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Special article

The mapping of women's physical attractiveness onto mate value: a proposed method of derivation

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Abstract

Though female attractiveness is one of the most widely studied variables in the human mating literature, there has been no attempt to quantify its relation with female mate value. I propose that the possibility of mapping female attractiveness onto mate value in the form of a curve should be explored. The curve will differ for short and long-term mating contexts and across individual males. The area under each curve could be used as a concise and global measure of male choosiness. I suggest a possible method of empirically deriving this curve, whereby male participants make forced choices between sets of female stimuli.

Keywords: female attractiveness, mate value, short-term mating, long-term mating, mate choice.

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Introduction. Female attractiveness and male choice.

The centrality of female physical attractiveness in men's mating desires and choices can scarcely be exaggerated. Decades' worth of experimental, observational, sociological, cross-cultural and neuroscientific data support the thesis that attractiveness is generally the most important determinant of female mate value, and the primary consideration underlying men's choices (1-5). Indeed, physical attractiveness (both female and male) is by far the most studied and manipulated variable in contemporary mate choice studies (6-8).

To date the evolutionary psychological literature has approached the relationship between female attractiveness and mate value in a largely particularistic, contextual or piecemeal manner. Research questions are often framed as between-groups' comparisons of means, e.g. "how do two treatment groups of men x and y differ in regard to their preference for attractive female faces?" Alternatively, correlational designs are used to test for the relationship between the mate value men derive from women and some third variable, e.g. "what is the minimum level of female attractiveness that a man will settle for given systematic manipulation of independent variable z?" or something along those lines. Invaluable as such research clearly is, there has been to my knowledge no attempt to quantify the relationship between the various levels of female attractiveness and the mate value these provide to men, stripped of complicating factors and third variables. By "quantify" I simply mean treating mate value as a function of female attractiveness, and attempting to derive this function.

But is it reasonable to even attempt this, to start putting numbers on women's mate value? Can we possibly hope to treat mate value as a scalar quantity and start making statements to the effect that, say, the mate value of one woman in the top percentile of female attractiveness equals that of ten women in the twentieth percentile? Only empirical research can eventually settle the matter, but a task analysis of the human motivational system by Tooby, Cosmides and Barrett suggests this is almost an inevitability:

"In order to make choices in a way that usually promotes fitness, our [psychological] architectures need to be able to discriminate alternative courses of action on the basis of computed indices of their probable fitness consequences. To serve this purpose, the minimum valuation-proprietary form of content is therefore a form of representational tagging with computed scalar utilities (or their equivalent) assigned to whatever representational parsing there is of goals, plans, situations, outcomes or experiences […] Although the motivational system is far richer than just a utility computing system, we know this unidimensional neural currency must exist as one aspect of the motivational system, or the system could not be designed to make mutually exclusive choices nonreflexively in a way that tracked higher fitness payoffs. *This form of payoff representation must be scalar so that magnitudes can be ordered, and should in addition have properties of a ratio scale so the computational system can arbitrate competing goals under different probability distributions.*" (9:320; emphasis added).

Viewed this way, mate value would simply be one expression of this "unidimensional neural currency". And just as this mate value would need to be compared against the value derived from other resources (unrelated to mating), so too must the value derived from different individual women be directly comparable to each other.

The mate value curve: Long and short-term functions.

It is assumed that the relationship between female attractiveness and the mate value this represents to men can be modelled by a continuous function with domain from the lowest to the highest value of female attractiveness. We can safely assume that this function's curve will be increasing, so that a man will derive larger mate value from higher levels of female attractiveness. Other than this we cannot say much with certainty, but *a priori* it is likely that the shape of the curve will change depending on the level of male involvement. Here I will consider the curve at two extremes, the short-term and long-term mating contexts (2,10). The human literature supports Trivers'

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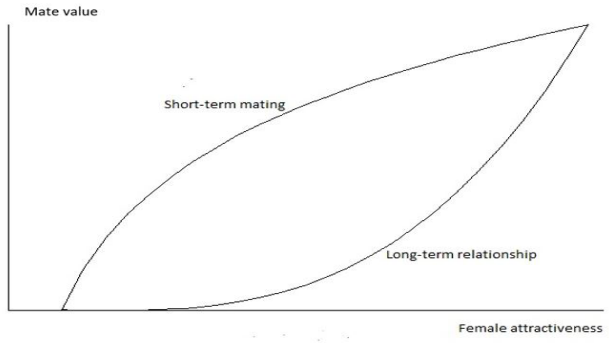
suggestion of males being more indiscriminate when pursuing low parental investment relationships and becoming progressively choosier as their level of investment increases (11). It has been found that men lower their minimum standards of what is acceptable in a woman when pursuing short-term matings and progressively raise them with increasing levels of involvement, so that when evaluating a potential marriage partner, they are nearly as choosy as women (10,12-14).

There is probably a range of females at the lower end of the attractiveness range (mostly older, non-fertile women, or those with phenotypic abnormalities) with zero mate value, for both short and long-term mating. But for short-term matings (like a single copulation) this range will be relatively small, and there will a low threshold value of attractiveness after which males start to derive mate value. Above this threshold value, the curve which maps female attractiveness to mate value will have a negative second derivative and be concave downward (Figure 1). The mate value will increase rapidly for lower values of female attractiveness and slower for higher values. In other words, from the vantage point of a male there will be a large difference between a moderately unattractive and an averagely attractive female. Equal distances for larger values of female attractiveness will not yield as large mate value increments: intuitively, it does not seem likely that from the vantage point of the male there will be such a large difference in mate value between a very attractive and an extremely attractive short-term partner.

Figure 1: The relationship between female attractiveness and mate value for short and long-term relationships.



In contrast to the aforementioned curve, we would expect a long-term relationship context to produce a curve that is concave upward (Figure 1). The threshold attractiveness value that yields non-zero mate value will be set higher than before. For the values immediately after this threshold, men will still gain very little mate value, so that the difference between a very unattractive and a moderately unattractive female will be relatively small. For larger values of female attractiveness, we would expect mate value to rapidly increase, so that there will be a very large difference in mate value between a moderately attractive and a highly attractive female. For convenience I will refer to this curve as the long-term mate value curve (U_L) and the previously discussed curve as the short-term mate value curve (U_S).

Though I have just described the "typical" short-term and long-term mate value curves, it is easy to see that curves derived from individual male subjects will constitute more useful research instruments than these population-level curves. Let us assume - for illustrative purposes - that both mate value curves can be adequately approximated by a third degree polynomial of the general form ax^3+bx^2+cx+d. Estimating a male subject's values for a, b, c and d (separately for both curves) would allow us to integrate and calculate the area under the two curves, equivalent to the cumulative mate value a male enjoys in the two mating contexts across the entire range of female attractiveness. The result of this integration would afford a global estimate of male 'choosiness' that would be clearly superior, for most research purposes, to any particularistic measure. Each male subject could be assigned three scalar quantities: S, L and D. S is the area under U_S, L is the area under U_L, and D is the difference between the two ($D=S-L$). The higher S and L are, the larger the mate value gained by a given male across all levels of female attractiveness, and therefore the less choosy he is. On the other hand, D is a measure of the extent to which a male alters his mate value curve from short to long-term mating contexts. This can be interpreted as a gauge of how much a male lowers his mate criteria in the context of short-term matings or, equivalently, how much he raises them in long-term relationships. Having calculated these quantities for each individual in a set of male subjects, the experimenter has at his disposal global

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variables whose practical use can be ascertained by finding, in the first place, how they correlate with such widely used variables as men's own attractiveness, dominance, resource acquisition potential, sociosexual orientation and so on (2,15-17).

The impossibility of theoretical derivation. A method of empirical derivation.

Ideally the curves discussed in the previous section would be derived theoretically, namely from an analysis of the various evolutionary pressures that have shaped male choice in relation to female attractiveness (18,19). This would presuppose a) knowledge of the precise fitness benefits female attractiveness conferred to ancestral males and b) the magnitude of these benefits as well as c) any relevant trade-offs, constraints etc. At the present time there is no consensus on the exact nature of these ancestral benefits. Though the role of female attractiveness as a cue to youthfulness and high reproductive potential is almost certain, its function as a cue for heritable genetic benefits or good health is less certain (7,20,21). Furthermore, even if we could be certain about the fitness benefits the preference for female attractiveness conferred on ancestral males, we would have no way of knowing the size of these benefits throughout evolution, or how they were traded off against each other. The theoretical derivation therefore, though undoubtedly the more aesthetically pleasing and elegant procedure, is an unattainable ideal.

But how could these curves be derived empirically? I suggest a possible method of derivation by trial and error. I will discuss the short-term mating context, though for a long-term context an analogous procedure could be used. Take a group of male subjects, where each subject is asked to make a series of forced choice decisions between pairs of female images as prospective short-term mates, or, in the language of today's western man, as hypothetical "one-night stands." Obviously presenting him with two photographs of women and asking him to choose one will reveal nothing we don't already know. He will invariably choose the most attractive of the two and merely confirm the obvious, namely that the curve is increasing. Presenting him, however, with a choice of one attractive female on the one hand (one one-night stand) and two less attractive females on the other (two one-night stands, one with each) will be far more informative. For example, assume that the man has first rated the females for attractiveness on an attractiveness scale familiar to him, say 1 to 10. He is then presented with a series of *n* forced choices that would look something like the following.

Trial #	Choice A	Choice B
1	{9}	{7,6}
2	{6}	{4,1}
3	{4}	{3,2}
.	.	.
.	.	.
n	{7}	{4,2}

The numbers in brackets refer to the untransformed attractiveness ratings of the females. The experimenter has produced these pairings at random, following only the rule that the female on the left column is always more attractive than either female on the right. Let us assume our male subject selects A for trials 2 and 3, but B for trials 1 and n. Assuming no diminishing marginal mate value (in other words that the mate value of the second female on the right-hand column is not discounted), his choices reveal the following *n* bits of information:

1.	$U_S(9)<U_S(7)+U_S(6)$
2.	$U_S(6)>U_S(4)+U_S(1)$
3.	$U_S(4)>U_S(3)+U_S(2)$
.	.
.	.
n.	$U_S(7)<U_S(4)+U_S(2)$

It is then only a matter of trial and error to find the function U_S that best describes this set of inequalities, i.e. the function that correctly predicts the largest number of forced choices.

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Alternatively, if we assume a scenario of diminishing marginal mate value (for every additional sexual partner after the first), then the mate value of the least attractive female on the right-hand side can be discounted by a constant c_1, where $0 < c_1 < 1$. This is the simplest scenario for diminishing marginal mate value; in principle the discounting functions could be far more complicated.

Having thus derived this "function of best fit" the next step would be to validate it by having every male subject make another set of choices and seeing how well the function fits the newly observed inequalities. We can explore the model's validity - and in particular the validity of the equal or diminishing marginal mate value assumption which we made in the previous step - by adding more complicated inequalities to the set, as in the following example:

t	Choice A	Choice B
1	{6}	{3,1}
2	{7,3}	{5, 5}
3	{9,4}	{5,4,2}
.	.	.
.	.	.
n	{8}	{6,5}

The scenario of equal marginal mate value involves a straightforward extension of the previous analysis. Alternatively, picking up from the least complicated scenario of diminishing marginal mate value discussed above, the simplest way to discount the third female on the right-hand side (or the second on the left) would be with a constant c_2 such that $1 < c_1 < c_2 < 0$. To explore this procedure's reliability and derive a baseline level of error, a separate set of male subjects could be asked, after a certain time interval, to choose again from the original set of stimuli.

Finally, it is worth asking if we will allow negative mate value to enter the analysis. I have up to this point assumed that the lowest possible mate value is zero, meaning that under a certain level of female attractiveness a male will refuse to mate. But this assumption can easily be modified, depending on the instructions given to male subjects. If the instructions stipulate that a male subject *must* mate with every single female on either side of the forced choice, then the mate value function should be modified to allow negative mate value associated with the least attractive females. Given the physiological costs associated with sexual activity such as time and energy expended, sexually transmitted diseases etc. (22), but most importantly the adverse social consequences arising from possible lowering of status and perceived mate value (23-25), it is likely that at least some males will shun mating opportunities with very unattractive females, so that "forcing" them to thus mate would confer negative mate value.

Conclusion

I have suggested that the mapping of female attractiveness onto mate value, if achieved, will allow a number of practical applications that won't otherwise be forthcoming. In addition to the forced choice method sketched here, other possible methods of derivation might involve allowing male subjects more freedom in manipulating the female stimuli (i.e. the setting of equalities in contrast to forced choices among inequalities), the use of monetary units etc. This line of research has the potential to provide insights unlikely to be reached through currently prevailing between-group and correlational designs.

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