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# THE VALIDITY AND STRUCTURE OF MATING INTELLIGENCE

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**Abstract.** Mating Intelligence (MI) is a hypothesized constellation of mental adaptations that generate adaptive strategies in human mating (Geher & Miller, 2008). Although past research has theoretically explored and empirically evaluated the construct, using a MI scale that was borne of the ideas from Geher and Miller's work, this study seeks further understanding of this construct by demonstrating incremental validity. Two studies, each with large samples, demonstrate that MI predicts important outcomes beyond traditional conceptions of personality and intelligence. Exploratory factor analyses revealed that the factor structure suggested in previous work was generally congruent with predictions. Further, MI accounted for a significant portion of variance in mating success after controlling for age, the five-factor model of personality and general intelligence.

**Keywords:** mating intelligence, mating strategies, incremental validity, intelligence, personality

## INTRODUCTION

Sexual selection is a potent evolutionary mechanism of change. Intraspecific within-sex competition for access to mates, in conjunction with intersexual preference, drives the process of adaptation by sexual selection (Andersson, 1994; Miller, 2001). Mate choice is facilitated by relevant fitness indicators that showcase genetic quality that signal low mutation load, elevated immunocompetence and high fecundity/fertility, all of which lead to an increased probability of producing a relatively large number of healthy offspring capable of successful reproduction themselves (Singh, 1994; Zahavi, 1975). This evolutionary process is contingent upon two factors: First, organisms must display fitness, allowing others to observe relative genetic value of potential mates. Second, or-

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ganisms must be able to interpret signals exhibited by others, both from same sex competitors and from opposite sex potential mates (Ridley, 2003).

The proposed construct of Mating Intelligence (MI), or "the mind's reproductive system" (see Geher & Miller, 2008; Geher & Kaufman, 2013; Geher, 2014), facilitates reproductive strategy formation by navigating the complex set of selection pressures related to mate choice. The MI construct is a novel conception of how humans integrate reproductively relevant information into a course of action aiming for mating success through synthesizing signals into adaptive behavior. This article seeks to first psychometrically evaluate a MI measure through an examination of factor structure and reliability. It then intends to demonstrate that this construct corresponds to fitness-increasing outcomes, by showing MI has efficacy in predicting mating success beyond traditional conceptions of intelligence and personality.

## MATE SELECTION IN HUMANS

Female physiology and behavior is a primary limiting factor in human reproduction; a large majority of the costs, risks, and responsibility of reproduction fall on females due to biologically mandatory minimal parental investment. Thus, females seek to ensure that they will obtain a good distribution of desirable traits in a mate, both in terms of genetic quality and the propensity to be a good parent (Burley, 1977; Miller, 2001). Evolution has endowed individuals with the ability to detect characteristics that advertise fitness such as mutation load (Zahavi, 1975) and androgenizing hormone levels (both current and neonatal, Salvador et. al, 1995), each of which is positively correlated with reproductive success. There are a variety of "attractive" physical traits conspecifics may focus on, as putative signals of underlying genetic worth (Gallup Jr. & Frederick, 2010). For instance, symmetry is linked to mutation load while optimal shoulder-to-hip ratios and facial bone structure are related to hormone levels throughout development (Hughes & Gallup Jr., 2003). These attributes partly comprise physical attractiveness, an important element in mate selection, at least initially. A highly desired trait beyond physical attractiveness is excelling at being a long-term partner, especially in the domain of fatherhood. Avoiding males who are prone to engage in short-term uncommitted sex and infidelity (at least in long-term scenarios), and choosing those males who appear to offer the prospect of years of quality time and care while sharing the responsibility of raising offspring typically results in an increased number of high genetic quality offspring (Cotar et al., 2008).

Buss (2008) classified fitness properties into four main groups: (i) indicators of genetic quality, (ii) indicators of the ability to attain resources, (iii) par-

enting quality indicators, and (iv) qualities belonging to a "good" partner in a serial mating arrangement. Gangestad (2007) suggested a mandatory tradeoff in female selection regarding the nature of genetic quality and potential investment. Males who have a lot to offer in terms of genotype can afford to invest less in parenting effort, while the opposite is true for males who are less desirable genetically. This list of preferred qualities focuses on the female tendency to favor relatively restricted sociosexual orientations, a preference which is demonstrated numerous times in the literature on the subject (e.g., Schmitt, 2005; Simpson & Gangestad, 1991). Males generally base mating-relevant decisions on comparatively fewer but no less critical criteria, mostly revolving around indicators of genetic quality (just as in females) and fecundity/fertility cues. The same rules that apply to mutation load and general health are utilized, placing an additional focus on qualities related to bearing children and mating access such as waist-to-hip ratio (Singh, 2002), youthfulness (Jones et. al, 1995), sociosexual orientation (Penke & Asendorpf, 2008), and voice pitch (Hughes, Dispenza & Gallup, 2004). Since males have decreased levels of mandatory direct investment, the potential cost of every mating decision reduces. However, males more generally engage in intrasexual competition for access to females, whom are generally "choosier." In any given environment, there are a limited number of resources. Intrasexual competition between females is less common and perhaps more subversive, but does indeed happen (Clutton-Brock, 2009; Fisher, 2013).

For these reasons demarcated here, it makes sense that MI may be partly sex-differentiated as many mating processes in humans are, in fact, sex-differentiated.

## MATE VALUE

The result of competition and selection is positive assortative mating (Thiessen & Gregg, 2000). Individuals with like "mate values" ultimately pair together. Each individual in a couple is trying to maximize his or her genetic returns by securing a mate with the best possible combination of traits, offering both the potential to be a good parent and possessing good genes. The mate-decision algorithm operates on personal mate value, shopping for wanted traits in a triaged fashion. It is evolutionarily beneficial to select traits with the highest payouts or that avoid the highest costs first and deal with the less important and minimally beneficial attributes later, all while limited by the selector's personal attributes. If a population of players adopts this strategy, selection will act like a sieve and unite individuals with similar mate values. For example, individuals who are the equivalent of a seven out of ten will end up with other individuals of the same value. No real processing needs to occur; with personal value on display, play-

ers just need to attempt to maximize payout. In a hypothetical mating game where participants received a budget intended to serve as an abstract representation of mate value to spend on various characteristics in a potential mate, participants first secured the most salient mating characteristics while later choosing more frivolous characteristics, but only when budgets were comparatively high (Li, 2007). Participants prioritized physical attractiveness, signifying the necessity of genetic quality. Focus then shifted to mate elements including intelligence, the promise of securing resources to support the family, a tendency to remain faithful, parenting skills and interest, and finally emotional and personality attributes that lend to the well-being of a long-term relationship (i.e., just being a "nice person," Li, 2007).

In real life, people do not randomly possess an abstract budget; they instead proffer signals of fitness and the promise for investment based on aesthetics and behavior. These attributes, in combination, form mate value. When like individuals attempt to maximize payout (this proclivity for maximization is itself tremendously beneficial in adaptive terms), pairs generally consist of similar quality partners, on average. Variables such as sex ratio can affect this, but payouts still remain maximized for all, regardless of the fact that one party may have to settle. After all, a modest payout is better than no payout at all. MI synthesizes information regarding personal mate value and allows one to project an image that increases success in mating, along with pointing the individual towards a partner of the highest fitness that will potentially mate with them.

## ADAPTIVE BIAS

However counterintuitive, being right all the time is not necessarily the most adaptive strategy to adopt, especially considering the tradeoffs that are often involved in evolutionary scenarios (Haselton and Nettle, 2006). While things like visuospatial processing need to be accurate while rock climbing, success in the mating market does not demand this standard; it sometimes rejects cognitive precision. First, consider hyperactive agency detection (HADD), the adaptive propensity to be hypersensitive to environmental threats. (Atran & Norenzayan, 2004).

The same logic of adaptive bias applies to the potential costs and benefits involved with mating. First consider females who are faced with a more inherently costly set of outcomes in mating as compared to males. Haselton and Buss (2000) demonstrated that most women are skeptical of levels of commitment communicated by potential male partners. Women reliably report lower estimated levels of intended commitment, erring on the safe side. If she is wrong, the only cost is opportunity while if she is right, the massive cost of being a sin-

gle parent is avoided. In males, a complementary bias regarding opportunity is found, albeit in the other direction. Haselton and Buss also demonstrated the oversexualization of females on behalf of males, in that males tended to overestimate the level and type of interest females displayed, favoring hyper-sexual appraisals. This inclination encourages hopeful individuals to try more than what is considered realistic. The cost of a negative reaction is outweighed by the benefit of trying a lot (Geher, 2009).

Self-deception, as Trivers (2000) conceptualized, suggests that personal inflation of mate value, despite its inaccuracy, increases the fitness of the actor. Although reliable errors in judgment seem to run counter to the idea of "intelligence," it is the case that a tradeoff exists. Projecting an inaccurate image regarding mate value, either resulting in an underestimation of value fostering low self-confidence or an overestimation that encourages a maladaptively large ego, would decrease mating success.

A functional balance of honest appraisal, skepticism and positively exaggerated evaluations would serve to ultimately increase fitness if strategically implemented in the correct fashion. Human MI includes the cognitive infrastructure that negotiates this balance.

## MATING INTELLIGENCE

The cognitive exchange between behavior and the environment is central to understanding the way humans navigate sexual selection processes. It is not only a product of sexual selection; the thinking/mating interface also enacts it. Regardless of personal mate value or the mate values of those around you, the ability to make sense of this information and act accordingly is key. The constellation of mental adaptations that collectively guide this process is coined as MI (Geher & Miller, 2008). A MI scale (Geher & Kaufman, 2007) was created in attempt to both qualitatively and quantitatively describe the new construct.

Due to the dissimilar strategies across the sexes, the scale is split into gender-specific versions. The male version of the scale is composed of five subcomponents: cross-sex mindreading, mating relevant self-deception, mating-relevant other-deception, cognitive courtship displays and sexual overestimation (measured by four items each). The female version exchanges only the last subcomponent (sexual overestimation) for commitment skepticism. Regardless of differences, these strategies are opposite sides of the same coin. These sex-specific approaches to mating accommodate the nuanced needs and risks of both males and females, playing to individual strengths and exploiting loopholes that exist in the behavior of both rivals and possible mates.

## COMPONENTS OF MATING INTELLIGENCE

### Cross-Sex Mindreading

Being able to infer and understand the mental states of others is necessary in all social behavior. In mating behavior, this need is amplified by the presence of sensitive and transient risk-laden situations, which may only present one chance for success. Judgments are often made with little information and it is crucial to be able to secure a new mate or keep an existing partner – tasks which demand the ability to understand others thoughts and intentions. Cross-Sex Mindreading is simply theory of mind applied in the mating domain.

### Mating relevant self-deception

Adaptive cognitive biases lead individuals to internally downplay personal shortcomings while exaggerating desirable attributes. This tendency results in bolstered confidence and the propensity to showcase or disguise fitness-related traits dependent on their value. Positive things are paraded about while negative qualities are hidden, all in an unconscious fashion. The effective display of traits coupled with increased levels of self-confidence plays a role in equipping both males and females with the desire and ability to bravely engage possibly ego-crushing situations, even if previous attempts were unsuccessful. MI confers the benefits of getting some things slightly wrong.

### Mating-relevant other-deception

The benefits of deception are not limited to the self. While it is advantageous to trick oneself into believing that he or she is better off than reality suggests, it is even more important to be able to extend this ability to influence others. A male's ability to cloak his short-term intentions and market himself as one who intends to remain for the long-term or a female's ability to hide her promiscuous past goes a long way in convincing a possible mate (Tooke & Camire, 1991).

### Cognitive courtship displays

Genotypic cues extend far outside of external morphology. The portrayal of elements including general intelligence, humor, athletic prowess, artistic skill, musical ability and desirable personality traits all entice mates in addition to

physical attractiveness (Miller, 2001). Moderated by both self- and other-deception, displays of cognitive attributes advertise mental health, creativity and intelligence, all of which are signals of a good mate that will produce fit offspring. There are nuances as to which attributes are most related to MI; for example, ornamental/aesthetic creativity was more appealing to both males and females in a potential sexual partner than other types of creativity, such as applied/technological or everyday/domestic creativity (Kaufman et al, in press). A different study found that creativity activity was related to sexual partners, but only in males (Beaussart, Kaufman, & Kaufman, 2012). These elements are not necessarily mating relevant per se, but MI dictate their tactful display.

### Sex-specific components: Sexual overestimation and commitment skepticism

Direct extensions of both deception components, the sex-specific factors of MI maximize success in males and mitigate risk in females. Haselton and Buss (2000) postulated the hyper-sexualization of females on the behalf of males and the overly skeptical nature of females regarding males' intended level of relationship commitment as two primary examples of Error Management Theory. The male perception of a more sexually receptive female provides further encouragement to court the female, regardless of actual sexual desire. Trivers' (1985) parental investment theory highlighted the asymmetrical cost of female reproduction while Simpson and Gangestad (1991) along with Schmitt (2005) demonstrated that males were more sociosexually unrestricted (i.e., more orientated toward promiscuous and/or short term strategies). Thus, the perception of lacking male commitment serves to protect females. Whether it leads to lengthened courtship duration as a costly signal in a vetting process (Seymour & Sozou, 2009) or the outright rejection of a suitor, female commitment skepticism mitigates cost before it is incurred. The sex-specific components of Mating Intelligence directly capture Error Management theory and marry them to the wide set of sexual strategies that this new conception of intelligence attempts to encapsulate.

## THE NEXT STEP FOR MATING INTELLIGENCE AS A CONSTRUCT

While the construct of MI was theoretically described (Geher & Miller, 2008), it was neither comprehensively nor empirically validated with the exception of one preliminary analysis of its reliability and power to predict mating success (O'Brien et. al, 2009). A more holistic verification of scale validity is the goal of the present investigation. Because of its crucial importance in understanding

the nature of mate choice in humans, it is necessary to examine the validity of this proposed construct by assessing its factor structure, which is delineated a priori by the MI scale in Geher and Miller (2008), and its independence from well-established constructs with possible overlap (e.g., the Big Five, general intelligence, and sociosexual orientation). Moreover, it is necessary to examine the scale's ability to predict mating success.

Explorations on the validity of a scale have two possible outcomes. Examining overall construct validity can synthesize previous research into a cohesive picture and guide future investigations, as was the case for many studies on the Big Five personality construct (e.g. Schmitt et al., 2007). Alternatively it can sound the death knell of a psychological construct, dealing devastating blows to previous work as exemplified by some of the work on Myers-Briggs Type Indicators (e.g. Pittenger, 1993). While psychological measures are not end-all verifiers of their related constructs, the two are intimately tied. If one falls, the other has an increased probability of meeting the same fate (interestingly, this is not the case with Myers-Briggs, which is still widely used despite the extensive work that contradicts it). It is important to note the differences in the modes of creation of the two provided examples as related to MI. While Myers-Briggs theory was borne of the introspective and anecdotally driven work of Jung (Briggs, Myers, & McCaulley, 1985), the Big Five conception of personality was established out of an accumulation of years of methodologically sound research and rigorous statistical calibration (Goldberg, 1993).

## Mating success: an essential correlate of mating intelligence

The modern environment is drastically different than the environment of evolutionary adaptedness (EEA) for MI. Measuring the number of children born does not accurately capture the relative fitness of involved parties. By sidestepping cultural phenomena like contraception, *mating success* can avoid the problems of merely counting children and offer a worthy outcome variable by which to test MI (e.g., MI predicting mating success in a regression). A mating success variable must accommodate both the variable short-term and long-term strategies that are employed within and between people. Some may habitually utilize one strategy or another while some may adopt a mixture of approaches. A variable that effectively captures mating success has to be a composite of these strategies. Quantifying short-term success is done fairly easily with a report of number of sexual partners, especially in males who see optimized payouts with such a strategy. However, a special consideration has to be made when doing this: it is crucial to account for age as it correlates with number of partners. Reporting number of partners while controlling for age directly addresses this difficulty while capturing short-term success.

Capturing long-term payout is more difficult and requires the consideration of a few variables. First, it is beneficial to record number of long-term relationships. This gathers the benefits gained by both male and female serial daters who may not stay with one and only one person throughout the lifespan but definitely are not those who seek one-night stands. This is the individual who is never singled but may have a moderately lengthy list of past partners and who has had nearly incessant reproductive access with the accompanying promise for mutual parental investment. Next, it is necessary to assess the qualitative aspects of long-term relationships in dimensions that are predictive of positive child outcomes. Aspects of parental relationships that ultimately result in children who are physically healthy, mentally sound and well-adjusted can be used a method to capture the parental ability to engage in investment. Levels of parental investment directly influence offspring fitness (Trivers, 1972). Those who invest a lot of quality resources raise fitter children. Parents who report high levels of relationship optimism and happiness within that partnership raise children who are advantaged with a slew of positive outcomes (Brody et al., 1994; Gable, Belsky, & Crnic, 1992; Brody & Flor, 1997). In sum, personal reports of emotional attributes of relationships are linked to child outcomes and this interrelationship can serve as a proxy for levels of parental investment, which, in turn, is highly predictive of offspring fitness.

## THEORIES OF MULTIPLE INTELLIGENCES AND EMOTIONAL INTELLIGENCE

Howard Gardner suggested that traditional definitions of intelligence are much too narrow to capture the entirety of human cognitive ability (Gardner, 1983). Gardner promoted the idea that a general factor of intelligence was inadequate in and of itself and was incapable of explaining the breadth of human mental aptitudes. He expanded general ability into seven additional distinct cognitive entities, not necessarily correlated with each other or general intelligence.

While it is probable that general intelligence falls short of a comprehensive inventory of all ability, theories of multiple intelligences as described by Gardner are not without problems (Kaufman, 2013). Gardner's ideas were largely reactionary to narrow educational practices and his definitions of the different domains he proposed were fairly ambiguous and difficult to pin down (Klein, 1998). Klein suggested, in a similar way that opponents of evolutionary psychology do, that a "just so story" could be invented and retrofitted to an explanation of any psychological phenomena, rendering the theory unfalsifiable. A more conservative (and successful) approach to expanding the domain of intelligence is Emotional Intelligence (Salovey & Mayer, 1990), which is the capac-

ity to understand the emotions of oneself and others. Arguably, the three most important entities in psychological theory at whole are personality, intelligence and emotionality. Emotional Intelligence links two of the biggest domains (both in experience and in research).

It is crucial to assess MI as a construct considering the history of Intelligence research. Expanding intelligence to include emotional capacities is the first step: assessing the possibility of many forms of multiple intelligences is necessary. Illuminating the methods by which the brain navigates sexual selection is critical. MI gets at the root of sex differences in sexual strategies. MI captures these behavioral differences in cognition between the sexes in a comprehensive fashion, frames them in a non-arbitrary light while providing a means by which to experimentally investigate these phenomena.

The rationale of the following studies is as follows. The psychometric properties of the MI Scale need to be evaluated before substantive analyses are done in order to establish that it is reliable and arranged in a way that it is congruent with its theoretical foundation. First iterations of measures are rarely perfect. It is beneficial to use data to refine the scale (if necessary) in hopes of capturing the construct more accurately. An examination of reliability and factor structure will likely provide suggestions regarding items without explanatory utility, redundant items and may even imply a shift in focus is necessary. By following these recommendations, further research or application of MI will be more successful. Next, incremental validity needs to be established. It is important to consider the possibility that the components of MI are merely a reframed take on general intelligence and personality. It could be that an individual with high MI is just somebody of high intelligence who is open, conscientious, extraverted, agreeable and emotionally stable. MI should offer additional explanatory utility when addressing research problems. In the name of parsimony, the incremental validity of a new construct has to be examined to avoid the renaming and remarketing of old ideas without any substantive update. Especially considering the far-reaching effects of both personality and intelligence in general and evolutionary realms, it is imperative that these concerns are addressed.

## STUDY 1

Using exploratory factor analysis, the researchers first analyzed the structure of the male and female MI scales independently to evaluate the factor structure of the measures. As a hypothesis, this analysis will reveal five latent factors in both the male and female versions of the scale. MI is young in its life cycle as a construct and its corresponding scale is still in its first version. For this reason, the researchers employed exploratory data-reduction techniques as opposed to

more specific confirmatory factor analytical methodologies. While structural equation modeling based approaches in which researchers specify associations from the ground up allow fine calibration of the relationships between involved variables, examining the model with zero constraints is advisable at this stage of the construct's development. Exploratory methods allow the freedom to let the data reveal their true structure without any theoretical imposition.

While it is less likely that the exact proposed structure will result with such an analysis, gaining insights will offer valuable suggestions regarding updating the scale if at all necessary.

## Procedure

Participants were all students at either SUNY New Paltz or Binghamton University and received credit for participation via the institutions' subject pools. There were 278 males and 922 females (N = 1,200). Students completed the dichotomous version of the MI survey online as part of a larger study on Hook-Up behavior. The MI scales took approximately 15 minutes to complete while the entire battery of questions took around an hour. Varimax rotation was used for both analyses.

## Results

Participants were between 18 and 57 years old ($M$ = 21.44, $SD$ = 5.64). In males, seven factors with eigenvalues greater than one emerged from the data, with five being interpretable in light of the items that loaded onto them *(Table 1)*. The largest of the factors, explaining 24.34% of the variance, represented a general factor of MI while it had a vein of items that related directly to the deception of others. This factor was largely congruent with the "Mating Relevant Other-Deception component of MI" and items such as, "I am good at saying the right things to the women I flirt with" and, "When I lie to women, I always get caught!" represent it. Involved Mating Relevant Other-Deception variables had loadings of .556, .611 and .762.

The second biggest factor related to Cross-Sex Mindreading (theory-of-mind related offering) explained 17.80% of the variance and mostly dealt with picking up the signals exhibited by potential mates and was represented by items with loadings of .887, .933 and .930. The third factor, accounting for 13.487% of the variance, was an uninterpretable mix of items relating to Cognitive Courtship Displays and Cross-Sex Mind Reading (although tipped into the direction of humor, so this factor very well may be an element of Courtship Displays). Mating Relevant Self Deception and Status Evaluation were the last two factors, the latter being a new addition to the construct. The two explained

11.419% and 8.483%, respectively. Two items with factor loadings of .863 and .917 indicated Self Deception. Items coming from the Cross-Sex Mind Reading subscale (loadings were .932 and .91) and from Cognitive Courtship Displays

*Table 1.* Male mating intelligence factor loadings

| Item | Mating-Relevant Other Deception | Cross-Sex Mindreading | Ambiguous Factor | Mating-Relevant Self Deception | Status Evaluation |
|---|---|---|---|---|---|
| Sexual Over Estimation 1 | .669 | .166 | –.047 | .454 | –.015 |
| Cross-Sex Mind Reading 1 | –.089 | .877 | –.132 | –.100 | .010 |
| Mating Relevant Self Deception 1 | .063 | –.141 | –.033 | –.033 | .932 |
| Mating Relevant Other Deception 1 | .556 | –.376 | .543 | .059 | .042 |
| Cognitive Courtship Display1 | .225 | .029 | .263 | .103 | .053 |
| Cross-Sex Mind Reading 2 | –.019 | .933 | –.068 | –.204 | .126 |
| Mating Relevant Self Deception 2 | .828 | .086 | –.107 | .002 | .293 |
| Mating Relevant Self Deception 3 | –.022 | –.205 | –.062 | .863 | .051 |
| Mating Relevant Other Deception 2 | .085 | .223 | .372 | –.229 | .268 |
| Cross-Sex Mind Reading 3 | .153 | .147 | –.046 | .066 | .910 |
| Mating Relevant Self Deception 4 | –.133 | –.066 | –.013 | .917 | .042 |
| Sexual Over Estimation 3 | .406 | .095 | .792 | .133 | .024 |
| Cognitive Courtship Display2 | .588 | –.400 | .293 | .016 | .486 |
| Mating Relevant Other Deception 3 | .611 | –.265 | .320 | –.322 | –.314 |
| Cross-Sex Mind Reading 4 | .118 | .930 | .021 | –.001 | –.109 |
| Mating Relevant Other Deception 4 | .762 | .031 | .301 | –.367 | .061 |
| Cognitive Courtship Display3 | .118 | –.002 | .335 | –.085 | .015 |
| Cognitive Courtship Display4 | –.348 | .379 | –.110 | –.428 | .350 |
| Sexual Over Estimation 3 | .217 | –.074 | .431 | .347 | –.286 |

*Table 2.* Female mating intelligence factor loadings

| Item | Cross-Sex Mindreading | Mating-Relevant Self Deception | Courtship Display I | Courtship Display II | Courtship Display III |
|---|---|---|---|---|---|
| Cross-Sex Mind Reading 1 | .472 | –.249 | .339 | –.314 | .338 |
| Mating Relevant Other Deception 1 | .099 | .254 | .273 | .395 | .026 |
| Mating Relevant Self Deception 2 | .387 | –.167 | .286 | .252 | .059 |
| Mating Relevant Other Deception 1 | .355 | .502 | –.219 | –.225 | –.185 |
| Cross-Sex Mind Reading 2 | .465 | –.092 | .198 | –.095 | .220 |
| Mating Relevant Other Deception 3 | –.045 | .130 | –.479 | .049 | .282 |
| Mating Relevant Other Deception 4 | .331 | .583 | .097 | –.037 | –.301 |
| Cognitive Courtship Display1 | .458 | –.129 | –.212 | .484 | .007 |
| Cross-Sex Mind Reading 3 | .638 | –.017 | .182 | –.078 | .065 |
| Cognitive Courtship Display3 | .078 | .203 | –.548 | .007 | .075 |
| Mating Relevant Self Deception 3 | .419 | .115 | –.005 | –.080 | .052 |
| Cognitive Courtship Display4 | .139 | –.031 | –.335 | –.171 | .627 |
| Cross-Sex Mind Reading 4 | .548 | .067 | .378 | –.164 | .005 |
| Mating Relevant Self Deception 4 | .285 | .410 | –.080 | .113 | .080 |
| Commitment Skepticism 1 | –.456 | .475 | .186 | .165 | .102 |
| Commitment Skepticism 2 | –.299 | .564 | .149 | .045 | .257 |
| Commitment Skepticism 3 | –.344 | .349 | .318 | .229 | .339 |
| Commitment Skepticism 4 | –.272 | .197 | .230 | –.300 | .331 |

(loading at .486 and .35) signified the new Status Evaluation component. Looking back to these four items, the evaluation of one's place in a social pecking order and how one perceives this ties each item together. The male version of the scale demonstrated an acceptable degree of reliability, Cronbach's $\alpha = .756$.

The female version of the scale had eight factors with eigenvalues greater than 1, with five being interpretable, as the case was for males *(Table 2)*. The single largest factor was hugely congruent with the proposed factor of Cross-Sex Mind Reading, encompassing 15.071 of variance explained, highlighting theory-of-mind's importance in female mating strategies. Items from the Cross-Sex Mind Reading subscale had factor loadings of .472, .465, .548 and .638. Although Other-Deception (loadings of .502 and .583) was not as pronounced as it was in males, it did form a large second factor explaining 8.674% of the variance, followed by three additional factors that were primarily focused onto items related to cognitive courtships displays, accounting for 7.003% (factor loadings of .338 and .389), 6.049% (factor loadings of .395 and .484) and 5.10% (a single item with a factor loading of .627) of variance, respectively. Unfortunately, the female version of the scale displayed a considerably lower level of reliability, Cronbach's $\alpha = .549$.

## STUDY 2

To test the independence of MI from personality and general intelligence *(g),* thereby speaking to its incremental validity, researchers regressed mating success on MI while controlling for age, *g,* and the Big Five to determine the amount of unique variance in mating success accounted for by MI. Running these three relevant variables in mating success in a multiple regression isolated the relationship between MI and mating success. This procedure directly addressed the contention that MI is simply a relabeled mixture of preexisting and well-established variables. Finally, MI should display a non-significant correlation with sociosexuality as the two should be independent.

### Procedure

As part of a larger study taking place at California State University, San Bernardino exploring different thinking styles, researchers administered a continuous p-point Likert version of the MI scale to those taking psychology undergraduate classes. There were 120 males and 708 females, N = 828. Participants were between 18 and 67 ($M = 21.20$, $SD = 4.925$) years of age and received

credit for participation. The present research took three separate measures from the larger questionnaire to use for analysis. First, the 25-item continuous version of the MI Scale (Geher & Kaufman, 2009) included five items that capture mating success and 20 that addressed MI with items such as "*I can definitely tell when a member of the opposite sex is into me.*" Also, the 120-item IPIP-NEO International Personality Item Pool (Goldberg et al., 2006), which was a Big Five inventory that captured the extent to which an individual was open, conscientious, extraverted, agreeable and emotionally stable. Finally, Raven's Progressive Matrices (Raven, et. al, 2003), which captured general intelligence by means of a series of visuospatial rotation tasks that were independent of language or cultural knowledge. Questionnaires were sex-specific due to the different versions of the MI scale. The survey also asked for demographic information.

## Results

After creating the standardized composite variable for mating success to use as the outcome (a variable which contained information regarding number of sexual partners, number of long-term relationships, relationship happiness and relationship optimism), researchers preformed a hierarchical multiple regression by entering age into the first block, results from the IPIP-NEO and Raven's Matrices went into the second and MI was placed into the third and final block. Sexes were analyzed separately – a point dictated by the fact that the MI scales are different across the sexes. In males, MI significantly predicted mating success after controlling for age, personality and general intelligence, $R^2 = .228$, $F(1,89)$ 7.60, $p = .007$, $\beta = .328$. This significant relationship held true across the sexes, with females also demonstrating that MI again accounts for a portion of unique variance $R^2 = .126$, $F(1,529)$ 9.237, $p = .002$, $\beta = .144$. It is important to note that while MI did display a high degree of incremental validity, age did predict mating success in males and females, $R^2 = .064$, $F(1,96)$ 6.594 $p = .012$, $\beta = .105$ and $R^2 = .049$, $F(1,536)$ 27.497 $p = .000$, $\beta = .188$, respectively. Interestingly, general intelligence and personality significantly predicted mating success only in females, $R^2 = .110$, $F(1,530)$ $p = .000$ with females scoring high on the measures of intelligence and personality (with emotional instability reverse scaled) having increased mating success. In males, all variables had substantial positive zero-order correlations with mating success *(Table 3).* Age ($r = .254$), intelligence as measured by Raven's ($r = .100$), extraversion ($r = .200$), agreeableness ($r = .318$), conscientiousness ($r = .182$), neuroticism ($r = .203$), openness ($r = .184$) and MI ($r = .411$) all increased with an increase in mating success. The directionality of the zero-order correlations in females followed the same

*Table 3.* Male zero-order correlations with mating success

| Variable | Zero Order Correlation |
|---|---|
| Age | .254 |
| General Intelligence | .100 |
| Extraversion | .200 |
| Agreeableness | .318 |
| Conscientiousness | .182 |
| Neuroticism | .203 |
| Openness | .184 |
| Mating Intelligence | .411 |

*Table 4.* Female zero-order correlations with mating success

| Variable | Zero Order Correlation |
|---|---|
| Age | .221 |
| General Intelligence | .022 |
| Extraversion | .171 |
| Agreeableness | .207 |
| Conscientiousness | .154 |
| Neuroticism | .143 |
| Openness | .136 |
| Mating Intelligence | .224 |

pattern but were dampened in magnitude *(Table 4)*. Age ($r$ = .221), intelligence as measured by Raven's ($r$ = .022), extraversion ($r$ = .171), agreeableness ($r$ = .207), conscientiousness ($r$ = .154), neuroticism ($r$ = .143), openness ($r$ = .136) and MI ($r$ = .224) also increased along with mating success.

## DISCUSSION

Study 1 used exploratory factor analysis to demonstrate that the emerged factor structure maps onto predictions made from the literature. Study two extends this finding by demonstrating that MI has incremental above other possibly related constructs. In combination, these two studies, which look into the plausibility of MI, suggest that the construct taps something substantial, separate from current theoretically important constructs and has the ability to predict behavior. The construct displays a high degree of incremental validity beyond personality and intelligence, suggesting it is an entirely separate entity and should be considered as such. MI is not a re-interpretation of *g*, it is an independent trait that guides

strategy formation in human mating, suggesting that constructs like sociosexuality can be reformulated as the result of a cognitive system processing mating-relevant information and arriving at a strategy with an optimized payout.

The complementary nature of the MI between the sexes suggests that the dovetailing abilities are the result of an evolutionary arms race. The single largest factor in males explaining nearly a quarter of the variance (24.34%) was Mating Relevant Other-Deception and in females was Cross-Sex Mind Reading, getting at 15.071% of the variance. The two biggest components of the construct are directly related strategies between the sexes. Males attempt to trick females into thinking they are fit or more willing to invest in offspring and females employ theory-of-mind to see through false promises and advertisements to separate a truly representative signal while erring on the side of caution (Commitment Skepticism). As one offense gets more advanced, so does the opposing defense. With the increased efficacy of female defense, deception on behalf of the males grows until the balance is tipped: females will not be encouraged to mate enough due to the risk of inaccurately evaluating a prospective partner and males will never be considered with their always deceitful nature, a scenario in which an increasingly truthful male or a more risk taking prone female would reap the benefits in the mating market. Tradeoffs moderate adaptations on the evolutionary battleground. The proposed factor structure in the extant MI literature (Geher & Miller, 2008) is largely congruent with what emerged from the analyses. This is especially the case with males, where our findings do not suggest major differences beyond the implication that it would be beneficial to highlight deception in further MI research. In the female version of the scale, beyond a newfound focus on theory-of-mind, a great deal of attention should be paid to the fact that the third, fourth and fifth largest factors that emerged all were led by items regarding Cognitive Courtship Displays. The popular metaphor in evolutionary psychology of "the human mind as the peacock's tail) seems to suggest that cognitive ornamentation is really only important in the sex that had to compete for mates (males). If this were the case, only males would develop these abilities, which is contradictory with both empirical and anecdotal evidence (females can be smart and funny too) (Miller, 2001). The analysis of the factor structure of MI stresses the fact that Cognitive Courtship Displays play a primary role in female mating strategies, which is a refreshing take on the subject and should be investigated in further studies. This avian analogy may fall short since both sexes have so much to signal in this domain.

The mating success variable used to test MI needs to be vetted itself. An empirical demonstration of the fact that healthy and well-adjusted children who experience a multitude of positive outcomes are, in fact, more fit is essential. This would be possible by regressing mating success on a concrete measure of

mutation load in hopes of demonstrating that those with high mating success produce children with a comparatively low mutation. Looking at reliability on item and subscale levels could be useful to eliminate any components that decrease reliability. As such, subscales were created and reliability analyses were computed for each subscale. This is an especially pressing issue for the female version of the scale, which demonstrates a level of reliability that was considerably less than standard accepted levels.

Females greatly outnumber males in both studies. This major limitation is most an artifact of the context in which the data was collected: college campuses. Females outnumber male students on campus. This is especially true for psychology majors. Future studies should draw samples from more representative real-world settings. This, of course, holds true for every other demographic variable, most notably age and socioeconomic status.

While it is outside of the scope of this research to recollect data to test a revised version of the scale, it may benefit from an update. By eliminating redundant items, reorganizing the structure of the scale based on emergent factors and tweaking the instrument to capitalize on increased validity, it is entirely possible to greatly improve the quality of the measure. A similar methodological design could be utilized, although an additional confirmatory factor analysis would be informative. A finely tuned instrument can only improve further experimentation and application. The female version of the scale should be left as is until further tests of subscale predictive validity can occur. Only then will there be enough information to guide a revamping of the scale that will hopefully increase its currently unacceptable level of reliability. However, item two of the male version of the scale should be deleted as it decreases reliability (subscale α increases .166 if item removed) and it does not load onto any of the five emerged factors.

Once subscale predictive validity is evaluated and reliability is increased in the females, the next step is to evaluate the incremental validity of MI in relation to Emotional Intelligence. Since Emotional Intelligence has such a strong foundation in theory-of-mind tasks (Geher, Warner, & Brown, 2001), it may eat up variance in mating success. This may be especially true for females, whose largest emerged MI factor was Cross-Sex Mind Reading. It would also be interesting to test the plasticity of mating strategies *vis-a-vis* MI. It is a reasonable prediction that the needs that spring from highly variable ecological and environmental conditions across space and time would favor those who could readily change their approach to fit the demands of their surroundings. Those with high MI should be able to do this with ease. Since the construct of sociosexuality can be thought of as the output of MI and it has a scale that is well established, a longitudinal investigation of the two would be a fitting approach. MI should remain steady across both space and time within an individual, while

those with increased MI should display greater variability in their sociosexual orientation as opposed to those who score low on the MI measure.

It is tedious to have exclusive sex-specific versions of a scale and there would be practical utility in synthesizing the current sex-specific versions. Two things need to be done to remedy this. First, it may be possible to reword items using gender nonspecific language. It is theoretically plausible that closely related items measure the same thing: the fact that a metric captures something similar in both sexes and concurrently demonstrates predictive validity suggests that something "real" is being captured. Second, the truly sex-specific adaptive bias portions of the scale need to be revisited. In theory, it is possible to have an item that captures the extent to which an individual utilizes adaptive bias in a wholesale fashion, regardless if it is in a female engaging commitment skepticism or a male unconsciously employing oversexualization.

It may be possible to take a step back and exploit an item or measure that could be incorporated into the MI scale that appraises adaptive bias upstream from mating strategies, something that can serve as an accurate surrogate for dissimilar subcomponents of the scale. A single wholesale proxy for bias would dodge the need for two scales.

MI presents itself here as a valid scale, one that demonstrates links to fitness-relevant outcomes. The measure has displayed congruent structure to what has been predicted in the literature and is moderately reliable. It is fundamentally separate from traditional conceptions of both personality and intelligence. With these propositions confirmed, the stage is set for further empirical tests of the construct. While previous expansions to traditional intelligence (e.g., emotional intelligence) have been met with some criticism in both theoretical and practical realms in that they may be redundant and unnecessary additions to an already sufficient theory, no researcher can deny the fact that these studies have turned up valuable discoveries and have influenced practice, especially as applied in education. MI frames these intellectual discrepancies between people in terms of individual differences with differential outcomes seen in both personal fitness and the fitness of offspring. These differences, the variation within a species, are the primary fuel of evolutionary change.

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