective, the genetic quality (as indicated phenotypically) of their mate is the most important[6] criteria when choosing a partner. Therefore, because males seek mates who are healthy enough to carry their offspring, males prefer youth and physical beauty (Buss & Barnes, 1986; Buss, 1994) in their partner because both traits are thought to be indicators of health.

Ratings of a woman's reproductive value, after the age of 20, decline until they are almost zero, at the age of 50 (Buss, 1994). Although across the centuries standards of beauty have varied, across decades there does tend to be consensus as to what constitutes beauty among females. Buss (1994) identifies clear, smooth skin, firm muscle tone, full lips, animated facial expressions, etc. as features that younger females possess. Additionally, females possessing these qualities tend to be viewed as more beautiful across a number of cultures (Cunningham, Roberts, Barbee, Druen, & Wu, 1995). Males can use these indicators of youth to estimate the reproductive value of a potential female partner. Because males can be concerned with finding a mate that meets standards of reproductive value and fitness, and little else, males are able to adopt a short-term mating strategy (i.e., mate with many people without investing time and resources in their offspring over time) that allows them to optimize this mating decision[7].

The Importance of Others When Making a Choice

Evolutionary principles appear to reduce mate choice down to straightforward investment decisions, however, Buss states that "a central message of human sexual strategies is that mating behavior is enormously flexible and sensitive to social context," (1994, p. 209). Although males and females adhere to general strategies of choice, their final mating decision is obviously dependent on many social factors. Hill and Buss (2008) affirm further that an increasing number of mate choice researchers have begun to place greater importance on understanding choice within a social context. Often times, however, manipulations of social contexts are used to provide evidence of ultimate level explanations of behaviors (e.g., Hill & Buss, 2008 is discussed).

One social context feature examined within the mate choice literature is that of social proof. The strength of social proof has been known for some time (e.g., Sherif, 1935; Asch, 1951; Milgram, 1974). The exact mechanisms of how social proof functions within a mate choice context were unclear until Dugatkin (1992) conducted a series of studies involving guppies. He found that when young female guppies were given a choice of a male mate that was either alone or in the presence of an older, presumably experienced, female, the young female guppies chose the male accompanied by the older female. Young female guppies also appeared to recall that older females had accompanied specific males and continued to choose those males in later trials as well. Pruett-Jones (1992) reviews previous findings that suggest that copying may occur in other animals such as the ruff, grouse, and some birds of paradise.

Copying the mate choice of others can be extremely advantageous in cases where the costs and benefits of choosing a mate is high and the ability to discriminate between options might be compromised; such is the case for females making a mate choice. Similar to the notion

of the *bystander effect* (Darley & Latané, 1968), when there is little discriminate information, people may look to others to help discern this information (Nordell & Valone, 1998). For females, in the case of selecting a mate, there may exist little discriminate information between suitors by sight alone. If Dunbar's (1983) *reproductive strategies model* is an accurate depiction and females do seek mates that have the potential to be long-term partners, then one would expect that without apparent visual cues to male commitment it would be difficult for a female to know with certainty their potential mate's level of commitment. Therefore, in order to aid in mate choice decision a female may observe other females' mate choice.

If Dunbar (1983) is correct then this scenario may not be the case for males. Males, alternatively, use a short-term reproductive strategy and base their mate decision on factors that are visually recognizable, such as physical attractiveness; therefore, there would be little need for social proof. In fact, among male guppies (Wade & Pruett-Jones, 1990; Dugatkin, 1992; Dugatkin & Godin, 1992) there is no evidence to suggest a copying effect. Additionally, among humans there has been no evidence to refute the copying effect sex difference (Graziano, Jensen-Campbell, Shebilske, & Lundgren, 1993; Hill & Buss, 2008). Graziano et al. (1993) presented male and female subjects with pictures of opposite-sex targets. The photographs of the target were accompanied by others' perceived ratings of the target (i.e., not attractive, average looking, attractive). The sex of the raters was matched to that of the subject. For example, a male subject viewed a photograph of a female target accompanied by other males' ratings of attractiveness of the female target. All male subjects viewed all potential female targets, but the targets' attractiveness, as rated by others, was varied between subjects. Therefore, subjects viewed all three targets, but subjects were assigned to only one attractiveness condition. Finally, subjects were asked to rate how physically attractive they believed the target to be.

Given Dunbar's (1983) model and Dugatkin's (1992) findings of mate choice among female guppies, one would expect that female subjects would be influenced by the ratings of others. Graziano et al. (1993) found just that; female subjects' ratings of male targets' attractiveness was influenced by the ratings other females. The more attractive other females rated male target, the more attractive female subjects believed the male target to be. Given Dunbar's (1983) model and the lack of evidence for a copying effect among male guppies (Dugatkin, 1992), one might expect that males would not be influenced by the ratings of others. Graziano et al.'s (1993) findings were consistent with this conjecture; there was no evidence to suggest that male subjects' ratings of female targets' attractiveness was influenced by the ratings other males.

Hill and Buss' (2008) Findings

Although Graziano et al.'s (1993) pattern of mean differences are consistent with Dugatkin's (1992) copying effect, it is unclear exactly how social information affects eventual desirability of a mate and the choice of a mate. Hill and Buss (2008) posited a mechanism for Dugatkin's and Graziano et al.'s findings and proposed that when opposite sex others are present there is a *desirability enhancing* effect for male targets and a *desirability diminishing* effect for female targets. Consistent with previous findings (Dugatkin, 1992; Graziano et al., 1993), Hill and Buss (2008) proposed that when a male target is in the presence of females, the females' presence enhances the female subject's desire for the male target. The opposite was proposed for male subjects: when a female target is in the presence of males, the males' presence diminishes the male subject's desire for the female target.

These effects (i.e., diminishing, enhancing) were tested by presenting subjects with a series of photographs of targets either alone or in the presence of same- or opposite-sex others.

Subjects were asked to rate on a 10-point scale: a) "How attractive do you find this person?", b) "How desirable is this person to you as a prospective sexual partner?", c) "How desirable is this person to you as a prospective long-term romantic partner?", d) "If this person were to ask you on a date, what is the likelihood that you would say yes?", and e) "In general, how desirable do you find this person?". These items were used to create a desirability composite score for each of the targets.

Hill and Buss (2008) concluded that findings were consistent with the *desirability diminishing* hypothesis; males rated female targets depicted with other males as being less desired than when she was depicted alone or when depicted with other females. There was no difference in ratings of desire given by male subjects for females targets depicted alone or with other females. Consistent with the *desirability enhancement* effect, females rated males depicted with other females as being more desired than when depicted alone or with other males. Females did rate males depicted with other males as being more desired than when males were depicted alone. Table 1 displays the adjusted means of Hill and Buss' findings.

Criticisms of Hill & Buss' Findings and Explanations. Although Hill and Buss' (2008) study has been cited a number of times, even outside of evolutionary psychology (e.g., organizational neuroscience; Becker, Cropanzano & Sanfey, 2011), there are a number of criticisms that can be lodged against their study including the execution of their study (i.e., confound), the interpretation of their findings, and the lack of conceptual clarity of their key construct.

Differential Desirability of Targets. In Hill and Buss' (2008) study, male subjects desired female targets more than female subjects desired male targets. Furthermore, male subjects rated female targets as more desirable than the same or opposite sex others presented

with the female target. Alternatively, female subjects did not desire male targets more than the same or opposite sex others presented with the male target. Instead, female subjects rated male targets as less desirable than the same- or opposite-sex others who were presented with them. Given the inconsistencies in ratings of desirability across male and female targets, it is possible that the physical attractiveness of female and male targets were not matched and an unintended confound was introduced. Therefore, it is impossible to know whether the *desirability* (i.e., enhancing or diminishing) effects are due to differences in sex of the subject/target or to differences in the attractiveness of the targets.

***Problems with Interpretation of Results*.** Although desire for the target was examined only as mean differences, Hill and Buss (2008) conclude that their findings support mediating processes that are consistent with hypotheses derived from the tenants of sexual selection; however, there was no direct examination of their proposed mechanisms. One cannot understand from a simple pattern of means complex human processes; therefore, further investigation of these mechanisms is warranted.

In addition, Hill and Buss (2008) do not fully explicate the mechanisms involved. They propose that when a female target is in the presence of males, male subjects would perceive greater competition from the other males. Hill and Buss, however, do not explain clearly why perceived competition would inhibit male subjects from desiring the target or choosing the target as their mate. On the other hand, when a male target is in the presence of females, female subjects use the presences of the other females as social proof in determining the quality of the potential mate. However, what type of information is being conveyed through social proof is not thoroughly explained.

Conceptual Unclarity: Mate Choice vs. Desirability. It would be difficult to refute that mate choice is one of the central constructs of interest to those who study sexual selection. Mate choice is the behavioral mechanism of Darwin's (1871) intersexual selection process and has been elaborated on by Fisher (1930) and others (see Bateson, 1983 for review). Although never clearly conceptually defined, one could gather that mate choice is conceptualized as a set of behavioral patterns displayed by a member of one sex that indicates his or her preference to mate with a specific member of the opposite sex. This definition is different from how preference or desire, in the case of Hill and Buss (2008), are used colloquially.

Conventionally, preference refers to a collection of evaluative judgments or attitudes toward an object (Lichenstein & Slovic, 2006; Scherer, 2005). As far back as antiquity, philosophers have written about the importance of desire as an important motivational impetus for human behavior. Aristotle argues that desire puts people in motion—that the desire for a goal, motivates one to engage in behaviors to achieve said goal. In fact many philosophers discuss desire as the motivator behind action (e.g., Descartes, 1649; Hume, 1739). Additionally, market researchers and advertisers have figured out how to tap into and create desire in order to motivate people to purchase. Furthermore, Kawabata and Zeki (2008) found that regardless of intensity, desired and undesired objects induced approach or avoidance activation in the mid-cingulate gyrus, providing further evidence that desire is an antecedent to behaviors, but is conceptually, and neurally, distinct. Although desire often will motivate behavior, desire and behavior are not conceptually equivalent, and should be considered as independent constructs.

Given that desire and mate choice have been used interchangeably, often choice is measured through attitude and attraction scales (i.e., cognitive measures of choice; e.g., Hill & Buss, 2008), as opposed to behavioral measures, although mate choice has been defined as

observable patterns of behavior. To be clear, intrasexual and intersexual selections do not attempt to elucidate any processes that involve desire or preference, and restrict their predictions to mate choice.

Resolving Issues with Hill and Buss' (2008) Study

The remainder of this paper will attempt to resolve the issue previously discussed regarding the execution of Hill and Buss' (2008) study. In addition, this paper will propose an alternative explanation for their findings and empirically test this explanation. Finally, this paper will also include both desire and mate choice as conceptually distinct concepts and empirically examine them as such.

Differential Desirability of Targets

As previously mentioned, Hill and Buss (2008) may have introduced a confound into their study by having differentially desirable male and female targets. It is possible that the differential desirability was due to differences in targets' physical attractiveness. In Hill and Buss' desirability scale, one item did ask about how physically attractive the subject believed the target to be, but did not include any questions regarding social attractiveness[8]. The importance of the targets' physical attractiveness should not be discounted. Conventional wisdom would suggest that highly physically attractive people are usually desirable. The effect of physical attractiveness on desirability of targets would not be an issue as long as it did not combine non-additively with any other variables of interest (i.e., subject/target sex). If, however, the attractiveness of the target and the presence of others do combine non-additively to affect the desirability of targets, then it is possible that the same pattern of means Hill and Buss found would result.

For instance, if a target was seen as very attractive—in the case of female targets to male subjects in all conditions of Hill and Buss' (2008) study—then male subjects would likely desire the target. If the same attractive target was presented with opposite sex others, then it is possible that the presence of others will be viewed as competition, regardless of the sex of the subject or target. Given Hill and Buss' design there would be no way to examine this possibility, because male targets were not seen as desirable, and possibly physically attractive, as female targets.

Hill and Buss (2008) conclude that social proof, or social information, was only used by female subjects when rating male targets, however, social information may be superfluous when making judgments about the desirability of a physically attractive target. Often people infer how socially attractive (i.e., affinity for a person based on feelings of liking, true friendship; Sternberg, 1986) a target is based on how physically attractive they find the target (e.g., Dion, Berscheid & Walster, 1972). If, however, the target is seen as unattractive, then social information, such as the presence of others, may be useful for making judgments of desire for target (e.g., Dugatkin, 1992; Graziano et al., 1993). There is no way to know whether social information is involved in the development of desire for both females and males, because of the differential desirability of the male and female targets in Hill and Buss' study.

If physical attractiveness does combine non-additively with the presence of others, then this alternative explanation may account for the exact same pattern of means presented by Hill and Buss (2008). If, however, targets' physical attraction was held constant, systematically varied, or statistically controlled, then one would be able to determine whether the presence of others had a non-additive effect with sex of the subject, attractiveness of the target, or both. In order to disentangle the possible effects of attractiveness of the target and the sex of the subjects on desirability of targets, physical attractiveness will be systematically varied. If the

attractiveness of the target and the presence of others have a non-additive effect on desire for the target, then the pattern of results would differ for attractiveness of the target, but the sex of the subject would have an effect on how desirable the target is believed to be.

Alternatively, if Hill and Buss (2008) were correct in their reasoning (i.e., that the sex of the subject has a non-additive effect with the presence of others on the desirability of the target, and that the attractiveness of the target does not matter), then a replication of Hill and Buss' findings would be expected. The pattern of results would differ for both male and female subjects, but attractiveness of the target would have no effect on desirability of target.

Finally, it is possible that the sex of the subject, the attractiveness of the target, and the presence of others all combine non-additively with each other. The means differ for both male and female subjects, the attractiveness of the target, and the presence of others.

Problems with Interpretation of Results

Variables and Mediating Models Derived from Hill and Buss (2008). Hill and Buss (2008) believe that the effect the presence of opposite sex others has on desirability of the target is moderated by sex of the subject. Although Hill and Buss' data are consistent with that hypothesis, their explanations for why there was such a difference between the two sexes (i.e., increased competition, social proof) were not actually examined. It is clear that the sex of subject and the presence of others are variables of interest to Hill and Buss. They believe that the sex of the subject changes the mediating processes involved between presence of others and mate choices. This hypothesis was derived from existing mate choice research. The presence of others is important to their model of mate choice, because they believe that the presence of others affects mate choice differently for males and females. Although the presence of others can vary continuously, for the purposes of Hill and Buss and the present study, the presence of others has

two levels (i.e., present or not) and is an independent groups factor. Additionally, the sex of the present others is nested within the present level of this variable.

Desirability Enhancing Model. Hill and Buss's (2008) explanation for the *desirability enhancing* effect (i.e., the process of female subjects' mate choice) is that the presence of others communicates some kind of social information or can be used as social proof. Hill and Buss do not provide enough information regarding how they believe social proof may function to increase desire among females subjects or what other variables may be involved in the mate choice process. It has been known that persuasion seems to work better when subjects believe that they are similar to the source of the message (e.g., Simons, Berkowitz, & Moyer, 1970; Wilson & Sherrell, 1993). If one thinks of the mate choice context as a complex persuasion scenario, then one might expect that the more similar subjects believe themselves to be with the others present in such a scenario, the more influential those others would be in their decision making process. The subject's similarity to others may affect how influential others are in shaping the subject's perceptions of others' desirability of the target.

How similar the subject feels to the others present may affect the perceptions the subject forms regarding how desirable others believe the target to be. When targets are alone, although subjects are able to formulate a perception about how desirable others believe the target to be, the subject has no reference group to aid in forming such a perception. Therefore, their perception, if it even occurs to them, is based solely on speculation. Hill and Buss (2008) found that female subjects rated male targets as more desirable when in the presence of same-sex others than alone. It is possible that the perception of similarity was higher (as discussed above) and was influential when developing perceptions of how desirable the target is. Given that the present others were also female, and presumably making similar mate choice decisions, the

presence of the opposite-sex others may have provided social information that was useful in forming a perception of how desirable the target is to others for female subjects.

Consistent with Dugatkin's (1992) reasoning and Graziano's findings, the perception of others' desire increases subjects' desire in the target as well. Therefore, Figure 2 presents the *desirability enhancing* model that represents the mediators as proposed by Hill and Buss (2008). This model shows, only for females, how the presence of opposite sex others, regardless of the attractiveness of the target, affects the subject's desire, and subsequently mate choice.

Desirability Diminishing Model. Hill and Buss's (2008) explanation for the *desirability diminishing* effect for males is that the presence of those others communicates increased competition. For male subjects, Hill and Buss believe that the presence of opposite-sex others could indicate greater competition for female targets' affection; Hill and Buss do not believe that this possiblity occurs for female targets when they are alone or in the presence of same-sex others. Although not defined by Hill and Buss, for the purposes of this manuscript perception of competition is defined as the belief that others are vying for the attention of, affection of, and ability to date the target.

Hill and Buss (2008) do not explain why competition would decrease desire for the target and they do not address the possibility that perceived competition may moderate the relationship between desire and mate choice[9]. It is possible that increases in perceptions of competition could decrease the subject's belief that the target would reciprocate feelings (e.g., Nash, 1950). The perception of probability of acceptance, for this study, is the perception of the likelihood that the target would reciprocate the subject's desire to share attention with, affection with, or date the target. If the perception of probability of acceptance is low, then the subject would be less likely to wish to pursue the target as a potential mate (e.g., Muehlenhard & Miller, 1988). In other

words, greater fear of rejection on the part of the subject, could lead to avoidance behaviors (Maner & Gerend, 2007) and thus subjects exert minimial effort to pursue the target. Therefore, the presence of opposite sex others decreases male subjects' desire, or mate choice, for the female target. Figure 3 presents the model that represents the mediators as proposed by Hill and Buss. This model explains, for male subjects only, how the presences of opposite sex others, regardless of the attractiveness of the target, affects desire, and subsequently mate choice.

An Alternative Attractiveness Mediating Model of Mate Choice. It is possible that neither of the models derived from Hill and Buss's (2008) propositions explain how the presence of others affects desire and mate choice. As stated earlier, when the target is perceived as physically attractive the presence of others may be superfluous information (even possibly not attended to), because people will infer personality characteristics and use these attributions to assess how socially attractive the target is. On the other hand, it is possible that when highly physically attractive people are in the presence of opposite-sex others, but not same-sex others, negative attributions regarding their personality are inferred. Dion, Berscheid, and Walster (1972) do find that people make attributions about others' personalities based on their physical appearance. When targets are attractive, subjects may formulate negative attributions that explain the behavior of others (i.e., hanging out with opposite-sex others), such as the target, in a socially undesirable way (e.g., promiscuity, concern about paternity of offspring). It is likely that the same negative attributions would not be made when the target is in the presence of same-sex others or alone.

Alternatively, when the target is unattractive, the presence of others may increase perceptions of social attractiveness and may still lead to desire and, subsequently, mate choice. It is possible that when unattractive targets are in the presence of others, positive attributions about

their personality are inferred (e.g., warm, caring). If this possibility were the case, then the presence of opposite-sex others increases, over that of same-sex others, the extent to which positive attributions are inferred. Therefore, when a target is unattractive and in the presence of others, the subject, regardless of sex, may make positive attributions regarding the personality of the target; however, the present review of the literature did not reveal an examination of how the presence of others and attractiveness affect judgments of personality.

The attributions that the subject makes when the target is in the presence of others or not may affect how socially attractive the subject believes the target to be. Social attraction has been defined, generally, as an affinity for a person based on characteristics that are desirable in one's personality or behaviors that encourages others to want to form and maintain interpersonal relationships. The more positive the attributions, either in quality, quantity, or both, the more socially attractive the subject believes the target to be. The more negative the attributions, either in quality, quantity, or both, the less socially attractive the subject believes the target to be.

Given that social attraction compels people to want to form and maintain relationships, the more a target is perceived to be socially attractive, the more desired that person becomes as a mate. Therefore, perceptions of social attraction are positively related to desire, which is positively related to mate choice. This mediating model would suggest a negative relationship between the presence of opposite others and mate choice. The following model, which represents an interpersonal model of choice, is proposed for highly attractive people. This alternative model is a more parsimonious explanation for why there exists enhancing and dimishing effects of the presences of others. This interpersonal model (presented as Figure 4) can explain why the relationship between the presences of others and the desirability of a target changes as a function of attractiveness with the same mediating variables affected.

Conceptual Unclarity: Mate Choice vs. Desire

The Importance of Communication in Mate Choice. Bateson (1983) posits that observable behaviors of mate choice may be manifestations of "selective responsiveness by animals to particular stimuli" (pg. 4), and that exactly how that selective responsiveness occurs is irrelevant to "understanding the dynamics of the mating system" (pg. 4). Despite the importance of understanding how the mating system functions, at a certain point it becomes important, as it is with any human phenomena, to examine the mechanisms that drive such a system (Bunge, 2004). Therefore, this paper seeks to disentangle desire and mate choice in order to understand more clearly the mechanisms involved in mate choice interactions. To reiterate, mate choice refers to non-cognitive, non-affective, observable behaviors that indicate one's decision to mate with another. Desire, on the other hand, is psychological, a collection of evaluative judgments or attitudes toward another.

Given that mate choice has been defined by sexual selection scholars as a collection of behaviors that indicate a decision to mate with another, mate choice may be best understood by observing communication patterns. In fact, there exist interpersonal communication theories that have indirectly elucidated mate choice behaviors. For example, Uncertainty Reduction Theory (URT, Berger & Calabrese, 1975) provides a potential explanation. URT states that people are motivated to reduce uncertainty regarding others by engaging in a variety of activities such as information seeking. The Theory of Motivated Information Management (Afifi & Weiner, 2004) suggests, however, that people need to be motivated to reduce uncertainty. It is possible that when subjects desire a target, they are motivated to reduce uncertainty. Therefore, mate choice behaviors may be similar to actions hypothesized by uncertainty reduction theory. For example, if a subject does desire a potential target and makes the decision to attempt to make the target a

mate, then one might expect that the subject might elect to communicate with the target, may communicate longer with the target than if they did not desire the target, may engage in greater information seeking behavior either directly by asking the target or through a third party source (e.g. the Internet), etc. Therefore, communication behavior will be used as indicators of choice with the expectation that greater frequency and duration of communication indicates choice in a mate.

Desire for a mate as well as mate choice will be examined by replicating Hill and Buss' (2008) procedures. In general, subjects will come to the lab with the notion that they will be trying out a new online dating company. Subjects will view pictures of targets of the opposite sex in the presence of others (same or opposite sex) or alone. Subjects will be asked to report on their affective and cognitive processes that occurred while viewing the targets. The overall pattern of subjects' mate choice, given the sex of the subject, the attractiveness of the target, and the presence of others will be examined. Additionally, the aforementioned competing mediating models will also be examined.

METHOD

Subjects

A total of 240 subjects (*S*s), 120 males and 120 females, were recruited from introductory communication courses at a large Midwestern unversity. The recruitment for this study specified that *S*s had to be heterosexual, not in a relationship, and not graduating. At the onset of the study *S*s were asked again if they fit these requirements; if *S*s indicated that they did not fit these requirements they were told that they were not eligible to participate. All *S*s were given partial course credit in exchange for their participation. The mean age of the sample was 19.66 with a *SD* = 1.89 and ranged from 18 years old to 33 years old.

Design

This study utilized a 2 (physical attractiveness of target: unattractive, highly attractive) x 3 (presence of others: alone, same sex others present, opposite sex others present) between-groups design. Therefore, *S*s were either in an unattractive or attractive condition and they were given stimulus materials in which the targets were either alone, in the presence of same sex others, or in the presence of opposite sex others. Within each condition, *S*s viewed two targets in one of two locations that met the condition specifications. All male *S*s saw the same two female targets in one of two locations, but both targets were never presented in the same location. Therefore, there were two combinations of stimuli that could have been presented to male *S*s, henceforth known as Female Target Combination 1 (FTC1) and 2 (FTC2). All female *S*s saw the same two male targets in one of two locations, but both targets were never presented in the same location. Therefore, there were two combinations of stimuli that could have been presented to females *S*s, henceforth known as Male Target Combination 1 (MTC1) and 2 (MTC2). Please refer to Figure 5 through 7 for stimuli combinations.

In order to identify targets for the attractiveness induction, 20 male and 27 female raters rated a number of potential targets' pictures in order to identify two females and two males who were similar in physical and social attractiveness. The first male and female set's physical attraction ($M_M = 3.41$, $SD_M = 0.53$; $M_F = 3.44$, $SD_F = 0.50$) and social attraction scores ($M_M = 3.15$, $SD_M = 0.53$; $M_F = 3.43$, $SD_F = 0.34$) were within sampling error of each other. The second male and female set's physical attraction ($M_M = 3.21$, $SD_M = 0.64$ $M_F = 3.43$, $SD_F = 0.52$) and social attraction scores ($M_M = 3.15$, $SD_M = 0.47$; $M_F = 3.15$, $SD_F = 0.63$) were within sampling error of each other. In order to try to maintain consistency between attractive and unattractive targets, the images of the attractive targets were altered in order to create the unattractive targets. Once the targets were identified, the pictures of them either alone or in the presences of others in various locations were taken.

The presence of others was induced by having targets presented alone in a photograph, in the presence of four same sex others in a photograph, or in the presence of four opposite sex others in a photograph. In all cases, the target person was more attractive than the surrounding others or the images were altered in order to create unattractive others. The same 46 raters, used to identify targets, were recruited to rate the attractiveness of the surrounding others. Additionally, the same four females used to surround a male target were never used for other male targets; however, the same set of four females were used as the surrounding females for a female target. This procedure was utilized so that subjects never saw different targets with the same set of surrounding others. The target person was always identified clearly by being placed in the center of the group. Additionally, *S*s were instructed to rate the person in the middle of the group facing the camera.

Procedures

Upon arrival at the lab, *S*s were informed that the study was being conducted in conjunction with a new online dating service that was attempting to replicate meeting people in real life settings. Once *S*s' consent was obtained, participants were given further information regarding the cover story and instructions. *S*s were told,

> "Given the department's extensive work with computer mediated communication and interpersonal relationships, we have been hired to do some initial research for a new local dating website, which cannot be named. The creators of this site believe that people are hesitant about participating in online dating, because people have a lot of control over what they present on dating sites and people often feel disappointed once they meet.
>
> Therefore, this company has come up with a way around this by interviewing people who wish to use the site and the company then decides what information should be presented on the dating profile. Additionally, they have noticed that most people who use dating websites present pictures of themselves that are either outdated or unrealistically flattering. Therefore, this company has a company photographer taking candid, unposed pictures of the clients over the course of a normal day. The company decides which pictures to present on the dating profile, with the intention that these pictures are more realistic depictions of the client's overall appearance. What we would like for you to do is give us some feedback about what you think about this type of dating website, rate profile information and pictures, and give us feedback about what you may be thinking regarding these profiles. For ease of time, people are randomly selected to see profile information or pictures or both.

> Also, as incentive, if you are interested the company will let you have free membership for a month. We, unfortunuately, do not have much information about the dating preferences of the clients, but you are free to leave them a message, since this site is active. There should be space provided for you along with their information and/or picture. Because you are not in the dating system yet, you will have to leave some type of contact information in the message if you want them to get in touch with you. Once you are done viewing the clients you can tell me if you would be interested in receiving the free membership and I can pass your information along."

When *S*s understood what they were to do, they were presented with the first target picture and given the measures to fill out. Once *S*s completed ratings of the first target, they then proceded to respond regarding the second target. When *S*s were finished, they were told that they were then instructed to filled out a questionnaire about their own personality. They were told that the personality questions were to allow the company to understand what types of people may or may not use their services. The personality questionnaire included items from the Big Five Inventory (Rammstedt & John, 2007), argumentativeness scale (Infante & Rancer, 1982), verbal aggressiveness scale (Infante & Wigley, 1986), rejection sensitivity scale (Downey & Feldman, 1996), social desirablity (Crown & Marlowe, 1960), and self-esteem scale (Rosenberg, 1965), but were not of central interest to this study. Additionally, subjects indicated their likelihood of using such a service.

After *S*s had provided information for both targets, they were told the true nature of the study and were asked to keep the true purpose a secret. When *S*s were done they were thanked and dismissed.

Instrumentation

Manipulation Checks. Given that the presence of others was manipulated, subjects reported whether they perceived that others were even present with the target. Therefore, after having completed the measures inquiring about mediators, *S*s were given a manipulation check for the presence of others. In order to assess the *S*s' awareness of the presence of others, *S*s were asked to indicate how many people were present in the picture with the target. *S*s assessing the presence of others with both the first and second targets were 100% accurate.

In order to assess whether *S*s were aware of the sex of the other people present, *S*s were asked to indicate whether the others who were present were male or female, or whether the question did not apply (in the case that they believed that there were not others present). *S*s assessing the sex of the others present with the first and second target were 100% accurate.

Whether or not *S*s accurately reported on the presence of others was coded. *S*s' responses to the presence of others manipulation check were rated as 2 (for getting both answers correct), a 1 (for getting one of the answers correct), or a 0 (for getting neither of these correct). In all cases, people were coded a 2, because both answers were correct for all *S*s.

Although the attractiveness of the target was manipulated and rated prior to data collection, *S*s were asked to report on how physically attractive they believed the target to be. The measurement of this variable was done by using McCroskey and McCain's (1972) Physical Attractiveness Subscale (PA) of their Interpersonal Attraction Scale. This scale utilized a 5-item Likert-type response scale that ranged from 1 (strongly disagree) to 7 (strongly agree). Given that *S*s filled out the PA for both targets, a 10-item unidimensional solution for the combination of two scales was assessed by performing a confirmatory factor analysis (CFA) in which factor loadings were estimated using a centroid solution (Hunter & Gerbing, 1982). For FTC1, the PA

scale yielded a 10-item single factor solution with a response distribution ranging from 1.20 to 6.50, that was slightly negatively skewed, with a mean of 4.64, *SD* = 1.29, α = .93. For FTC2, the PA scale yielded a 10-item single factor solution with a response distribution ranging from 1.80 to 7.00, that was relatively normally distributed, with a mean of 4.74, *SD* = 1.10, α = .90. For MTC1, the PA scale yielded a 10-item single factor solution with a response distribution ranging from 2.20 to 6.00, that was relatively normally distributed, with a mean of 4.65, *SD* = 0.92, α = .86. For MTC2, the PA scale yielded a 10-item single factor solution with a response distribution ranging from 2.30 to 6.20, that was slightly negatively skewed, with a mean of 4.84, *SD* = 0.90, α = .86. Please refer to Appendix B for items on the manipulation checks.

Similarity to Others. Given that it is believed that the presence of others would be more influential if the subjects believed themselves to be similar to the others, Fiedler's Assumed Similarity of Opposites (ASo, 1953) was modified in order to assess how similar the *S*s believe they were to the others that were present with the target. *S*s were given the 10-item Big Five Invetory (Rammstedt & John, 2007) self-report short form, as well as a 10-item Big Five Inventory observer-report short form and were asked asked to report on what they believed the targets' personalities were like. Both the self and observer-report forms used a 7-point Likert-type response form similar to the other scales. In order to assess similarity to others, a similarity score was calculated by creating a composite difference score between the self and observer-reports (e.g., $\sum(|\text{Self}_i\text{-Observer}_j|)/10$). A lower score indicates greater perceptions of similarity between the self and the target. For FTC1, the ASo for the first target ranged from 0.30 to 2.70, was relatively normally distributed, had a mean of 1.42, *SD* = 0.51, P ($1.29 \leq \bar{x} \leq 1.55$) = .95, and the ASo for the second target ranged from 0.10 to 3.90, was slightly positively skewed, had a mean of 1.60, *SD* = .71, P ($1.42 \leq \bar{x} \leq 1.80$)= .95. For FTC2, the ASo for the first target ranged

from 0.20 to 3.40, was slightly positively skewed, had a mean of 1.49, *SD* = 0.53, P ($1.36 \leq \bar{x} \leq 1.62$) = .95, and the ASo for the second target ranged from 0.10 to 3.50, was slightly positively skewed, had a mean of 1.54, *SD* = .59, P ($1.39 \leq \bar{x} \leq 1.69$) = .95. For MTC1, the ASo for the first target ranged from 0.40 to 2.50, was slightly positively skewed, had a mean of 1.39, *SD* = 0.53, P ($1.26 \leq \bar{x} \leq 1.52$) = .95, and the ASo for the second target ranged from 0.20 to 3.30, was slightly positively skewed, had a mean of 1.51, *SD* = .59, P ($1.36 \leq \bar{x} \leq 1.66$) = .95. For MTC2, the ASo for the first target ranged from 0.60 to 2.70, was relatively normally distributed, had a mean of 1.41, *SD* = 0.48, P ($1.29 \leq \bar{x} \leq 1.53$) = .95, and the ASo for the second target ranged from 0.40 to 3.10, was relatively normally distributed, had a mean of 1.45, *SD* = .54, P ($1.31 \leq \bar{x} \leq 1.59$) = .95. Please refer to Appendix C for items.

Perception of Other's Desirability. The *S*s' belief about how desirable others believe the target to be was rated using a 6-item Likert-type response scale that ranged from 1 (strongly disagree) to 7 (strongly agree), but were standardized for consistency across other measures of interests. Given that *S*s filled out the perception of other's desire scale (POD) for both targets, a 12-item unidimensional solution for the combination of two scales was assessed by performing a CFA. For FTC1, the POD scale yielded a 12-item single factor solution with a response distribution ranging from 2.83 to 6.67, that was relatively normally distributed, with a mean of 4.93, *SD* = 0.83, α = .90. For FTC2, the POD scale yielded a 12-item single factor solution with a response distribution ranging from 3.58 to 7.00, that was slightly positvely skewed, with a mean of 5.06, *SD* = 0.85, α = .91. For MTC1, the POD scale yielded a 12-item single factor solution with a response distribution ranging from 3.37 to 6.50, that was relatively normally distributed, with a mean of 5.06, *SD* = 0.63, α = .85. For MTC2, the POD scale yielded a 12-item single factor solution with a response distribution ranging from 3.00 to 6.42, that was slightly

playtokurtic distributed, with a mean of 5.09, *SD* = 0.75, α = .89. Given that responses to the two targets were correlated (*r* = .34, *p* < .001) standardized composites were used to assess the fit of the models in order to stay consistent with other outcomes of interest. Please refer to Appendix C for items.

Perception of Competition. Given that the perception of competition is defined as the belief that others are vying for the attention of, affection of, and the ability to date the target, a scale was developed in order to assess this variable. After viewing the photograph, *S*s were asked to rate the extent to which they believed there to be competition for the target's affection, attention, and ability to date. Perception of competition (POC) was measured by using a 6-item Likert-type response scale that ranged from 1 (strongly disagree) to 7 (strongly agree) but were standardized for consistency across other measures of interests. Given that *S*s filled out the POC scale for both targets, a 12-item unidimensional solution for the combination of two scales was assessed by performing a CFA. For FTC1, the POC scale yielded a 12-item single factor solution with a response distribution ranging from 1.58 to 6.08, that was relatively normally distributed, with a mean of 3.98, *SD* = 0.93, α = .90. For FTC2, the POC scale yielded a 12-item single factor solution with a response distribution ranging from 2.25 to 6.58, that was relatively normally distributed, with a mean of 4.10, *SD* = 0.93, α = .89. For MTC1, the POC scale yielded a 12-item single factor solution with a response distribution ranging from 2.08 to 6.17, that was relatively normally distributed, with a mean of 4.04, *SD* = 0.76, α = .86. For MTC2, the POC scale yielded a 12-item single factor solution with a response distribution ranging from 1.50 to 5.50, that was slightly negatively skewed, with a mean of 4.01, *SD* = 0.84, α = .89. Given that responses to the two targets were correlated (*r* = .40, *p* < .01) standardized composites were used to assess the fit

of the models in order to stay consistent with other outcomes of interest. Please refer to Appendix D for items.

Probability of Acceptance. Additionally, *S*s were asked to rate the extent to which they believed that the target would accept a dating offer. The probability of acceptance is the perception of the likelihood that the target would reciprocate the subject's desire to share attention, affection, and date the target. Therefore, a 7-item Likert-type response scale the probability of acceptance (POA) scale that ranged from 1 (strongly disagree) to 7 (strongly agree), but were standardized for consistency across other measures of interests. Given that *S*s filled out the POA scale for both targets, a 14-item unidimensional solution for the combination of two scales was assessed by performing a CFA. For FTC1, the POA scale yielded a 12-item single factor solution with a response distribution ranging from 3.64 to 6.64, that was relatively normally distributed, with a mean of 4.99, $SD = 0.67$, $\alpha = .86$. For FTC2, the POA scale yielded a 12-item single factor solution with a response distribution ranging from 1.50 to 7, that was relatively normally distributed, with a mean of 4.92, $SD = 1.04$, $\alpha = .95$. For MTC1, the POA scale yielded a 12-item single factor solution with a response distribution ranging from 2.07 to 6.71, that was relatively normally distributed, with a mean of 4.68, $SD = 0.86$, $\alpha = .92$. For MTC2, the POA scale yielded a 12-item single factor solution with a response distribution ranging from 2.36 to 7.00, that was relatively normally distributed, with a mean of 4.95, $SD = 0.92$, $\alpha = .95$. Given that responses to the two targets were correlated ($r = 1.00$, $p < .01$) standardized composites were used to assess the fit of the models in order to stay consistent with other outcomes of interest. Please refer to Appendix D for items.

Attributions About Personality. Given that people make causal explanations about other people's behaviors, *S*s were asked to list, in an open-ended format, positive and negative

attributes they believe the target to possess. *S*s reported on a variety of attributes that were not exclusive to the targets' personality. Therefore, two coders coded positive and negative attributes for both targets as unmanipulated physical attractiveness (e.g., handsome, beautiful), manipulated physical attractiveness (e.g., nice hair), personality traits and social attractiveness (e.g., kind, outgoing, lazy), intelligence (e.g., smart), relationship orientation (e.g., might not have dated a lot), or miscellanous (e.g., not sure). Kappas between the two coders for positive and negative attributes for both targets ranged from $\kappa = .66$ to .89.

A sum of responses for both positive and negative was calculated. An index was created such that scores indicated positive attributes less the negative attributes. Therefore, the smaller, or more negative, the number, the more negative attributes reported. Alternatively, the larger, or more positive, the number, the more posititive attribures reported. The attribution index (AI) for the first female target, the difference in negative and positive attributes ranged from -4 to 5, that was relatively normally distributed, with a mean of 0.77, *SD* = 1.75, P ($0.55 \leq \bar{x} \leq 0.99$) = .95. The AI for the second female target, the difference in negative and positive attributes ranged from -4 to 5, that was relatively normally distrubted, with a mean of 0.40, *SD* = 1.56, P ($0.20 \leq \bar{x} \leq 0.60$) = .95. The AI for the first male target, the difference in negative and positive attributes ranged from -3 to 5, that was relatively normally distrubted, with a mean of 0.95, *SD* = 1.52, P ($0.76 \leq \bar{x} \leq 1.14$) = .95. The AI for the second male target, the difference in negative and positive attributes ranged from -4 to 5, that was relatively normally distributed, with a mean of 0.94, *SD* = 1.56, P ($0.74 \leq \bar{x} \leq 1.14$) = .95. Please refer to Appendix E for instructions.

Social Attraction. Social attraction compels people to want to form and maintain interpersonal relationships. Therefore, *S*s were asked to report on how socially attractive they believed the target to be by using McCroskey & McCain's (1972) Social Attractiveness Subscale

(SOC) from the Interpersonal Attraction Scale a 5-item Likert-type response scale that ranged from 1 (strongly disagree) to 7 (strongly agree), but were standardized for consistency across other measures of interests. Item four was modified slightly to indicate a relationship that would be more than simply friendship. Given that *S*s filled out the POC scale for both targets, a 10-item unidimensional solution for the combination of two scales was assessed by performing a CFA. For FTC1, the SOC scale yielded a 10-item single factor solution with a response distribution ranging from 3.30 to 6.80, that was relatively normally distributed, with a mean of 5.23, *SD* = 0.71, α = .77. For FTC2, the SOC scale yielded a 10-item single factor solution with a response distribution ranging from 3.20 to 6.70, that was relatively normally distributed, with a mean of 5.27, *SD* = 0.66, α = .70. For MTC1, the SOC scale yielded a 10-item single factor solution with a response distribution ranging from 3.20 to 6.60, that was relatively normally distributed, with a mean of 4.99, *SD* = 0.73, α = .73. For MTC2, the SOC scale yielded a 10-item single factor solution with a response distribution ranging from 3.70 to 6.50, that was relatively normally distributed, with a mean of 5.36, *SD* = 0.65, α = .73. Given that responses to the two targets were correlated ($r = .14$, $p < .05$) standardized composites were used to assess the fit of the models in order to stay consistent with other outcomes of interest. Please refer to Appendix E for items.

Desirability. *S*s were asked to report on how much they desired the target. Desire for the target was measure using a 6-item Likert-type response scale that ranged from 1 (strongly disagree) to 7 (strongly agree), but were standardized for consistency across other measures of interests. A few items from Hill and Buss (2008) that pertained to desire were modified and used for this study. A few additional items were also created. Given that *S*s filled out the desire scale (DES) for both targets, a 12-item unidimensional solution for the combination of two scales was assessed by performing a CFA. For FTC1, the DES scale yielded a 12-item single factor solution

with a response distribution ranging from 0.92 to 5.58, that was slightly negatively skewed, with a mean of 3.42, *SD* = 1.24, α = .95. For FTC2, the DES scale yielded a 12-item single factor solution with a response distribution ranging from 1.42 to 6.75, that was slightly positvely skewed and playkurtic, with a mean of 3.61, *SD* = 1.26, α = .93. For MTC1, the DES scale yielded a 12-item single factor solution with a response distribution ranging from 0.92 to 5.00, that was relatively normally distributed, with a mean of 2.96, *SD* = 1.02, α = .93. For MTC2, the DES scale yielded a 12-item single factor solution with a response distribution ranging from 1.00 to 5.42, that was slightly playtkurtic, with a mean of 3.28, *SD* = 1.18, α = .93. Given that responses to the two targets were correlated (*r* = .51, *p* .01) standardized composites were used to assess the fit of the models in order to stay consistent with other outcomes of interest. Please refer to Appendix F for items.

Mate Choice. Choice was measured by a number of indicators. Given that *S*s were given the opportunity to leave a message for the targets, a dichotomous measure of choice was obtained simply by examining whether *S*s left a message or not. Eleven male *S*s left a message for the first target, while nine male *S*s left a message for the second target. Additionally, 10 female *S*s left a message for the first male target, while six female *S*s left a message for the second target. There was no evidence that male and female *S*s differed from each other in the frequency of messages left for their first target, X^2= 0.05, *df* = 1, *p* = .82, or the second target, X^2= 0.64, *df* = 1, *p* = .42.

Additionally, global assessments of the content of the message, left by the *S*, were assessed by 2 raters. The raters coded the messages for how much the message indicated desirability of the target. Messages were rated as either low, medium, or high levels of desire. There was 100% agreement between the two coders, therefore κ = 1.00. Male (target 1: M =

1.81, SD = .87; target 2: M = 1.89, SD = .78) and female (target 1: M = 1.40, SD = .52; target 2: M = 1.67, SD = 1.03) *S*s did not differ from each other in the number of questions asked to their first target, $t = 1.32$, $df = 19$, $p = .20$, or the second target, $t = 0.48$, $df = 13$, $p = .64$.

A composite was created by standardizing both indicators of mate choice and summing across each target. Given, that the sum of the standardized indicators were correlated with one another ($r = .91$, $p < .01$), an index that combined the two standarized indicators was created. This index ranged from -1.54 to 3.40, was skewed positively, had a mean of -1.27, and had a $SD = 0.89$.

RESULTS

Differences between Predictors of Interest

The first set of analyses examined whether any of the predictors of interest (i.e., physical attraction, social attraction, similarity, perceptions of others attraction to target, perceived competition for the target, percevied probability of acceptance for the target, personality attributes) differed between the male and female targets. There was no evidence that the predictors of interest differed between the two targets and means for each target were within sampling error of each other. Please see Table 2.

Examination of Pattern of Means

The second analysis conducted examined whether the pattern of desire means would replicate those obtained by Hill and Buss (2008). As can been seen in Table 1, Hill and Buss (2008) found no evidence that male subjects' desire for female targets differed when she was presented alone (M_c = 5.44) or with same sex others (M_c = 5.45); however, their desire of her when presented with opposite sex others (M_c = 5.02) did differ from these two conditions. Alternatively, when female subjects rated male targets, Hill and Buss (2008) found that their desire of him was lowest when he was alone (M_c = 3.64), followed by when he was in the presence of same sex others (M_c = 3.91), and highest when he was presented with opposite sex others (M_c = 4.72). Given that analyses were done collapsed across targets, the following analyses employed the same procedure.

A 2 x 3 factorial ANOVA was used to compare the sex of the target being rated, the presence of others, and the non-additive effect of the two on desire for the target (means and standard deviations are presented in Table 3). The analysis did reveal a significant main effect for sex of target being rated, $F(1, 234) = 6.79$, $p = .01$, $\eta^2 = .03$, female targets were more desired

by male subjects (M = 3.51, SD = 1.24) than male targets were desired by female subjects (M = 3.12, SD = 1.11). Unlike Hill and Buss (2008) the current analysis did not reveal a significant main effect for the presence of others on desire, $F(2, 234) = 0.89$, $p = .41$, $\eta^2 = .007$; there was no evidence to suggest that subjects' desire for the target differed when the target was presented alone (M =3.44, SD = 1.26), in the presence of same sex others (M = 3.32, SD = 1.11), or in the presence of opposite sex others (M = 3.19, SD = 1.21). There was no evidence suggesting that target sex and the presence of others combined non-additively, $F(2, 234) = 1.90$, $p = .15$, $\eta^2 = .02$. There is no evidence that for male or female targets, the presence of others affected desirability ratings.

In all conditions of Hill and Buss' (2008) study, male subjects found female targets more desirable than female subjects found male targets. Further support for this attractiveness explanation can be found in the fact that all female targets were rated as more desirable than the others presented with them, but male targets were rated as less desirable than the others presented with them. The omnibus pattern of means presented in the current study differs from the pattern that Hill and Buss (2008) obtained and suggests an explanation that differs from an evolutionarily rooted one—differences in attractiveness of the male and female targets. Therefore, a third analysis was conducted in order to examine the effect of attractiveness on desire.

It was hypothesized that attractiveness combines non-additively with the presence of others or that it combines non-additively with the presence of others and target sex. A 2 x 2 x 3 factorial ANOVA was used to compare the sex of the target being rated, the manipulated attractiveness of the target, the presence of others, and the non-additive effect of the three on desire for the target. Similar to the two-way ANOVA performed above, the analysis revealed a

significant main effect for sex of target being rated , $F(1, 228) = 8.44$, $p = .004$, $\eta^2 = .03$; female targets were more desired by male subjects (M = 3.51, SD = 1.24) than were male targets were desired by female subjects (M = 3.12, SD = 1.11). Again, there was no evidence to suggest that the presence of others had a main effect on desire, $F(2, 228) = 1.11$, $p = .33$, $\eta^2 = .007$; targets alone (M =3.44, SD = 1.26) were just as desired as targets in the presence of same (M = 3.32, SD = 1.11) and opposite sex others (M = 3.19, SD = 1.21). The three-way ANOVA did reveal a significant main effect for the manipulated attractiveness of target on desire, $F(1, 234) = 50.62$, $p < .001$, $\eta^2 = .17$; attractive targets (M = 3.80, SD = 1.15) were rated as more desirable than unattractive targets (M = 2.83, SD = 1.03).

Additionally, similar to the two-way ANOVA there was no evidence suggesting that target sex and the presence of others combined non-additively, $F(2, 228) = 2.36$, $p = .10$, $\eta^2 = .02$. For male or female targets, the presence of others did not affect desire ratings. Furthermore, although hypothesized, there was no evidence suggesting that attractiveness and the presence of others combined non-addively, $F(2, 228) = 1.32$, $p = .27$, $\eta^2 = .008$. There was no evidence that for both attractive and unattractive targets the presence of others effected desire ratings. There was, however, evidence suggesting that target sex and manipulated attractiveness of the target did combine non-additively, $F(1, 228) = 7.41$, $p = .001$, $\eta^2 = .02$, but the effect is small. Desire for the two different sexed targets, changed as a function of their attractiveness.

Finally, there was no evidence suggesting that target sex, the presence of others, and manipulated target attractiveness combined non-addivitely, $F(2, 228) = 1.01$, $p = .37$, $\eta^2 = .007$.

Upon examination of the means, however, a pattern does emerge. The omnibus ANOVA performed may not have been powerful enough to detect the three-way interaction apparent in the Table 4. Specifically, for attractive targets, male subjects rated female targets as more

desirable than female subjects rated male targets, however, the pattern of means across the presences of others was consistent; male and female subjects rated targets presented alone as more desirable than targets presented with same or opposite sex others. On the other hand, male and female subjects differed in their ratings of their desirability for targets when targets were unattractive. More specifically, male subjects rated female targets presented alone and female subjects rated male targets presented with opposite sex others as equally less desirable than the other presentation combinations. The specific three-way interaction was tested using the contrasts presented in Table 5. As expected, target sex, the presence of others, and manipulated target attractiveness combined non-addivitely to affect subjects' desirability of the targets, $F(1, 228) = 61.38$, $p < .001$, $\eta^2 = .20$.

Model Testing

Although the pattern of means were not consistent with the proposed Hill and Buss (2008) *desirability diminishing* effect, the *desirability diminishing* model was tested using OLS estimation of the parameters only for male subjects. The zero-order correrlations in Table 6 were used to assess the fit of the *desirability diminishing* model. One may observe that the parameters present in Figure 8 are not very ample. Additionally, upon examination of the local fit indices, a large departure from the predicted perception of competition-desire relationship was identified (i.e., z = 1.69). Furthermore, the error in predicting the presence of others-mate choice relationship was large and outside of sampling error of zero (RMSE = .26, $X^2(df = 6, N = 120) = 23.40$, $p < .05$; corrected RMSE = .29, $X^2(df = 6, N = 120) = 30.92$, $p < .05$). Given that the pattern of means are not consistent with Hill and Buss' (2008) original study, the size of the parameters, and the test of fit indices, the data are inconsistent with the hypothesized *desirability diminishing* model.

Despite the fact that the pattern of means were not consistent with the proposed Hill and Buss (2008) *desirability enhancing* effect, the *desirability enhancing* model was tested using OLS estimation of the parameters only for female subjects. The zero-order correrlations in Table 7 were used to assess the fit of the *desirability enhancing* model. One may observe that the parameters present in Figure 9 are not very ample. An examination of the local fit indices did not reveal large departures from predicted correlations. The error in predicting the presence of others-mate choice relationship was not outside of sampling error of zero (RMSE = .10, X^2(*df* = 3 , N = 120) = 3.90, *p = ns*; corrected RMSE = .12, X^2(*df* = 3 , N = 120) = 5.13, *p = .ns)*. Although the fit indices from the model testing were consistent with the proposed *desirability enhancing model*, the pattern of means were not consistent with the hypothesized *desirability enhancing* pattern, therefore, the model was rejected.

Although the data were not consistent with the attractiveness of the target and presence of others two way interaction, the alternative *attractiveness* model was assessed using OLS estimation of the parameters for all subjects. The zero-order correrlations in Table 8 were used to assess the fit of the *attractiveness* model. One may observe that the parameters present in Figure 10 are not very ample. Additionally, upon examination of the local fit indices, an ample error from the predicted perception of competition-desire relationship was identified (i.e., z = 3.45). Furthermore, the error in predicting the presence of others-mate choice relationship was large and outside of sampling error of zero (RMSE = .14, X^2(*df* = 6 , N = 240) = 13.21, *p < .05*; corrected RMSE = .14, X^2(*df* = 6 , N = 240) = 14.74, *p < .05*). Given that the pattern of means are not consistent with Hill and Buss' (2008) original study, the size of the parameter, and the test of fit indices, the data are inconsistent with the hypothesized *attractiveness* model and, therefore, the model was rejected.

Posthoc Model Test

Given that desire for the target was highly correlated with both physical attraction (r = .73) and social attraction (r = .36) as well as the fact that the largest error was produced in the *attractiveness* model, a multiple regression analysis was conducted in order to examine whether physical and social attractiveness were significant predictors of desire. The analysis showed that the data were consistent with that hypothesis, $F(2, 237) = 143.38$, $p < .001$, $R^2 = .55$. Both physical attractiveness ($\beta = .68$, $t = 14.76$, $p < .001$) and social attractivness ($\beta = .15$, $t = 3.23$, $p < .005$) were signficant predictors of desire. Desire was dropped from the alternative *attractiveness* model in order to keep the model parsimonious. The *revised attractiveness* model was assessed using OLS estimation of the parameters. The zero-order correrlations in Table 9 were used to assess the fit of the *revised attractiveness* model. One may observe that the parameters present in Figure 11 are not very ample, however, the model produced trivial errors and no local fit indices were outside of sampling error of zero. Furthermore, the error in predicting the presence of others—mate choice relationship was trivial and within of sampling error of zero (corrected RMSE = .04, $X^2(df = 3, N = 240) = 1.27$, $p = ns$). Given the present evidence, the *revised attractiveness* model was not rejected.

DISCUSSION

The following will summarize the analyses of interest, specifically the mean differences, model testing, and the posthoc model examination. Additionally, limitations to external and internal validity due to the use of an online dating paradigm and the potential influence of non-verbal communication behaviors will also be discussed. Finally, implications for how desire may be conceputalized and ideas regarding how sex differences in desire may affect one's understanding of desire within sexual selection will be put forth.

Summary of Findings

Mean Differences. First, this study sought to replicate Hill and Buss' (2008) study with a few modifications. Additionally, it extended Hill and Buss' study by empirically testing their hypothetical mediating mechanisms as well as proposed alternative mediating mechansims.

The first analysis of interest examined Hill and Buss' (2008) set of hypotheses, which suggests that the desire male and female subjects have for targets will differ based on the presence of others. The pattern of means from the current study was not consistent with the pattern of means from Hill and Buss' study. Additionally, there was no evidence that subjects' desire for a target was the result of the non-additive combination of target sex and the presence of others. Given that the pattern of means from this current study and Hill and Buss' study differed, an additional analysis was conduced in order to examine the effect of attractiveness on desire.

In Hill and Buss' (2008) study, male subjects desired female targets more than female subjects desired male targets and the others presented with them. Given the information provided, there was no way to know whether physical attractiveness was systematically or statistically controlled for in Hill and Buss' study. The current paper argued that physical

attractiveness of the female targets was responsible for the pattern of means obtained in Hill and Buss' study; therefore, the current study systematically controlled perceived physical and social attractiveness of the targets so that they were matched across sex. Data obtained from the current study were inconsistent with the hypothesis that physical attractiveness and presence of others combined non-additively to affect subjects' desire for targets. Furthermore, it was speculated that physical attractiveness, presence of others, and target sex would combine non-additively to affect subjects' desire for targets, but the omnibus ANOVA provided no evidence. However, contrast analysis did reveal that desirability for targets did differ for men and women across the presence of others differently. Specifically, when targets were attractive, men reported desiring their targest more than females, but the pattern of desirability for targets did similarily across the presence of others. Alternatively, when targets are unattractive, males desired targets alone equally as desirable as females rated male targets when presented with opposite sex others; however, both male and female in these conditions reported lower desirability for the target than all the other condition combinations.

In addition to the lack of non-additive effects, there was no main effect for the presence of others. Subjects' desire for targets presented alone, with same-sex others, and with opposite-sex others did not differ among the three groups. Although physical attractiveness was systematically controlled , subjects' desire for targets did, however, differ as a function of target sex; implications will be discussed subsequently.

Model Testing. Although the pattern of means found in this study were inconsistent with those obtained by Hill and Buss (2008), a test of their proposed mediating process was examined. Simply put, the data were inconsistent with both the *desirability diminishing*, the data neither reflected the expected pattern of means nor the proposed model. The *desirability*

enhancing hypothesis was less straightforward. Although the data were consistent with the proposed model, the pattern of means were inconsistent with Hill and Buss' study; therefore, the model was also rejected, because it did not reflect the pattern of means obtained.

Additionally, although the pattern of means was not consistent with the *alternative attractiveness* model, a test of this proposed model was conducted. Simply put, the data were inconsistent with the *attractiveness* model and the model was rejected.

Posthoc Model Test. A posthoc model test was conducted because the data were consistent with the possibility that both physical and social attractiveness were predictors of desire. Desire was then dropped from the model and the *revised attractiveness* model was tested. Simply put, the data were consistent with the *revised attractiveness* model and the model failed to be rejected.

Limitations

Use of an Online Dating Scenario. With any study there are a number of limitations and the current study is not an exception. One limitation was the use of a fake online dating website. Although no subject indicated having disbelieved the cover story, the actual use of an online dating website may have limited the ecological and external validity of the study.

First, although the materials were presented as professionally as possible, the websurveying instrument utilized limited the quality of the website interface's appearance. Although the websurveying instrument was not intended to function as the online dating website's interface, many subjects believed that it was in fact the online dating website and a few subjects stated that they believed the online dating website (i.e., the websurveying instrument) was outdated.

Additionally, given that this study was not truly an online dating study, the extent to which the findings from a study such as this one generalizes to real dating interactions—either online dating or face-to-face—is unclear. Although Walther (1996) and colleagues have written extensively regarding the interpersonal features of computer-mediated communication, this study was slightly different than a traditional online dating website given that subjects were not members of the dating website and instead subjects rated pictures of the hypothetical online daters, as opposed to simply viewing profiles. Whether the methodological conveniences of using such a format encouraged subjects to behave in ways that depart too greatly from real online dating or face-to-face dating scenarios remains unclear.

For instance, there are a number of reasons to believe that the simple use of such a format may have altered subjects' communication behaviors toward the target. Given that the online dating paragdigm allows for selective self-presentation (Ellison, Heino & Gibbs, 2006), one might expect that there may greater communication with targets than in a real-life setting. In the current study, however, very few subjects chose to initiate communication with the targets. Therefore, either the format did not encourage subjects to communicate with the target as expected or there may be other features of the format that affected whether subjects chose to communicate with the target.

Although attitudes toward online dating have changed (Finkel, Eastwick, Karney, Reis & Sprecher, 2012), people who use online dating websites are still often stigmatized (Whitty & Carr, 2006; Wildermuth & Vogl-Bauer, 2007). Therefore, subjects may have not wished to communicate with the target because they believed that target to be stigmatized or they themselves wished not to be stigmatized. This possibility may explain why there were few messages left for the targets and few people wanted to sign up for a one year free trial of the

service. Examining the effect of the presence of others in a paradigm that does not increase stigma of the subject or target and in a real life dating scenario—either online or face-to-face—should be done.

Another issue that may have arisen from using an online parardigm was that intrasexual selection processes may have been inhibited. Although Hill and Buss (2008) suggest that perceived competition for the target would diminish the desire for the target, the data were inconsistent with this hypothesis. The paradigm, however, may not have allowed for competition to be relevant to their immediate mate choice decision. Although subjects did report on their perceptions of competition for the target, subjects may not have believed the people present in the picture were competition or that they would need to engage in tête-à-tête competiton with the pictured individuals for the target. In fact, the presence of others did not seem to affect perceived competition; instead, and not surprisingly, perceptions of competition appears to be affected by the attractiveness of the target ($r = .63$, $p < .001$). If the same procedures were conducted in a face-to-face setting, in which targets were actual actors, then the effect of the presence of others may play a more pivitol role in subjects' perceptions of competition. Implications for this possibility are discussed subsequently.

Inconsistent Non-Verbals of Targets.

Although pictures of targets were taken to ensure consistency across all images, there are a number of concerns regarding the non-verbal characteristics of the targets. For instance, although the orientation of the body is toward the picture viewer, the orientation of the head is always to the person directly to the target's right and not to the viewer. The orientation of the head may have caused problems with the subjects' ability to determine what the face of the individual looks like. Research has shown consistently that symmetical faces are seen as more

attractive (Rhodes, Proffitt, Grady & Sumich, 1998; Thornhill & Gangestad, 1993, 1999); therefore, not being able to see the targets' face completely may have affected subjects' judgments of physical attractiveness.

Additionally, Goldin-Meadow (1999) discusses the importance of gesturing and posits that particularly in the absence of speech, gesturing can serve a communicative function. Given that subjects only saw pictures, the targets' gestures (i.e., arms at side) may have communicated unintended information. In fact, negative attributes listed by subjects that may have been attributed to the targets' posture and lack of gestures include issues with self-esteem, being insecure and self-conscious, and being conservative. There did not appear to be positive attributes listed by subjects that could have been the result of the targets' posture, lack of gestures, or both. This issue becomes an even greater problem if more negative attributes were generated for unattractive targets than attractive targets, because the gesture would have combined non-additively with attractiveness to affect differentially positive and negative attributes.

Implications

Perceived Competiton. Although the *desirability diminishing* pattern was not replicated here and the representative model was rejected, there is some intuitive appeal regarding perceived competition as an important construct to the mate choice literature and it is possible that the paradigm simply did not allow for competition to be a relevant factor, as mentioned previously. Given that part of the sexual selection process involves intrasexual selection, more specifically mate competition, exactly how competition influences selection in a dating or mate choice scenario would be interesting to examine further.

In a face-to-face scenario, when a subject views a target surrounded by opposite-sex others, perceived competition may become more relevant to the subject's ability to initiate communication with the target. In the paradigm utilized for the current study, the presence of others in the pictures do not necessarily pose any threat to future communications, presumably, because the target will receive a message privately. In a face-to-face interaction, however, the presence of others may increase psychological distance (i.e., the subject ponders all the ways in which the others may inhibit his or her ability to communication with the target) between the subject and the target.

As mentioned previously, competition may function in one of two ways: as a direct effect on probability of acceptance, or moderating the effect of desire on mate choice. The findings of the current study indicate that this first possibility is not the case, at least given this paradigm; there was no relationship between presence of others and perceptions of competition and a modest relationship between perceptions of competition and probability of acceptance. The possibility that perceptions of competition may moderate the relationship between desire and mate choice was not examined in the current study. However, future research should examine whether perceptions of competition inhibits subjects willingness to approach targets and the relationship between desire and mate choice.

Additionally, the effect of competition may not be linear. One could argue that perception of competition has a curvilinear relationship with desire and serves as social information, akin to Hill and Buss' social proof explanation for the *desirability enhancing effect*. For instance, when competition is high, one does not engage in mate choice behaviors, either because one wants to avoid intrasexual competition or because of low perceived probability of acceptance. Additionally, when competition is low, one does not engage in mate choice behaviors, possibly

because one perceives that if others do not find the target desirable, he or she does not either—a hypothesis consistent with the *desirability enhancing effect*. Moderate levels of perceived competition may be enough to motivate one to desire a target without inhibiting mate choice behaviors. This possibility should be examined further.

Desire and Mate Choice Revisited

Toward a Conceptualization of Desirability. The current paper's most significant contribution is to disentangle desire and mate choice. As discussed previously, desire is a cognitive, psychological construct that motivates mate choice behaviors. Although this paper has not explicated the construct of desire, findings from the current study have some interesting implications for considering how desire should be conceptualized and examined further.

The findings suggest that both physical and social attractiveness were significant predictors of desire. It is possible that physical and social attraction are second-order unidimensional and comprise desire. This possibility was examined prior to data analysis; however, the data were inconsistent with this hypothesis and the factor structure was rejected. There are two possible reason as to why the data did not fit a second order unidimensional solution. First, McCroskey and McCain (1972) did not intend to write a scale of desire, but instead attraction, in which physical, social, and task attraction were conceptualized as three distinct factors. Therefore, the items in McCroskey and McCain's physical and social attraction scales are not construct valid for desire. Additionally, it is possible that physical and social attraction alone do not completely capture the construct of desire. Although physical and social attraction are defined as an affinity for an object based on either physical or social features of the object, desire also has a goal obtainment component. Physical and social attraction, as conceptualized and measured by McCroskey and McCain, lack a goal attainment component.

Males and Females' Differential Desirability. Similar to Hill and Buss (2008), the current study also found that male subjects desired female targets more than female subjects desired male targets. It was hypothesized that the reason for why male and female subjects differed on how much they desired the targets was due to difference in physical attraction. Although the physical attractiveness for male and female targets was matched and measured in the current study (as well as social attractiveness), a difference between how much male and female subjects desired the target still emerged.

One possible explanation for why this might be the case could be due to differential thresholds in motivation in their pursuit of their goal—mating (i.e., sex). Previous studies have found sex and gender differences in desire for opposite-sex others, but typically these studies measure how physically attracted to the target subjects were (see Feingold, 1990 for a review). In the current study, male and female targets did not differ from one another in how physically attractive they believed the targets to be, however, there was still a sex difference in how much they desired their targets. A number of studies suggest that male sex drive—sex for its own sake—is stronger than that of females (e.g., see Baumeister, Catanese & Vohs, 2001 for a review). Given this evidence it is possible that males' drive for sex is simply greater, leading to greater feelings of desire, in comparison to females, regardless of whether targets are seen as equally attractive. This possiblity is consistent with the notion that desire is comprised of physical and social attraction as well as a goal attainment component.

CONCLUSION

The purpose of the current study was to address issues surrounding Hill and Buss' (2008) original study. In order to remedy the potential attractiveness confound, the current study systematically varied physical attractiveness for all targets. Additionally, in order to examine the explanatory mechansims for Hill and Buss' findings, the current study measured variables of interest and empirically tested hypothesized models. Finally, the current study also disentangled desire and mate choice within the models as well as discussed implications for the conceptualization of desire.

Results did not replicate the pattern of means found in Hill and Buss' (2008) study. Additionally, the *desirability diminishing* and *enhancing* models were rejected. Although an *alternative attractiveness* model was proposed, this model was also rejected. A posthoc *revised attractiveness* model was putforth and tested; data were consistent with this revised model and the model failed to be rejected.

Though there were some limitations with regard to using an online dating paradigm and the lack of gestures within the stimulus materials, the current study was generative, providing a platform from which future research can build. The current study's most significant contribution was providing evidence to support the conceptual distinction between desire and mate choice. Future research would benefit from explicating and developing measures of both of these constructs.

Footnotes

Footnotes

[1] Genetic mutations are deviations in the genomic sequence and can be caused by a variety of factors (e.g., radiation exposure) or they can occur naturally. Some mutations can be fatal to an organism. For example, sickle cell anemia, which can lead to death if left untreated, is the result of a single gene mutation. Other mutations, however, may simply increase the organisms overall fitness. For instance, CCR5-Δ32 mutation appears to increase resistance to the HIV in humans (Galvani & Slatkin, 2003).

[2] Living longer does not necessarily mean that an organism's reproductive capacity increases linearly. At times survival and reproduction conflict with one another. For example, reproduction can actually decrease an organism's survival (e.g., sexual cannibalism of the praying mantis). Although an organism may live half as long as other conspecifics, said organism may reproduce at a greater rate, thus having lower survival but greater fitness than their conspecifics.

[3] Genes are selected passively by a gene-environment interaction and are not actively selected by the organism(s) itself. Depending on the changes in the environment, different genes may increase survival and reproduction rates. Those genes that help increase survival and reproduction in a new environment have an increased likelihood to be passed onto subsequent generations and genes that do not increase survival and reproduction rates have a smaller likelihood of being passed onto subsequent generations.

[4]Although discussed as genetic mutations being selected for, natural selection actually works on the phenotype and not the genotype. The genotype responsible for the phenotype, however, will also increase in the population.

[5] This model is a very simplified decision making process. In reality, there are an infinite number of possible reproductive strategies when one considers all the decisions one must make before mating.

[6] This criterion is not the only important criteria. Males do need to be concerned with the paternity of their partners' offspring. Because fertilization occurs internally, it is impossible to know with certainty (until after birth) whose sperm fertilized the ovum.

[7] Many sex difference claims in this paper are simplified by speaking of the differences between men and women as polar opposites (e.g., all females chose long-term and all males chose short-term or all females use social proof and all males do not). However, it is likely that in most instances men and women use both types of strategies or social information to some extent, but use may be greater for one sex. Despite this reality, this paper discusses sex differences in the traditional manner to maintain consistency with the extant literature.

[8]The desirability scale further provides evidence that desirability as a construct was not conceptually well defined. Although physical attractivness may be an imnportant antecedent to desirability, these constructs are conceptually distinct from one another.

[9]A proposition that cannot even be derived from Hill and Buss (2008) given their conceptual definition of mate choice and desirability.

APPENDICES

Appendix A: Manipulation Check Measures

McCroskey & McCain's (1972) Physical Attractiveness Subscale of the Interpersonal Attraction Scale

Please report on how physically attractive you believe this person to be. People often confuse types of attraction so be sure to report just how physically attracted you are to this person.

1. I think s(he) is pretty (handsome).
2. S(he) is sexy looking.
3. I find her (him) to be very physically attractive.
4. I do not like the way s(he) looks.
5. S(he) is ugly.

Presence of People Scale

Please indicate your response to the following questions.

1. How many people were present?
2. If there were people what was their sex? Male Female

Appendix B: Measures of Hill & Buss' Enhancing Effects Model

Similarity to Others

Please provide your response to the items below.

1. I see myself as someone who is reserved.
2. I see myself as someone who is generally trusting.
3. I see myself as someone who tends to be lazy.
4. I see myself as someone who is relaxed and handles stress well.
5. I see myself as someone who has few artistic interests.
6. I see myself as someone who is outgoing and sociable.
7. I see myself as someone who tends to find fault with others.
8. I see myself as someone who does a thorough job.
9. I see myself as someone who gets nervous easily.
10. I see myself as someone who has an active imagination.

Perception of Others' Desirability of the Target.

Please provide your response to the items below.

1. Others desire to ask the target out on a date.
2. There are a lot of people who would like to go on a date with the target.
3. The target has likely gone on dates with many people.
4. The target likely receives lots of offers for dates.
5. The target is desired by others.
6. Even if no one is asking the target out on a date, there are still people who desire the target's attention.

Appendix C: Measures of Hill & Buss' Dimishing Effects Model

Perception of Competition Scale

Please provide your response to the items below.

1. There would be competition from others to take the target on a date.
2. I would have to contend with others to get the targets' affection.
3. Many other people would like to date this person.
4. If I wanted to date this person, I would have to ask well in advance because the target is likely to get asked out a lot.
5. It would be a struggle to gain the target's affection.
6. I would anticipate that there are many others who would vie with me for the target's attention.

Probability of Acceptance

Please provide your response to the items below.

1. I would have a good chance of securing a date with the target.
2. The target would be uninterested in going on a date with someone like me.
3. The target probably would not accept a dating offer from me.
4. I believe that the target would be interested in going on a date with me.
5. I have just as good of a chance as anyone else at getting a dating with the target.
6. If I asked the target out, s/he would be likely to say yes.
7. I do not think the target would be interested in going on a date with somene like me.

Appendix D: Measures of the Interpersonal Effects Model

Attributions About Personlity

Please list negative qualities that you believe this person may possess.

Please list positive qualities that you believe this person may possess.

McCroskey & McCain's (1972) Social Attractiveness Subscale from the Interpersonal Attraction Scale

Please report on how socially attractive you believe this person to be. People often confuse types of attraction so be sure to report just how soically attracted you are to this person.

1. I think s(he) could be a friend of mine.
2. It would be difficult to meet and talk with her (him).
3. S(he) just would not fit into my circle of friends.
4. We could never establish a personal relationship with each other.
5. I would like to have a friendly chat with him (her).

Appendix E: Measures of Desirability and Mate Choice

Please provide your response to the items below.

1. I desire the target as a sexual partner.
2. I wish that I could get to know the target further.
3. I desire the target as a romantic partner.
4. In general, I desire the target.
5. I desire to spend time with the target in a romantic setting.
6. I am eager to be close to the target.

Appendix G: Tables

Table 1. Hill & Buss' (2008) Findings

	Alone	With Same Sex	With Opposite Sex
Men Rating Women	5.44a	5.45a	5.02b
Women Rating Men	3.64a	3.91b	4.72c

Note: Subscripts across sex indicate groups that are different from one another at $p < .05$. These means were also adjusted to account for any contrast effects that may have altered ratings of target attractiveness due to others-in-picture's attractiveness.

Table 2. Unstandardized Difference between Male and Female Targets on Predictors of Interest

Predictors of Interest	Target Sex	N	Mean	SD	t	df	p	95% Confidence Interval of the Difference	
								Lower	Upper
Physical Attraction	Male	120	4.75	0.91	0.44	238	0.657	-0.21	0.33
	Female	120	4.69	1.19					
Social Attraction	Male	120	5.18	0.71	-0.82	238	0.412	-0.25	0.10
	Female	120	5.25	0.68					
Similarity with Target A	Male	120	1.40	0.50	-1.06	238	0.289	-0.20	0.06
	Female	120	1.47	0.52					
Similarity with Target B	Male	120	1.48	0.56	-1.13	238	0.259	-0.24	0.07
	Female	120	1.57	0.65					
Perception of Others' Attraction to the Target	Male	120	5.07	0.69	0.79	238	0.431	-0.12	0.27
	Female	120	4.99	0.84					
Perception of Competition for the Target	Male	120	4.02	0.79	-0.14	238	0.886	-0.24	0.20
	Female	120	4.04	0.93					
Perceptions of Probability of Acceptance	Male	120	4.81	0.90	-1.23	238	0.220	-0.37	0.08
	Female	120	4.96	0.87					
Psychological Attributes Target A	Male	120	0.93	1.62	0.65	238	0.517	-0.28	0.56
	Female	120	0.79	1.66					
Psychological Attributes Target B	Male	120	0.78	1.51	1.10	238	0.272	-0.18	0.63
	Female	120	0.56	1.65					

Table 3. Pattern of Means for Hill & Buss' Non-Additive Effect of Target Sex and Presence of Others on Desirability

	Men Rating Female Targets			Women Rating Male Targets		
	Alone	Same Sex Others	Opposite Sex Others	Alone	Same Sex Others	Opposite Sex Others
Mean	3.43	3.61	3.51	3.45	3.04	2.87
SD	1.45	1.15	1.15	1.05	1.00	1.21

Table 4. Pattern of Means for the Non-Additive Effect of Manipulated Attractiveness, Presence of Others, and Target Sex on Desirability

		Unattractive			Attractive		
		Alone	Same Sex Others	Opposite Sex Others	Alone	Same Sex Others	Opposite Sex Others
Men Rating Female Targets	Mean	2.54	3.15	2.85	4.32	4.07	4.17
	SD	1.14	0.89	1.01	1.16	1.22	0.87
Women Rating Male Targets	Mean	3.20	2.85	2.41	3.70	3.23	3.33
	SD	0.71	1.01	1.25	1.27	0.98	1.01

Table 5. Contrasts to Examine the Non-Additive Effect of Manipulated Attractiveness, Presence of Others, and Target Sex on Desirability

	Unattractive			Attractive		
	Alone	Same Sex Others	Opposite Sex Others	Alone	Same Sex Others	Opposite Sex Others
Men Rating Female Targets	-4	0	0	3	2	2
Women Rating Male Targets	0	0	-4	1	0	0

Table 6. Correlation Matrix of the Desirability Diminishing Model

	Presence of Others	Perception of Competition	Perception of Probability of Acceptance	Desirability	Mate Choice
Presence of Others			0.02	0.03	-0.06
Perception of Competition	0.06 (0.06) P(-.12 ≤ ρ≤ .24)			0.64	0.09
Perception of Probability of Acceptance	0.00 (0.00) P(-.18 ≤ ρ≤ .18)	-0.30 (-.32) P(-.46≤ ρ≤ -.14)			0.08
Desirability	0.03 (0.03) P(-.15 ≤ ρ≤ .21)	0.70 (0.76) P(.60 ≤ ρ≤ .79)	-0.21 (-0.23) P(-.38 ≤ ρ≤ - .04)		
Mate Choice	-0.06 (-0.09) P(-.24 ≤ ρ≤ .12)	0.10 (0.15) P(-.08 ≤ ρ≤ .28)	0.05 (0.06) P(-.13 ≤ ρ≤ .23)	0.21 (0.32) P(-.38 ≤ ρ≤ -.04)	

Note: Correlations are presented in the bottom triangle and errors are in the upper triangle. Correlations correct for measurement error are in parentheses. The 95% CI was calculated around the uncorrected correlation.

Table 7. Correlation Matrix of the Desirability Enhancing Model

	Presence of Others X Similarity with Others	Others Attraction to Target	Desirability	Mate Choice
Presence of Others X Similarity with Others			-.23	.10
Others Attraction to Target	0.05 (.05) P(-.13 ≤ ρ≤ .23)			0.05
Desirability	-0.21 (-0.22) P(-.38 ≤ ρ≤ -.04)	0.42 (0.45) P(.27 ≤ ρ≤ .57)		
Mate Choice	0.10 (0.15) P(-.08 ≤ ρ≤ .28)	0.05 (0.08) P(-.13 ≤ ρ≤ .23)	0.01 (0.02) P(-.17≤ ρ≤ .19)	

Note: Correlations are presented in the bottom triangle and errors are in the upper triangle. Correlations correct for measurement error are in parentheses. The 95% CI was calculated around the uncorrected correlation.

Table 8. Correlation Matrix of the Alternative Attractiveness Model

	Presences of Others X Manipulated Attractiveness	Attributes	Social Attractiveness	Desirability	Mate Choice
Presences of Others X Manipulated Attractiveness			0.07	0.32	0.03
Attributes	0.08 (0.25) P(-.05 ≤ ρ≤ .21)			0.03	-0.03
Social Attractiveness	0.08 (0.08) P(-.05 ≤ ρ≤ .21)	0.15 (0.16) P(.03≤ ρ≤ .27)			0.06
Desirability	0.32 (0.33) P(.21 ≤ ρ≤ .43)	0.08 (0.08) P(-.05 ≤ ρ≤ .21)	0.36 (0.40) P(25 ≤ ρ≤ .47)		
Mate Choice	0.03 (0.04) P(-.10 ≤ ρ≤ .16)	-0.02 (-0.03) P(-.15 ≤ ρ≤ .11)	0.11 (0.17) P(-.02 ≤ ρ≤ .24)	0.13 (0.20) P(.01 ≤ ρ≤ .25)	

Note: Correlations are presented in the bottom triangle and errors are in the upper triangle. Correlations correct for measurement error are in parentheses. The 95% CI was calculated around the uncorrected correlation.

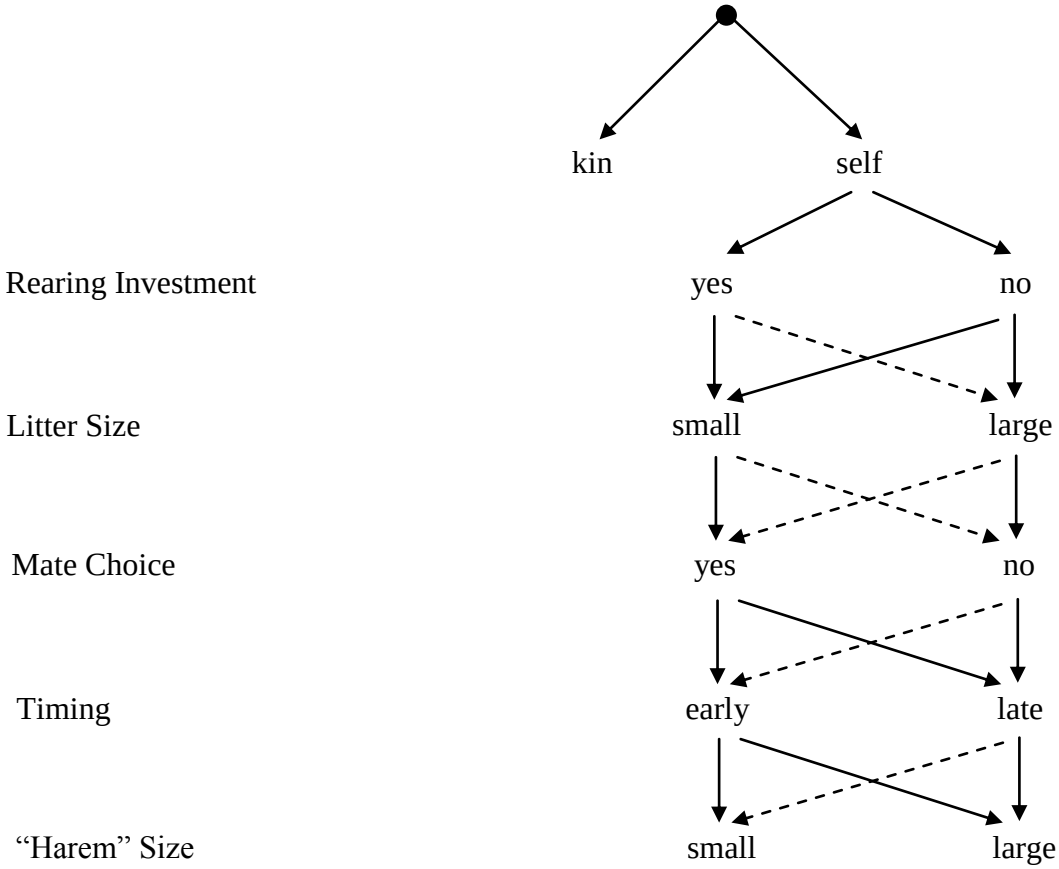
Table 9. Correlation Matrix of the Revised Attractiveness Model

	Presences of Others X Manipulated Attractiveness	Attributes	Social Attractiveness	Mate Choice
Presences of Others X Manipulated Attractiveness			0.07	0.03
Attributes	0.08 (0.25) P(-.05 ≤ ρ≤ .21)			-0.03
Social Attractiveness	0.08 (0.08) P(-.05 ≤ ρ≤ .21)	0.15 (0.16) P(.03≤ ρ≤ .27)		0.06
Mate Choice	0.03 (0.04) P(-.10 ≤ ρ≤ .16)	-0.02 (-0.03) P(-.15 ≤ ρ≤ .11)	0.11 (0.17) P(-.02 ≤ ρ≤ .24)	

Note: Correlations are presented in the bottom triangle and errors are in the upper triangle. Correlations correct for measurement error are in parentheses. The 95% CI was calculated around the uncorrected correlation.

Appendix H: Figures

Figure 1. Recreation of Dunbar's (1983) *Reproductive Strategies Model*



Note: Solid lines indicate the likely choice(s); alternatively, the hashed lines indicate the less likely choice(s).

Figure 2. The Mediating Model of the *Desirability Enhancing* Hypothesis for Women Rating Men

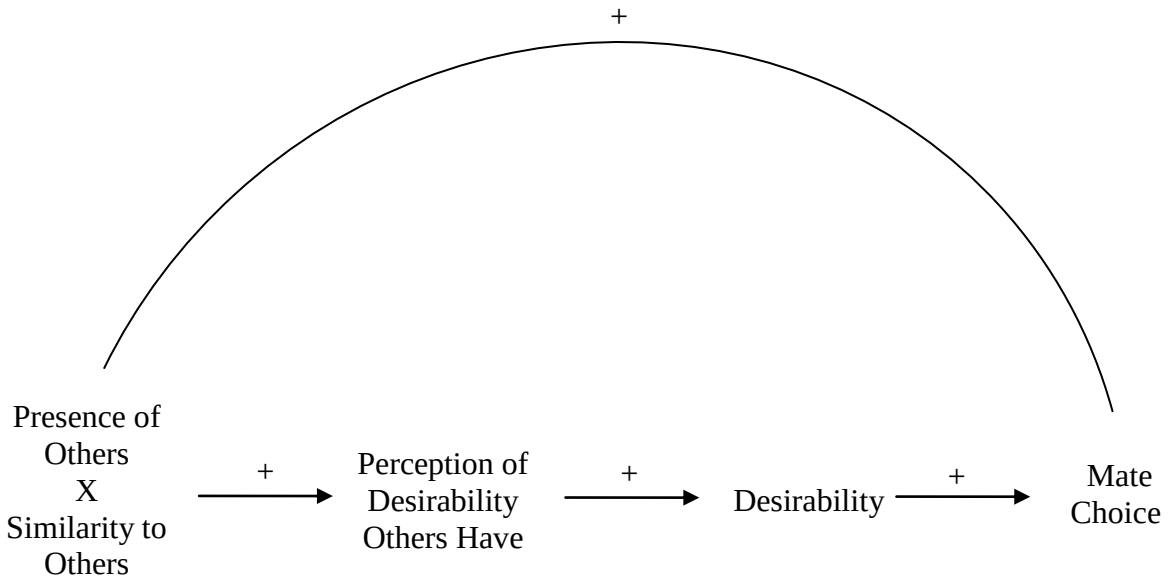


Figure 3. The Mediating Model of the *Desirability Diminishing* Hypothesis for Men Rating Women

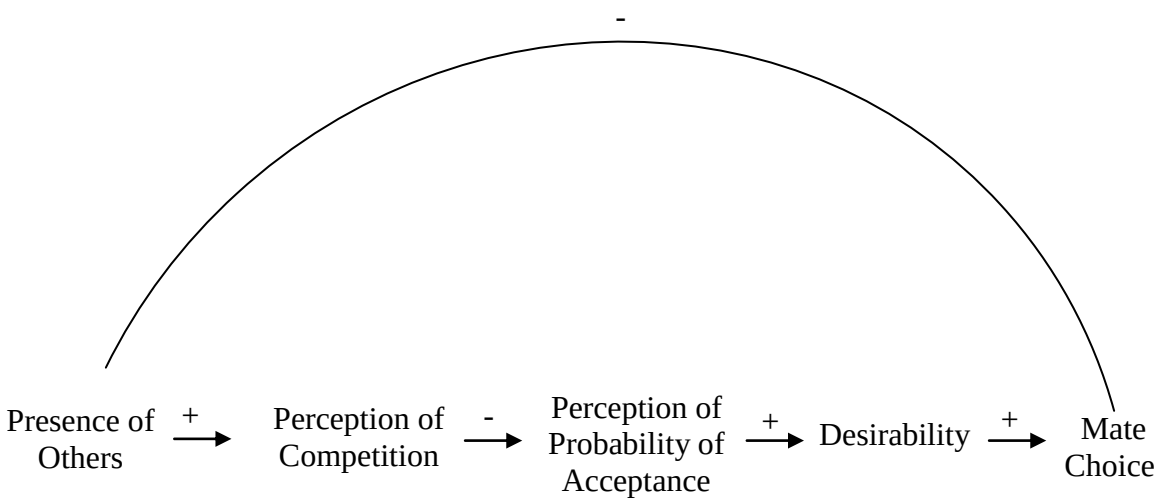


Figure 4. The *Alternative Attractiveness* Model

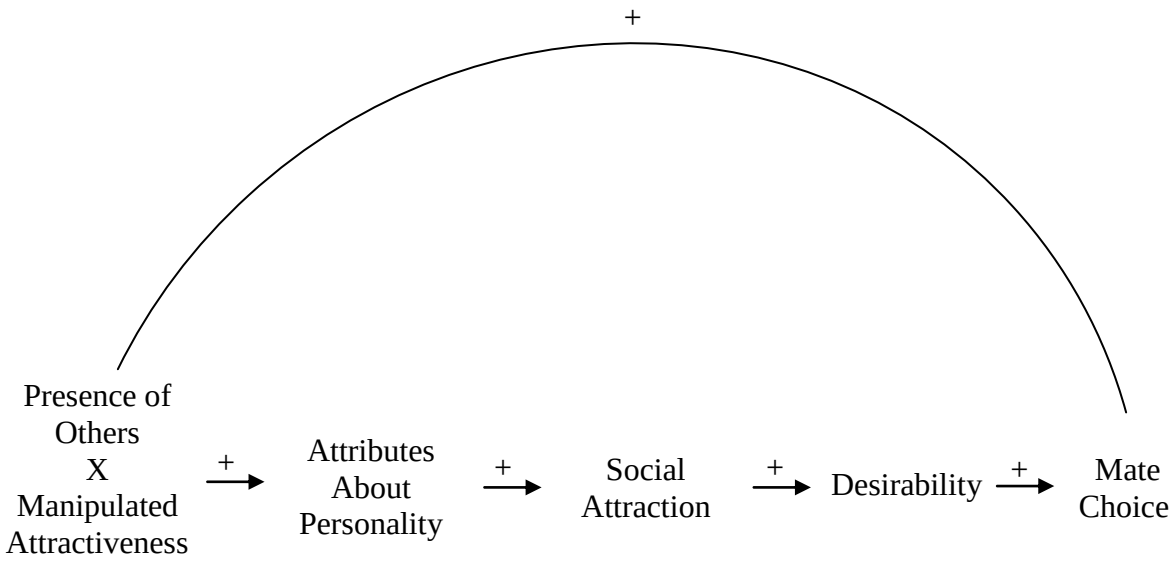
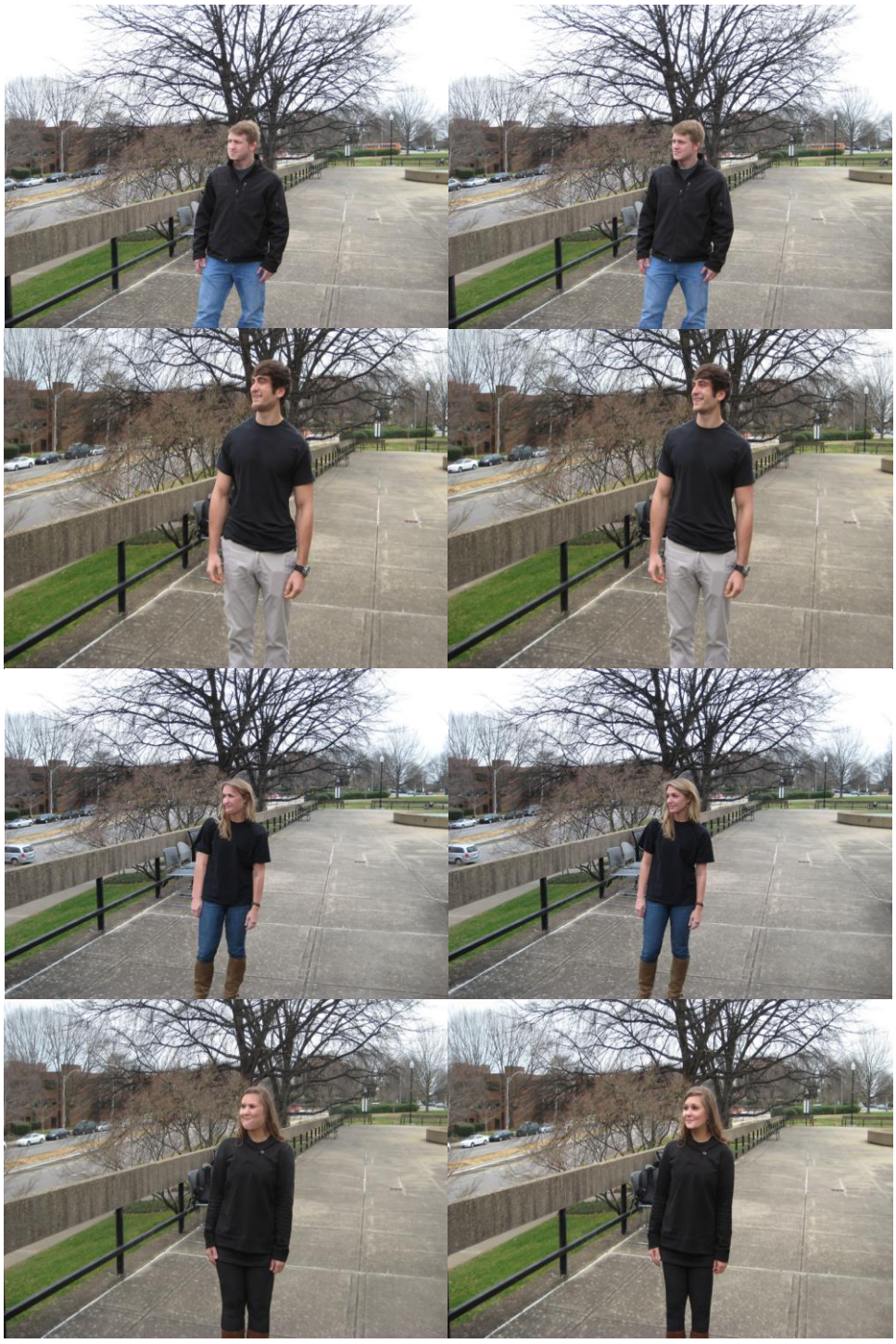


Figure 5. Stimulus Materials—Targets Alone



***Note: For interpretation to the references to color in this and all other figures, the reader is referred to the electronic version of this dissertation.

Figure 6. Stimulus Materials—Targets with Same Sex Others

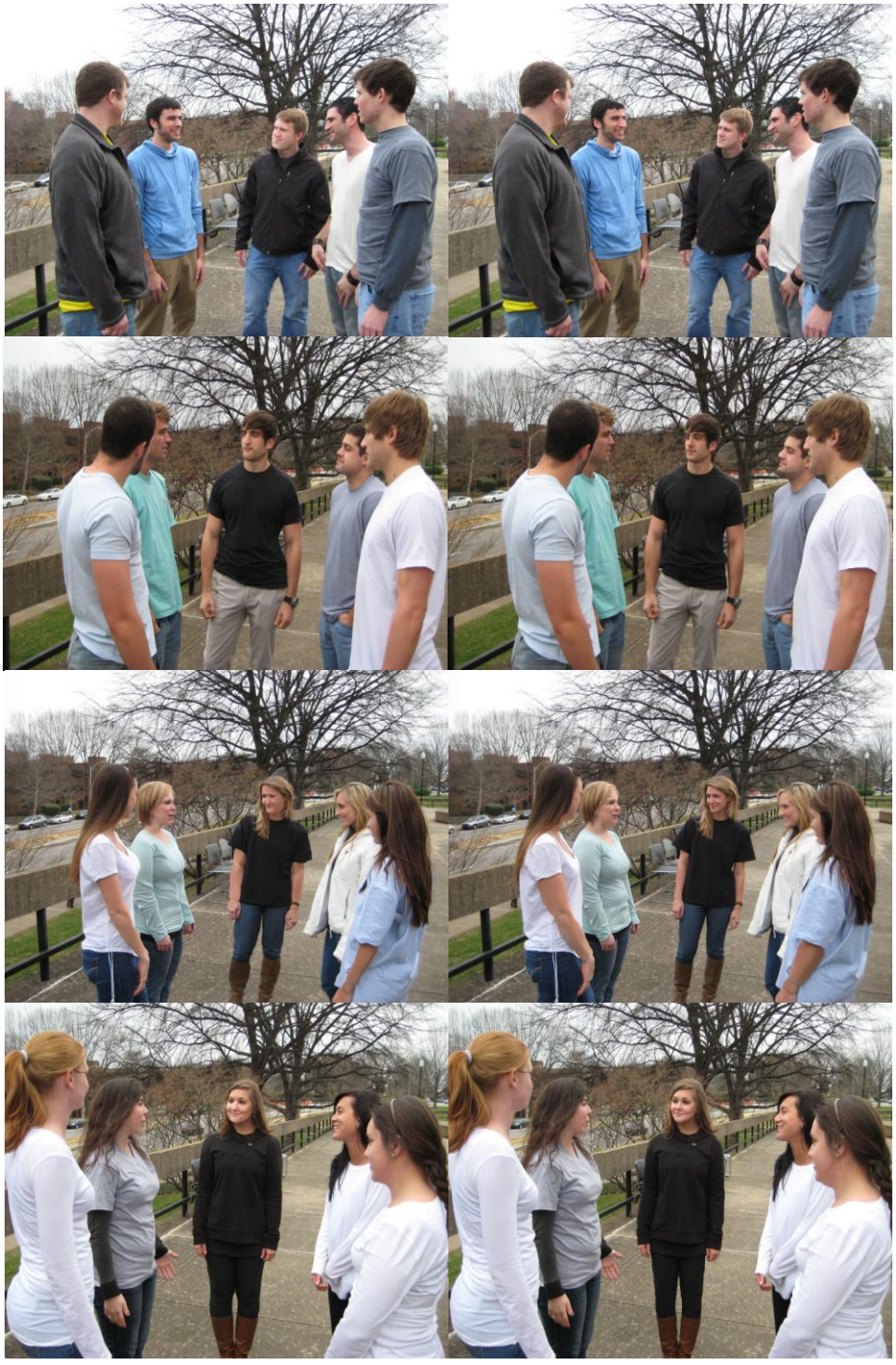


Figure 7. Stimulus Materials—Targets with Opposite Sex Others

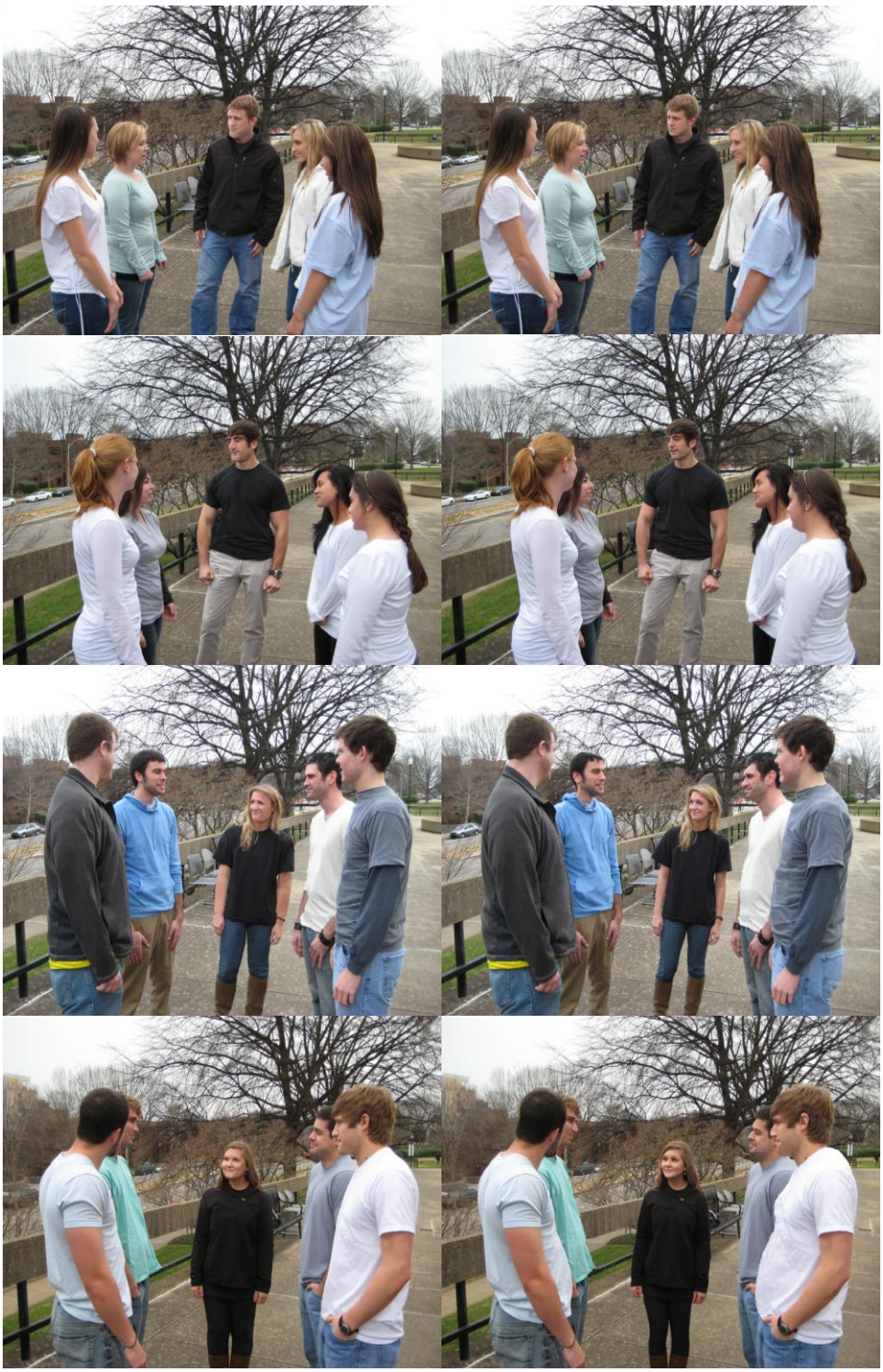
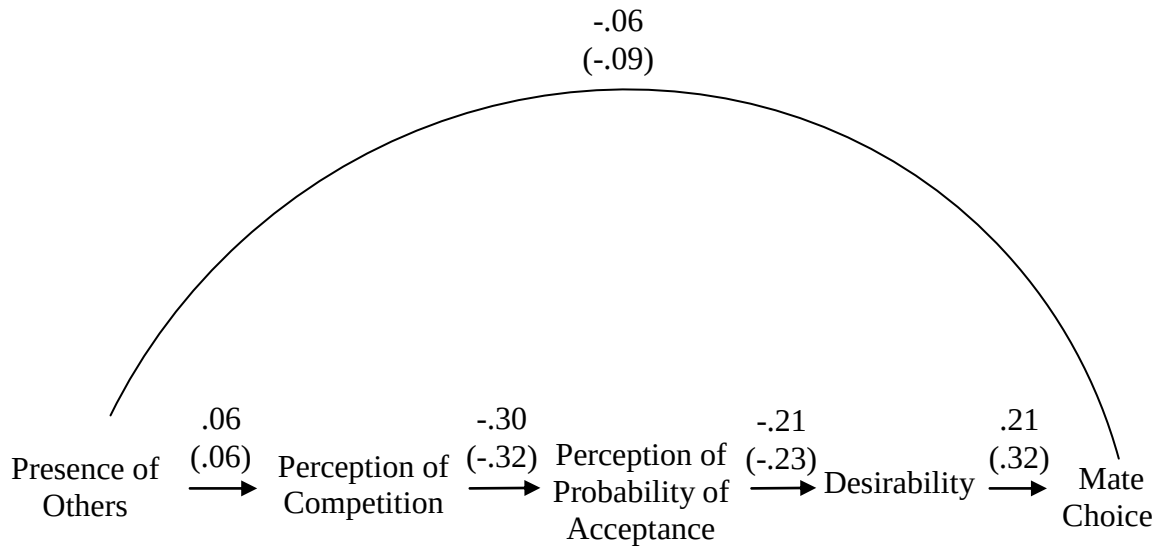


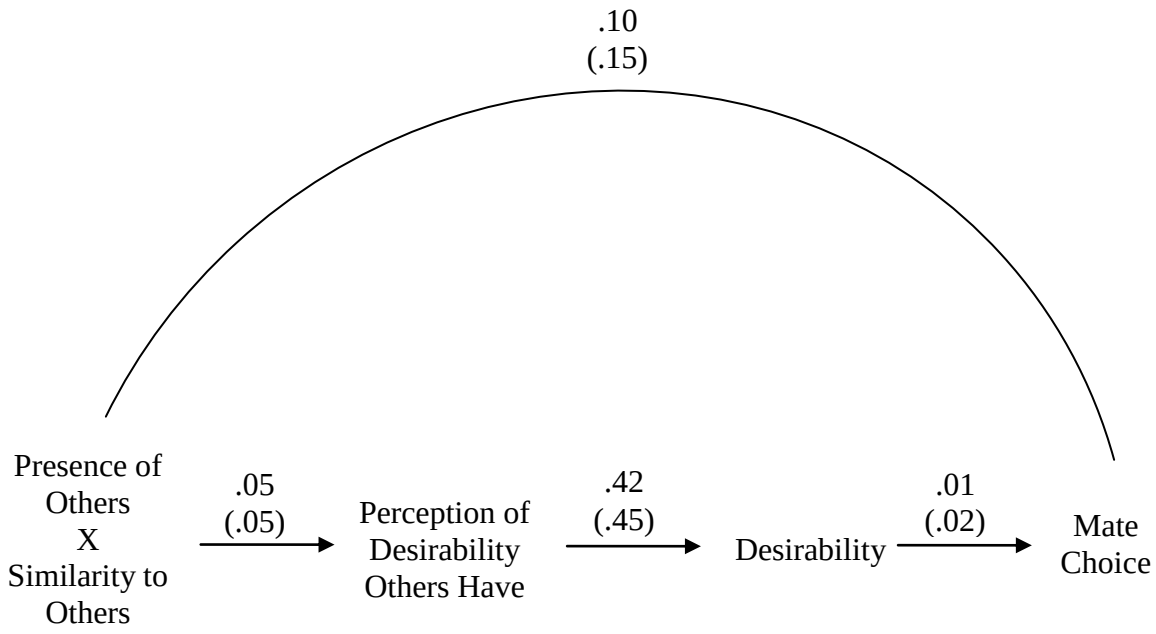
Figure 8. The *Desirability Dimishing* Model



Uncorrected: RMSE = .26, $X^2(df = 6, N = 120) = 23.40, p < .05$
Corrected: RMSE = .29, $X^2(df = 6, N = 120) = 30.92, p < .05$

Note: Correlations corrected for measurement error are presented in parathenses.

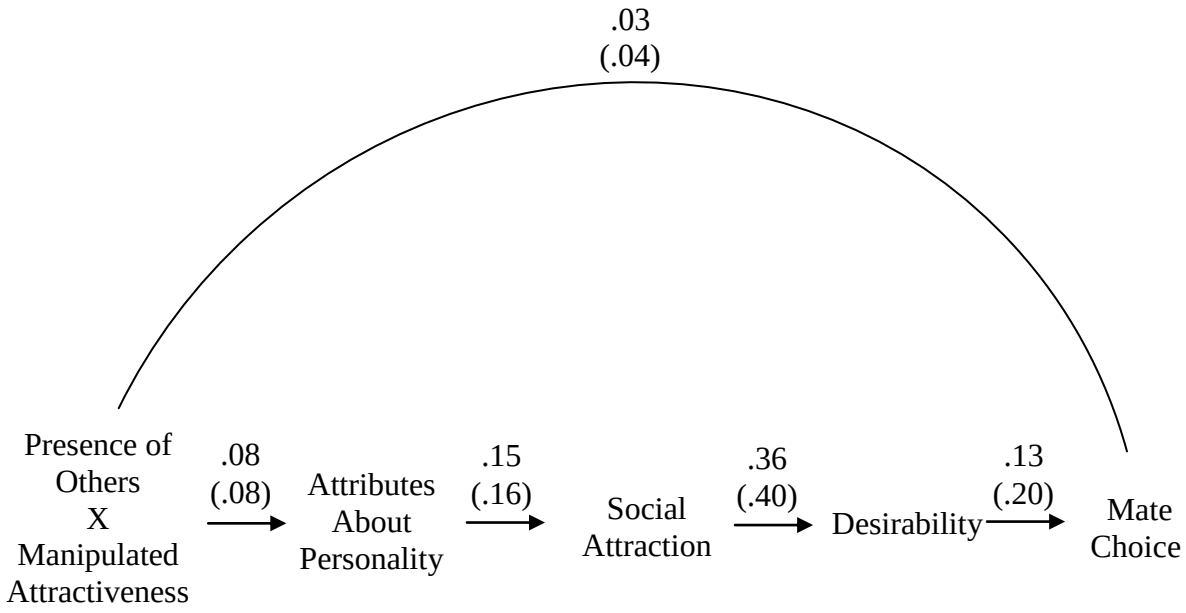
Figure 9. The *Desirability Enhancing* Model



Uncorrected: RMSE = .10, $X^2(df = 3, N = 120) = 3.90, p = ns$
Corrected: RMSE = .12, $X^2(df = 3, N = 120) = 5.13, p = .ns$

Note: Correlations corrected for measurement error are presented in parathenses.

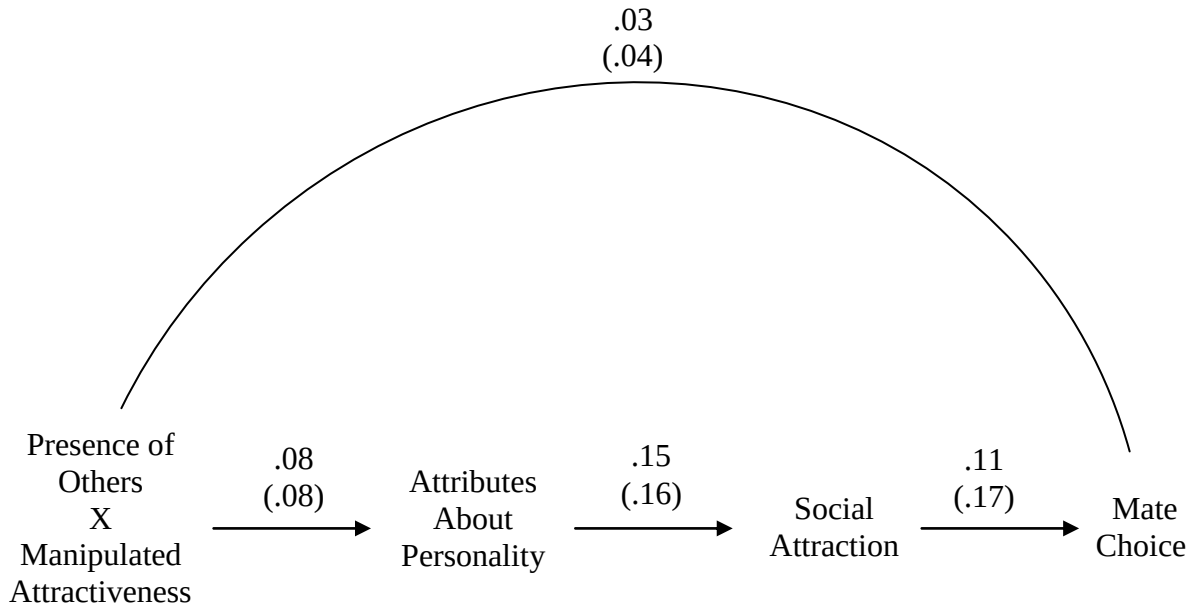
Figure 10. The *Alternative Attractiveness* Model



Uncorrected: RMSE = .14, $X^2(df = 6, N = 240) = 13.21, p < .05$
Corrected: RMSE = .14, $X^2(df = 6, N = 240) = 14.74, p < .05$

Note: Correlations corrected for measurement error are presented in parathenses.

Figure 11. The *Revised Attractiveness* Model



Corrected: RMSE = .04, $X^2(df = 3, N = 240) = 1.27$, $p = ns$

Note: Correlations corrected for measurement error are presented in parathenses

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