Too much of a good thing? Variety is confusing in mate choice

Alison P. Lenton1,* and Marco Francesconi2
1Department of Psychology, University of Edinburgh, 7 George Square, Edinburgh EH8 9JZ, UK
2Department of Economics, University of Essex, Wivenhoe Park, Colchester CO4 3SQ, UK
*Author for correspondence (a.lenton@ed.ac.uk).

Choice variety is supposed to increase the likelihood that a chooser’s preferences are satisfied. To assess the effects of variety on real-world mate choice, we analysed human dating decisions across 84 speed-dating events (events in which people go on a series of sequential ‘mini-dates’). Results showed that choosers made fewer proposals (positive dating decisions) at events in which the available dates showed greater variety across such attributes as age, height, occupation and education, and this effect was particularly strong when choosers were confronted with a larger number of opposite-sex speed daters. Additionally, participants attending events in which the available options showed greater variety across these attributes were less likely to choose the sensually preferred mate option and more likely to choose no one at all. In contexts in which time is a limited resource, choice variety—rather than facilitating choice quality or increasing choosiness—is confusing and potentially detrimental to choice quality.

Keywords: choice variety; mate choice; choice quality; choice overload; human behaviour

1. INTRODUCTION
Humans and non-human animals alike are adept at detecting variety [1], possibly because variety increases the likelihood of satisfying one’s needs [2]. But how do choosers manage choice variety? This study aimed to advance researchers’ understanding of how the choice environment shapes observed mate preferences. In particular, we examined how choice variety—a term we restrict to mean the degree to which a set of mate options is heterogeneous versus homogeneous, over and above the number of options—influences humans’ dating choices.

With respect to human behaviour, the relationship between variety and choice has been investigated in consumers. While some studies find that choice variety is attractive and increases consumers’ product consumption (when the options are few; [3]), others show that variety leads to dissatisfaction [4], poorer quality choice [5] and lesser consumption [6].

Among ethologists, a related issue has been addressed with theoretical modelling. One model suggests that choices will be more assortative in a high than a low-variety environment [7]. Additionally, Luttbeg’s [8] modelling indicates that perceived variety will lead choosers to set a higher acceptance threshold and thus, to increased choosiness (i.e. decreased responsiveness; [9]). A simple measure of choosiness is the proportion of individuals rejected. Accordingly, one might predict that this proportion increases with option variety.

A crucial difference between the ethologists’ and psychologists’ explanations for variety leading to more rejections, however, is the latter’s proposal that it results from confusion rather than choosiness. That is, consumers are thought to be less likely to choose from a high-variety option set because search, discrimination and evaluation costs are higher (more time and effort); and if they choose at all, the probability of sub-optimal choice increases [10]. To illustrate, imagine two sets of five options, each of which possesses eight attributes. In the lower variety set, the options are the same on four of the eight attributes. In the higher variety set, the options vary across all eight attributes. Choosers facing the latter set may find it more difficult to evaluate the options and choose between them. Likewise, Heitmann et al. [10] found that ‘too much’ perceived variety decreased purchasing, because choosers associated variety with higher evaluation costs and future regret.

Many ethologists have also discussed the notion of perceiver errors in cue assessment and option discrimination [11–13], but what has yet to be addressed is how the assumptions that (i) this error is likely to increase with choice variety and (ii) greater choosiness also increases with choice variety, play out against one another. Jennions & Petrie [14] suggest one type of evidence that could help tease apart perceiver error (owing to confusion) from choosiness: if a population-level ‘bias’ (mean preference) strengthens in a high-variety context, it would point to increasing choosiness, whereas if the ‘bias’ weakens, it would point to increasing confusion. Assuming that a positive correlation exists between the number and variety of options (but see below), chooser confusion may explain why mating skew usually decreases with an increasing number of options ([15,16]; but see [17]).

The present study is novel in empirically investigating the effects of choice variety on human mate-choice behaviour, a domain in which the relationship between number of options and variety occurs naturally. This study also enables us to begin disentangling choosiness from confusion. By doing so, we hope to further elucidate the function and consequences of variety in choice behaviour.

2. MATERIAL AND METHODS
(a) Sample
We analysed dating decisions made by 1868 female and 1870 male participants in 84 commercially run speed-dating events. In brief, single individuals registered for an event. Participants then created an online profile in which they reported their age, weight, height, educational attainment, religion, occupation and smoking habits (‘attributes’). At the event, several women met a comparable number of men for a 3 min mini-date each (male–female ratio: mean ± s.d. = 1.00 ± 0.08, range 0.85–1.23), with the events gathering an average of 24 speed daters of each sex (range: 15–31). Usually within 48 h, participants communicated their decisions (‘yes’ or ‘no’ for each opposite-sex speed dater) to the agency. Consequently, our results are less relevant to decision-rule models necessitating that a single option is chosen...
Table 1. Attribute definitions and descriptive statistics. (The descriptive statistics are based on the attributes of the 1868 female and 1870 male participants.)

<table>
<thead>
<tr>
<th>attribute</th>
<th>number of levels</th>
<th>definition</th>
<th>descriptive statistics (mean ± s.d.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>continuous</td>
<td>in years</td>
<td>female 34.3 ± 7.5, male 35.6 ± 6.9</td>
</tr>
<tr>
<td>education</td>
<td>2</td>
<td>university degree or more</td>
<td>female 0.37 ± 0.48, male 0.40 ± 0.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(proportion)</td>
<td>female 0.63 ± 0.48, male 0.60 ± 0.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>any qualification below university level</td>
<td>male 0.40 ± 0.49, female 0.40 ± 0.49</td>
</tr>
<tr>
<td>occupation</td>
<td>3</td>
<td>professional/managerial</td>
<td>male 0.20 ± 0.40, female 0.27 ± 0.44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(proportion)</td>
<td>female 0.29 ± 0.45, male 0.25 ± 0.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>skilled non-manual</td>
<td>male 0.48 ± 0.50, female 0.48 ± 0.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(proportion)</td>
<td>female 0.51 ± 0.50, male 0.51 ± 0.50</td>
</tr>
<tr>
<td>smoking</td>
<td>2</td>
<td>smoker (proportion)</td>
<td>male 0.06 ± 0.24, female 0.06 ± 0.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>non-smoker (proportion)</td>
<td>male 0.05 ± 0.22, female 0.05 ± 0.22</td>
</tr>
<tr>
<td>religion</td>
<td>2</td>
<td>no religious affiliation</td>
<td>male 0.94 ± 0.24, female 0.94 ± 0.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(proportion)</td>
<td>male 0.25 ± 0.22, female 0.25 ± 0.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>having a religious affiliation</td>
<td>male 0.40 ± 0.40, female 0.40 ± 0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(proportion)</td>
<td>female 0.86 ± 0.34, male 0.86 ± 0.34</td>
</tr>
<tr>
<td>height</td>
<td>continuous</td>
<td>in centimetres</td>
<td>female 165.5 ± 5.1, male 179.2 ± 5.5</td>
</tr>
<tr>
<td>BMI</td>
<td>continuous</td>
<td>weight in kilograms/square of height in metres</td>
<td>female 20.83 ± 1.98, male 23.75 ± 2.71</td>
</tr>
</tbody>
</table>

than they are to models that allow for multiple choices and/or models in which options are winnowed in stages [8,9,18,19].

(b) Variety index
For each of the 168 option sets (84 for male choosers and 84 for female choosers), we calculated the variance in each attribute, and then centred and standardized these scores by subtracting the mean variance for each attribute and dividing by its standard deviation (table 1). To characterize the overall variability of a given option set, we averaged these standardized variance scores across all attributes. Thus, the attributes contribute equally to the overall score. This average variance was our measure of variety. Variety scores were strongly correlated with entropy ($r = 0.91$), another approach to assessing complexity [20], indicating that these measures captured cue dispersion similarly.

Because we sought to investigate how the characteristics of an option set influence choice and, further, because the characteristics of any one set were the same for all choosers at a given event, the analyses were performed at the event level. We note that number of options was strongly correlated with number of choosers ($r = 0.91$, $p = 0.0001$), an inherent feature of speed-dating events. Variety and number of options were also positively correlated, but only weakly ($r = 0.25$, $p = 0.002$).

(c) Data analysis
We regressed the number of proposals (i.e. number of yes decisions) made by sets of choosers on (simultaneously): (i) the variety of their option set (standardized and centred about the mean); (ii) the number of options (standardized and centred about the mean); (iii) the sex of the chooser set (male = 0, female = 1, centred about the mean); and (iv) all two- and three-way interactions.

3. RESULTS
Table 2 presents the results. As found elsewhere [21], men made significantly more proposals than women did. More interestingly, as overall option variety increased, the number of proposals decreased. Supplementary analyses suggest that these results are unlikely to be accounted for by increasing option variety making it less probable that choosers’ idiosyncratic preferences were satisfied or by increasing option variety yielding higher quality options (electronic supplementary material, tables S1 and S2). Nevertheless, future research should investigate these alternative explanations further.

As the number of options increased, so did the number of proposals. A significant variety × chooser-sex interaction revealed that, although the variety–proposal relationship was significantly negative for both sexes ($p < 0.01$), it was stronger among men ($\eta^2_p = 0.21$) than women ($\eta^2_p = 0.17$). A significant interaction between variety and number of options (figure 1) showed that the negative effect of variety on choice was greater when choosers faced many (more than 23 participants; $\eta^2_p_{\text{large-set}} = 0.24$) rather than fewer (less than or equal to 23 participants; $\eta^2_p_{\text{small-set}} = 0.14$) options. A significant interaction between number of options and chooser sex indicated that the positive effect of number of options on choice was greater when choosers faced many (more than 23 participants; $\eta^2_p = 0.19$) than for women ($\eta^2_p = 0.13$), though both remained statistically significant ($p < 0.001$). Overall, women and men managed choice variety similarly. The three-way interaction was non-significant.

We performed an additional analysis using a modified dependent variable to understand the effects of these variables on individual (rather than group) choice behaviour. This dependent variable was formed by dividing number of proposals in an event by the number of available choosers. The new results showed that the predictors related to the new dependent variable in the same way as before, except for the chooser-sex main effect and the chooser-sex × number of options interaction (which remained negative, but were no longer significant).

Returning to number of proposals as the dependent variable, regression analyses for each attribute...
separately showed that the main effect of variety was significantly negative for every attribute and for both male and female choosers, except for variability in the options' smoking habits for both male ($\beta_{53} = -0.59, p = 0.559$) and female choosers ($\beta_{53} = -0.44, p = 0.663$). Similarly, the interaction effect was at least marginally significant ($p < 0.10$) and in the same direction (a positive coefficient) for every attribute and for both sexes, with the exception of variability in women’s occupations for male choosers ($\beta_{53} = 1.58, p = 0.123$). The primary findings were not driven by a subset of the attributes.

To assess whether the reduction in number of proposals might reflect increasing confusion rather than increasing choosiness, we examined how variety related to the proportion of choosers: (i) selecting the top-ranked opposite-sex speed dater, as positive consensus by choosers is used as a marker of choice quality among those studying non-human animals [2] and, further, increasing consensus is supposed to be indicative of greater choosiness [14]; and (ii) making no proposals, as deciding not to choose is interpreted as uncertainty by consumer researchers [5,6]. The set of predictors described previously was used. Being proportions, both dependent variables were first arcsine root transformed; and although correlated, they were not redundant ($r = -0.35, p = 0.001$). We focus here on the main effect of variety (see the electronic supplementary material, tables S3 and S4 for complete results). Increasing variety was associated with choosers being significantly less likely to select the top-ranked speed dater ($t_{167} = -2.26, p = 0.025$) and more likely to make 0 proposals ($t_{167} = 3.93, p = 0.001$). When these behaviours were simultaneously added to the regression model, the joint effect of variety and the variety × number of options × chooser sex were their medians. Light grey bars represent low variance and dark grey bars represent high variance.

Figure 1. Mean (± s.e.) number of proposals made at speed-dating events with a small (less than or equal to 23) or large (greater than 23) number of options showing either lower (less than or equal to 0.21) or higher (greater than 0.21) attribute variety. The mean number of options in the small events was 19.80, while it was 26.67 in the large events. We remind the reader that our predictor variables were centred and standardized, but we describe ‘number of options’ here in its raw form, as these values are more comprehensible. The values used to categorize ‘number of options’ (small versus large) and ‘variety’ (high versus low) were their medians. Light grey bars represent low variance and dark grey bars represent high variance.

4. DISCUSSION

Variety is detectable by mate choosers, and it increases with the number of options; but variety and number of options are not substitutable. Indeed, choosers made more proposals when faced with more options, but fewer proposals when these options were highly variable in their attributes; suggesting that choice variety yields greater confusion rather than greater choosiness. Also this effect was stronger when there were more options available. Such an interaction is not predicted by the choosiness account, while it accords with the confusion account. Notably, there is nothing to prevent speed daters from ‘hedging bets’ by choosing several options. Instead, increasing variety led some participants not to choose at all and some to make ‘lower quality’ choices. As with the number of mate options [2], there may be a natural range of variety in mate options that a given species is adapted to select among, with variability outside this range yielding confusion (see [22]). Overall, our findings strengthen evidence for the bounded rationality of human mate choice [18].

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