Self-esteem and the Matching Effect in Mate Selection

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Abstract

The matching effect is the empirical finding that romantic couples have a high correlation in physical attractiveness. It remains a debate as to whether this correlation is based purely on similarity preference - the matching hypothesis - or marketplace forces. We present a new marketplace model for romantic relationships. Previous models granted every person access to his/her own attractiveness. In reality, people have only a vague idea of their own attractiveness ratings. We introduce a concept analogous to self-esteem to model this phenomenon. Further, we extend beyond previous models by dealing explicitly with both the initialization and development of a relationship. Our model accounts for the experimental tendency to choose more attractive partners, while still explaining observed intra-couple attractiveness correlation and the difference in correlation between casual and serious daters.

Keywords: mate selection; matching hypothesis; self-esteem; social cognition

Introduction

The study of dating behavior in humans has both shed light on and raised many questions about the dynamics of human relations. A common parameter across myriad studies of human partner selection has been the physical attractiveness of individuals (Cash, 1981). Walster, Aronson, Abrahams, and Rottman (1966) attempted to address the tyranny in the advantages of attractive individuals by proposing the matching hypothesis. Basing their hypothesis on the Level of Aspiration Theory (Lewin, Dembo, Festinger, & Sears, 1944), they predicted that, in making a realistic social choice, an individual would choose a partner similar in social desirability. Simply, when faced with a realistic choice, one would choose a romantic partner of nearly identical physical attractiveness.

The theoretical sanctuary that the matching hypothesis offers from physical misgivings has not been well supported by direct experimental tests (Kalick & Hamilton, 1986). When homely men estimated attractive women as more likely to reject them compared to their handsome brethren, no significant difference in their choice of prospective partners was observed: both groups opted to choose the more attractive women (Huston, 1973). Even the most promising early experiments (Berscheid, Dion, Walster, & Walster, 1971) showed only a weak matching effect (Wetzel & Insko, 1982) that was overpowered by the attractiveness effect. So, why has the matching hypothesis survived?

Direct experiment is not the only way to test the hypothesis; one can also observe existing couples. The matching theory has been consistently supported when the correlation between the attractiveness of male and female partners in real couples was studied (Kalick & Hamilton, 1986). In average couples correlations of .38 (Murstein, 1972a), .39 (Price & Vandenberg, 1979), .42 (Feingold, 1981) and .53 (Citelli & Waid, 1980) were found. Further studies (White, 1980) expanded their investigation to differentiate between the type (and associated longevity) of relationships, observing intra-couple attractiveness correlations of .18 for casual dates, compared to the correlation of .56 and .63 for serious daters and engaged or married couples, respectively. The strong correlations in real couples provide the main evidential support for the matching hypothesis.

The stark dichotomy between direct experiment and observations of existing couples raises the question: is the matching hypothesis a good model for human courtship? By itself the matching hypothesis fails to match experiment but corresponds well to correlation studies in existing couples. It is the goal of this paper to provide a synthesis of the hypothesis and the apparent preference for the most attractive partner into a single computational model.

The computational approach was famously pursued by Kalick and Hamilton (1986). The Kalick and Hamilton simulation assumed every person has access to both their own attractiveness rating and their partner's attractiveness rating. Experimentally, the latter assumption is valid. Cunningham and Wu (1995) found a correlation of .9 between a single rating and the average rating of pictures of women. This correlation remains high if either the female picture of the rater is from a different culture. The assumption of access to own attractiveness, however, is not supported by experiment. Rand

and Hall (1983) found that people are very inaccurate at rating their *own* attractiveness. Females tend to have a .5 correlation between their self-perception of attractiveness and the rating of male judges. Males have only a .1 correlation between self-attractiveness ratings and the ratings of female judges. The inability of people to accurately judge their own attractiveness cannot be disregarded when simulating the matching hypothesis. Hence, for a model to have ecological validity, it must incorporate the inaccuracy of judging self-attractiveness.

Our model incorporates this self-perceptive inaccuracy through the effect of a variable self-esteem (or body-image) rating. We use a simple model of self-esteem based on sociometer theory (Leary, 2005). As suggested by naturalistic studies, self-esteem mediates self-perception of attractiveness (Fleming & Courtney, 1984; Feingold, 1988; Leary, 2005) and changes based on acceptance (or rejection) in the initiation of relationships and by the dissolution of relationships (Helgeson, 1994; Leary, 2005; Pass, 2009; Pass, Lindenberg, & Oark, 2010). We also extend beyond previous models by dealing explicitly with both the initialization and development of a relationship. This allows us to study the expected difference in attractiveness correlation between casual and serious daters (Cavior & Boblett, 1972; White, 1980) and track the effects of break-ups on self-esteem.

Method

The method of simulation is widely used to help understand certain types of complex systems. Models of human courtship lend themselves particularly well to simulation, since the goal is to define relatively simple rules for individual parts (people) and observe a more complex behavior and trend in the whole system (group). In our model, each individual i is parametrized by two values: a static $\alpha_i \in (0, 1)$ to represent the person's attractiveness and a dynamic $s_i \in (-1, 1)$ (referred to as 'self-esteem'). Together these parameters are used to derive $A_i \in (0, 1)$ — the person's perception of their own attractiveness. The two parameters that describe a person (α_i and s_i) are generated randomly from a uniform distribution. If two individuals i and j form a couple, then the relationship caries an extra parameter, $l_{ij} \in \mathbb{N}$, called longevity. Longevity counts the number of 'dates', or amount of time, i and j have been in a relationship. The longevity parameter is used to track the longest lasting couples and is reset to zero upon relationship dissolution.

Individuals are not explicitly given a gender, but the simulation is constructed such that males only ever show up in the list of male individuals (or the male side of a relationship) and vice-versa for females. For simplicity, the simulation is restricted to have the same number of male and female individuals. At the start all individuals are initialized as singles (not part of a couple) and only heterosexual relationships were considered. The simulation proceeds in discrete steps (epochs). On each epoch we follow the procedure:

1. existing couples are examined for a potential break up,
2. agents from dissolved couples are reintegrated into the pool of singles,
3. new couples are formed from the pool of singles, and
4. statistical data collected.

Any changes to self-esteem are incorporated at the instant they occur.

Formation and dissolution of relationships

The probability of date formation is based around the empirical observations that individuals seek the most attractive partners regardless of their own attractiveness (Huston, 1973; Kalick & Hamilton, 1986). In the simulation, each single man i is paired with a single woman j and each decides if they want to accept the date based on a probability of acceptance equal to the attractiveness of their potential partner ($P(m_{ij}) = \alpha_j$). If both partners accepts, then the pair become a couple, l_{ij} is initialized and self-esteem is modified as detailed in the next subsection.

For established couples, the break up probability is based on equity theory and the matching hypothesis. Since a break-up is seldom mutual (Hill, Rubin, & Peplau, 1976) we compute a separate break up probability for each member of the couple. Given a couple of woman x and man y the break up probability, $P(b_{xy})$ and $P(b_{yx})$, is calculated for each person, respectively, according to equation 1. The probability of i breaking up with j is linearly dependent on the absolute difference between i's perceived attractiveness, A_i, and his partner's actual attractiveness α_j. The dependence on absolute difference in perceived attractiveness is based in equity theory (Murstein, 1972b; Walster, Hatfield, Walster, & Berscheid, 1978) and the empirically observed importance of similar physical attractiveness to the longevity of relationships (Hill et al., 1976; Feingold, 1988). The values of 0.15 and 0.85 are arbitrary, but by rescaling time we can always assume the values we chose add up to 1.

$$P(b_{ij}) = 0.15 + 0.85|A_i - \alpha_j| \tag{1}$$

If the couple ij remains, then one more 'date' is added to their longevity ($l_{ij} \leftarrow l_{ij} + 1$). If at least one of i or j decides to break up with the other then the relationship ends, both individuals are added to the singles list before new couples are formed, and l_{ij} is reset to zero. The impact on individual's self-esteem depends on whether the dissolution was mutual or unilateral.

Self-esteem effects

The primary effect of the self-esteem variable s_i is on i's perception of its own attractiveness. Our model of the effect of self-esteem on self-perception is grounded in the Fleming and Courtney (1984) finding that self-ratings of attractiveness loaded heavily on self-esteem factors. In particular, we use equation 2 to determine an individual's self-perceived attractiveness A_i in terms of their actual (externally determined and static) attractiveness α_i and their varying self-esteem s_i.

$$A_i = \begin{cases} \alpha_i + (1-\alpha_i)s_i, & s_i \geq 0 \\ \alpha_i(1+s_i), & s_i < 0 \end{cases} \tag{2}$$

Equation 2 is the simplest choice of equation that ensures that any value of actual attractiveness $\alpha_i \in (0, 1)$ and self-esteem $s_i \in (-1, 1)$ results in a perceived self-attractiveness A_i in the correct range of $(0, 1)$. From the upper clause of equation 2 we can see that a positive s_i produce a linear increase in perceived attractiveness from $A_i = \alpha_i$ for $s_i = 0$ to $A_i = 1$ for $s_i = 1$. Thus, $s_i > 0$ corresponds to an overly high self-esteem or even arrogance and an overestimation of one's own physical attractiveness. In the lower clause of equation 2 we see that $s_i < 0$ produce a linear decrease in perceived attractiveness from $A_i = \alpha_i$ for $s_i = 0$ to $A_i = 0$ for $s_i = -1$. Negative s_i model a low self-esteem. A perfect judgement of one's own attractiveness is achieved with the 'perfect' esteem of $s_i = 0$.

Through its effect on A_i, self-esteem is important for the duration of relationships. However, in the formation of couples we only consider the actual attractiveness α_i and self-esteem plays no role. We do not incorporate self-esteem in the selection of a mate because Walster (1970) established that self-esteem has no effect on the tendency to prefer the most attractive choice of partner.

The key difference between α_i and s_i is that α_i is static throughout the simulation and s_i varies depending on social interactions. In other words, a person's physical attractiveness is not affected by social interactions, but their self-esteem, self-image, or body-image is affected (Leary, 2005; Pass, 2009). To lower an agent i's self-esteem by a factor x without exceeding the range of $(-1, 1)$ we use $d_i(x)$:

$$d_i(x) = \begin{cases} s_i - x, & s_i \geq 0 \\ s_i - (1+s_i)x, & s_i < 0 \end{cases} \tag{3}$$

and to raise it by a factor x we use $u_i(x)$:

$$u_i(x) = \begin{cases} s_i + (1-s_i)x, & s_i \geq 0 \\ s_i + x, & s_i < 0 \end{cases} \tag{4}$$

If an agent has a positive self-esteem ($s_i \geq 0$) and we lower it by x with equation 3 then we simply subtract x from the agent's esteem. If an agent has a negative self-esteem ($s_i < 0$) then we need to worry about potentially reducing it past -1 and so we do as equation 2: lower self-esteem linearly from $d_i(0) = s_i$ to $d_i(1) = -1$. The same procedure is used in equation 4 except with negative and positive esteem swapped and raising instead of lowering. $u_i(x)$ and $d_i(x)$ allow us to increase and decrease an agent i's self-esteem in a simple and consistent way without leaving the range $(-1, 1)$.

During the relationship forming stage, if both agents accept the relationship then each receives a self esteem boost: $s_i \leftarrow u_i(0.3)$. This corresponds to the feeling of well being individuals receive from the social acceptance of relationship formation as predicted by sociometry theory (Leary, 2005). On the other hand, if agent i proposes the relationship, but agent j declines, then agent i suffers a self-esteem loss from rejection (in our model: $s_i \leftarrow d_i(0.2)$) and agent j receives a small self-esteem boost from the flattery and reassurance of their attractiveness($s_j \leftarrow u_i(0.1)$) (Pass et al., 2010). If both agents reject the potential pairing then self-esteem is left unchanged because neither individual proposed a relationship.

The most drastic effects on self-esteem are in the case of unilatteral termination of a relationship (Helgeson, 1994). If one of the individuals decides to break up with the other, then the dumped agent's self-esteem is lowered to a new level: $s_i \leftarrow d_i(0.4)$. However, if both individuals want the relationship to end, then neither self-esteem is affected. Although the specific values 0.1, 0.2, 0.3, and 0.4 in our model are chosen for simplicity, the relative ordering of them is meant to correspond to the general ordering observed by Helgeson (1994): break-ups are the most damaging ($d_i(0.4)$), with rejection less damaging ($d_i(0.2)$) and the awards for acceptance higher for a new relationship ($u_i(0.3)$) compared to just the flattery of an offer ($u_i(0.1)$).

Results

To provide an idea of how effective the model is while keeping errors and simulation times reasonable, the simulation was run 50 times with 300 men and 300 women courting for 50 epochs. The main observed quantity was the mean intra-couple attractiveness correlation for the couples in each epoch. Figure 1 provides a visualization of the collected data. The mean correlation was collected for all of the couples in each epoch (blue), as well as the top 30% by longevity (red). Effectively, the blue points represent the 'average' daters and asymptote at around $r = .23$. The top 30% correspond to the 'serious' daters and asymptote near $r = .60$ which is in the observed range of .56 to .63 for serious and engaged or married couples (White, 1980). The large gap between between the attractiveness correlation in average and serious daters is consistent with White's (1980) em-

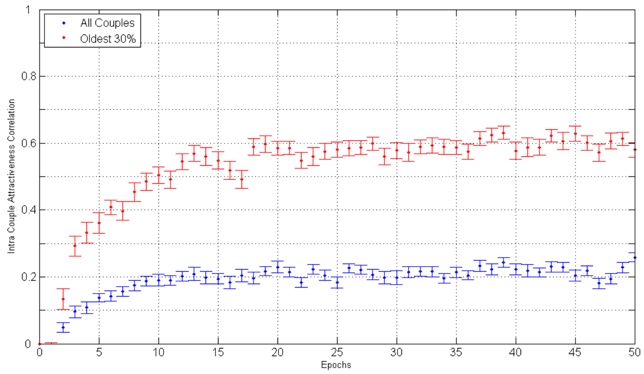

Figure 1: The intra-couple attractiveness correlation versus epochs with statistical error. The blue data points are the correlations of all of the couples in an epoch. The red data points are of the oldest 30% of the couples. The data were generated by averaging over 50 simulations of 50 epochs with 300 men and 300 women courting

pirical results. The lower correlation value of our model also matches empirical data much better than the unreasonably high correlations of earlier models (Kalick & Hamilton, 1986).

Discussion

Earlier simulations (Kalick & Hamilton, 1986) yielded an intra-couple attractiveness correlation of approximately .9, .85, and .55 for the matching hypothesis, combined, and mate attractiveness selection rules respectively. Kalick and Hamilton (1986) concluded based on these simulations that the matching hypothesis alone could not explain intra-couple attractiveness correlations as they were simply too high. By introducing modified rules that incorporated both formation and development of relationships, our model provided realistic correlations of .23 for average daters and .60 for serious and engaged or married couples. We matched experimental results of attractiveness selection by allowing partners to favour accepting dates with more attractive partners. We incorporated the matching hypothesis in the break-up probability instead of relationship formation. This allowed our model to track both the formation and development of relationships. Allowing couples to break-up also addressed an important shortcoming of earlier models (Aron, 1988). By allowing individuals to be single instead of eventually forcing everyone into a relationship we ensure that there is always choice of potential partners.

Our model has provided promising results, but only a portion of its potential has been examined. The model and simulation were used to show how the matching hypothesis can be present in a place other than the probability of date acceptance. This approach accounts for matching effects (especially in long-lived couples) while allowing for the experimental tendency to choose more attractive partners. The simulation could be extended to allow one of the sexes to select a potential partner (instead of random assignment). We believe that such a modification is essential to account for the asymmetry in male and female perception of self-attractiveness. In particular, if males select a potential partner more often, then they will face rejection more often than females and produce more variation in self-esteem and hence a lower correlation between self-perceived and externally judged attractiveness. However, the most important part of the model that needs more attention and study is the self-esteem variables and the choices of weights in various equations. As it stands, lack of knowledge about the self-esteem factor is the largest limitation of the model. To truly test and understand the model and simulation, experiments are essential.

The structure of the simulation and relative simplicity of the model, lends itself nicely to empirical studies. Our model's predictions could be tested with human participants. The attractiveness score of each individual could be evaluated by a panel of judges or by querying participants of the other gender. Individuals' self-esteem parameter could be estimated by comparing their own evaluation of attractiveness, A_i, to the attractiveness assigned by judges, α_i. The dates and choices to break up or accept partners can be carried out as in existing studies. The computer simulation can be run with the same initial population of parameters and results compared. By doing parameter fitting on the inputs for equations 3 and 4 we could estimate the effects of rejection and acceptance on self-esteem.

A further contribution of our simulation is the clarity a formal model brings to theories of human romantic relationships. This clarity allows us to easily generate hypotheses and, more importantly, to relate our model to work in the nearby fields of evolutionary and cognitive psychology. In particular, we hope that — using attractiveness as a proxy for fitness (Singh, 1993; Hönekopp, Rudolph, Beier, Liebert, & Müller, 2007) — future work can connect our social/psychological model to evolutionary and cognitive models. The methods of evolutionary game theory have already been used to study parts of equity theory such as the evolution of fairness in the ultimatum game (Nowak, Page, & Sigmund, 2000; Bolton & Ockenfels, 2000) and the predominance of ethnocentrism (Hammond & Axelrod, 2006; Shultz, Hartshorn, & Kaznatcheev, 2009). Recently, Kaznatcheev (2010) incorporated cognition into these evolutionary models. Recasting our model of mate selection in such a setting can provide important insights into the basis of romantic relations. By looking at the evolutionary and cognitive underpinning of mate selection (Miller & Todd, 1998), future work could explain not only *how* romantic relationships progress, but *why* this is the case.

Our model offers a new and alternative look at the dynamics of romantic relationships. Unlike earlier studies (Kalick & Hamilton, 1986), not only the initialization of a relationship is examined, but also its longevity. As any romantic can tell you, knowing how to start a relationship is nothing compared to keeping an existing one going. Hopefully, this model and simulation can illuminate the mysteries of dating and help us understand human interaction a little better.

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