Chapter 2

How Self-Assessments Can Guide Human Mating Decisions

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From puberty onward, mating becomes a major focus of thought: Whom shall I date? Shall I stay with my current partner, or look for someone else? Can I find someone better? Will she like me? Will he leave me for someone else? How popular with the opposite sex am I, compared to my peers? These types of questions, which sometimes persist throughout adulthood, point to the complexity of mating decisions.

These decisions roughly fall into two categories: Mate-choice decisions and mating-tactic decisions. *Mate choice* concerns the target of one's mating effort: which available members of the opposite sex should an individual pursue for a mating relationship (Darwin, 1871; Jennions & Petrie, 1997; Miller & Todd, 1998; Miller, 2000a; Kokko, Brooks, Jennions, & Morley, 2003; Geary, Vigil, & Byrd-Craven, 2004). Should I go with the most popular guy, or with the one who tries hardest to win my heart? Should I court highly attractive girls, or would I be better off with the girl-next-door? *Mating tactic* decisions, on the other hand, concern how an individual should allocate his or her overall efforts (i.e., time, money, energy, and other resources) in the mating area: Should I invest my resources in finding, choosing, and courting new potential mates, or in stabilizing and protecting a committed relationship (and potentially investing in the resulting offspring)? Within a mixed mating strategy (Gangestad & Simpson, 2000; Gross, 1996), more investment in the former translates into the decision to adopt a *short-term* mating tactic, while more investment in the latter implies the decision to adopt a *long-term* mating tactic. (Note that we use the term "tactic" here to broadly describe the poles of a dimension of effort allocation in the mating domain. Other authors apply the term in a more narrow sense to specific behaviors that promote long-term or short-term mating, e.g., Buss & Shackelford, 1997; Greer & Buss, 1994.) Throughout this chapter, we will use the term "*mating decisions*" to refer to both *mate choice* decisions and *mating tactic* decisions.

It is important to note that, while cogitation about the opposite sex is often a reflective, deliberate process, not all mating decisions are consciously made. Indeed, the biological literature often defines the preferences that guide mating decisions as any traits that bias the mating success of opposite-sex individuals, be they cognitive, behavioral, physiological, or morphological (Halliday, 1983; Maynard Smith, 1987; Pomiankowski, 1988; Arnquist & Rowe, 2005). This definition carefully circumvents not only the involvement of consciousness, but the necessity of cognition in general. For example, females may implement mate choice by evolving more acidic reproductive tracts, which make it harder for sperm to reach their eggs—they are thereby selecting for more robust sperm, but are not using cognition to do so. Mate choice mechanisms like these appear to be quite widespread in nature (Jennions & Petrie, 2000). We will concentrate on cases where cognition does play a role in human mating decisions, and argue that these decisions are informed by affective experiences that result from self-assessments (i.e., cognitive processes based on internal representations of the self, see Baumeister, 1997), no matter if they are consciously reflected or not.

From an evolutionary perspective, mating decisions are extremely important for any sexually reproducing species: The opposite sex is the only means by which one can transmit one's own genes to the next generation, and therefore successful mating is a prime determinant of an individual's fitness (Darwin, 1871). We could thus expect that the proximate mechanisms that guide mating decisions were under especially strong selective pressures over evolutionary time, resulting in specially designed psychological adaptations as parts of our Mating Intelligence (Buss, 1995). However, clear descriptions of such mechanisms are generally absent from the literature (Miller, 1997; Miller & Todd, 1998; Mata, Wilke, & Todd, 2005; Penke & Denissen, 2006).

We will argue that, despite the seeming complexity of mating decisions, simple heuristics can enable individuals to make adaptive choices in this domain (Gigerenzer, Todd, & the ABC group, 1999). These heuristics exemplify the principles of bounded rationality because they selectively exploit the natural structure of the social environment, steered by specific evolved capacities (e.g., sexual lust, Diamond, 2004; Fisher, Aron, Mashek, Li, & Brown, 2002; aesthetic preferences for mate qualities, Grammer, Fink, Møller, & Thornhill, 2003; Miller, 2000a; the desire for sexual variety, Buss & Schmitt, 1993; Schmitt et al., 2003; and the adult attachment system, Hazen & Diamond, 2000; Fraley & Shaver, 2000). For example, an aesthetic preference that values symmetry in a potential mate's face as attractive would lead to adaptive mate choice decisions, because facial symmetry is an honest indicator of genetic qualities that buffer against environmental disturbances (pathogens, toxins, etc.) during development (Thornhill & Gangestad, 1999a) and will be passed to offspring if present in a chosen mate. However, if the social environment deviates from those natural conditions under which this mating competence evolved (e.g., because environmental disturbances became uncommon or are efficiently counteracted by cultural innovations, as in Western cultures today), the validity of symmetry as a cue for genetic quality might be compromised, and consequently the adaptive value of the heuristic is attenuated. The greater male desire for sexual variety, on the other hand, is an evolved capacity that apparently endows men with the mating heuristic "Consider having a short-term sexual affair whenever given the opportunity" (see Clark & Hatfield, 1989). Since the adaptive value of this heuristic mechanism depends on the lesser minimal parental investment of men compared to women (Trivers, 1972), it will remain adaptive as long as the social environment consists of women who get pregnant and men who do not (Hagen, 2005). In interaction with certain general self-related motives (i.e., self-esteem maintenance, Baumeister, 1997; social comparison, Gilbert, Price, & Allan, 1995; Festinger, 1954), heuristics like these are able to produce adaptive mating decisions under realistic assumptions of information availability. As we will see, the inclusion of self-related motives can also help us to explain how individual differences in mating decisions can result from a universal component of Mating Intelligence—mate preference adaptations (see also Keller, this volume).

To support our contentions, we first provide a short, selective review on what is known about the nature of human mating decisions. Next, we explain the advantages that decisions based on simple heuristics have when compared to more complex mechanisms that try to optimize decisions. In the focal part of this chapter, we discuss the nature of some of these heuristics, including those based on self-assessments, which we suggest can guide mate choice decisions for long-term committed relationship partners (a task quite similar for both sexes). *Self-assessments* are cognitive representations of one's identity and abilities. They include an important affective-evaluative component (self-esteem), and appear to exist for various hierarchically integrated life domains (Baumeister, 1997). Mating is one of these domains (Kirkpatrick & Ellis, 2001). Mating-related self-assessments include self-perceptions of attractiveness, popularity, and ability to draw the attention and manipulate the behavior of potential or actual mates. We also address how sex differences complicate mating dynamics in a manner that is predictable from evolutionary theorizing, and show that, despite these complications, simple heuristics informed by self-assessments remain capable of solving mate choice problems. Finally, we consider self-related decision mechanisms relevant to mating tactic choices. Throughout this chapter, we will focus on mating decisions in heterosexual individuals. However, most aspects should generalize to homosexuals, who tend to have mate choice preferences like heterosexuals of the opposite sex (Bailey, Kim, Hills, & Linsenmeier, 1997) and desires for sexual variety and romantic attachment like heterosexuals of their own sex (Schmitt et al., 2003; Diamond, 2003).

THE NATURE OF HUMAN MATING DECISIONS

As one would expect from the important role that mating decisions have in the evolutionary process, there is ample evidence that the targets of sexual interest are not random in humans: People mate assortatively with regard to many characteristics, including physical attractiveness, intelligence, education, socioeconomic status, height, age, values, and attitudes (Buss, 1984; Lykken & Tellegen, 1993; Kenrick & Keefe, 1992; Mascie-Taylor & Vandenberg, 1988; Mascie-Taylor, 1989; Nagoshi, Johnson, & Honbo, 1992; Philips et al., 1988; Plomin, DeFries, & Roberts, 1977; Reynolds, Baker, & Pedersen, 2000; Tambs, Sundet, & Berg, 1993; Vandenberg, 1972; Watkins & Meredith 1981; Watson et al., 2004). This evidence for assortative mating in humans is primarily based on the resemblance among mating partners, a finding that could, theoretically, stem from passive processes such as random mating in environments that are stratified for these characteristics (i.e., social homogamy, Kalmijn, 1998; Lykken & Tellegen, 1993). An example of this would be that brighter people end up going to universities instead of joining the work force early in life. Since mere opportunity might lead students to marry people they meet at the university while workers marry people they met at work, assortative mating could in principle be a by-product of cognitive stratification by university entrance requirements. However, in more sophisticated studies that are able to separate active and passive sources of mate assortment, there is good evidence that active mate choice plays a sizeable role, meaning that people selectively decide whom to mate with and whom not (Mascie-Taylor & Vandenberg, 1988; Nagoshi et al., 1992; Reynolds, Baker, & Pedersen, 2000; Watson et al., 2004;).

The preferences, desires, and ideals on which people report basing their mating decisions have been studied extensively. The overall pattern of results can be summarized as follows:

1. Both men and women prefer mates who are in good overall condition, as revealed by cues of physical attractiveness (Langlois et al., 2000; Rhodes, 2006; Thornhill & Grammer, 1999b; but see also Weeden & Sabini, 2005, vs. Grammer, Fink, Møller, & Manning, 2005), healthy appearance (Jones et al., 2001; 2004; Roberts et al., 2005), good cognitive functioning (i.e., general intelligence, Miller, 2000a, b, and absence of mental disorders, Keller & Miller, in press; Shaner, Miller, & Mintz, 2004), pleasant scent (Gangestad & Thornhill, 1998; Rikowski & Grammer, 1999; Thornhill & Gangestad, 1999; Thornhill et al., 2003), behavioral displays (Gangestad et al., 2004; Miller, 2000a, b), sexually dimorphic hormonal markers in the face (reviewed in Rhodes, 2006), body build (Kasperk et al., 1997; Singh, 1993; Swami & Tovée, 2005), and voice (Dabbs & Mallinger, 1999; Feinberg et al., 2005; Puts, 2006). While some authors assume that these traits signal different kinds of mate qualities (Cunningham et al., 1995), many of them have been linked to the direct mating benefits of fecundity (Buss, 1989; Jasienska, Ziomkiewicz, Ellison, Lipson, & Thune, 2004; Manning, Scutt, & Lewisjones, 1998; Singh, 1993), as well as to the indirect benefits of low genetic mutation load and other heritable qualities ("good genes," Gangestad & Simpson, 2000; Gangestad & Thornhill, 2003; Grammer et al., 2003; Hunt, Bussière, Jennions, & Brooks, 2004; Miller, 2000b, this volume; Keller, this volume), suggesting that they indeed represent cues which signal a single underlying quality (Grammer et al., 2002). Brunswik (1956) introduced the concept of "vicarious functioning" in the context of his famous lens model of perception to describe such a constellation where different cues are independently perceived as indicators of the same latent trait (see Miller & Todd, 1998). Further, the preference for good overall condition may reflect more an avoidance of bad condition in a mate than a direct attraction to good condition per se (Arnquist & Rowe, 2005; Grammer et al., 2002; Zebrowitz & Rhodes, 2004). Indifferent to the question of whether this part of our person perception system is more closely linked with an approach or avoidance motivation, we will refer to the preference for good overall condition as *condition preference*.

2. For long-term committed relationships, both men and women want a dependable, kind, and trustworthy mate to whom they can securely attach (Buss, 1989; Kenrick, Sadalla, Groth, & Trost, 1990; Li, Bailey; Kenrick, & Linsenmeier, 2002; Fletcher, Tither, O'Loughlin, Friesen, & Overall, 2004). That is, both sexes possess an attachment system that motivates stable, monogamous pair-bonding with an appropriate partner (Fraley & Shaver, 2000; Hazan & Diamond, 2000). There are general reasons (e.g., risk of desertion, loss of support and investments, and opportunity costs), as well as sex-specific reasons (e.g., risk of cuckoldry for men, risk of losing paternal investment for women) (Buss & Schmitt, 1993) for the human desire for attachment. The attachment system likely evolved to facilitate biparental care for offspring (Miller & Fishkin, 1997; Fraley, Brumbaugh, & Marks, 2005). We will refer to the preference for a dependable, kind, and trustworthy mate as *attachment preference*.
3. Additionally, women have a stronger preference than men for mates who can provide resources (e.g., hunted meat in prehistoric times, earned income today) or at least have a high resource-acquisition and maintenance potential, which facilitates successful child rearing (Buss, 1989; Li et al., 2002). We will refer to this rather female-specific preference as *resource preference*. Men, on the other hand, have on average a much greater desire for sexual variety than women, and therefore tend to be strongly attracted to women who are easily sexually accessible and to refrain from committed relationships. This preference would allow for a great number of sexual partners with relatively low costs, an aim that is generally much more attractive to men than women (Buss & Schmitt, 1993; Schmitt et al., 2003). We will refer to this rather male-specific preference as *variety preference*. Both of these sex-specific preferences can ultimately be explained by sex differences in the minimal investment in the reproductive process, which is higher for women than for men on the level of gametes (i.e., anisogamy: female egg cells are bigger than male sperm), physiology (i.e., gestation, placentation, child birth, lactation), and postnatal childcare (Trivers, 1972).

This core structure of mate preferences has been found to be cross-culturally universal (Buss, 1989; Buss et al., 1990; Marlowe, 2004; Schmitt et al., 2003; Schmitt 2005a, b). However, following the Brunswikian ecological psychology approach, there can be cultural variation in the actual cues that serve as indicators of the underlying qualities preferred in mate choice (Hammon & Ingoldsby, 2003; Marlowe, Apicella, & Reed, 2005; Miller & Todd, 1998). This is completely in line with the modern evolutionary psychological approach, which assumes that mate preferences develop ontogenetically from evolved innate capacities (aesthetic valuations, learning preparedness) in interaction with a given sociocultural and environmental context (cp. ; Barrett, 2006; Cummins & Cummins, 1999; Tooby, Cosmides, & Barrett, 2005).

The relative importance a population puts on these qualities also varies across cultures (Eagly & Wood, 2000; Hammon & Ingoldsby, 2003), but partly in a predictable functional relationship to environmental factors such as pathogen prevalence and harshness of the environment (Gangestad & Buss, 1993; Gangestad, Haselton, & Buss, in press; Nelson & Morrison, 2005; Penton-Voak, Jacobson, & Trivers, 2004 Swami & Tovée, 2005). Environmentally contingent shifts of preferences, in turn, are intertwined with shifts in the average mating tactic of populations (Gangestad & Simpson, 2000; Low, 1990; Schmitt, 2005b), which in turn relate to the social evolution of cultural differences in the degree of individual freedom of mate choice (Hammon & Ingoldsby, 2003). However, individuals in every culture still have to face similar trade-offs in their mate choices between these qualities, as revealed by the culturally universal structure of self-reported preferences (Shackelford, Schmitt, & Buss, 2005; see also Fletcher et al., 2004; Gangestad & Simpson, 2000).

To summarize, both data and theory suggest that humans are endowed with four broad classes of preferences that guide their mating decisions. Two of them, the condition and the attachment preferences, play important roles in both male and female mating behavior, while the other two, the resource and the variety preferences, are rather sex-specific, the former being much more important for women and the latter for men. The aesthetic and affective valuations of the four associated kinds of mate qualities, which lead to their perceptual and motivational effects in the mating process, can be regarded as evolved and innate capacities present in every human being. Making these quality evaluations is necessary for adaptive mating decisions based on simple heuristics. The directly observable cues to these mate qualities might vary between human populations and most of them are likely learned over ontogenetic development, a process that is also steered by the evolved innate capacities. Beyond that, two other things have to be learned in order to make a successful mating decision: (1) The range of qualities in the present population of potential mates, which is necessary to evaluate whether a mate with a certain quality is actually high or low on that dimension, and (2) how an individual should solve the conflicts between the four preference classes that are likely to occur "in the wild." The next section will be on the range problem, while the rest of the chapter will address the trade-offs between conflicting preferences in men and women, and the role that self-assessments play in this process.

SIMPLE HEURISTICS AS MATING DECISION MECHANISMS

To decide whether a potential mate is worth pursuing, we need to compare him or her to the other possibilities we might be able to pursue instead. One way is to compare him or her to the other potential mates we have previously encountered and rejected; the problem is that if we decide that one of those previous mates was actually more attractive overall, we often have little chance of being able to return to that person and try again, because he or she is likely to have found someone else. Instead, we can look to the future—but how can we tell who else might await us in the months ahead, and how attractive that person might be? This is the twin challenge of sequential mate search: Not being able to go back in time, nor look ahead to the future, and so struggling to make a good *yes* or *no* choice concerning the person before us right here and now.

In a situation like this, where the distribution of available alternatives is unknown, there is no way to return to previous options, and it is hard to switch to another option once a committed choice has been made, a good approach is to search with an 'aspiration level': a minimum threshold of apparent mate value for saying 'yes' to the current potential mate. Aspiration-level search is a simple heuristic method that Herbert Simon (1990) called *satisficing*. (This situation has been studied mathematically in probability theory as the 'Dowry Problem' or 'Secretary Problem'—see Ferguson, 1989.) In particular, satisficing search can be divided into two phases: In the first phase, potential mates are just looked at without a selection being made, so that the searcher can gather information about the available range of mate values. For example, this would include young adolescents being keenly interested in observing and evaluating individuals of the opposite sex, but being 'too shy' to actually court them—because they're still learning who's worth courting. This information is used to set an aspiration level—the minimum mate value that the searcher will try to get in further search. The second phase then consists of looking at additional potential mates, until one is found who exceeds the aspiration level set in phase 1. Search is stopped at that point and that individual is pursued: one gets a 'crush' on him or her and invests substantial mating effort in attracting his or her romantic attention. Once the aspiration level is set, the length of the second search phase is out of the searcher's control—it depends on the more or less random sequence of mates encountered from the mating market. But how long the *first* phase should be for setting the aspiration, and how the aspiration level is set, depends on the goals of the searcher.

If the searcher is trying to maximize the chance of picking the single highest-value mate, the *optimal* way to set the aspiration level is to search long enough in phase 1 that enough information is obtained about the available mate qualities to make a good decision, but not *so* long that the searcher passes by the best alternative in phase 1 without selecting him or her. The aspiration level is then set to the highest mate value seen so far. Mathematically, the length of phase 1 that optimizes this balance is to look at N/*e* of the available alternatives, where N is the 'search horizon length' or expected number of potential mates whom one will meet in a lifetime, and $e \approx 2.718$ is the base of the natural logarithm system (see Ferguson, 1989, for an explanation of why this exact formula works best). This optimal phase 1 length is 37 percent of N, so the optimal approach in this case is to follow the "37 percent rule": In phase 1, look at 37 percent of the potential mates; then set the aspiration level to equal the *highest overall mate value* seen among all those individuals; and then continue search in phase 2 until someone is found whose mate value exceeds the aspiration level. (For example, if a woman expects to meet a constant number of new potential mates each year from puberty [around age 13] until fertility declines [around age 40], then the woman should take about 10 years [37 percent of 27 years reproductive life-span] to form her aspiration level during phase 1, and start 'searching in earnest' [phase 2] around age 23 for the first male ['Mr. Right'] who exceeds that aspiration level.)

This method gives a better than 1 in 3 chance of picking the *highest mate value* out of N individuals, but it requires searching through 74 percent of those individuals on average before it says to stop. (In the example above, the woman would not find 'Mr. Right' until she was 33 years old on average—having wasted 20 years of potential fertility.) In contrast, if a searcher has the more reasonable and modest goal of selecting a mate in the top 10 percent of the quality distribution, he or she would do best by setting an aspiration level after only seeing about 14 percent of the potential mates to be encountered (Todd & Miller, 1999), which would lead to a choice being made after seeing 40 percent of the potential mates on average. (In the example above, this aspiration level could be set by age 17 and a mate would be chosen by age 24 on average.) Other goals also require relatively little amounts of search to set an aspiration level that reflects the range of mate values likely to be encountered. Thus, successful mate search in this kind of situation can rely on a simple satisficing mechanism that constantly adjusts a searcher's condition preferences (in terms of their aspiration level) upwards with each successively better potential mate that is encountered.

There is ample evidence that both men and women set their aspiration levels as assumed in the simulations: People reduce their evaluations of potential mates (i.e., behave as if their aspiration level is higher) after exposure to highly attractive members of the opposite sex (Kenrick & Gutierres, 1980; Kenrick, Gutierres, & Goldberg, 1989; Kernis & Wheeler, 1981;

Melamed & Moss, 1975). Further, even the attraction to current romantic partners can be affected by changes in the comparison group (Kenrick et al., 1989; Kenrick, Neuberg, Zierk, & Krones, 1994; Weaver, Masland, & Zillman, 1984). These are social equivalents of the 'contrast effects' known from psychophysics (Helson, 1964).

The literature on development during adolescence provides support that a learning period (phase 1 in the simulations) indeed precedes serious mate choice attempts during adulthood. Adolescent romantic relationships tend to be very experimental and appear to be aimed at developing one's Mating Intelligence instead of finding a lifetime mate (Furnam, 2002). In this vein, Locke and Bogin (2006) argued that the evolution of the human-specific adolescence period was driven by the increasingly complex nature of culturally transmitted human mating cues and rituals (cf. Miller, 2000a). There is mounting evidence that this learning period now extends well beyond biological adolescence and into early adulthood, at least in Western societies (Arnett, 2000). One reason might be that the much greater mobility nowadays leads to an evolutionarily novel degree of instability in peer groups, including the group of available mates. These changes might impose a recurring need to update one's aspiration level. For example, if someone moves from his or her small hometown to a big city, most of his or her peer group likely changes, including the group of potential mates. The exposure there to more potential mates will also on average mean exposure to more *attractive* potential mates, which would raise this person's aspiration level and make him or her pickier than he or she tended to be in the smaller social environment of the hometown.

SIMPLE HEURISTICS FOR LONG-TERM PARTNER CHOICE

While such satisficing heuristics based on aspiration levels are quite plausible models for mate choice in an uncertain social environment, they still contain an unrealistic oversimplification: The assumption that mate choice is one-sided. Such heuristics resemble more the sequential-choice processes of consumers shopping for wares on an economic market than those of singles making *mutual* choices on a mating market. If someone samples cars and makes a choice, the car won't reject this person as its new owner; but if the same person samples potential mates and decides on Brad Pitt or Angelina Jolie, his or her chosen mate is quite likely to say *no* in return. In humans, long-term mate choice must be mutual—except in rare cases of abduction, coercion, or slavery. An individual's failure to understand this mutuality constraint in human mating represents a major failure of Mating Intelligence, and typically leads to unrequited love, sexual stalking, or "erotomania" (De Clerembault's syndrome).

In general, conceptualizing the social dynamics of mating decisions in a market framework is highly promising, since it allows for unifying scientific progress from the fields of psychology (social exchange theory, Baumeister & Vohs, 2004; Kelley & Thibaut, 1978; Thibaut & Kelley, 1959), economics (e.g. modeling of marriage decisions, Choo, & Siow, 2006; Wong, 2003) and biology (biological market theory, Hammerstein & Hagen, 2005; Noë & Hammerstein, 1995).

"Shopping" for mates on a mating market with mutual choice is a highly competitive endeavor. If individuals base their mate choices on aspiration levels learned solely by observing the conditions of available mates, they might be able to find someone who closely matches their condition preference in a fast and frugal manner, but they would also risk wasting their courting efforts if their proposals are declined by the ones chosen, who have *their own* aspiration levels for *their* mate choice decisions. Further risks of making mate choices without reference to one's own condition include opportunity costs (i.e., lost chances to find other mates), and being abandoned for someone better later on in a relationship (Kenrick, Groth, Trost, & Sadalla, 1993). This last risk, which is basically relevant only in committed, long-term romantic relationships, puts individuals' condition preference in conflict with their attachment preference: The better a mate's condition, the more attractive he or she is to any of his or her alternative mates, and the greater the probability that he or she will attract and consider better alternatives. Needless to say, if one is completely deserted by a mate (i.e., all contact is broken off), this person is no longer available to satisfy the attachment preference. But even if both "stay friends" or switch over to a polygamous relationship (which are alternatives that could still stimulate the condition preference in some way), the attachment preference will not be as satisfied anymore. The reason for this is that meeting a preference for good condition is fundamentally different from meeting a preference for secure attachment. Attachment relationships develop in a process of mutual responsiveness and trust, requiring spending plenty of time with each other and paying careful attention to the other's needs (Fraley & Shaver, 2000; Hazan & Diamond, 2000). Exactly these "spendings" and "payments" make being a secure attachment figure literally costly: Since time and attention are always limited resources, no one can be a "safe haven" for a large number of people simultaneously. In contrast, if someone is in good overall condition, it is rather easy to be attractive for many potential mates. To put it another way, while good condition is a characteristic of a mate (i.e., an individual trait), secure attachment is a characteristic of a relationship with a mate (i.e., a dyadic trait).

In a similar vein, seeking attachment is fundamentally different from seeking a mate in good overall condition. For all individuals except those in the best condition, almost all potential mates who match their condition preference will contradict their attachment preference, as these individuals will seek mates with high levels of condition themselves. For example, a woman may feel awe and lust at the sight of Brad Pitt's condition as he is acting in a movie, but may not feel the warm glow of secure attachment she gets from sitting next to her boyfriend during the movie, even though he may be in comparatively less good condition. This is because her boyfriend is responsive to her needs, while Brad Pitt never pays attention to her. Because she knows from her experiences that men like Brad Pitt are out there on the mating market, her aspiration level for condition might tell her to go for someone better. But her need for a secure attachment figure might never be satisfied by any of those "Brad Pitts," simply because none of them will care for her long enough in the presence of alternative women in better condition. Due to the forces of the mating market, only men with a similar (or lower) rank on condition will consider her such a good choice that they bother giving her enough time and attention to make the development of a secure attachment relationship possible. Of course, the reverse is also true for the men she chooses. Taken together, this leads to (monogamous) assortative mating for condition at the population level in spite of absolute condition ideals at the individual level, caused by a trade-off between the preferences for condition and attachment.

A direct implication of these mating market dynamics is that the preferences of one sex become social constraints on the choices of the other sex: We can strive for mates in top condition, but as long as we fail to take into account how well we are able to fit to the condition preference of potential mates, we may get rejected most of the time, and we are especially unlikely to end up in a long-term attachment relationship. Instead of running into these kinds of emotional disasters over and over again, it would be adaptive for individuals to track their own value on the mating market, that is, their ability to live up to the condition preferences of the opposite sex, and to adjust their own condition preference accordingly (Barkow, 1989; Dawkins, 1982; Kenrick et al., 1993; Sloman & Sloman, 1988; Trivers, 1972; Todd & Miller, 1999; Tooby & Cosmides, 1990).

In this way, self-assessment processes (as defined above) become relevant for mate choice decisions. Tracking one's own mate value can be regarded as a special, domain-specific function of self-esteem, for which Kirkpatrick and Ellis (2001, in press) coined the term *mate value sociometer*. Note that this framework accords an interpersonal function to self-esteem (see already Cooley, 1902; Mead, 1934). As such, it is an instance of 'sociometer theory' (Leary et al., 1995; Leary & Baumeister, 2000), which proposes that general self-esteem is an evolved mechanism which monitors one's overall risk of social exclusion. Penke and Denissen (2006) argue that being rejected by a courted mate for not reaching his or her condition preferences can be regarded as a form of social exclusion, namely exclusion from mating. Repeated experiences of this kind imply a severe threat to an individual's reproductive fitness, since they might portend a lifelong exclusion from mating in general. It would therefore be highly adaptive if the general human motive of self-esteem maintenance (Baumeister, 1997) used domain-specific cues of reductions in one's own value on the mating market to motivate either striving for the improvement of mate value (e.g., through getting in better physical shape, learning courtship skills, or seeking higher status, though improvement of condition itself might be difficult, since cues to condition follow the biological principle of honest signaling—Kokko et al., 2003; Miller, 2000a; Zahavi, 1975; Zahavi & Zahavi, 1998), the downward adjustment of the condition preference, or the reallocation of one's general life-effort from short-term to long-term mating (or from mating in general to investment in kin).

But before a mate value sociometer can serve a regulatory function in mating decisions, it has to be properly calibrated; a mate-value sociometer must acquire some validity to be of any use. People have to learn their own mate value relative to other members of their sex. Todd and Miller (1999) argued that this happens by experiences of acceptance and rejection in flirtatious interactions with the opposite sex, especially during the adolescent years (see also Penke & Denissen, 2006). Complementary to that, another general self-related cognitive process can help to accomplish mate value sociometer calibration in a more indirect manner: the motive for social comparison (Festinger, 1954; Gilbert, Price, & Allan, 1995; Mussweiler, 2003). Studies have shown that people are especially likely to compare themselves with same-sex peers on traits that are preferred in mate choice decisions of the opposite sex, and to adjust their self-appraisals accordingly (Gutierres, Kenrick, & Partch, 1999; Brown, Novick, Lord, & Richards, 1992), especially when the competitors appear real and are not professional models (Cash, Cash, & Butters, 1983). This finding is similar to the contrast effects people show in adjusting their aspiration level for mate choices based on condition preferences, as discussed above. Since direct rejection by a potential mate can be a very painful experience, especially for those singles who lack prior experiences of mating success (Penke & Denissen, 2006), social comparisons with one's own sex might add helpful information at low embarrassment cost.

We argued earlier that when it comes to choosing a mate for a long-term, committed relationship, most people face a trade-off between their preferences for condition and attachment. This trade-off might be handled by the mate value sociometer. There is empirical evidence suggesting that people indeed use their mate value sociometer to adjust their condition preference until it roughly matches their own condition (Buston & Emlen, 2003; Kenrick et al., 1993; Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Pawlowski & Dunbar, 1999; Regan, 1998a, b). Recently, Srivastava and Beer (2005) showed that an insufficiently satisfied attachment preference (as indicated by an insecure attachment style) increases the sensitivity of the sociometer mechanism to signs of social exclusion. This implies that larger adjustments of the condition preference can be expected when people are in need of attachment, after even minimal experiences of rejection by mates. For example, someone who lacks secure social support from good friends or family members might be much more willing to accept a mate lacking in physical attractiveness or other desirable features, if that mate could instead become a "safe haven" soon. Someone who is better integrated in his or her social environment might also desire a long-term relationship, but because getting a new attachment figure is a less urgent goal for such a person, there is no need to compromise the condition preference as much in this case. It might also be that there are stable interindividual differences in the sensitivity of people's sociometers that are more due to genetic differences than due to differential social integration. Indeed, it might well be that personality differences in neuroticism (i.e., emotional stability), which are highly related to sociometer sensitivity, only exist because the optimal level of sociometer sensitivity differs between environments, so that the genetic variation underlying this personality dimension could not be eroded by natural selection (Denissen & Penke, 2006).

Todd and colleagues (Todd & Billari, 2003; Todd, Billari, & Simão, 2005; Todd & Miller, 1999) developed agent-based computer simulations of the mutual mate choice process outlined so far. These models typically simulate a mating market composed of 100 males and 100 females, each with a condition value drawn from a uniform distribution from 0 (minimum) to 100 (maximum). As in real life, individuals do not innately know their own condition value, but they can accurately assess the values of all potential mates they encounter. Individuals meet in male-female pairs, assess each other, and decide whether to make a romantic proposal to each other. This meeting and assessing process happens in two phases, as in the one-sided (non-mutual) satisficing mate search mechanisms discussed earlier. In the first "adolescent" phase, proposals and rejections do not result in actual pairing, but they can be used to set or adjust an aspiration level that will determine to whom future proposal offers are made. In the following "adult" phase, the aspiration level set during the adolescent phase is fixed and used to make decisions in the rest of the search. These proposal and rejection decisions are now "real," in that mutual proposals result in a long-term pair being made and the couple leaving the mating market simulation. The necessity for mutual agreement is what makes this scenario different from the one-sided case described above—from one searcher's perspective, the decisions of potential mates as to whether they judge the searcher as a suitable mate as well are critical to that searcher's mating success, so the searcher's own decision mechanism, based on his or her mate value sociometer, should take these others' perspectives into account.

Search strategies can be sensitive to the decisions of potential mates in different ways. The information available to these strategies at each time-step is the mate value of the current potential mate being encountered, and whether that individual makes an offer or a rejection to the searcher. A reasonable approach is to use the assessments that others make about oneself as a cue about one's own mate value, which only the others can see clearly. So one could raise one's self-appraisal, and hence one's aspiration level, every time an attractive offer is received and, similarly, one could lower it after every unattractive rejection. This also fits with our intuitions about how romantic successes and failures can induce the mate value sociometer to go up and down, which in turn can affect how high or low people aim in their next romantic endeavors. For example, we feel great after an attractive person reciprocates a kiss passionately, or terrible after a less attractive person shows disinterest. To specify a decision mechanism in more detail, all individuals start with an initial aspiration level of 50 (the middle of the 0–100 mate value range), which corresponds to assuming oneself to be just average. Then, during the adolescent learning period, for every proposal from someone more attractive than one's current aspiration level, raise one's aspiration level to be partway to the other's attractiveness value. Any proposals from someone less attractive than one's aspiration level are to be expected, and so do not have any effect. Just the reverse happens for rejections: for every rejection from someone below one's current aspiration level, lower the aspiration level toward the other's attractiveness. As each individual's aspiration level changes over the course of the adolescence period, he or she influences the learning of everyone else's aspiration levels via the combined effect of the proposals and rejections made.

Simulations of populations using such a simple rule produce results similar to patterns of human mate choice, with most individuals finding marriage partners of similar overall mate value in a relatively short period of time (Todd & Miller, 1999). In addition, the behavior of these proposed search mechanisms can be assessed against population-level outcome measures. For instance, demographers have long puzzled over a frequently observed skewed-bell shape distribution of ages at which people first get married (Coale, 1971). When Todd and colleagues created an agent-based demographic model of a population of males and females looking for marriage partners with the mutual sequential search heuristic just described, they found that the "ages" at which the individuals got married fit the observed demographic data (Todd & Billari, 2003; Todd, Billari, & Simão, 2005).

To recap, mating markets are characterized by mutual choices, with both sexes showing a preference for a partner in good condition as well as a secure attachment relationship. When it comes to long-term relationships like marriage, the attachment preference becomes paramount for either sex. Since market dynamics frequently result in conflicts between both preferences, people need to adjust their condition ideal in these cases. It is assumed that this is accomplished by an aspiration level for condition that reflects one's self-perceived mate value, as learned from past and present interactions with the opposite sex and from social comparison processes. This special instance of self-esteem has been called the mate-value sociometer. We therefore propose that mate-choice decisions are guided by simple heuristics based on satisficing aspiration levels not only when it comes to evaluating a potential mate of high condition in a sequential search process, but also when it comes to acquiring the best mate for a secure attachment relationship. Thus, the accurate calibration and use of one's mate-value sociometer during adolescence and beyond is an important aspect of human Mating Intelligence.

THE COMPLICATION OF MATING DECISIONS BY SEX DIFFERENCES

So far, our discussion of mating decisions and their underlying mechanisms has ignored sex differences. This is somewhat defensible as long as we concentrate on long-term mate choice, where male and female mate preferences converge (Kenrick et al., 1992; Li & Kenrick, 2006), and men and women face similar trade-offs between condition and attachment preferences (cf. Miller & Fishkin, 1997). However, as Trivers' (1972) seminal parental investment theory implies, a discussion of mating decisions that neglects sex differences completely would surely miss a basic point.

One sex difference that follows from parental investment theory is the greater female preference for resources (Buss, 1989; Feingold, 1992; Li et al., 2002). Bearing a child is a very costly endeavor for the female body, just as successfully raising a child is costly in terms of time, money, energy, and other efforts. Although the child-bearing costs are inevitably a female burden (though it can be eased by male support), the child-rearing ones can easily be shared between both parents. In humans, the quality of parental investment a male can provide depends heavily on the quantity of resources he can provide. The implied prediction is that women, but not men, have evolved a resource preference (i.e., preferring males who are reliable providers) in addition to their condition and attachment preferences, which has to be taken into account when they make mate choices. This extension is hardly necessary for biologists studying mating in nonhuman animals, since physical condition is so closely intertwined with resource acquisition and resource-holding ability in most species that they are often equated (Hunt et al., 2004; Rowe & Houle, 1996). To some degree, both are overlapping in humans, too. Intelligence, for example, predicts both genetic quality (Miller, 2000b, this volume) and occupational success

(Schmidt & Hunter, 2004). But specifically human phenomena such as wealth inheritance, extensive political alliances, and complex financial markets lead to many cases where condition and wealth diverge: Some men happen to possess a significant amount of money, even though they would have lacked the condition to earn it on their own. The consequence is that women sometimes face an additional trade-off between their condition preference and their resource preference, due to an imperfect correlation between these variables. (In fact, a study by Waynforth, 2001, suggests that this trade-off is the only reason for the well-known finding that men have a stronger preference for physical attractiveness in mates than women do; see also Li et al., 2002).

A straightforward solution to this difficult trade-off is for the female (but not the male) ideal of overall mate value to be based on both the overall physical condition *and* the overall resource provision of a mate. Taking this into account, it is logical to then assume that women looking for a long-term mate use a combination of both their condition preference *and* their resource preference as a starting point for setting their aspiration level in the simple mate choice heuristics outlined above. Accordingly, the mate value sociometer of men should track their individual combination of condition and resources, and not just condition alone. An alternative solution arises if women are not able to find one man who fulfills the three-way trade-off between the condition, resource, and attachment preference. Gangestad and Simpson (2000; Thornhill & Gangestad, 2003) propose that women switch to a pluralistic conditional mating strategy in this situation: Securing resources and attachment in a committed relationship with a long-term mate that might not satisfy their condition preference, and acquiring good genes from extra-pair matings with men of good condition when conception is likely, during peak fertility in the ovulatory cycle (Thornhill & Gangestad, 2003; Gangestad, Thornhill, & Garver-Apgar, 2005a, b, but see also Pawlowski, 1999; Roney, 2005).

Another important sex difference is the greater male desire for sexual variety. In all cultures studied so far, men report a much higher number of desired sexual partners over any period of time, a greater willingness to have sex with someone after a short period of time, a greater active search for short-term mating partners, more positive attitudes towards sexual promiscuity than women (Buss & Schmitt, 1993; Schmitt et al., 2003; Schmitt, 2005a, b), and fewer feelings of regret after having short-term sexual affairs than women report (Townsend, 1995; Townsend, Kline, & Wasserman, 1995). These are the largest psychological sex differences found so far (Hyde, 2005; Schmitt et al., 2003).

In the terminology of mating decisions, these sex differences translate into a greater male variety preference (i.e., a preference for easily sexually accessible mates), and a strategic male tendency to allocate more effort to courting new mates than to investing in an established relationship and resulting offspring (i.e., to invest more in short-term mating tactic). This is, again, related to the fact that minimal parental investment is smaller in males than in females from the level of gametes onward, allowing males a higher reproductive potential than females (Trivers, 1972). Physiologically, any fertile man would be able to produce a seemingly endless number of offspring in his lifetime, which is not true for women due to pregnancy and lactation. But since every child has to have a father and a mother, and the number of reproductive-aged men and women is roughly the same most human population most of the time, the actual offspring numbers has to be equal for men and women on average. Thus fertile women become the limited resource for male reproductive success. Even though this has the implication that hardly any man will ever actually receive his full potential reproductive success (Kokko & Jennions, 2003), it still implies that a greater variety preference and a short-term mating orientation is the optimal default value for men with the highest potential payoff (Buss & Schmitt, 1993; Schmitt, Shackelford, & Buss, 2001), and that men should not be very discriminating when it comes to short-term, purely sexual affairs (Kenrick et al., 1990, 1993), at least above a certain minimal threshold of female condition that makes fecundity likely. However, how successful a man will be in pursuing a short-term tactic is heavily dependent on his condition, because women, who need not care about trading off their attachment preference in the short-term context anymore, show a much greater condition preference when seeking short-term mates (Kenrick et al., 1990; Li et al., 2002; Regan 1998a, b). Under these circumstances, the only way for men to compensate for a lack of condition might be immediate resource provision (Buss & Schmitt, 1993). That is, men can "pay" to have short-term sex with choosy women through being extremely attractive (offering good condition) or extremely generous (offering good resources). The former is called *romance*, the latter is called *prostitution*. Overall, this analysis reflects Darwin's (1871) prediction of competitive males and choosy females (see also Trivers, 1972).

Hill and Reeve (2004) modeled aspects of these dynamical trade-offs of preferences in a game theory framework and took sex differences into account. They assumed that both men and women choose their mates in a competitive mating market, where all individuals have a certain condition (dependent on genetic quality and a sex- and age-dependent decline function) and resource value. When two (or more) men courted one woman, they offered their condition and attempted to overbid their competitor by providing enough resources to yield a higher overall mate value (condition plus resources—which is an oversimplification in these models since, as we argued above, condition and resources are likely related in men; however, we do not expect that any of the conclusions Hill and Reeve drew from their model would be substantively altered by a more realistic assumption of correlated mate value components). In this model, resource-generosity could influence male mating success over and above condition. The condition and provided resources of the "winning" man were then combined with the condition and resources of the woman to influence their joint reproductive fitness (number of offspring) as a couple. For women, the relative preference for male resources versus male condition was partly dependent on her own resources and partly a preset constant. This constant was meant to reflect relative environmental demands for paternal investment vs. good genes, as discussed by Gangestad and Simpson (2000), but was not dynamically modeled. However, when more than one woman was interested in the same man, he could lower his resource offerings until all but one women refused to accept it anymore. He was therefore left with resources to invest in additional female reproductive partners (satisfying his variety preference). These models predicted not only assortative mating for overall mate value, but, more importantly, that both the competition between potential mates and same-sex competitors on the mating market would influence the overall value of the mate (or mates) an individual will end up with. Interestingly, Hill and Reeve emphasized that competitors on either side do not necessarily need to be immediately present. This maps nicely onto the sequential nature of mate choice in uncertain social environments, as outlined above. Hill and Reeve further support a sociometer-type mutual search mechanism by suggesting that, to make adaptive mating decisions, men and women should monitor their own relative mate value and the distribution of mate values in the population of potential mates, in order to avoid unnecessary mating costs. Their models can thus be taken as further formal evidence for the plausibility of the simple mate choice heuristics we propose.

PARADIGMS FOR STUDYING MATE CHOICE: BOUNDARIES AND LIMITATIONS

To recap, decades of research in various disciplines provide us with useful conceptualizations and elaborated theories about mate choice decision mechanisms. The current knowledge on relevant aspects of human nature and the structure of our social environment can be integrated in precisely specified decision models, which in turn can be evaluated using computer simulations and game theory. However, the most important test is still provided by reality: Are these models valid descriptions of how people make their mate choices?

Unfortunately, we encounter a methodological problem at this point: real mating decisions are intimate processes for which a detailed assessment "in the wild" is not easily done. As a consequence, informative field experiments are difficult to design (for a notable exception, see Clark &

Hatfield, 1989), and many factors have to remain uncontrolled. Instead, most empirical research on mate choice decision making seeks refuge in more convenient approaches, typically relying on self-reports (Cooper & Sheldon, 2002), either of recalled past choices, present preferences and desires, or hypothetical decisions based on vignettes. All these approaches are compromised in their validity by the fact that subjects have insufficient conscious insight into the relevant processes that lead to their decisions (Wilson, 2002). Another widespread approach is to let participants report their attraction to isolated aspects of potential mates that were artificially generated or extracted from real individuals. Example include line drawings differing in body built (Singh, 1993) or foot size (Fessler et al., 2005), computer morphs of still faces with neutral expression (Rhodes, 2006), vocal recordings altered for voice pitch (Puts, 2006), videotapes of men flirting with video screens (Gangestad et al., 2004), and jars with sweaty t-shirts (Thornhill & Gangestad, 1999b). These studies are experimentally more controlled, but might artificially alter the natural occurrence and interrelations of the cues utilized in mate choice. How relevant each of these cues becomes once it is embedded in its natural environment cannot be predicted with any certainty from these studies.

But most importantly, almost all paradigms used to study mate choice so far have failed to take its mutual nature into account: Usually, participants in mate-choice studies do not experience the reactions of potential mates, and trade-offs between preferences, if considered at all, are either enforced by the researchers (e.g., Buss, 1989; Fletcher et al., 2004; Li & Kenrick, 2006; Li et al., 2002) or indirectly inferred from self-ratings (e.g., ; Buston & Emlen, 2003; Kenrick et al., 1993; Regan, 1998a, b) instead of being a natural consequence of the dyadic interaction. In some ways, this is also true for retrospective reports from existing couples, even though their relationship was once formed in a process of mutual choice: because it is difficult to disentangle initial choices from retrospective memory-shifts (e.g., due to reduction of cognitive dissonance, Festinger, 1957), it is difficult to tell which preferences affected the couple formation in hindsight. Finally, studies of romantic relationship development offer some hope, but due to their mostly unpredictable onset, even these studies (e.g., Fletcher, Simpson, & Thomas, 2000) are normally done with already-existing couples, providing little knowledge about the initial mating decisions that led to them.

Therefore, mate-choice research is faced with a solid body of theoretical models and many supportive empirical hints from a variety of methodologically limited paradigms on the one hand, but a dearth of sufficiently ecologically valid studies to evaluate their predictions on the other hand. But an interesting solution to this predicament has recently appeared with the emergence of “speed-dating.”

THE SPEED-DATING PARADIGM FOR STUDYING INITIAL MATE-CHOICE DECISIONS

Speed-dating is essentially a faster, more formalized type of sequential mate choice than what usually occurs "in the wild." Speed-dating events are held by commercial firms in many Western countries. The design of these events is largely similar: Single people interested in finding a partner sign up and are assigned to events, usually according to age (and sometimes other demographic variables). The event itself involves seven to thirty men meeting a similar number of women during a single evening. Usually the women stay seated at assigned tables, while the men take turns talking to each woman for a prescribed time interval of three to ten minutes (depending on the company organizing the event). After each of these accelerated "dates," each participant marks a card indicating how interested he or she is in meeting that person again, usually via a categorical decision ("I would like to meet again" vs. "I would not like to meet again"; in some cases, a third category is offered in which participants can indicate that they would consider this person for "friendship,"—i.e., resource investment without immediate sexual access—if not for a romantic/sexual partner). Only those pairs of participants who expressed mutual consensus regarding the desire to meet again are provided with each other's contact information (e.g., phone numbers or e-mail addresses) after the event. Speed-dating thus provides a microcosm for studying Mating Intelligence with a combination of laboratory-like control and ecological realism, since real mate-choice decisions of real singles can be observed systematically. A unique advantage of the speed-dating paradigm is that it allows for a separate assessment of male and female choices in the couple-formation process (based on each individual's marked cards indicating interest or disinterest in each prospect), which is, as we argued above, virtually impossible after relationships have been formed.

Although speed-dating events may be somewhat different from the process of normal dating, they are not as problematic as they might appear at first glance. For example, the artificially set length of the dating interactions might look too short for serious mate choices, but research on person perception in the minimal information paradigm has repeatedly shown that people are surprisingly accurate in judging others after very brief periods of time. This is not only the case for superficial traits like physical attractiveness, but also for less directly observable personality characteristics, such as broad personality traits and general intelligence (Ambady, Bernieri, & Richeson, 2000; Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004). Furthermore, studies of speed-dating events can of course only capture the initial "screening" stage of the mate-choice process—not every speed-dating match will result in a marriage. However, the initial stage is crucial, since it determines which pairings have any chance at all to result in committed romantic relationships, for if the initial decision is a negative one, the potential partner will be dropped from further consideration.

A more severe limitation of the speed-dating paradigm might be hidden in a less obvious design feature: Participants at speed-dating events know in advance that they will not experience direct face-to-face rejections of their choices, and this knowledge might influence their choice behavior. Embarrassment is minimized, so individuals may set higher aspirations in their choices. However, it is not clear at the moment what kind of effect, if any, this lack of direct rejection has. We do not know, for example, if people can tell (or, maybe more importantly from a sociometer perspective, feel) if their choices were reciprocated. Neither do we know if prior knowledge about the setting (like how many potential partners they will meet or the indirect format of acceptance and rejection) really alters people's behavior during dating interactions or the choice process. These aspects clearly await further research.

Kurzban and Weeden (2005) were among the first to examine mate-choice decisions and mating success in the context of speed-dating events. In particular, they examined more than 10,000 speed-dating participants, scattered over many events in the United States, to explore the role of mate value (assessed by self-report questionnaires in advance) in initial mating decisions. Just as Darwin (1871) and Trivers (1972) predicted, Kurzban and Weeden found that women were much more selective than men: While men chose, on average, every second woman, women only wanted to meet every third man again. Both mean male and female success at the events (i.e., the number of times they were chosen, regardless of whether they themselves reciprocated the choice) was mainly predicted by visible indicators of good condition (like lower-than-average body mass index given a generally overweight population), suggesting that condition preferences influenced the choices of both sexes. Resource indicators (like income and education) had surprisingly little impact on male success (in terms of number of offers they received). However, having more resources made men more selective (in terms of number of choices made), and having indicators of good condition increased selectivity in both sexes. Greater selectivity, in turn, was related to higher condition preferences in both sexes. This pattern is consistent with our hypothesized trade-off between the attachment preference and the condition preference across both sexes, regulated by the mate value sociometer (though the evidence is indirect here).

In an intensive study of a single speed-dating event in Germany, Todd, Penke, Fasolo, and Lenton (2006; Todd, Fasolo, & Lenton, 2004) were able to examine the mating-decision processes in far greater detail. Before the event run by the German FastDating company, 20 of the women and 26 of the men reported via an online survey their demographic information, their mate choice preferences for condition (physical appearance), resources (wealth and status), and attachment (family values), and their self-evaluations regarding these same three dimensions. Additionally, all participants were rated for physical attractiveness by two raters during the event. As in the study by Kurzban and Weeden (2005), women were, on average, more selective than the men, though both sexes were much more selective in the German sample than in the U.S. sample. Also in concordance with Kurzban and Weeden, indicators of good condition best predicted success at the event, especially observer-rated attractiveness. Indeed, self-reported age and observer-rated attractiveness together explained 83 percent of the variance in female speed-dating success (i.e., younger, more beautiful women received more offers of interest from men). However, male success was significantly less well predicted by condition indicators, which explained only about a quarter of the variance in their success (though this was statistically significant). Just as in the American sample, resource indicators failed to improve this prediction.

Novel results appeared, however, when self-reported preferences and self-perceptions were added to the picture: First of all, across the sexes, self-reported condition, resource, and attachment preferences showed no statistically significant link to actual choices, as assessed by the mean self-perceptions in these domains of all chosen dating partners. This could either mean that the participants in the sample were generally unable to indicate their preferences accurately, that the cues for the preferred qualities could not be assessed within the context of these short meetings, or that the general trade-offs between conflicting preferences that occur in real choices altered the preferred ideals they reported in the questionnaires in a manner that blurred the linear relationships.

The last interpretation appears more likely if the generally low male selectivity is taken as the behavioral expression of a high variety preference: Although men might have high condition and attachment preferences for a long-term relationship with a single woman, their variety preference might lead them to accept a wider array of female characteristics. Especially in the speed-dating context, where courting approaches are facilitated and rejections are covert by design, many men might take the opportunity to maximize their chances for mating success, be it long-term quality or short-term quantity. This would explain the lack of a relationship between male self-perceptions and choices at speed-dating events.

However, the strong relation between condition and speed-dating success in women suggests that men are still not totally indiscriminating with respect to condition, though any condition level above a certain minimal threshold might do (in line with the "avoid-the-worst" heuristic of attractiveness judgments proposed by Grammer et al., 2002; see also Arnquist

& Rowe, 2005; Zebrowitz & Rhodes, 2004). Indeed, the two women who were not chosen by any man during the German speed-dating event had an observer-rated attractiveness which was more than one standard deviation below the mean of those women who were chosen at least once. Thus, replacing condition preference (beyond some minimal threshold) and attachment preference with a high-variety preference might be the best description of typical male mate-choice decisions in the speed-dating context.

If an indifference towards the outcome (long-term vs. short-term relationship) is a viable interpretation of the typical male mating tactic in the speed-dating context, we further should expect no downward adjustments of preferences due to mate value self-perceptions. This was indeed the case: Men's self-perceptions in the condition, resource, and attachment domains, as well as an overall aggregate of these self-perceptions that reflected the mate value sociometer (cf. Penke & Denissen, 2006), were generally unrelated to the mean self-perceptions of each man's chosen partners in each individual domain and overall. Similar results emerged when the men's choices were evaluated by observer-rated attractiveness.

Female results were notably different: Besides being choosier overall and showing at least a slight correspondence between reported preferences and actual choices, women showed some tendency to adjust their choice behavior to their self-perceptions. This effect was especially true for self-perceived physical attractiveness, which was positively related to the average self-reported condition, resources, attachment, and overall mate value of their choices. Given that physical attractiveness, literally the most visible aspect of condition, almost perfectly predicted female speed-dating success, it was highly adaptive for women to adjust their choice thresholds upwards according to their own attractiveness.

The overall pattern of results thus suggests that low mate-choice costs lead men to satisfy their variety preference by indifferently choosing any woman who falls above a minimal condition threshold, while women stayed choosy and appeared to fine-tune social-comparison processes to the situation (meaning, in this context, that their mate-value sociometer mainly reflected their physical attractiveness), adjusting their mate choices accordingly. An interesting implication is that, at least as long as choices are not very costly for men, direct mate assortment (i.e., assortative mating that is not an indirect result of social homogamy) is primarily a result of female, not male, choices. However, since the main results stem from a fairly small sample, this interpretation awaits replication. The bottom line is that mate-choice behavior in the speed-dating paradigm appears consistent with the interactive operation of mate preferences as proposed in this chapter. The outlined simple heuristic for mate choice decisions based on learned aspiration levels was especially well supported in women, but seemed to be overridden by the variety preference in men, at the cost of their preferences for condition and attachment.

MATING TACTIC DECISIONS

The evidence from the speed-dating paradigm also reveals how interrelated our mate-choice and mating-tactic decisions are (see also Simpson & Oriña, 2003). For men, choosing a short-term mating tactic means giving strong priority to their variety preference, which imposes severe trade-offs against their condition and attachment preferences. While female condition indicates fecundity and is therefore necessarily preferred to some minimal degree (Grammer et al., 2002; Todd et al., 2006; Zebrowitz & Rhodes, 2004), the preference for a secure attachment partner can be abandoned when all effort is allocated towards short-term mating. For women, a short-term tactic means a similar drastic reduction in their attachment preference, which ultimately would have more severe consequences for them than for men (Trivers, 1972). Their much lower variety preference (Schmitt et al., 2001, 2003) would not provide much motivational compensation to make this trade-off. Instead, only an increase in their aspiration level for condition (or possibly the resources if they are provided immediately, see Buss & Schmitt, 1993) might motivate women to trade off their attachment preference and choose a short-term tactic. As a consequence, only men with high mate value will be able to successfully pursue a short-term tactic, while a similar relationship between mate value and proclivity toward promiscuity does not exist for women (Gangestad & Simpson, 2000). Since an allocation of effort to short-term tactics implies both direct and opportunity costs when such attempts remain unsuccessful (except in rare cases that mirror the low-cost speed-dating context in this regard), men, but not women, should adjust their mating tactic decisions to the level of their mate value sociometer. Exactly this relationship was found by Landolt, Lalumiere, and Quinsey (1995) for hypothetical mating decisions in college students.

Penke and Denissen (2006) took a closer look at how the mate value sociometer might guide male mating tactic decisions. They integrated the domain-specific interpretation of sociometer theory (Kirkpatrick & Ellis, 2001) with the social risk hypothesis by Allen and Badcock (2003), who regard general self-esteem as the phenomenological output of a psychological mechanism that weighs an individual's overall social value against his or her overall social burden (i.e., the overall costs someone induces to his or her social environment). This mechanism produces a depressed mood if the social value/social burden ratio drops too low, thereby motivating the individual to shun socially risky behaviors (i.e. social behaviors with high outcome variance, such as sexual courtship) that might provoke social exclusion. Since short-term mating tactics are proximately more rewarding and ultimately more adaptive for men than for women, and since, as a consequence, women become especially selective when choosing a short-term mate, only a small fraction of men with extraordinarily high mate value will be able to successfully pursue a short term tactic. Put differently, even though most men would prefer a variety of short-term mates, the high standards that women have for short-term mates would lead to their rejection of most of these men. Female mate preferences thus create a potential threat of social exclusion for short-term oriented men, namely an exclusion from mating. (Needless to say, this would severely endanger reproductive fitness.) Therefore, allocating effort to short-term tactics is a risky social behavior with both high potential costs and benefits for men, which, according to the motivational mechanism proposed by Allen and Badcock (2003), should be avoided as a consequence of depressive affect when general self-esteem is low. To be adaptive, the social cues that should trigger the avoidance response of this mechanism are signs of rejection by potential mates, as tracked by the mate value sociometer. This interpretation is consistent with the literature on depression, which is often triggered by failure in courtship, relationships, or status-striving, and which often results in a dramatic reduction in short-term mating effort.

But while the evocation of depressive mood by a low mate-value sociometer would have highly adaptive de-motivational effects on men who might otherwise unsuccessfully try to allocate their efforts in short-term tactics, it would be rather maladaptive for men who are successful in pursuing short-term tactics (because their potential benefit of fathering many offspring is so high), as well as for men who already chose to reallocate their efforts to a long-term relationship with a single mate and to providing paternal investment to their children (who would also shun any social risk in non-mating domains only because of their low mate value sociometer). Therefore, Penke and Denissen (2006) proposed, and subsequently found, that the influence of general self-esteem on the mate value sociometer shifts adaptively in men, but not in women, with lifestyle aspects that indicate short-term mating success (such as lifetime number of one-night stands) and mating tactic choice (such as involvement in a committed long-term relationship or having children): The self-esteem of men with a history of low short-term mating success was especially sensitive to a low mate-value sociometer, while the influence was much smaller for those with high short-term mating success, but also for those in stable romantic relationships and especially fathers. The effects were much weaker and seldom significant in women, but replicated for different operationalizations of the mate value sociometer in men (i.e., both the Mate

Value Scale by Landolt et al., 1995, and an aggregate of diverse self-perceptions of traits preferred in mate choice).

These adaptive sociometer contingencies allow men of very high mate value to stay motivated to seek multiple mating partners even when sometimes unsuccessful in this endeavor, while simultaneously motivating the avoidance of such tactics in men with suboptimal mate values, for whom gaining independence from their mate-value sociometers by choosing a long-term mating tactic becomes an attractive alternative. Consequently, they are a plausible mechanism for male mating tactic decisions based on self-assessments.

Interestingly, these cognitive-level results parallel effects that were recently found on the endocrinological level pertaining to free testosterone which is a major determinant of sexual motivation (Regan, 1999) that influences such mating-relevant correlates as sexual-variety fantasies (Leitenberg & Henning, 1995). It is also lower in men committed to a romantic relationship compared to singles (Burnham et al., 2003; Gray et al., 2004a, b), in fathers compared to non-fathers (Gray, Kahlenberg, Barrett, Lipson, & Ellison, 2002), and in men who invest more in their romantic relationships compared to those who invest less (Gray et al., 2002). Therefore, testosterone has been called a *hormonal index of effort allocation* in the reproductive domain (i.e., the current mating-tactic decision) (Ellison, 2001; Gray et al., 2004a, b). It is thus plausible that testosterone relates to adaptive shifts in the contingency of self-esteem on the mate value sociometer, constituting its physiological basis. In other words, free testosterone might be the endocrinological mediator of male mating-tactic decisions.

Overall, there is no evidence for a similar guidance of female mating-tactic decisions by self-assessments (Landolt et al., 1995; Penke & Denissen, 2006). This is hardly surprising, given that there is less need for women to base these decisions on their own mate value. Indeed, female mating tactic decisions appear to be much more dependent on ecological factors than are male decisions (Baumeister, 2000), especially those environmental cues that indicate the current relative importance of biparental care compared to good genes for reproductive success (Gangestad & Simpson, 2000; Schmitt, 2005b). How women use and process such environmental cues in order to reach adaptive mating tactic decisions is largely unknown (but see Swami & Tovée, 2005) and, as such, remains an interesting area for future research on Mating Intelligence.

CONCLUSION

Human mating decisions take place in a dynamic mating market characterized by mutual mate choice, high interindividual variability in preferred characteristics (condition and resources) in both sexes, and conflicting optimal allocations of reproductive effort between the sexes. Even though these dynamics can get rather complex and each individual enters the market naïve with regard to its local structure, simple mating heuristics can nonetheless guide adaptive mating decisions by taking advantage of environmental regularities.

In line with the principle of bounded rationality, these mating heuristics develop from evolved and innate capacities in interaction with the local environment's ecological and social structure. The capacities include broad motives, such as sexual lust, the adult attachment system, the desire for sexual variety, the needs for social comparison and self-esteem maintenance, and the avoidance of social risks, which are triggered by the sociometer mechanisms. They also include highly specific cognitive biases, such as the learning preparednesses for and aesthetic valuations of cues to condition and resources in mates. In line with the sex-specific optimal reproductive strategies of both sexes, some of these capacities show large sex differences, leading to a "default" orientation of men towards short-term and of women towards long-term tactics. The environment not only provides the cultural context in which the concrete cues for condition and resources are learned, but also information about the distribution of these mate qualities in both potential mates and competitors on the mating market, and on their relative importance for indicating successful reproduction. All this information is initially learned during adolescence, but is constantly updated throughout the reproductive lifespan. The proposed influences of preferences, self-assessments, and sex on mate choice and mating tactic decisions are summarized in Table 1.

A direct implication of the heuristics approach is that a high degree of Mating Intelligence can be achieved by fairly simple cognitive operations. The necessary competences are basically present in everyone, since they are part of our universal human nature. However, what can seriously distort the adaptiveness of mating heuristics is invalid environmental input. When high social requirements for spatial mobility lead to instable peer groups and thereby hinder social comparison processes, when adolescents develop their attractiveness standards via exposure to artificial hyperstimuli in the media, when American school programs bias sociometers by trying to maximize the self-esteem of every student, or when unrealistic models of the competitive mating market are internalized as a result of hyper-egalitarian ideologies of human uniformity, we can expect systematic failures of Mating Intelligence.

Although the role of self-assessments for human mating decisions has been proposed repeatedly by various authors and supportive correlations have sometimes been demonstrated, detailed descriptions of *how* such cognitive representations might come about and influence mating decisions are almost absent from the literature. The simple heuristics we outlined in this chapter fill much of this gap. Although they can be further

TABLE 2.1.
Summary of Mating Decisions and the Role Played by Preferences and Self-Assessments Therein

Mating tactic decision

Sex	
♂	Preferably short-term; mainly based on the adaptive contingency of general self-esteem on the mate value sociometer
♀	Preferably long-term; mainly based on ecological cues (pathogen prevalence, environmental harshness); strategic pluralism possible

Mate choice decision

Mating tactic	Sex	Condition preference	Resource preference	Attachment preference	Variety preference	Role of self-assessments in decision making
Long-term		+	–	+	–	Adjust condition preference according to mate value sociometer (which tracks a combination of own condition and resources relative to male competitors)
	♀	+	+	++	(+)[1]	Adjust combination of condition preference and resource preference according to mate value sociometer (which tracks condition relative to female competitors)
Short-term		(+)[2]	–	–	++	None known
	♀	++	(++)[3]	–	–	None known

Notes: ++: very important, +: important, –: unimportant, [1]: strategic pluralism possible to satisfy both the condition and the resource preference, [2]: only minimal threshold necessary, [3]: possibly a substitute for the condition preference when resources can be received immediately improved in some details and require rigorous empirical testing in the future, they are concrete and realistic specifications of the psychological adaptations that guide human mating and thus constitute important components of Mating Intelligence.

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