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From Dating to Mating and Relating: Predictors of Initial and Long-Term Outcomes of Speed-Dating in a Community Sample

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Abstract

We studied initial and long-term outcomes of speed-dating over a period of 1 year in a community sample involving 382 participants aged 18–54 years. They were followed from their initial choices of dating partners up to later mating (sexual intercourse) and relating (romantic relationship). Using Social Relations Model analyses, we examined evolutionarily informed hypotheses on both individual and dyadic effects of participants' physical characteristics, personality, education and income on their dating, mating and relating. Both men and women based their choices mainly on the dating partners' physical attractiveness, and women additionally on men's sociosexuality, openness to experience, shyness, education and income. Choosiness increased with age in men, decreased with age in women and was positively related to popularity among the other sex, but mainly for men. Partner similarity had only weak effects on dating success. The chance for mating with a speed-dating partner was 6%, and was increased by men's short-term mating interest; the chance for relating was 4%, and was increased by women's long-term mating interest.

Key words: evolutionary psychology; sexuality; social and personal relationships

INTRODUCTION

Hundreds of empirical studies have been devoted to sexual and romantic attraction, but most were methodologically limited in that they were based on self-report of preferences for attributes of hypothetical partners, dyadic interactions between undergraduates in the laboratory, indirect inferences on preferences from traits of existing couples or self-presentations in and responses to lonely hearts advertisements.

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In recent years, researchers have begun to adopt a new dating research design: In speed-dating, multiple men meet multiple women of similar age for brief encounters one after the other. This design allows researchers to separate *actor effects* (how do I behave towards others in general?) from *partner effects* (which behaviour do I evoke in others in general?) and *relationship effects* (is my behaviour towards a specific partner different from what is expected from my actor effect and the specific partner's effect?), the dyadic gist of the interaction (Kenny, 1994; Kenny, Kashy, & Cook, 2006: chap. 8). In traditional studies of dyadic interactions, where one participant is interacting with only one dating partner, these three different effects are inextricably confounded. In a speed-dating design they can be separated, and actor and partner effects can be estimated quite reliably because behaviour is averaged across many dyads. Also, speed-daters get access to a dating partner's address only in the case of *matching* (reciprocated choices, i.e. both partners choose each other for further contact), and thus the frequency of matching is a clearly interpretable measure of immediate dating success that reflects the mutual interest of both dating partners.

Although a few studies using speed-dating data have recently been published (e.g. Eastwick & Finkel, 2008; Fishman, Iyengar, Kamenica, & Simonson, 2006; Kurzban & Weeden, 2005, 2007; Luo & Zhang, 2009; Place, Todd, Penke, & Asendorpf, 2009, in press; Todd, Penke, Fasolo, & Lenton, 2007), only one study that has followed speed-dating participants over some time after the event to study the outcomes of speed-dating (Eastwick & Finkel, 2008). However, this study included only young students (mean age 20 years), as in most dating studies, and the time range was limited (only 1 month). The present study is the first one that followed a large community sample of speed-daters over a full year after the event. We used these data in order to study the impact of age and personality in a broad sense (including physical traits, education and income) on the participants' dating preferences and their short- and long-term dating success. Our analyses were based on evolutionarily informed hypotheses, particularly by the general assumption that men's and women's preferences were based on sex-typical mating strategies; therefore, we ran most analyses separately for men and women.

STRUCTURE OF THE HYPOTHESES

Our research design made it possible to distinguish *popularity* (the probability of being chosen by the opposite sex) from *choosiness* (the tendency to choose few versus many dating partners for further interaction), and to study *dyadic effects* (the reciprocity of choices within dyads as well as effects of similarities and interactions of men's and women's attributes on the frequency of reciprocated choices). Accordingly, our first three sets of hypotheses concern (1) what makes a dating partner popular (*popularity hypotheses*); (2) what makes oneself more or less discriminative in one's choices (*choosiness hypotheses*); (3) to which extent are the immediate choices reciprocated by the dating partners, and do reciprocated choices depend on similarities and interactions of men's and women's attributes (*dyadic hypotheses)*. In addition, we assessed before the speed-dating events the participants' interest in finding a partner for a short-term affair versus a long-term committed relationship in order to study the impact of short- versus long-term interest on the tendency to engage in mating (sexual intercourse) versus relating (establishing a serious romantic relationship) during the year following the speed-dating event (*short- versus long-term interest hypotheses)*.

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POPULARITY HYPOTHESES

From an evolutionary perspective, what makes an (opposite sex) dating partner popular can be generally desirable attributes such as health and good overall condition, but it also depends on (a) one's sex, (b) whether one pursues short-term versus long-term mating tactics, and (c) environmental conditions related to survival and need for biparental investment in offspring (Buss & Schmitt, 1993; Gangestad & Simpson, 2000; Penke, Todd, Lenton, & Fasolo, 2007).

Concerning generally desirable attributes that can be judged in the brief encounters of speed-dating and that predict popularity (probability of being chosen as a dating partner by the opposite sex), facial averageness and symmetry are probably the most prominent cues to health and overall condition in both men and women (Rhodes, 2006). Because these cues strongly influence the judgment of facial attractiveness (Rhodes, 2006), facial attractiveness is expected to predict the popularity of both men and women. Indeed, observer-rated facial attractiveness emerged in virtually all dating studies based on real interactions as a powerful, and often the most powerful, predictor of popularity (Feingold, 1990; Kurzban & Weeden, 2005; Luo & Zhang, 2009). Less clear is the evidence for vocal attractiveness (attractiveness of one's voice, independent of what one says) although a few studies suggest that the human voice also contains cues to health and is used as a cue for attraction (Feinberg, 2008; Hughes, Dispenza, & Gallup, 2004).

Concerning sex-typical attributes, women are expected to prefer men that are able to provide more resources for future children, implying that women in Western cultures prefer men of high education, high income and high openness to experience as a cue to socioeconomic status and intelligence, as well as high conscientiousness as an indicator of achievement motivation and occupational perseverance. Although women state such preferences in questionnaires, the evidence from dating studies involving real interactions is mixed, including speed-dating studies (Eastwick & Finkel, 2008; Kurzban & Weeden, 2005). Also, taller men have higher reproductive success than shorter men (Pawlowski, Dunbar, & Lipowicz, 2000; Mueller & Mazur, 2001) and are especially unlikely to remain childless (Nettle, 2002a), indicating that women prefer height in long-term partners. This might be because male height relates to health and resource provision ability (Magnusson, Rasmussen, & Gyllensten, 2006; Mascie-Taylor & Lasker, 2005; Silventoinen, Lahelma, & Rahkonen, 1999; Szklarska, Koziel, Bielecki, & Malina, 2007). Effects of height on mating success are much less clear in women (Nettle, 2002b; Pollet & Nettle, 2008), but a physical trait clearly preferred by men (particularly in the short-term mating context, Swami, Miller, Furnham, Penke, & Tovée, 2008) is lower body mass, which, unless extremely low, is an indicator of general health and thus ultimately fecundity (Swami & Furnham, 2007; Yilmaz, Kilic, Kanat-Pektas, Gulerman, & Mollamahmutolu, 2009).

Concerning environment-contingent attributes, it has been suggested that in addition to the health-fecundity effect, higher body mass is preferred in environments providing low resources, and lower body mass in resource-rich environments such as those usually found in current Western cultures, were it signals better health and fitness (Swami & Furnham, 2007; Swami & Tovée, 2005). Together, this suggests a preference of both men and women in current Western cultures for slimmer partners with a more marked preference by men, which has been largely confirmed by the literature (e.g. Kurzban & Weeden, 2005; Thornhill & Grammer, 1999).

Concerning personality dimensions, we expected that the trait of shyness, which cuts across the dimensions extraversion and neuroticism, is negatively related to popularity

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judgments after brief interactions because shyness hinders social interaction with strangers (Asendorpf, 1989) and the establishment of new relationships with peers (Asendorpf & Wilpers, 1998).

Another domain of attributes that both men and women prefer particularly in long-term partners is warmth and trustworthiness (Penke et al., 2007), behavioural tendencies that are related to the personality dimension of agreeableness. However, when first meeting another person, agreeableness is relatively difficult to detect (Connolly, Kavanagh, & Viswesvaran, 2007; John & Robins, 1993; Kenny & West, 2008). This should be particularly true for romantic relationships: How warm and trustworthy someone is perceived by his or her romantic partner depends on the attachment system that develops between two persons within a relationship, a process that takes at least a year (Fraley & Shaver, 2000). If this logic is correct, agreeableness should not affect popularity judgments after brief interactions typical for speed-dating studies.

In sum:

H1 Popularity hypotheses

H1a *General attributes: The participants are expected to prefer particularly facially (and perhaps also vocally) attractive dating partners, and also partners of low body mass and low in shyness. Agreeableness might not be generally preferred.*

H1b *Sex-typical attributes*: *In addition, women are expected to prefer men who are tall, open to experience, conscientious, well educated and have high income*.

CHOOSINESS HYPOTHESES

Popularity is the price people seek on the mating market, and therefore it is expected that individuals who possess attractive attributes are also choosier, given that they have more options. Or put differently, individuals with less attractive attributes should try to increase their number of matches while individuals with more attractive attributes should try to narrow down their number of matches by their active choice behaviour (Kenrick, Sadalla, Groth, & Trost, 1990; Lenton, Penke, Todd, & Fasolo, in press; Penke et al., 2007).

Interestingly, this pattern implies that the individual reciprocity of dating choices should be negative: Individuals who are frequently chosen (i.e. are popular) should not choose others very often (i.e. are choosy). In other words, because the same attributes that make people popular should also make them choosier, popularity should be positively related to choosiness. Indeed, self-rated popularity is often positively related to choosiness (Todd et al., 2007), and observer-rated popularity has also been found to be positively related to choosiness, although not always statistically significantly (Eastwick, Finkel, Mochon, & Ariely, 2007; Luo & Zhang, 2009).

The correlation between being popular and selective is also important for sex differences in choosiness. In most evolutionary accounts, women are expected to be more selective than men (Darwin, 1871) because they invest more in their children (Trivers, 1972). However, more differentiated views have pointed out that this general tendency will be moderated by the effects that women generally prefer somewhat older men, and the older men are, the more they prefer younger women (Kenrick & Keefe, 1992). Thus, women's popularity is expected to decrease with age, and a popularity–choosiness correlation would

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then imply that their choosiness also decreases with age. Most studies of attraction miss this sex-by-age interaction because they focus exclusively on younger adults or only on older adults. Our age-heterogeneous sample made it possible to study the expected changes in men's and women's choosiness. In sum:

H2 Choosiness hypotheses

H2a *Correlation between attractive attributes and choosiness: Participants who have more attractive attributes are expected to be more selective in their choice behaviour.*

H2b *Correlation between popularity and choosiness: The more often men and women are chosen, the more selective they should be in their choices of dating partners.*

H2c *Age by sex interaction: With increasing age, men's choosiness is expected to increase, while women's choosiness should decrease.*

DYADIC HYPOTHESES

Whereas the hypotheses so far answer questions at the level of individuals (actor and partner effects), speed-dating offers the opportunity to study in addition effects at the level of dyads (relationship effects). A first question concerns the *dyadic reciprocity* of choices: To what extent are men's specific relational choices reciprocated by women's specific relational choices? Dyadic reciprocity requires interaction (Kenny, 1994), and because speed-dating encounters last only for short time (3 minutes in the present study), not much reciprocity is expected to emerge. Indeed, earlier speed-dating studies have found a positive but low dyadic reciprocity for the choices at the end of the event, whereas post-event dyadic reciprocities (when participants had received feedback about the choices of their dating partners) were somewhat higher (Eastwick et al., 2007; Luo & Zhang, 2009).

The folk wisdom that similarity attracts was confirmed mainly in studies of hypothetical partners and in studies of established relationships, particularly married couples (e.g. for facial attractiveness, height, education, IQ and openness to experience; see overviews in Klohnen & Luo, 2003; Watson, Klohnen, Casillas, Simms, Haig, & Berry, 2004), and was often based on similarity scores that were confounded with individual differences. In speed-dating studies that controlled similarity scores for actor and partner effects (Eastwick & Finkel, 2008; Kurzban & Weeden, 2005; Luo & Zhang, 2009), few effects of similarity on matching were found, and there was no evidence for dissimilarity effects. Therefore, we expected, if any, positive effects of similarity on matching, particularly for attributes where similarity is usually found in established relationships, such as physical attractiveness, height and education.

In addition to these tests of similarity effects, speed-dating data make it possible to predict relationship effects from statistical interactions between the individual characteristics of men and women, e.g. do sociosexual men match particularly often with facially attractive women (more than expected by the additive effects of men's sociosexuality and women's facial attractiveness)? Because of the huge number of possible interactions (k^2 interactions for k individual characteristics), α inflation was a serious problem in this case, and therefore we did not explore such dyadic effects. In sum:

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H3 Dyadic hypotheses

H3a *Dyadic reciprocity: Choices are expected to show a low positive reciprocity at the dyadic level.*

H3b *Similarity: Matching of dating partners is expected to be more likely if they have similar individual attributes.*

SHORT- VERSUS LONG-TERM INTEREST HYPOTHESES

From an evolutionary perspective, there are good reasons for both men and women to pursue either long-term or short-term tactics, depending on context (Buss & Schmitt, 1993; Gangestad & Simpson, 2000). Speed-dating is usually meant to find a long-term partner, although some participants may have different intentions. Therefore, we expected that speed-dating participants report relatively more interest in a long-term partner than in a short-term partner.

However, while long-term mating is usually the preferred tactic for single women (at least after a period of experimental exploration during adolescence, Furman & Shaffer, 2003), this is less true for men, who generally have a stronger desire to pursue short-term mating tactics (Buss & Schmitt, 1993) which they apparently try to pursue (i.e. finding sexual affairs instead of or in addition to long-term tactics) as long as they feel they can be successful with them (i.e. are not completely rejected all the time when trying to have a sexual affair) (Penke & Denissen, 2008). Thus, post-adolescent single men should show greater short-term mating interest than women, but since some men will have experienced success with their short-term mating attempts and some won't, men should also be more variable in their short-term interests then women. Also, we expected a similarity effect at the dyadic level such that matching is more likely for men and women with similar short- or long-term mating interest.

Because we followed the speed-dating participants over the full year after the speed-dating event and most participants with matches had more than one match, we could use differences between the matches of a participant to predict with whom the participant ended up mating (having sex) or relating (developing a romantic relationship). These are strong tests because they test within-participant effects, where the influence of the participant on mating or relating is held constant. Because short-term interest predicts mating rather than relating and should vary more among men, we expected that women's mating is predicted from the short-term strategy of their male matches. Conversely, because long-term interest predicts relating rather than mating and women are generally more selective with regard to long-term partners and thus more influential than men in establishing a romantic relationship (Todd et al., 2007), we expected that men's relating is predicted from the long-term interest of their female matches. In sum:

H4 Short- versus long-term interest hypotheses

H4a *Overall tendency: Higher long-term interest than short-term interest is expected for both men and women.*

H4b *Sex difference: Whereas no sex difference is expected for long-term interest, short-term interest is expected to show a higher mean and variance in men than in women.*

H4c *Similarity: Matching of dating partners is expected to be more likely if they have similar short- or long-term interest.*

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H4d *Mating versus relating: For participants with matches, we expect that women's mating is predicted by the short-term mating preferences of their male matches, whereas men's relating is predicted by the long-term preferences by their female matches.*

METHOD

Participants

German singles were invited through email lists, links on various German webpages and advertisements in various media to participate in free speed-dating sessions. They were informed that participation included videotaping of the interactions for exclusively scientific purposes and required answering personal questions before and on the day of testing. A total of 703 German heterosexual adult singles (292 men, 411 women) completed the initial online questionnaire about demographic information, personality and relationship/sexual history.

From this sample, participants were invited for a speed-dating session with similar numbers of men and women of about the same age. A total of 17 sessions were scheduled within 5 months, including 190 men and 192 women aged 18–54 years ($M = 32.8$, $SD = 7.4$); 12 sessions included only women not using hormonal contraceptives, and five sessions only women using such contraceptives in order to avoid within-session effects of women's contraceptive usage (Gangestad, Thornhill, & Garver-Apgar, 2005). On average, men were 1.6 years older than women, $t(380) = 2.16$, $p < .05$, $d = .22$). The sessions included 17–27 participants ($M = 22.7$, $SD = 2.4$); mean age within a session varied from 24.0 to 45.0 years, with a mean within-session age range of +/− 4.8 years, and the mean age difference between men and women within a session tended to increase with increasing mean age, $r = .19$, *ns*. Thus, the age composition of the sessions reflected the expected age preferences. In terms of education, the sample was biased towards higher educational level with little variance in secondary education (92.2% had finished high school with *Abitur* or *Fachabitur*) but substantial variance in university degrees (41% reported one). All were currently single, but 14.9% had been married before, and 16.5% had at least one child; 6.3% were sexually inexperienced. Prior speed-dating experience was indicated by 12.3%. We would like to emphasize that these were all real singles whose sole motivation to participate in the study was the chance to find a real-life romantic or sexual partner. In this, the current study differs from other lab-based speed-dating studies, where participants were students that received course credit in addition to the opportunity to find a partner.

Speed-dating procedure

All sessions took place on a Saturday or Sunday from 3 pm to approximately 7 pm. Men and women entered the speed-dating location in a large building of Humboldt University from different streets and were guided to separate waiting rooms, minimizing the chance that they met before the speed-dating interactions. Upon arrival, participants received a tag with a unique number, a scorecard and a pre-event questionnaire that they answered while in the waiting room. Pre-event testing included brief video and audio samples and the measurement of height and weight; it took place in separate rooms for males and females and was conducted by a same-sex experimenter. The actual 'dates' took place in booths equipped with two opposing chairs. Women were asked to take a seat in their booths before

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the men entered the scene. They sat with the back to the booth entrance such that they were hardly visible from outside. Women stayed in their booth until they had interacted with all male participants. This ensured that each man saw each woman for the first time when he entered her booth. Men and women had tags with a unique identity number. Similar to conventional speed-datings, men rotated through the booths until they had dated every female participant. Each interaction period lasted 3 minutes, as indicated by a bell rung at the end of the interaction. After the men had left the booths, but before they entered the next, both men and women recorded their choices of the current 'date' on a scorecard. When everybody was finished, the experimenter rung the bell again to ensure that all men entered their next booth simultaneously.

At the end of all interactions, the participants had a chance to revise their choices on the basis of their information on all potential mates. After all speed dating interactions were completed, the experimenters collected the scorecards, and males and females were separated again for a post-event assessment. Thereafter, they were informed about the follow-up studies, were asked for permission to analyse the video and audio samples for scientific purposes (all agreed), thanked, and released. Within the next 24 hours, the participants' choices were processed, matching choices were calculated, and those who had indicated mutual interest instantly received each other's contact details via email.

Follow-ups

Six weeks and 12 months after a speed-dating session, all participants were invited by email to answer a brief online questionnaire about their sexual and relationship history. For participation in the 12-months follow-up, they received a voucher for a cinema ticket worth 5 Euros. Of the 382 participants, 94.8% participated in the follow-up after 6 weeks and 85.9% in the follow-up after 12 months.

Measures

Pre-event online questionnaire

The online questionnaire assessed demographic details, health status, stable personality traits and relationship and sexual history including questions about women's contraception usage and menstrual cycle. The current analyses refer to the following variables: age (years), education (a scale from 1 = no school grade to 9 = PhD), monthly income (€), sociosexuality as measured by the nine-item revised Sociosexual Orientation Inventory (men $\alpha = .84$, women $\alpha = .83$) (SOI-R; Penke & Asendorpf, 2008; Penke, in press), the dimensions of the Five Factor Model (FFM) of personality neuroticism (men $\alpha = .86$, women $\alpha = .83$), extraversion (men $\alpha = .79$, women $\alpha = .74$), openness to experience (men $\alpha = .71$, women $\alpha = .65$), agreeableness (men $\alpha = .75$, women $\alpha = .74$) and conscientiousness (men $\alpha = .83$, women $\alpha = .81$) (German NEO-FFI; Borkenau & Ostendorf, 1993; 12 items per dimension), shyness as measured by a five-item shyness scale (men $\alpha = .85$, women $\alpha = .81$) (Asendorpf & Wilpers, 1998), and one-item ratings on seven-point scales (1 = currently not searching, 7 = currently strongly searching) of the extent to which the participants were currently seeking a long-term mating partner ('To what extent are you currently looking for a stable partner for a long-term relationship?') and a short-term mating partner ('To what extent are you currently looking for somebody for a short sexual affair or a one-night stand?') (Buss & Schmitt, 1993).

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Pre-event assessment
During the pre-event assessment, participants were recorded with a camcorder while standing upright in front of a neutral white background and under standardized lightning conditions in order to allow the extraction of various standardized facial and whole-body photographs from the videotapes. In addition, standardized vocal samples (counting aloud from 1 to 10) were recorded, and body height (m) and weight (kg, dressed but without shoes) were measured, from which the body mass index (BMI, kg/m^2) was calculated.

Immediate dating outcome
Directly after each interaction with a dating partner, each participant recorded on a scorecard whether they wanted to see this person again (yes/no). The scorecards contained the identity numbers of the dates in the exact order of encounter, to avoid assignment errors of the ratings. An additional column allowed participants to change their rating at the end of all dating interactions; this final choice served as the dating outcome variable at the time of the event.

Follow-up 1
During the first online follow-up 6 weeks after the speed-dating event, participants were asked about any contacts with speed-dating partners. This was guided by a list of all participants with whom they had matches. For each participant with whom contact was indicated, they were asked (1) how often it came to (a) written (email, SMS etc.), (b) phone or (c) face-to-face contact, (2) if they thought a romantic relationship was about to develop and (3) whether sexual intercourse had occurred. Because the reported frequencies were low, we reduced all outcome variables to dichotomous variables (contact yes/no).

Follow-up 2
The second online follow-up 1 year after the speed-dating event repeated the questions (2) and (3) of the follow-up 1 assessment. The current analyses refer to the two dichotomous variables that can be directly compared to the earlier follow-up, development of a relationship and occurrence of sexual intercourse.

Facial attractiveness ratings
Video capturing software was used to choose the one frame with the most frontal and neutral recording of each participant's face and to convert it to a digital picture. Size was standardized to identical interpupilar distance. Because attractiveness impressions may vary with age of the perceiver, younger participants (those from the seven sessions with the lowest mean age, age $M = 25.8$, $SD = 2.7$) were judged by 15 heterosexual opposite-sex undergraduates who received course credit (age $M = 21.7$, $SD = 3.8$), and the remaining older participants (age $M = 37.6$, $SD = 5.5$) by 15 heterosexual opposite-sex older raters from the general population (age $M = 45.4$, $SD = 9.4$). Thus, a total of 60 raters were involved. All raters judged the attractiveness of each picture on a scale from 1 (not attractive at all) to 7 (very attractive). Interrater reliabilities were good for both men rating female participants (younger: $\alpha = .89$, older: $\alpha = .91$) and women rating male participants (younger: $\alpha = .89$, older: $\alpha = .88$) such that the ratings could be aggregated across the raters.

Vocal attractiveness ratings
The standard vocal samples were judged for attractiveness on the same scale that was used for facial attractiveness. Male samples were rated by 28 heterosexual female

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undergraduates ($\alpha = .92$), female samples were rated by 22 heterosexual male undergraduates ($\alpha = .90$); all raters received course credit. Because interrater agreement was good, the ratings were aggregated across the raters.

RESULTS

Overview

First, we explain our strategy for data analysis, which is complex because of (1) the mutual dependency of the data within the speed-dating sessions and because of the systematic age differences between the sessions, and (2) the mutual dependency of the long-term outcome data for participants with multiple matches. We solve problem (1) by applying the Social Relation Model (SRM; Kenny, 1994; Kenny & La Voie, 1984) to each session, and by analysing the resulting SRM parameters with multi-level analyses with individuals at level 1 and sessions at level 2. We solve problem (2) by multi-level analyses with individuals' matches at level 1 and individuals with matches at level 2. After presenting the overall outcome of the SRM analyses in terms of variance partitioning and reciprocity correlations, and the overall immediate and long-term outcomes of speed-dating, we present the results in the order of the hypotheses.

Analysis strategy

Speed-dating offers the possibility to decompose each observed score x_{ij} during speed-dating for a target individual i and an interaction partner j (short- and long-term interest in j, final choice of j, match of the choices of i and j) into three components according to a half-block design of the Social Relations Model (Kenny et al., 2006, chap. 8): The *actor effect* of individual i (mean of x_{ij} across all j; e.g. average short-term interest of i across all interactions), the *partner effect* of the interaction partner j (mean of x_{ij} across all i; e.g. average short-term interest evoked in interaction partners across all interactions of j) and the *relationship effect* of i with j (x_{ij}—actor effect of i—partner effect of j; e.g. the degree to which i reported short-term interest in j more or less than expected by the general short-term interest of i and the general tendency of j to evoke short-term interest). Our design of approximately 22 participants within each of 17 groups provides estimates of SRM effects with sufficient statistical power (see Kenny et al., 2006, Table 8 .8).

Actor and partner effects are scores at the *individual level*, whereas relationship effects are scores at the *dyadic level* and include measurement error unless it is controlled by repeated assessments. Based on this decomposition, two kinds of reciprocity can be computed: *individual reciprocity* (correlation between actor and partner effects of the same individual; e.g. does a person that chooses many dating partners (low choosiness) is also often chosen by them (high popularity)? and *dyadic reciprocity* (correlation of the relationship effects of i with j with the relationship effects of j with i; e.g. if i specifically chooses j, is also j specifically choosing i?).

The actor and partner effects characterize individuals and can be predicted by other individual attributes (including physical attractiveness, education, income, personality). The relationship effects characterize dyads and can be predicted by other dyadic attributes such as the similarity of the members of a dyad in an individual characteristic, or by statistical interactions between individual attributes of the two dyad members.

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Most studies using the SRM approach assume that the interacting groups are random samples from the same population (e.g. college students), and therefore control for group differences by centering actor and partner effects within each group; relationship effects are centred by definition anyway. In the current study, however, the groups were speed-dating sessions that strongly varied in the mean age of the participants of a session, and also somewhat in the number of participants of a session (session size). Therefore, we used uncentred actor and partner effects and analysed cross-session differences in these uncentred effects within a multi-level approach, using HLM 6.0.3 (Raudenbush, Bryk, & Congdon, 2005). The SRM actor and partner effects were predicted by individual attributes (level 1), and the regression coefficients at level 1 were predicted by mean age in session, session size and women's contraceptive usage (level 2). Because session size and contraceptive usage did not show any significant effects, we report here only analyses with mean age in session as the level 2 predictor.[1]

It was important to include only few predictors in the multi-level models because the degrees of freedom for the statistical tests were limited by the number of level 2 units (17 groups).[2] Therefore, we first explored significant effects for single predictors at level 1, with mean age in session as the level 2 predictor. Level 1 predictors that showed a significant main effect or a significant cross-level interaction with age were then pairwise entered into new analyses until a maximum set of predictors at level 1 remained where each predictor showed a significant unique contribution in terms of a main effect or a cross-level interaction with age. This analysis strategy minimized problems of unstable results due to insufficient degrees of freedom or suppressor effects.

The individual reports obtained during the two follow-ups refer only to properties of matching dyads, with matched opposite-sex participants nested within individuals. Therefore, the long-term outcome data were analysed only for participants with matches by a multi-level analysis with data on the matches at level 1 and participants at level 2, using age as a level 2 variable. We ignored the nesting of participants within sessions for these analyses because the resulting 3-level analyses would require the estimation of too many parameters. Because all outcomes were dichotomous, logistic multi-level analyses were used (HLM Bernoulli option with robust standard errors).[3]

Hypotheses were tested by one-tailed statistical tests; all other tests are two-tailed.

[1]When the number of males and the number of females in a session were treated as separate level 2 predictors no significant level 2 effects were revealed either. Age differences within a session (age centered within session as a level 1 predictor) did not show any significant effect, which can be readily attributed to the low age variance within sessions. We also ran all analyses with age grand-centred at level 1 and no level 2 predictor (this age variable confounds effects of age within sessions and age between sessions). The results were highly similar to those found for age as a level 2 predictor. We prefer to report the results for age as a level 2 predictor because these results capture most of the age effects and can be more clearly interpreted.

[2]Compared to typical applications of multi-level analyses in social psychology, the number of sessions (level 2 units) was rather small but the number of individuals within sessions (level 1 units) was rather large, providing more reliable estimates of regression coefficients within level 2 units. On balance, application of multi-level analyses seems appropriate (Richard Gonzalez, personal communication, October 2008). Nevertheless, we also analysed the data ignoring the nested data structure by ordinary multiple regression analyses based on all 382 individuals or all (fe)males in the sexwise analyses, taking advantage of stepwise regression techniques. The results were quite consistent with those reported here. We prefer to report the results for the multi-level analyses because they are conceptually superior.

[3]The regression coefficients in these analyses refer to log-odds ratios logOR and changes in log-odds ratios $\text{logOR}_{\text{change}}$; for the ease of interpretation, they were transformed into probabilities p and changes in probabilities p_{change} by using the transformations $p = 1/(1 + e^{-\text{logOR}})$, $p_{\text{change}} = 1/(1 + e^{-(\text{logOR}+log\text{ORchange})})$—$p$ (see Raudenbush et al., 2005).

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SRM analyses of dating

The SRM effects were computed according to the formulas provided by Kenny et al. (2006: chap. 8), but using uncentred actor and partner effects (see analysis strategy). The variance components and reciprocity correlations resulting from these SRM analyses are shown in Table 1. Relationship effects could not be separated from measurement error because multiple assessments were not available.

The relative amount of actor variances tended to be higher for males than for females. Thus, differences in choosiness and achieved matches were more pronounced in men than in women, which may be attributed to their higher variance in short-term mating interest (see Hypothesis 4b). The relationship plus error variance was always the largest share, as in nearly all SRM studies, which can be attributed to specifically relational dating preferences as well as the larger measurement error of the disaggregated dyadic effects as compared to the aggregated individual effects. The individual reciprocities were negative for both men and women, as expected in Hypothesis 2a. That is, there was a tendency that the more popular participants were more selective; however, this tendency was only significant for men. Fully confirmed was Hypothesis 3a, which expected a low positive dyadic reciprocity for choices. Thus, the more a participant was particularly attracted to a dating partner, the more the dating partner was also attracted to the participant (controlling for the participant's actor effect and the dating partner's partner effect). The reciprocity correlation was low, but highly significant due to the large number of dyads ($N = 2160$). The matches showed perfect reciprocities because the actor and partner effects of a participant are identical for matches.

Outcomes

The 382 participants were chosen on average by 3.92 speed-dating partners (range 0–13) and achieved on average 1.28 matches (reciprocated choices) (range 0–8); 116 men and 116 women (60.7%) achieved at least one match. Another way of looking at these immediate dating outcomes is to compute the individual probability of being chosen by one of the dating partners in one's session, and the probability of achieving a match with one of these partners. These probabilities were on average 34.7% and 11.5%; for participants with matches, they were somewhat higher (see Table 2).

The long-term outcome of speed-dating was assessed in two follow-up assessments (6 weeks after the session, T1, and 1 year after the session, T2). Of the 232 participants with

Table 1. Variance partitioning and reciprocity correlations for choices and matches

	Choices		Matches	
Parameter	Men	Women	Men	Women
Actor variance	13%	9%	11%	7%
Partner variance	17%	19%	7%	11%
Relationship + error variance	70%	72%	82%	82%
Individual reciprocity	$-.24^{**}$	$-.08$	1.00	1.00
Dyadic reciprocity	$.06^{**}$		1.00	

Note. $N = 2160$ dyads in 17 sessions.
$^{**}p < .01$.

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Table 2. Between-partner agreement and probabilities of the speed-dating outcomes

Outcome	Agreement κ	Probability (%) for speed-daters		
		With matches, for		All daters
		Each match	Overall	Overall
Being chosen by a dating partner[†]	—	—	43.4	34.7
Match with a dating partner[†]	—	—	18.9	11.5
Any contact (T1)	.70	68.4	143.6	87.2
written	.54	59.9	125.8	76.4
phone	.79	41.2	86.5	52.5
face-to-face	.94	38.6	81.1	49.2
Sexual intercourse (T1)	.79	3.4	7.1	4.3
Relationship is developing (T1)	.59	5.2	10.9	6.6
Sexual intercourse (T2)	.88	4.7	9.6	5.8
Relationship had developed (T2)	.55	3.5	7.2	4.4

Note. Reported are within-dyad agreements (Cohen's κ) and estimated probability of outcomes for the 232 participants who achieved at least 1 match and all 382 participants.
[†]Frequency of being chosen or reciprocated choices divided by number of one's dating partners.

matches, 221 (95.3%) were reassessed at T1 and 205 (88.4%) at T2; thus, sample attrition was low. *t*-tests comparing the drop-outs with the continuing participants did not reveal any significant difference between these two groups in the individual attributes assessed before the speed-dating, neither for T1 nor for T2. The speed-dating outcomes also did not show any significant differences, with one exception: The drop-outs at T2 had more matches (24% of their speed-dating partners) than the participants continuing participation until T2 (18%; $t(230) = 2.21$, $p < .05$, $d = 0.29$). Thus, the T2 data may slightly underestimate the incidence of romantic relationships and sexual intercourse.

Data for the various outcomes after the speed-dating session at T1 and T2 are presented in Table 2. They are presented in terms of the probability of occurrence, both for all 382 speed-dating participants and for the 232 participants who achieved at least one match. For the latter participants, the occurrences are reported both for each match and overall (at T1, the participants reported on average 2.10 matches; at T2, they reported on average 2.05 matches). For example, the probability of meeting a speed-dating participant face-to-face after the day of the speed-dating was 38.6% for each match, thus $38.6\% \times 2.10 = 81.1\%$ overall, and because only 60.7% of the speed-dating participants achieved a match, this probability reduced to an average of $81.1\% \times 0.607 = 49.2\%$ for each speed-dating participant.

As Table 2 indicates, the probabilities for the various kinds of contact strongly decreased with increasing intensity of contact, from 87.2% for any contact to 49.2% for face-to-face contact, 6.6% for a developing romantic relationship 6 weeks after speed-dating, 5.8% for sexual intercourse at any time in the year following speed-dating, and 4.4% for reports of romantic relationships 1 year after speed-dating (which is a somewhat stronger requirement than the earlier judgement of a developing relationship).

Within-dyad agreement in the outcomes could be evaluated for the matching dyads by comparing men's and women's reports. As Table 2 indicates, agreement was high for face-to-face contact, contact by phone and sexual intercourse; these figures show that the participants reliably answered the follow-up questions. In contrast, the agreement was

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much lower for contact in written form (e.g. e-mails) and for romantic relationships. It seems that the participants did not remember written contacts very well and that they used somewhat different criteria for calling a relationship romantic.

Sex and age differences in the occurrence of the various types of contact were evaluated by multi-level analyses, with the matches of a speed-dating participant nested within this participant, treating sex and age as level 2 variables. Because the outcomes were dichotomous, we used logistic regressions (Bernoulli option in HLM with robust standard errors) and estimated probabilities p and changes in probabilities p_{change} (see section on analysis strategy). All sex and all sex by age effects were not significant, which is not surprising because sex differences could arise only by a sex difference in biased reporting. Two of the eight age effects were significant. Overall contact ($p_{change} = .007$, $p < .05$) and written contact ($p_{change} = .008$, $p < .05$) increased with age, such that an increase in 1 year of age corresponded to an increase of 0.7% in overall contact and of 0.8% in written contact. It seems that older participants tended to approach the matches in written form before interacting by phone or face-to-face.

Popularity hypotheses

Popularity as a dating partner was captured by the frequency of being chosen by one's dating partners (i.e. the partner effect for choices). On average, male participants were chosen by 3.6 females (32% of their 11.2 dating partners), female participants were chosen by 4.1 males (37% of their dating partners). Individual differences in popularity were predicted separately for males and females by 13 individual-level variables: physical attractiveness (facial and vocal attractiveness, height and body mass index BMI); education and income; and personality (sociosexuality, shyness and the FFM dimensions). These 13 predictors showed low within-sex correlations ($|r| < .34$), except for medium-sized correlations between some of the personality scales.[4] To facilitate the comparison of the results across the predictors with their heterogeneous scales, all predictors and outcomes were standardized within sex with $M = 0$ and $SD = 1$ such that $\beta = 1$ indicates that 1 *SD* increase in the predictor leads to 1 *SD* increase in the outcome.

The significant predictors of popularity are presented in Table 3. Age by predictor interactions were tested but failed to reach significance in every case; thus, the predictions were invariant across age, and Table 3 presents the results for multi-level models without predictor at level 2. As described in the analysis strategy section, each predictor was first tested for significance. Significant effects were subsequently combined in a final set of predictors where each predictor showed a significant unique contribution in terms of a main effect. Because the βs in these multiple regressions did not differ much from the βs of the single predictions, they are not reported here.

As expected by Hypothesis 1a, men and women who were judged (by independent raters) as facially or vocally attractive, or who were slim according to their objectively measured BMI, were chosen more often by their dating partners. The expected negative effect of shyness was also confirmed but reached significance only for men. As expected by Hypothesis 1a, agreeableness had no effect on being chosen by either sex. Hypothesis 1b was also partly confirmed, in that men who were tall, open to experience, well educated, or

[4]Height and BMI were used either as raw scores or as the absolute deviation from the sex-typical mean in the sample; because the effects for the raw scores tended to be stronger, results for the deviation scores are not reported here.

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Table 3. Significant predictors of choices and matches by sex

	Choices				Matches	
	Actor effect		Partner effect		Effects	
Predictor	Men	Women	Men	Women	Men	Women
Facial attractiveness	−.17*	−.12	**.49*****	**.52*****	**.31*****	**.25****
Vocal attractiveness	−.05	−.12	**.33*****	.19*	.20*	.03
Body mass index	.11	**.24****	−.13*	−.18*	−.10	.02
Height	−.08	−.02	**.17***	.05	.04	−.04
Years of education	−**.22****	−.02	.16*	.08	.02	−.03
Income	−.13	.02	.13*	−.03	−.02	.02
Sociosexuality	.03	.01	**.24****	.10	**.23****	.09
Shyness	.08	**.15****	−.15*	−.08	.08	.08
Openness	−.03	−.04	.20*	.05	.14	.00

Note. 190 men, 192 women, 17 sessions. All variables were standardized within sex. Reported are βs in multi-level predictions with the predictor at level 1 and no predictor at level 2. Predictors in boldface were retained in the final set of predictors with significant unique variance.
*$p < .05$; **$p < .01$; ***$p < .001$.

had high income (all potential indicators of resource providing ability) were chosen more often by their female dating partners. However, contrary to Hypothesis 1b, conscientiousness (an indicator of steady resource striving) had no effect on male popularity. Instead, men's sociosexuality was attractive to women and showed incremental validity over and above men's physical attractiveness (see Table 3). Finally, the broad FFM dimensions of extraversion and neuroticism did not significantly predict popularity. Thus, the choices of both men and women were most strongly predicted by their dating partner's facial attractiveness, females based their choices on more criteria than men did, and personality effects were found only for openness to experience, sociosexuality and shyness.

Choosiness hypotheses

Choosiness was captured by a low frequency of selecting dating partners (i.e. the negative actor effect for choices). As expected, many of the attributes that made individuals attractive were negatively related to the frequency of choices (see Table 3), and thus positively related to choosiness (Hypothesis 2a). Another way of looking at this pattern of results is to correlate the columns in Table 3 for the actor and partner effects separately for men and women. For example, the nine predictions of men's actor effect are correlated with the nine predictions of men's partner effect. These correlations were highly negative (for men, $r = -.65$, for women, $r = -.82$; because each relied only on nine data points, tests for significance made no sense in this case). These high negative correlations suggest that individual characteristics that made participants attractive for the opposite sex (high partner effect) made them also choosy (low actor effect). Consequently, popularity and choosiness were positively related (Hypothesis 2b) as shown by a negative individual reciprocity correlation between the frequency of choices received and choices made (see Table 1). This, however, reached statistical significance only in men.

The most important individual outcome variable for the further course of mating, the frequency of matches (reciprocated choices), was predicted for women equally well by

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their own choices and the choices of men (in both cases, $\beta = .57$, $p < .001$), whereas men's matches relied more on women's choices ($\beta = .71$, $p < .001$) than on men's own choices ($\beta = .52$, $p < .001$; $\chi^2(\mathrm{df} = 1,\ n = 17) = 4.37$, $p < .05$, for the difference; all variables standardized with $M = 0$ and $SD = 1$). The negative individual reciprocity for men's choices (see Table 1) contributed to this significant sex difference in the contribution of actor and partner effects.

Because the same predictor had opposite or at least different effects on the actor and partner effects that contributed positively to the matches, it is not surprising that the matches were less strongly predictable than the received choices (see Table 3). For men, only facial and vocal attractiveness and sociosexuality increased the frequency of matches, for women only facial attractiveness, and the predictions tended to be weaker for matches than for received choices in all four cases (see Table 3).

Concerning sex and age differences, men chose on average 4.1 women (37% of their 11.2 dating partners), whereas women chose on average 3.6 men (32% of their dating partners). By definition, these figures mirror those for popularity (see above). As expected by Hypothesis 2c, a significant sex by age interaction ($b = -0.015$, $p = .01$) was found. As Figure 1 shows, men's choosiness increased and women's choosiness decreased with increasing age. Interestingly, no main effects of age or sex on choosiness were found: The sex difference in choosiness was not significant ($b = -0.05$, *ns*), nor was the age difference (with age as a level 2 predictor, $b = -0.011$, *ns*).

Dyadic hypotheses

Whereas the preceding hypotheses refer to the level of individuals, the dyadic hypotheses refer to the dyadic level. The SRM relationship effects for choices assess the degree to which a participant tends to choose a speed-dating partner more or less often than one would expect on the basis of the participant's actor effect and the partner's partner effect. Thus, each of the 2160 dyads was characterized by one relationship effect for the man and one for the woman. As already described in the section on the SRM results, Hypothesis 3a of a positive but low dyadic reciprocity was confirmed (see Table 1). Therefore, participants achieved fewer matches than they received choices (see Table 2). The fewer and less variable matches, in turn, limited the predictability of the individual dating success in terms of the frequency of achieved matches (see Table 3), further confirming Hypothesis 3a.

In order to test Hypothesis 3b that similarity in individual attributes (rather than dissimilarity) increased the probability of matching, we computed absolute differences

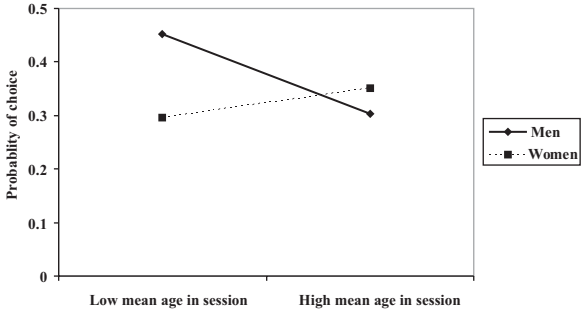

Figure 1. Sex by age interaction in partner choice.

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between all within-sex standardized ($M = 0, SD = 1$) predictors of the individual effects for each dyad and regressed, for each predictor, the relationship effects for matching on these dissimilarity scores as well as on men's and women's individual scores across the 2160 dyads, using multi-level regressions. Statistically controlling for the individual predictors was necessary because the dissimilarity scores can be confounded with individual effects (see also Luo & Zhang, 2009). Age effects were studied as before in terms of mean age in session (level 2 variable), but were non-significant in all cases. Only one significant effect of similarity on matching was found in the 12 analyses: The more similar men and women were in their facial attractiveness, the higher was the relationship effect for matching for such a dyad ($\beta = -0.044$, $p < .03$). Thus, Hypothesis 3b was confirmed, but only for similarity in one individual characteristic, which is facial attractiveness.

Short- versus long-term interest hypotheses

Effects of age and sex on participants' reports of short- versus long-term interest before the speed-dating events were analysed in a mixed analysis of covariance, with sex as a between-participant factor, mating interest as a within-participant factor, and age in session as a covariate. Because the age and the age-by-interest interactions were not significant, age was dropped for the final model. All three effects were significant ($F > 6.72, p < .01$, in each case). Confirming hypothesis H4a, the participants reported more long-term interest ($M = 5.12$, $SD = 1.84$) than short-term interest ($M = 2.85$, $SD = 1.45$), $t(381) = 18.99$, $p < .001$, $d = 1.37$ (Cohen's effect size of the difference for paired-samples t-test). Confirming hypothesis H4b, the sex by interest interaction was due to the fact that men reported more short-term interest than women (for men, $M = 3.21$, $SD = 1.90$; for women, $M = 2.50$, $SD = 1.72$), $t(380) = 3.81$, $p < .001$, $d = 0.39$, and this effect was due to a higher variance of short-term interest in men than in women (for Levene's test, $F(1380) = 7.15$, $p < .005$). In contrast, men and women did not differ in their long-term interest (for men, $M = 5.06$, $SD = 1.48$; for women, $M = 5.18$, $SD = 1.42$), $t < 1$ for difference in mean, $F < 1$ for difference in variance.

We tested Hypothesis 4c (compatibility of men's and women's mating tactics) by computing dissimilarity scores separately for short-term and long-term mating interest, just as in the tests of Hypothesis 3b. No significant (dis)similarity effects on matching were found.

Hypothesis 4d, predicting that short-term mating interest facilitates mating and long-term mating interest facilitates relating after the speed-dating sessions, requires that mating and relating were not overlapping completely. Indeed, a cross-classification of mating and relating showed only moderate agreement (Cohen's κ was .54 at T1 and .53 at T2). Therefore, we could test Hypothesis 4d by multi-level models with matches' short- and long-term interest entered as simultaneous predictors at level 1, and age in session and sex as predictors at level 2. This person-centred approach is informative about attributes of matches that increase or decrease the probability of long-term outcomes with them, and the cross-level interactions test for moderating influences of sex and age on these predictive relations at level 1. Because age did not show any significant effects, it was dropped in the final models.

Significant cross-level effects were found in 6 of the 8 cases. Therefore, the effects of short- and long-term interest on mating and relating are reported separately for men and women. As Table 4 indicates, Hypothesis 4d was fully confirmed. Women had a preference for having sex with men who pursued more a short-term mating tactics but did not tend to

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Table 4. Prediction of mating and relating by matches' attributes

Characteristic of matches	After 6 weeks		After 1 year	
	Sexual intercourse	Romantic relationship	Sexual intercourse	Romantic relationship
Short-term interest				
of males	.019*	−.003	.018*	−.012
of females	.007	.012	.010	.013
Long-term interest				
of males	.008	−.012	.013	−.007
of females	.000	.016*	.002	.024**

Note. Reported are predicted changes in probabilities for mating and relating with matches as estimated by logistic multi-level multiple regressions (HLM Bernoulli option) for standardized predictors ($M = 0$, $SD = 1$) at T1 ($n = 221$) and T2 ($n = 205$). Short- and long-term interest were tested simultaneously.
*$p < .05$; **$p < .01$; ***$p < .001$.

develop a romantic relationship with them, whereas the long-term interest of men did not influence women's mating or relating. Conversely, men had a preference for relating with women who pursued more a long-term mating tactics but did not tend to have sex with them, whereas the short-term interest of women did not influence men's mating or relating. This pattern was identical for T1 and T2.

It should be noted that these effects were within-participant effects and were thus controlling for all individual attributes of the participant, providing stronger tests than between-participant analyses at the individual level. This seems to be the reason why it was possible at all to significantly predict variations in the small probabilities for mating and relating.

DISCUSSION

We studied short- and long-term outcomes of speed-dating in a large, age-heterogeneous community sample, predicting participants' dating success by their own and their dating partner's personality characteristics, and the mating and relating of successful daters over the year following the speed-dating event by their short- versus long-term mating interest. Our analyses were based on numerous evolutionarily informed hypotheses. Most of these hypotheses were confirmed and were consistent with earlier dating studies, lending further support to evolutionary accounts of human dating, mating and relating. First, we discuss the findings in the order of the hypotheses. Second, we highlight strengths and weaknesses of the speed-dating paradigm for research on sexual and romantic attraction. Third, we discuss practical implications for speed-dating as a means for finding a short- versus a long-term partner. Finally, we offer suggestions for future research using a speed-dating paradigm.

Popularity

The key finding for popularity was that both men and women's popularity was largely based on easily perceivable physical attributes such as facial and vocal attractiveness,

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height and weight. This was already the full story for women's popularity in speed-dating, that is, men used only physical cues for their choices. In contrast, women included more criteria, namely men's sociosexuality and shyness as well as cues for current or future resource providing potential, such as education, income, and openness to experience (but not cues of steady resource striving like conscientiousness). Interestingly, there is evidence that all these attribute can be accurately judged in short periods of time (Asendorpf, 1989; Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004; Boothroyd, Jones, Burt, DeBruine, & Perrett, 2008; Gangestad, Simpson, DiGeronimo, & Biek, 1992; Kraus & Keltner, 2009). However, only sociosexuality added incremental predictive power over and above physical attributes in the current study.

Unexpected was that sociosexuality emerged as a relative powerful predictor of men's popularity to women, particularly because women largely expressed a long-term mating interest. A possible explanation is that that male sociosexuality indicates a history of successful mating experience or mating skills that are attractive to women. Similarly, shyness showed the expected negative effect on popularity only for men, which might be explained by the traditional male sex role, which requires them to behave more active and proceptive in initial encounters with potential mates and is likely particularly difficult for shy men.

The broad personality dimensions extraversion, neuroticism, agreeableness and conscientiousness showed no influence on participants' popularity. This was inconsistent with the findings of Luo and Zhang (2009) for a student sample who reported rather high correlations with these traits for women (but not men). Future studies are needed for deciding whether the personality effects reported by Luo and Zhang (2009) were chance findings due to their relative small sample of only 54 women and the heterogeneity of the correlations across speed-dating groups, or whether broad personality effects on popularity characterize only more homogeneous student populations.

In our study, the personality dimensions sociosexuality and shyness, which are specifically related to mating and social interactions with strangers, had more predictive power than the FFM dimensions of extraversion and neuroticism with which sociosexuality and shyness correlate: Sociosexuality with high extraversion (Schmitt & Shackelford, 2008), and shyness with low extraversion and high neuroticism (e.g. Asendorpf & Wilpers, 1998). This finding relates to the bandwidth-fidelity trade-off in behavioural predictions from personality (Cronbach & Gleser, 1965; Ones and Visweswaran, 1996; Paunonen, 2003), that is, narrower traits that are tailored to specific situational contexts and behaviours often outperform broader traits in predictive power, whereas broader traits often outperform narrower traits if the goal is to predict many different behaviours in many different contexts.

Choosiness

Our data confirmed the expected positive correlation between choosiness and popularity (negative individual reciprocity in the terminology of the SRM), but significantly only for men. Luo and Zhang (2009) also found positive, though non-significant correlations for both men and women, possibly due to their small sample. Eastwick et al. (2007) reported negative individual reciprocities for ratings of romantic interest and 'good chemistry'. Together with our finding that the predictions of actor and partner effects by individual attributes were mostly opposite in sign (see Table 3), we conclude that there is evidence for a positive correlation between choosiness and popularity. This is in line with mating market

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models, where highly popular people are predicted to be more careful in their choices and unpopular people are predicted to be more indiscriminative (Penke et al., 2007).

Strong evidence was found for the predicted interaction between age and sex for choosiness: The higher choosiness of women that is ubiquitous in studies of young adults decreased and even tended to reverse for older women. This is an important finding, because evolutionary accounts often assume a generally higher choosiness of the sex that invests more in offspring (females in most species; Trivers, 1972). It is interesting that Trivers's parental investment model is based on a reproductive argument that does not apply to women that have reached menopause. Our expectation was based on context-dependent mating strategies (Gangestad & Simpson, 2000), and our results confirm that life history phases (e.g. reproductive vs. post-reproductive) provide an important context that affects human mating behaviour. However, studies of dating in older adults are scarce, so our finding awaits replication.

Short-term versus long-term mating tactics

Evolutionary theories predict that single women should generally pursue more long-term mating tactics (with certain exceptions), whereas men are more variable in pursuing long-term and short-term tactics (Buss & Schmitt, 1993; Gangestad & Simpson, 2000; Penke & Denissen, 2008). This hypothesis was strongly confirmed by participants' self-rated interests before the speed-dating event.

Despite this expected sex difference, we also found clear evidence that speed-dating is a context dominated by long-term mating interest for both men and women. Due to their higher variability in short-term interest, men reported higher on average interest in short-term mating than women, but still much lower short-term interest than long-term interest, and their overall preference for long-term mating was not moderated by age. Thus, speed-dating is a social context that attracts mainly people pursuing long-term tactics, even at younger age.

Dyadic effects

We confirmed earlier findings by Eastwick et al. (2007) and Luo and Zhang (2009) of a positive but low dyadic reciprocity of choice. A particular preference for a dating partner, controlling for one's choosiness and the partner's popularity, tends to be reciprocated by this dating partner. Such reciprocal preferences require interaction to develop. It seems that the 3 minutes of interaction in our design were sufficient to build up such reciprocity in liking. However, the reciprocity was not high compared to figures such as .45 after participants having already received feedback about the choices of the dating partners (Luo & Zhang, 2009), or .61 for long-term acquaintances (Kenny, 1994: p. 102). The rather low dyadic reciprocity implied that participants' matches were much rarer than their choices, which, in turn, limited the variability of dating success and its predictability by individual characteristics (see Table 3).

Also confirmed was our expectation that similarity of the dating partners facilitates reciprocated choices. However, after controlling for individual effects the similarity effect was only significant for facial attractiveness. Kurzban and Weeden (2005) found similarity effects for height and BMI, whereas Luo and Zhang (2009) did not find any significant effect for 44 tests of similarity. Together, these findings suggest that similarity effects are weak in studies of brief real dating interactions. This result is different from the

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conclusions from questionnaire studies of attraction to hypothetical partners, from dyadic interaction studies where similarity effects are confounded with individual effects, and from studies of similarity in couples that regularly find clear similarity effects even after controlling for individual effects (Klohnen & Luo, 2003). It seems that similarity effects need more time to emerge than the 3 minutes provided by speed-dating.

Finally, our expectation that women's mating is predicted by the short-term mating preferences of their male matches, whereas men's relating is predicted by the long-term preferences by their female matches was confirmed both 6 weeks and 1 year after speed-dating, attesting to the robustness of these findings. A differentiation of mating from relating was possible because after 6 weeks some participants reported relating without mating, and some participants reported sex outside of the context of a romantic relationship. Also, the within-participant tests were more powerful than the more traditional between-dyad tests, because they controlled for all individual characteristics of one of the partners.

Strength and weaknesses of the speed-dating paradigm

The present study highlights several strength of the speed-dating paradigm for research on sexual and romantic attraction: (a) A study of real life interactions with participants who are actually motivated to find a partner rather than being interested in participating in a psychological study, (b) the possibility to distinguish actor, partner and relationship effects in dating behaviour, (c) the possibility to distinguish individual from dyadic reciprocities, (d) the possibility to estimate actor and partner effects reliably because they are averaged across multiple dating partners, (e) a clear-cut criterion for dating success in terms of matching, (f) the possibility to study the further development of interactions and relationships with matched speed-dating partners from both partner's perspective. The current study is the first one that took full advantage of (f) in a community sample.

Despite these strengths, the speed-dating paradigm has also two weaknesses for studies of attraction. First, it is not clear to which extent speed-dating participants are representative for their age group in terms of individual attributes and dating, mating and relating behaviour. Second, the first minutes of dating can be studied in much detail in this design, but there is a long and often rocky road from dating to mating and relating as indicated by the strong reduction in probabilities from dating success via written/phone contact to face-to-face contact, sexual intercourse and establishment of a romantic relationship (see Table 2). Along this road, multiple factors influence mating and relating that are not captured by dating, which is the focus of speed-dating studies, and therefore it is tempting but premature to generalize any finding from dating to attraction in general. For example, the strong influence of physical attractiveness and the weak influence of personality traits on attraction and choices in most dating studies including all speed-dating studies cannot be generalized to sexual or romantic attraction in the long run.

Practical implications

The two most important practical questions for men and women are: What kind of people will I meet in a speed-dating event, and what is my chance for securing a sexual or romantic partner from one speed-dating event? Concerning the first question, the composition of the present study in terms of age of participants seems to be representative for speed-dating events in general according to information provided both by speed-dating companies in

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Germany as well as the published data of more than 10 000 North-American speed-dating participants by Kurzban and Weeden (2005) who reported a mean age of 33.1 years (in our study: 32.8 years); the variability in age was even higher in our study (7.4 years as compared to 5.3 years). Therefore we are rather confident that our results can be generalized to speed-dating at least in Germany, if not in western cultures in terms of age range although our sample seems to be biased towards better education. From our data and the reports of the students who guided the participants through the session, we have no reason to assume that speed-dating participants are different from their age group in terms of personality or sexual and relationship experience. For example, the participants' mean scores in the Big Five factors of personality closely correspond to those reported for representative German samples except for higher scores in openness to experiences which can be attributed to their higher educational level, and their partner history closely corresponds to data from a large German internet survey (Penke & Asendorpf, 2008, Study 1).

Concerning the chance to secure a sexual or a romantic partner, these chances are 6% and 4% according to our results. It is difficult to say whether these percentages are high or low because empirical data for alternatives to speed-dating are missing. What is the chance to find a sexual or romantic partner if one visits a café or a bar for 2 hours, looking for a partner? Probably much lower in case of a café, and probably much higher for bars with certain reputation, at least what a sex partner is concerned. Another way of looking at the probabilities of 6% and 4% is to convert them into time and money spent on multiple speed-dating events, assuming independence of the outcomes of each event. Assuming that one has to pay 30 € for a speed-dating event lasting 3 hours including everything, finding a relationship partner requires investing 75 hours and 750 € on average.

Future studies

Future studies using the speed-dating paradigm should make sure that dating outcomes are measured with more than one criterion, so that separating measurement error from relationship effects is possible. Also, they should try to study the process from dating to mating and relating in more detail by asking participants more often than we did about their contact with each other during the first 6 weeks or so after speed-dating (see Eastwick & Finkel, 2008, for such an approach). Much happens during these weeks, and a detailed process analysis of the post-dating routes to mating and relating would help to correct the picture from the first minutes of dating that shows men focusing only on physical attractiveness, and women focusing on not much more. Complemented by such process analyses, speed-dating seems to be a valuable tool for better understanding human mating and relating.

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REFERENCES

Asendorpf, J. B. (1989). Shyness as a final common pathway for two kinds of inhibition. *Journal of Personality and Social Psychology*, *57*, 481–492.

Asendorpf, J. B., & Wilpers, S. (1998). Personality effects on social relationships. *Journal of Personality and Social Psychology*, *74*, 1531–1544.

Boothroyd, L. G., Jones, B. C., Burt, D. M., DeBruine, L. M., & Perrett, D. I. (2008). Facial correlates of sociosexuality. *Evolution and Human Behavior*, *29*, 211–218.

Borkenau, P., Mauer, N., Riemann, R., Spinath, F. M., & Angleitner, A. (2004). Thin slices of behavior as cues of personality and intelligence. *Journal of Personality and Social Psychology*, *86*, 599–614.

Borkenau, P., & Ostendorf, F. (1993). *NEO-Fünf-Faktoren Inventar (NEO-FFI) (NEO five-factor inventory)*. Göttingen, Germany: Verlag für Psychologie.

Buss, D. G., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review*, *100*, 204–232.

Connolly, J. J., Kavanagh, E. J., & Viswesvaran, C. (2007). The convergent validity between self and observer ratings of personality: A meta-analytic review. *International Journal of Selection and Assessment*, *15*, 110–117.

Cronbach, L. J., & Gleser, G. C. (1965). *Psychological tests and personnel decisions*. Urbana, IL: University of Illinois.

Darwin, C. (1871). *The descent of man and selection in relation to sex*. London, UK: John Murray.

Eastwick, P. W., & Finkel, E. J. (2008). Sex differences in mate preferences revisited: Do people know what they really desire in a romantic partner? *Journal of Personality and Social Psychology*, *94*, 245–264.

Eastwick, P. W., Finkel, E. J., Mochon, D., & Ariely, D. (2007). Selective versus unselective romantic desire: Not all reciprocity is created equal. *Psychological Science*, *18*, 317–319.

Feinberg, D. R. (2008). Are human faces and voices ornaments signaling common underlying cues to mate value? *Evolutionary Anthropology*, *17*, 112–118.

Feingold, A. (1990). Gender differences in effects of physical attractiveness on romantic attraction: A comparison across five research paradigms. *Journal of Personality and Social Psychology*, *59*, 981–993.

Fishman, R., Iyengar, S. S., Kamenica, E., & Simonson, I. (2006). Gender differences in mate selection: Evidence from a speed-dating experiment. *Quarterly Journal of Economics*, *121*, 673–697.

Fraley, R. C., & Shaver, P. R. (2000). Adult romantic attachment: Theoretical developments, emerging controversies, and unanswered questions. *Review of General Psychology*, *4*, 132–154.

Furman, W., & Shaffer, L. (2003). The role of romantic relationships in adolescent development. In P. Florsheim (Ed.), *Adolescent romantic relations and sexual behavior: Theory, research, and practical implications* (pp. 3–22). Mahwah, NJ: Lawrence Erlbaum.

Gangestad, S. W., & Simpson, J. A. (2000). The evolution of human mating: Trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, *23*, 573–644.

Gangestad, S. W., Simpson, J. A., DiGeronimo, K., & Biek, M. (1992). Differential accuracy in person perception across traits: Examination of a functional hypothesis. *Journal of Personality and Social Psychology*, *62*, 688–698.

Gangestad, S. W., Thornhill, R., & Garver-Apgar, C. E. (2005). Adaptations to ovulation. *Current Directions in Psychological Science*, *14*, 312–316.

Hughes, S. M., Dispenza, F., & Gallup, G. G. Jr., (2004). Ratings of voice attractiveness predict sexual behavior and body configuration. *Evolution and Human Behavior*, *25*, 295–304.

John, O. P., & Robins, R. W. (1993). Determinants of interjudge agreement on personality traits: The Big Five domains, observability, evaluativeness, and the unique perspective of the self. *Journal of Personality*, *61*, 521–551.

Kenny, D. A. (1994). *Interpersonal perception: A social relations analysis*. New York: Guilford Press.

Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic data analysis*. New York: Guilford Press.

Kenny, D. A., & La Voie, L. (1984). The social relations model. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 18, pp. 142–182). Orlando: FL. Academic Press.

DOI: 10.1002/per

Kenny, D. A., & West, T. V. (2008). Zero acquaintance: Definitions, statistical model, findings, and process. In N. Ambady, & J. J. Skowronski (Eds.), *First impressions* (pp. 129–146). New York, NY: Guilford Press.

Kenrick, D. T., & Keefe, R. C. (1992). Age preferences in mates reflect sex differences in human reproductive strategies. *Behavioral and Brain Sciences*, *15*, 75–133.

Kenrick, D. T., Sadalla, E. K., Groth, G., & Trost, M. R. (1990). Evolution, traits, and the stages of human courtship: Qualifying the parental investment model. *Journal of Personality*, *58*, 97–116.

Klohnen, E. C., & Luo, S. (2003). Interpersonal attraction and personality: What is attractive – Self similarity, ideal similarity, complementarity, or attachment security? *Journal of Personality and Social Psychology*, *85*, 709–722.

Kraus, M. W., & Keltner, D. (2009). Signs of socioeconomic status: A thin-slicing approach. *Psychological Science*, *20*, 99–106.

Kurzban, R., & Weeden, J. (2005). Hurrydate: Mate preferences in action. *Evolution and Human Behavior*, *26*, 227–244.

Kurzban, R., & Weeden, J. (2007). Do advertised preferences predict the behavior of speed-daters? *Personal Relationships*, *14*, 623–632.

Lenton, A. P., Penke, L., Todd, P. M., & Fasolo, B. (in press). The heart has its reasons: Social rationality in mate choice. In R. Hertwig, & U. Hoffrage The ABC Research Group (Eds.), *Social rationality.* New York, NY: Oxford University Press.

Luo, S., & Zhang, G. (2009). What leads to romantic attraction: Similarity, reciprocity, security, or beauty? Evidence from a speed-dating study. *Journal of Personality*, *77*, 933–964.

Magnusson, P. K. E., Rasmussen, F., & Gyllensten, U. B. (2006). Height at age 18 years is a strong predictor of attained education later in life: Cohort study of over 950 000 Swedish men. *International Journal of Epidemiology*, *35*, 658–663.

Mascie-Taylor, C. G. N., & Lasker, G. W. (2005). Biosocial correlates of stature in a British national cohort. *Journal of Biosocial Sciences*, *37*, 245–251.

Mueller, U., & Mazur, A. (2001). Evidence of unconstrained directional selection for male tallness. *Behavioral Ecology and Sociobiology*, *50*, 302–311.

Nettle, D. (2002a). Height and reproductive success in a cohort of British men. *Human Nature*, *13*, 473–491.

Nettle, D. (2002b). Women's height, reproductive success and the evolution of sexual dimorphism in modern humans. *Proceedings of the Royal Society of London B*, *269*, 1919–1923 .

Ones, D. S., & Visweswaran, C. (1996). Bandwith-fidelity dilemma in personality measurement for personnel selection. *Journal of Organizational Behaviour*, *17*, 609–626.

Paunonen, S. V. (2003). Big Five factors of personality and replicated prediction of behavior. *Journal of Personality and Social Psychology*, *84*, 411–424.

Pawlowski, B., Dunbar, R. I. M., & Lipowicz, A. (2000). Tall men have more reproductive success. *Nature*, *403*, 156.

Penke, L. (in press). Revised sociosexual orientation inventory. In T. D. Fisher, C. M. Davis, W. L. Yarber, & S. L. Davis (Eds.), *Handbook of sexuality-related measures* (3rd ed.). Thousand Oaks, CA: Taylor & Francis.

Penke, L., & Asendorpf, J. B. (2008). Beyond global sociosexual orientations: A more differentiated look at sociosexuality and its effects on courtship and romantic relationships. *Journal of Personality and Social Psychology*, *95*, 1113–1135.

Penke, L., & Denissen, J. J. A. (2008). Sex differences and lifestyle-dependent shifts in the attunement of self-esteem to self-perceived mate value: Hints to an adaptive mechanism? *Journal of Research in Personality*, *42*, 1123–1129.

Penke, L., Todd, P. M., Lenton, A., & Fasolo, B. (2007). How self-assessments can guide human mating decisions. In G. Geher, & G. F. Miller (Eds.), *Mating intelligence: Sex, relationships, and the mind's reproductive system* (pp. 37–75). Mahwah, NJ: Lawrence Erlbaum.

Place, S. S., Todd, P. M., Penke, L., & Asendorpf, J. B. (2009). The ability to judge the romantic interest of others. *Psychological Science*, *20*, 22–26.

Place, S. S., Todd, P. M., Penke, L., & Asendorpf, J. B. (in press). Humans show mate copying after observing real mate choices. *Evolution and Human Behavior.*

DOI: 10.1002/per

Pollet, T. V., & Nettle, D. (2008). Taller women do better in a stressed environment: Height and reproductive success in rural Guatemalan women. *American Journal of Human Biology*, *20*, 264–269.

Raudenbush, S., Bryk, A., & Congdon, R. (2005). *HLM 6.0.3 for windows (Manual and software)*. Lincolnwood, IL: Scientific Software International.

Rhodes, G. (2006). The evolutionary psychology of facial beauty. *Annual Review of Psychology*, *57*, 199–226.

Schmitt, D. P., & Shackelford, T. K. (2008). Big Five traits related to short-term mating: From personality to promiscuity across 46 nations. *Evolutionary Psychology*, *6*, 246–282.

Silventoinen, K., Lahelma, E., & Rahkonen, O. (1999). Social background, adult body-height and health. *International Journal of Epidemiology*, *28*, 911–918.

Szklarska, A., Koziel, S., Bielecki, T., & Malina, R. M. (2007). Influence of height on educational attainment in males at 19year of age. *Journal of Biosocial Sciences*, *35*, 575–582.

Swami, V., & Furnham, A. (2007). *The psychology of physical attraction*. London: Routledge.

Swami, V., Miller, R., Furnham, A., Penke, L., & Tovée, M. J. (2008). The influence of men's sexual strategies on perceptions of women's bodily attractiveness, health and fertility. *Personality and Individual Differences*, *44*, 98–107.

Swami, V., & Tovee, M. J. (2005). Female physical attractiveness in Britain and Malaysia: A cross-cultural study. *Body Image*, *2*, 115–128.

Thornhill, R., & Grammer, K. (1999). The body and face of women: One ornament that signals quality? *Evolution and Human Behavior*, *20*, 105–120.

Todd, P. M., Penke, L., Fasolo, B., & Lenton, A. P. (2007). Different cognitive processes underlie human mate choices and mate preferences. *Proceedings of the National Academy of Sciences USA*, *104*, 15011–15016.

Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man* (pp. 136–179). Chicago, IL: Aldine.

Watson, D., Klohnen, E. C., Casillas, A., Simms, E. N., Haig, J., & Berry, D. S. (2004). Match makers and deal breakers: Analyses of assortative mating in newlywed couples. *Journal of Personality*, *72*, 1029–1068.

Yilmaz, N., Kilic, S., Kanat-Pektas, M., Gulerman, C., & Mollamahmutoglu, L. (2009). The relationship between obesity and fecundity. *Journal of Women's Health*, *18*, 633–636.

DOI: 10.1002/per