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How do pairs matched in physical attractiveness form if people are unaware of their own attractiveness?

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ABSTRACT The correlation of physical attractiveness in romantic partners has been widely documented. However, it has also repeatedly been demonstrated that people are largely unaware of their own attractiveness, which raises the question about the mechanism responsible for the within-pair matching. One hitherto unexplored possibility is that low accuracy in attractiveness self-assessments results from methodological drawbacks. Participants were usually asked to rate their attractiveness on a numeric scale, and independent judges evaluated them on the basis of facial photographs. We hypothesized that the accuracy of self-assessment may be increased if (1) participants and judges evaluate the same characteristic, e.g., both groups assess facial attractiveness, (2) own attractiveness is estimated in a comparative manner (with reference to attractiveness of other individuals) rather than by abstract numbers, (3) judges rate attractiveness of people as seen in video clips rather than in photographs. To test these hypotheses we photographed and videotaped faces of 96 women and 78 men. Independent judges rated attractiveness from these photographs and video clips, and the participants assessed own attractiveness in several ways. None of the above hypotheses was confirmed by statistical analysis. We discuss how the within-pair matching in attractiveness can arise, given such poor awareness of own appeal.

KEY WORDS: assortative mating, self-assessment, methodology

Assortative mating, which means that mating tends to occur between phenotypically similar individuals, is widespread in animals and involves many features including attractiveness [Thiessen & Gregg 1980, Burley 1983]. In humans assortative pairing is well known for age, education, social class, personality [Spuhler 1968, Mascie-Taylor 1987], facial measurements [Spuhler 1968, Susanne 1977], facial appearance [Zajonc *et al*. 1987, Hinsz 1989], stature, body mass, and body mass index [Allison *et al*. 1996, Courtiol *et al*. 2010]. Physical attractiveness is no exception.

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A meta-analysis of 15 studies yielded a correlation of 0.39 in partner attractiveness [Feingold 1988]. More recent studies gave similar estimates [e.g., Little *et al*. 2006, Hitsch *et al*. 2010].

Assortative mating has important biological consequences. It increases the genetic additive variance of the relevant traits in the population [Breese 1956, Crow & Felsenstein 1968], which, according to Fisher's fundamental theorem of natural selection, increases the pace of their evolution [Edwards 1994]. Assortative pairing also facilitates kin altruism [Thiessen & Gregg 1980] and may lead to speciation [Irwin & Price 1999, Gavrilets 2003]. The level of within-pair matching of psychological and physical features (including attractiveness) predicts the bond duration [Hill *et al*. 1976, White 1980, Folkes 1982], and thereby influences reproductive success [Thiessen & Gregg 1980]. Interestingly, however, the similarity in physical attractiveness of spouses does not enhance the marital satisfaction or helping behavior [Murstein & Christy 1976, McNulty *et al*. 2008].

Mechanisms of matching on attractiveness

Many mechanisms can produce within-pair similarity of physical attractiveness [Kalick & Hamilton 1986, Lee *et al*. 2008, Courtiol *et al*. 2010, Hitsch *et al*. 2010]:

1. *Homotypic Preference*: This means that individuals prefer partners of similar attractiveness to their own. Homotypic preference has been documented in humans for personality [Buston & Emlen 2003], race [Kurzban & Weeden 2005], age [Kurzban & Weeden 2005] and stature [Courtiol *et al*. 2010, Salska *et al*. 2008], and it was also observed in animals [Riebel *et al*. 2010]. People believe that spouses matched in physical attractiveness are more satisfied than the others [Bar-Tal & Saxe 1976] and one may therefore expect them to seek a partner of similar attractiveness. Scientists premised homotypic preference for a long time [Walster *et al*. 1966] until empirical research proved that people prefer individuals of high attractiveness rather than that similar to their own [Walster *et al*. 1966, Huston 1973] (see also the newer studies cited below).

2. *Courtship Rejections*: All people prefer highly attractive individuals but only the attractive ones are accepted by them. In consequence, the attractive people will pair with each other leaving the nonattractive ones to mate among themselves [Burley 1983, Kalick & Hamilton 1986]. Experiments by Ellis and Kelley [1999] seem to support this view. A random number, unknown to each participant, was assigned to each and affixed to their respective foreheads. The participants were then situated in a room and their task was to pair with a person bearing the highest possible number. A pair was established when both sides agreed by a handshaking. In agreement with the Courtship Rejections view, the game resulted in pairs being highly matched for the assigned numbers ($r \approx 0.7$). Further support for the mechanism of courtship rejections comes from blind dates [Asendorpf *et al*. 2011, Back *et al*. 2011] and internet dates [Hitsch *et al*. 2010, Shaw Taylor *et al*. 2011], where highly attractive participants are universally preferred yet people who are mutually interested in further contact are similar in physical attractiveness. However, a strong refutation of this mechanism stems from computer simulations of real-world mating. The time required to establish pairs matched for attractiveness proved overlong, reaching up to thousands of dating cycles [Kalick &

Hamilton 1986]. Even if unattractive individuals become decreasingly less choosy over time and more likely to accept an unattractive candidate, the required time is still unrealistically long [Todd & Miller 1999, Simão & Todd 2002].

3. *Strategic Courtship*: All people prefer highly attractive individuals yet they know that the attractive candidates are choosy and therefore, in reality, court in a homotypic way. Individuals are expected to learn strategic courtship via modulation of their own choosiness in response to mating behavior experienced from others (proposals, acceptances, rejections) and during the course of time [Murstein 1972, van Straaten *et al*. 2009]. Computer simulations corroborate the importance of this learning process and suggest that modulation of own choosiness by behavior received from others is more effective than its simple decrease with time [Kalick & Hamilton 1986, Johnstone 1997, Todd & Miller 1999, Simão & Todd 2002]. In the abovementioned experiment (people bearing numbers on their foreheads), participants could reliably estimate their own number after the game ended ($r \approx 0.65$), and many of the lowly numbered people admitted that they recognized their low attractiveness during the course of game and down-regulated their choosiness and strategy of solicitation [Ellis & Kelley 1999]. This means that own attractiveness can be efficiently learnt from social stimuli and impact on mating behaviors. Indeed, lowly-attractive people consider interest from and a date with a highly attractive person as being less probable than do attractive people [Huston 1973, Montoya 2008].

Strategic mating behaviors were observed in experimental studies, where participants declared the will to date with strangers [Berscheid *et al*. 1971, Stroebe *et al*. 1971] or newly acquainted persons [van Straaten *et al*. 2009], or when participants' involvement in a relationship with a newly acquainted person was analyzed [van Straaten *et al*. 2009]. However, all people in these studies preferred the attractive over unattractive candidates, even though the effect was less marked in lowly- than highly-attractive individuals (or, more specifically, the unattractive people were relatively more tolerant to unattractive candidates). Therefore, the preferences and behaviors were strategic but not homotypic. Strategic behaviors, however, were not found in participants of blind dates [Kurzban & Weeden 2005, Todd *et al*. 2007, Luo & Zhang 2009, Asendorpf *et al*. 2011, Back *et al*. 2011] and internet dates [Hitsch *et al*. 2010, Shaw Taylor *et al*. 2011, but see Lee *et al*. 2008]. Courtship thus may not be strategic when the number of prospective partners is large and costs of searching or being rejected are low [Hitsch *et al*. 2010].

4. *Tentative Relationships*. Non-committal relationships, in which the current partner may be opportunistically changed for a better one, are common in humans, especially in the young [Ha *et al*. 2010]. Computer models indicate that such relationships may be important for assortative mating by physical attractiveness [Simão & Todd 2002]. A strategy that combines tentative relationships with learning of own attractiveness seems to be superior to other strategies in terms of reproductive success, which may have advanced it during the course of evolution [Simão & Todd 2002]. Unlike other approaches, a simulation of mating processes involving this strategy results in a realistic level of within-pair matching in attractiveness, the pace of formation of stable relationships, and the percentage of people remaining single [Simão & Todd 2002].

Practicing tentative relationships may be profitable for other reasons too. The percep-

tion of attractiveness of other people varies intra-individually (i.e., changes in time) and inter-individually [Hönekopp 2006, Kościński 2010]. A tentative relationship allows the partner to be seen a number of times by the interested individual and frequently also by his/her friends and relatives who may express an opinion about the partner's attractiveness. Both mechanisms may increase the reliability of the partner's attractiveness evaluation. Empirical research supports the concept of tentative relationships: the matching of a dating pair in physical attractiveness predicts its further development and duration and, for this reason, the matching is higher for longer-lasting pairs and spouses than for dating partners [Hill *et al*. 1976, White 1980, Folkes 1982].

5. *Social Stratification*. Owing to physical proximity and ease to contact, people in a romantic pair tend to come from the same rather than different social groups. This is why partners are usually similar in characteristics associated with a social group, such as age (due to attending to schools), education and social status [Feingold 1988]. Although physical attractiveness is, indeed, related to socioeconomic status [Hume & Montgomerie 2001, Jokela 2009] this association is too weak to meaningfully contribute to the observed matching in attractiveness.

6. *Phenotypic Correlation*. Within-pair matching for a feature may arise even if people pay no attention to this feature in prospective partners, if the feature is correlated with a trait of homotypic preference. For example, the homotypic preference for body height results in matching on the length of arms [Crow & Felsenstein 1968]. Because people perceive faces similar to their own in a positive way, matching in physical attractiveness may result from seeking a physically similar partner [Lee *et al*. 2008]. However, the preference for self-similar faces pertains largely or exclusively to own-sex rather than opposite-sex faces [DeBruine *et al*. 2008, Watkins *et al*. 2011, but see Fraley & Marks 2010]. Furthermore, facial attractiveness is non-monotonically associated with many traits, and peaks at their medium, not extreme, values. For example, facial attractiveness increases with the averageness of facial proportions [Rhodes 2006, Kościński 2007], and women prefer men with moderately masculine faces [Kościński 2007, Scott & Penton-Voak 2011]. This weakens the influence of a possible preference for self-similar partners on within-pair matching for attractiveness.

Self-perceived attractiveness

The above discussion suggests that main mechanisms responsible for assortative pairing on physical attractiveness are Courtship Rejections, Strategic Courtship and Tentative Relationships. Although Courtship Rejections can operate with no knowledge of own attractiveness (individuals court the most attractive available person and choose the most attractive solicitor), the mechanism is ineffective when operating alone. An awareness of own attractiveness is however important for Strategic Courtship, where lowly-attractive individuals accept relatively unattractive candidates, and for Tentative Relationships, where lowly-attractive people refrain from dropping an unattractive partner to form a tentative bond with a more attractive alternative.

Because an accurate knowledge of own attractiveness determines the efficacy of Strategic Courtship and Tentative Relationships, and the fact that the efficacy of these mechanisms is profitable in

reproductive, and thereby evolutionary, terms [Simão & Todd 2002], one may expect that natural selection has developed psychological mechanisms for accurate evaluation of own attractiveness [Wade 2000, Brewer *et al*. 2007]. Contrary to this expectation, however, the correlation between self-assessed attractiveness and the evaluation by independent judges is low. A meta-analysis of 21 studies gave a correlation coefficient of 0.24 for men and 0.25 for women [Feingold 1992]. Similar results were obtained in a somewhat older meta-analysis [Feingold 1988] and from newer empirical research [e.g., Diener *et al*. 1995, Bleske-Rechek & Lighthall 2010]. However, several methodological drawbacks might have contributed to obtaining such a low accuracy of self-evaluation:

1. Participants were usually requested to assess their overall physical attractiveness, even though judges rated only their facial attractiveness. Participants and judges therefore evaluated different characteristics. Although facial attractiveness is the most important factor of overall physical attractiveness [Currie & Little 2009], the latter is determined also by stature, body mass index, waist-to-hip ratio and many other features [Sugiyama 2005]. It is also known that self-assessment of overall physical attractiveness is influenced by many extra-facial body characteristics, including body mass index [Weeden & Sabini 2007, Swami *et al*. 2010], waist-to-hip ratio [Singh 2004, Weeden & Sabini 2007], stature [Manning & Quinton 2007], breast size [Harrison 2003], athletic physique [Frederick & Haselton 2007, Weeden & Sabini 2007], genital appearance [Lever *et al*. 2006], and body odor [Roberts *et al*. 2009]. In the studies in which participants assessed the attractiveness of their faces, the estimates of the self-assessment accuracy varied from low and nonsignificant to high [Penton-Voak *et al*. 2003], occurring also between sexes [Rand & Hall 1983] and between samples [Clark 2004].
2. Judges usually rated attractiveness on the basis of facial photographs, while the self-assessment may depend on dynamic features to a considerable degree. However, in studies where judges saw subjects on video clips [Diener *et al*. 1995], or live [Marcus & Miller 2003], the accuracy of self-assessed attractiveness was similar to that in studies relying on photographs.
3. Participants almost always evaluated their attractiveness on a numeric scale (e.g. from 1 to 7). This may underestimate the accuracy of attractiveness self-assessment if different people interpret the numeric values somewhat differently. For example, one person may consider the attractiveness of 7 (on a 1-7 scale) as very rare while another may assume that this value is not so unique. The latter person may then be more inclined to rate own attractiveness as 7 than the former. To ensure inter-individual comparability of self-assessments, Clark [2004] presented, in series, photos of 20 female faces to women who were asked to rate each face as more or less attractive than their own; the number of faces regarded as less attractive than self was the measure of attractiveness self-assessment. Unfortunately, the author obtained highly mixed results for two samples ($r = 0.58$ and -0.15), which impedes an evaluation of this method.

Present study

The aim of the present study was to determine whether the abovementioned methodological drawbacks may, at least partly, be responsible for the previously observed

low accuracy in attractiveness self-assessment. The participants had their faces photographed and videotaped, then assessed their attractiveness in several ways, and were rated by independent judges for attractiveness from the photos and video clips.

We formulated three hypotheses upon methodological refinements which may lead to a relatively high accuracy of attractiveness self-assessment: (1) The accuracy will be higher when participants assess attractiveness of their faces rather than overall attractiveness. (2) The accuracy will be higher when own attractiveness is estimated in a comparative manner (with reference to attractiveness of other individuals) rather than by abstract numbers. (3) The accuracy will be higher when judges rate attractiveness of people seen on video clips rather than photographs.

Methods

Overview

Participants were 96 white women (aged 18.3-24.8 years, M = 20.1) and 78 white men (aged 19.0-25.4 years, M = 21.0) who were students of Adam Mickiewicz University in Poznań (Poland). Their faces were photographed and videotaped, digitally processed and posted on an Internet page. Each participant was then provided with an URL address of the page, a unique password to the profile of his/her facial photograph and a common questionnaire focused on perception of own attractiveness. On a separate web page independent judges rated the facial photographs and clips. All participants provided informed consent for the use of depictions of their faces for research on face perception purposes.

Facial images

Participants were photographed and videotaped with a digital camera (Panasonic DMC-FZ18, 8.1MPx) in a sitting position from a distance of three meters. Subjects were illuminated with fluorescent light with no flash. Their glasses and jewelry were removed and hair swept from their faces. Frontal photographs of the faces were taken while displaying a neutral expression with a direct gaze and lips held gently together, and saved as JPG files. Using Adobe Photoshop software, an ellipsoid white mask was then digitally applied to each photograph so as to hide all elements around the face. Researchers frequently present faces to judges in this manner [e.g. Little & Mannion 2006, DeBruine *et al*. 2010], and the non-visibility of the hair allows for rating of the attractiveness of the face itself.

Each participant in turn was first photographed and then asked to act out a dramatic scene. The following instruction was presented to women: “Imagine that you meet a man who appeals to you. You want to get acquainted with him and behave in the following way. Initially, you look left – your head and gaze are turned towards the phone (the phone was placed at an angle of 30 degrees to the camera). Because the man is in front of you, you turn your gaze, and then your head, forward (toward the camera). Next, you smile at this man, then, still smiling, say: ‘Cześć! Jestem Ania’ (Hi, I’m Ann). Portray this scene naturally as if it was in real life.” The instruction was the same for the men, except “man” was replaced by “woman” and the actor was requested to say ‘Cześć! Jestem Tomek’ (Hi, I’m Tom). In addition, the photographer sat on the chair and acted out this scene for the participant. The participant

was then videotaped while performing the scene. Performances that did not exactly follow the instruction were repeated. Clips encompassing the whole head, including hair, were recorded in 480 x 360 resolution at 30 fps and saved as AVI files. In this way, facial clips included head, gaze, expressive, and vocal movements.

Self-assessments

Firstly, participants were asked to rate the attractiveness of their own face on a 1-7 numeric scale (SelfFace7). Secondly, a board appeared with a row of 100 small human silhouettes and the following instruction: "Imagine that these 100 silhouettes depict 100 random (wo)men, which are ordered from the one having the most attractive face to the one with the least attractive face. One of these (wo) men is you. Please, indicate which of these images depicts you in regard to your facial attractiveness." This percentile mode of self-assessment is referred to as SelfFace100. Thirdly, 28 own-sex faces taken from 18-26 year-old white people other than the participants were individually displayed on the screen and the participant asked to state whether the face is more or less attractive than his/her own face. The percentage of cases where own face was regarded as the more attractive yielded the one-face comparative self-assessment (SelfFaceComp1). Fourthly, participants viewed 28 pairs of faces, where each pair included own face and an unknown own-sex face, and were asked to choose the more attractive face. The percentage of own face choices yielded the two-face comparative self-assessment (SelfFaceComp2). The comparative faces belonged to 18-26 year-old white people, other than those used at the previous stage and equivalent to them in terms of attractiveness (these groups having been obtained by careful division of two 56-face sets – one per each sex – on the basis of attractiveness evaluations by five individuals and, like the participants' faces, displayed with a white mask around them). Finally, participants assessed, on 0-to-5 scales, the attractiveness of their face (SelfFace6) and their overall visual attractiveness, including face, silhouette, hairstyle, clothes, jewelry etc. (SelfBody). Facial attractiveness was then self-assessed on two, slightly different, numeric scales (SelfFace7 and SelfFace6) to ascertain the reliability of the evaluation. Participants therefore saw images of their own face only during the two-face comparative self-assessment.

Independent judgements

Two groups of judges, each consisting of 10 white women and 10 white men, rated facial attractiveness on the photographs and video clips. They were students at Adam Mickiewicz University in Poznań, predominantly in faculties other than those of the posers. The women were aged 21-28 years (M = 23.8), and the men aged 20-28 years (M = 24.3). Attractiveness assessments were made on Internet pages designed specifically for this purpose. Photographs were scaled down and presented in 400-pixel width, which had the effect of approximating the size of the faces in the photos and video clips on the screen. Using Macromedia Flash software, clips were imported to SWF files, to which a "Play" button was added. Judges viewed, in random order, opposite-sex faces and estimated their attractiveness on a 1-7 scale (1 – lowest attractiveness, 4 – moderate attractiveness, 7 – highest attractiveness). In the case of video clips, the picture was initially invisible, and only played (with no

sound) when the "Play" button was mouse-clicked. When the film reached its end, the picture disappeared. Judges were allowed to play a clip as many times as they wished before making the attractiveness assessment. No time limit was set for evaluation of an image or a film. After the participant had rated a facial stimulus, another was displayed. Raters were asked to skip past a face if they were able to recognize the owner.

Analysis

Attractiveness evaluations for each participant were averaged separately for photographs and video clips across all judges. Pearson's correlation coefficients were calculated between each self-assessment of attractiveness (SelfFace7, SelfFace100, SelfFaceComp1, SelfFaceComp2, SelfFace6, SelfBody) and independent assessments of facial attractiveness on photographs and video clips. Among 3480 intended assessments of facial attractiveness (i.e. 174 faces x 2 stimulus types x 10 judges), there were 19 cases (0.55%) where a judge had recognized and therefore did not rate the depicted person. The missing data were replaced with average values computed from the values obtained for the remaining judges.

The equality of correlation coefficients calculated for the different types of attractiveness assessment was tested with William's test for dependent correlations [Steiger 1980]. The equality of corresponding correlation coefficients for males and females was tested with the test for independent correlations [Ferguson & Takane 1989]. All variables were standardized within each sex making it possible to pool data for both sexes and thereby increasing the power of tests for equality of correlation coefficients. Analysis was conducted using Statistica StatSoft 8.0 and two-tailed *P*-levels were reported.

Results

Table 1 presents descriptive statistics for attractiveness data and gives results of the t-test for sexual differences in those variables. All types of attractiveness self-assessment were significantly intercorrelated in women (rs = 0.39–0.73, all Ps < 0.001) and men (rs = 0.26–0.77, all Ps < 0.03). Two numeric self-assessments (SelfFace7 and SelfFace6) correlated at 0.73 in women and 0.65 in men. According to the independent judges, attractiveness of the facial photos was closely related to attractiveness of the facial clips (r = 0.71 for women and 0.64 for men, both Ps <0.001).

Table 2 gives correlations between self- and other-assessed attractiveness for women, males, and both sexes pooled together. Because no correlation coefficient differed significantly between sexes (all zs < 1.82, all Ps > 0.06), further analysis was conducted on both sexes taken jointly. Each type of self-assessment is significantly related to attractiveness evaluated by the judges from a photograph or a clip, and the accuracy of this self-perception is similar to that previously reported in the literature.

Hypothesis 1 predicted that facial attractiveness rated by independent judges (on the basis of both photos and clips) is related more strongly with numeric self-assessments of the face (SelfFace7 or SelfFace6) than overall body (SelfBody). Although the pattern of correlation values was consistent with the hypothesis to a large degree, differences were non-significant in all four comparisons (all ts$_{171}$ < 1.37, all Ps > 0.17).

Hypothesis 2 claimed that attractiveness evaluated by judges (on the basis of both photos and clips) correlates more strongly with referential (SelfFace100, SelfFaceComp1, SelfFaceComp2) than abstractive facial self-assessments (SelfFace7, SelfFace6). As can

Table 1. Means, (standard deviations), and sex differences for facial attractiveness and questionnaire variables.

	Women (n=96)	Men (n=78)	t	p-level
Photo attractiveness	2.23 (0.75)	2.62 (0.75)	-3.45	0.001
Clip attractiveness	3.33 (0.90)	3.15 (0.72)	1.43	0.154
SelfFace7	4.38 (1.32)	4.55 (1.23)	-0.90	0.368
SelfFace100	57.38 (21.26)	63.96 (22.20)	-1.99	0.048
SelfFaceComp1	0.79 (0.21)	0.87 (0.19)	-2.72	0.007
SelfFaceComp2	0.60 (0.26)	0.78 (0.22)	-4.92	0.000
SelfFace6	2.55 (1.20)	2.99 (1.21)	-2.36	0.019
SelfBody	3.01 (1.19)	3.06 (1.06)	-0.31	0.757

Photo and clip attractiveness are assessed (on 1-to-7 scales) by independent judges from, respectively, facial photographs and video clips. The remaining variables are attractiveness self-evaluations: SelfFace7 and SelfFace6 – numeric assessments of own face on 1-to-6 and 0-to-5 scales, respectively; SelfFace100 – indicating own position in an ordered row of peers (1-to-100); SelfFaceComp1 – one-face comparative self-assessment (0-to-1); SelfFaceComp2 – two-face comparative self-assessment (0-to-1); SelfBody – numeric assessments of own body (0-to-5). Higher numbers indicate higher attractiveness.

Table 2. Pearson's correlation coefficients between self-and other-assessed attractiveness.

	Women (n=96)		Men (n=78)		Both sexes (n=174)	
	Photo	Clip	Photo	Clip	Photo	Clip
SelfFace7	0.26 *	0.29 **	0.22 †	0.29 *	0.24 **	0.29 ***
SelfFace100	0.27 **	0.28 **	0.16	0.29 *	0.22 **	0.28 ***
SelfFaceComp1	0.33 **	0.33 **	0.24 *	0.40 ***	0.29 ***	0.36 ***
SelfFaceComp2	0.29 **	0.32 **	0.31 **	0.43 ***	0.30 ***	0.37 ***
SelfFace6	0.40 ***	0.46 ***	0.14	0.27 *	0.28 ***	0.38 ***
SelfBody	0.21 *	0.34 **	0.13	0.26 *	0.18 *	0.30 ***

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
See footnote under Table 1 for explanation of abbreviations.

be seen in Table 2, the hypothesis was ill-supported and no appropriate pair of correlation coefficients differed significantly (all $ts_{171} < 1.16$, all $Ps > 0.24$).

Hypothesis 3 predicted that self-assessed facial attractiveness evaluations are closer to those of independent judges on the basis of a facial video clip rather than a photograph. Although the correlation values for clips were systematically higher than for photographs, none of the differences was statistically significant (all $ts_{171} < 1.76$, all $Ps > 0.07$).

Discussion

The accuracy of self-perceived attractiveness in the present study was not significantly related to the manner of assessment or to the type of stimulus presented to the

independent judges (photograph vs. video clip). These two stimulus types differed in several respects (hair visibility, and head, gaze, expressive and vocal movements) and each was expected to increase the accuracy of self-assessment in the video clip format compared to the photograph format. Because the stimulus type did not influence the accuracy of self-assessment, it seems that none of these aspects had significant impact.

The independence of the accuracy of self-assessment from the stimulus type and manner of assessment is reassuring in that the commonly used numeric scales for evaluation of own attractiveness seem to be of satisfactory reliability. However, this also means that the previously reported low accuracy in attractiveness self-assessments were not the result of methodological drawbacks. Therefore, intra-pair matching on physical attractiveness actually occurs with little awareness of own attractiveness. Although this is possible in Courtship Rejections, the efficacy of this mechanism seems too low to explain the matching found in natural populations [Todd & Miller 1999, Simão & Todd 2002].

We therefore propose a model of assortative pairing with no knowledge of own attractiveness (Fig. 1). In this, we assume that an individual's mate value impacts on his/her mating strategy, i.e., the rules governing whom to court and whose courtship to accept or reject. These rules derive from own choosiness and the predicted choosiness of others, and determine the individual's mating behavior (own courtship and acceptance/rejection of other's courtship). One's mate value may be estimated on the basis of his/her physical attractiveness as well as other cues to mate value such as wealth, intelligence, likeability, etc. [Buss 1999]. The observed cues to someone's mate value would influence mating behavior of prospective partners. Another factor taken into account in the proposed model is sexual strategy, i.e., willingness to form different kinds of relationships, chiefly short-term and long-term ones [Simpson & Gangestad 1991]. Sexual strategy influences one's mating strategy (e.g., individuals open to casual sex would seek partners open to casual sex) and behavior of prospective partners (e.g., individuals open

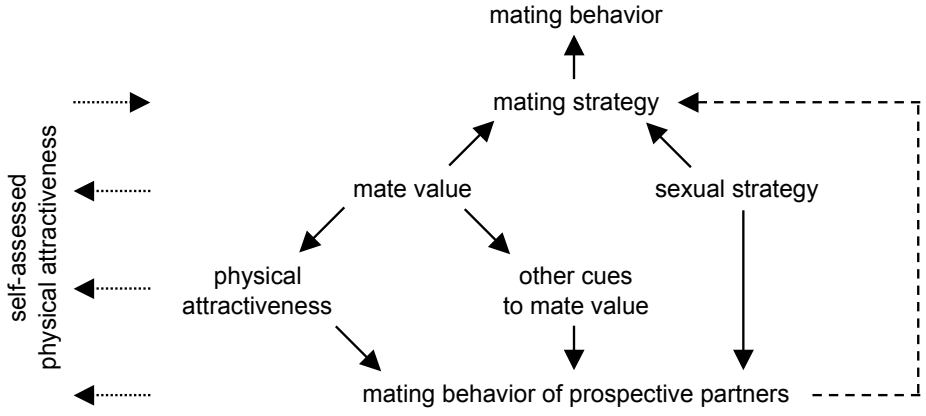

Fig. 1. Model of mating that leads to assortative pairing and assumes no individual awareness of own attractiveness.

to casual sex may be avoided by sexually reserved opposite-sex people). It should be also emphasized that the mating strategies and behaviors do not need to be deliberate; they may be learnt and/or evolutionary shaped automatisms.

The key element of the proposed model is that mating behavior experienced by an individual from others (solicitations and reactions to be solicited) should exert a regulatory influence on own mating strategy and behavior (the dashed arrow on Fig. 1). The individual therefore learns whom he/she can effectively court and whose courtship should be rejected in the hope of finding a better alternative. Thus, the proposed model predicts formation of pairs matched on physical attractiveness without reference to perception of own attractiveness. The model is similar to those assuming Strategic Courtship and found in computer simulations to be effective in producing assortative pairing [Johnstone 1997, Simão & Todd 2002], but it dissociates an individual's mate value (which adaptively impacts his/her mating behavior via behavior of prospective partners) from the individual's physical attractiveness to which he/she may be oblivious.

Although no accuracy in self-perceived physical attractiveness is required for assortative mating, the self-assessment can facilitate and reinforce matching in physical attractiveness. This would true if attractiveness self-evaluation depends on own mate value, true attractiveness and/or mating behavior of prospective partners, and simultaneously influences the individual's mating strategy (see the dotted arrows on Fig. 1). Below we present evidence for each of these conditions.

Mate value impacts on attractiveness self-assessment: the assessment is higher in fertile than non-fertile phase of female menstrual cycle [Haselton & Gangestad 2006], in women with a relatively high level of estrogen [Durante & Li 2009] or high second-to-fourth digit ratio [Wade *et al*. 2004], and in men with low values of the ratio [Manning & Quinton 2007]. High and low values of this ratio indicates, respectively, the feminine or masculine hormonal milieu [Manning 2002]. Self-perceived attractiveness in women depends relatively strongly on physical cues to their fertility, and in men on visual cues to physical strength [Wade 2000]. Therefore, self-assessment depends mainly on those features that are most important for mate value of each sex. The evaluation of own attractiveness also correlates with psychological well-being [Noles *et al*. 1985, Diener *et al*. 1995], mental health [Feingold 1992], and narcissism [Gabriel *et al*. 1994, Bleske-Rechek *et al*. 2008] which may be a cue to mate value and/or sexual strategy [Holtzman & Strube 2010].

As was discussed in the introduction, self-perceived attractiveness depends to some degree on true attractiveness. Furthermore, numerous experimental studies have shown that watching attractive faces or bodies of own-sex people decreases self-judged attractiveness [Wade & Abetz 1997, Gutierres *et al*. 1999, Blond 2008]. The perception of own attractiveness is then suitably corrected by the attractiveness of mating rivals. People also changed assessment of their attractiveness after they were (falsely) told how it was rated by others [Kowner 1996].

Self-perceived attractiveness influences mating preferences and behavior: people of high self-assessment are more choosy [Buston & Emlen 2003, Todd & Penke 2007], value physical attractiveness more highly [Cornwell *et al*. 2006, Moore *et al*. 2006], and more strongly prefer partners with cues to high mate value, that is, individuals who are relatively hard to attain and

retain [Chu *et al*. 2011, Shaw Taylor *et al*. 2011]. The preferred cues to mate value that depend on self-perceived attractiveness include facial symmetry [Little *et al*. 2001], sexual features on faces [Little *et al*. 2001, Little & Mannion 2006], bodies [Little *et al*. 2007] and voices [Vukovic *et al*. 2008, but see Fraccaro *et al*. 2010]. Studies which experimentally manipulated self-assessment have provided evidence for its causal impact on preferences [Little & Mannion 2006].

If accurate perception of own attractiveness enhances assortative pairing, and pairs matched on physical attractiveness are more durable and have higher reproductive success (see the introduction), then it may be asked why humans have not evolved psychological mechanisms for more accurate perception of own attractiveness. One reason seems to be that there was little possibility to accurately determine own attractiveness, especially facial attractiveness which is more important than body attractiveness [Currie & Little 2009], in the evolutionary past when no mirrors existed and reflections in a water table were usually of poor quality. Another reason may be that self-perceived attractiveness possesses some other functions beyond facilitating assortative pairing [Brewer *et al*. 2007]. For example, it may be an element of sexual strategy. The attractiveness self-assessment is positively related to sexual desire [Welling *et al*. 2008] and openness to casual sex [Clark 2004, Weeden & Sabini 2007]. An overestimation of own attractiveness may thus facilitate courtship in people interested in short-term relationships. Some marked correlations existing between self-perceived physical attractiveness and the number of sexual partners [Feingold 1992, Weeden & Sabini 2007] seem to attest to this proposition, although the causal direction in these associations is not unambiguous.

Conclusions

We tested the hypothesis that previously observed poor accuracy of self-assessed attractiveness resulted from methodological drawbacks. However, the accuracy obtained with a refined methodology was not significantly higher than the standard method. This justified the use of numeric scales for attractiveness self-evaluation and indicated that well-known intra-pair matching on physical attractiveness occurs with little awareness of own attractiveness. A model of assortative pairing with no knowledge of own attractiveness is proposed. The model posits that mating behavior experienced by an individual from others exerts a regulatory influence on his/her own mating strategy and behavior. Although the modest accuracy in self-assessment may enhance the matching in physical attractiveness and, thereby, reproductive success, it is also proposed that overestimation of own attractiveness may be adaptive for people interested in short-term relationships.

Notes

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Streszczenie

Partnerzy romantyczni częściej są podobni niż niepodobni do siebie pod względem atrakcyjności fizycznej. Pary dobrane pod tym względem są trwalsze i odnoszą statystycznie większy sukces reprodukcyjny. Skłonność do wiązania się z osobami o podobnej atrakcyjności jest więc przystosowawcza i powinna była powstać w toku ewolucji. Znajomość swojej atrakcyjności w oczywisty sposób ułatwia wybór partnera o atrakcyjności podobnej do własnej, dlatego zaskakujący jest fakt, że ludzie zwykle postrzegają swoją atrakcyjność fizyczną inaczej niż jest ona postrzegana przez osoby postronne (zazwyczaj ją zawyżają).

Przyczyną słabej korelacji pomiędzy samooceną atrakcyjności a oceną przez niezależnych obserwatorów może być niedoskonałość metodyczna dotychczasowych badań. Po pierwsze, badani zwykle szacowali swoją ogólną atrakcyjność, a sędziowie oceniali ich atrakcyjność na podstawie zdjęcia samej twarzy. Po drugie, badane osoby określały swoją atrakcyjność fizyczną na skali liczbowej, więc ich odpowiedzi mogły być wypaczone przez różną interpretację wartości tej skali. Po trzecie, sędziowie najczęściej oceniali atrakcyjność na podstawie statycznych zdjęć, natomiast oceniane osoby znają wygląd swojej twarzy w ruchu.

Można więc przypuszczać, że trafność samooceny atrakcyjności będzie wyższa, jeżeli: (1) uczestnicy i sędziowie będą oceniać atrakcyjność tej samej cechy, na przykład twarzy, (2) ocena własnej twarzy będzie dokonywana w odniesieniu do twarzy innych osób, (3) sędziowie będą oceniać atrakcyjność twarzy widzianej w ruchu. W celu weryfikacji tych hipotez sfotografowano i sfilmowano twarze 96 kobiet i 78 mężczyzn, którzy ponadto oceniali swoją atrakcyjność fizyczną na kilka sposobów. Niezależni sędziowie oceniali atrakcyjność zdjęć i filmów tych osób (Tab. 1). Korelacje pomiędzy samooceną atrakcyjności a jej niezależnymi ocenami wynosiły ok. 0,25–0,35. Nie potwierdzono żadnej z powyższych hipotez (Tab. 2), co oznacza, że niska trafność samooceny atrakcyjności wynika z innych przyczyn niż niedoskonałość dotychczas stosowanych metod.

W celu wyjaśnienia zaskakująco niskiej trafności samooceny atrakcyjności zaproponowano mechanizm wyboru partnera, który może prowadzić do znacznego podobieństwa partnerów pod względem atrakcyjności nawet przy całkowitym braku znajomości własnej atrakcyjności (Fig. 1). Mechanizm ten zakłada, że atrakcyjność fizyczna osobnika wpływa, wraz z innymi jego cechami, na zachowania partnerskie (zaloty i reakcje na zaloty) potencjalnych partnerów, które to z kolei zwrotnie i regulacyjnie wpływają na przyszłe zachowania partnerskie tego osobnika, ale nie na jego postrzeganie własnej atrakcyjności fizycznej. Zachowania potencjalnych partnerów wykorzystywane są więc przez osobnika, by uczyć się, do kogo można skutecznie kierować swoje zaloty oraz czyje zaloty opłaca się odrzucić w nadziei na utworzenie w przyszłości związku z lepszym kandydatem.