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ONLY CHEAP TALK AFTER ALL? NEW EXPERIMENTAL PSYCHOLOGICAL FINDINGS ON THE ROLE OF VERBAL PROFICIENCY IN MATE CHOICE

Recent evolutionary experimental psychological research found that high verbal proficiency (VP) increased the perceived attractiveness of individuals (more so for males than females), especially in the context of a long-term relationship. Our study had the objective of replicating and extending this research. Similar to previous studies, audio files in which speakers performed scripted self-presentations that had equal content but varied on VP were used as stimuli for opposite-sex participants. VP was found to increase attractiveness ratings. The effects were mostly small for numerous variables relating to short-term mating, whereas they were moderate to large for long-term mating. Our participants attributed more future income, but not more total number of mates to speakers with higher VP. Female menstrual cycle effects on attractiveness ratings were not found. Contrary to former research, being more verbally proficient was not found to be more beneficial for one sex over the other.

Key words: attractiveness, evolutionary psychology, mate choice, sexual selection, verbal proficiency

Introduction

We use language quite naturally in everyday life and often take this skill for granted. Despite the fact that words come quite easily to us and that children acquire their mother tongue rapidly and effortlessly, language is a complex phenomenon (Pinker, 1994). For instance, as far as we know only our species demonstrates such complete command of this trait, and designing machines that

can cope with language has taken decades. These facts point to the necessity of explaining the very nature of language, which includes a consideration of our ability to use language as an adaptation or, as Pinker (1994) called it, an instinct. On the one hand, language can be considered a psychological or cognitive trait. On the other hand, language has a clear biological foundation (e.g. Jenkins, 2000), which means that like numerous other traits language might have evolved during the phylogeny of our species.

However, the reasons and manner in which language evolved during anthropogenesis has not yet been sufficiently explained (Miller, 2002). Claiming that language is the result of human evolution necessarily entails an exploration of the selection pressures that shaped this trait. This task requires an investigation into the possible advantages that language offered for the survival and reproduction of members of our species (Maestripieri, 1997). One simple answer that is often postulated lies in the reference to human beings as social animals (e.g. Dunbar, 1996; Maestripieri, 1997; Pinker, 1994; Pinker & Bloom, 1990). Large social groups can be difficult to manage, especially when each individual has very special fitness interests. This might result in a situation where the selection pressure to evolve some sort of language that is beneficial for survival and has advantages over other forms of communication is substantial (Dunbar, 1996; Pinker, 1994). Hence, the evolution of language might be explained by referencing Darwin's (1859) theory of natural selection.

However, even Darwin was not too satisfied with what his theory of natural selection offered, as many excessive and luxurious traits (e.g. the peacock's plumage) spoke against the key assumption of his theory, namely that traits which promote survival while being parsimonious should be favored by selection. Hence, Darwin (1871) developed the theory of sexual selection, according to which the competition within (intrasexual selection) and between the sexes (intersexual selection) are the main evolutionary forces. Many modern evolutionary psychological researchers (see Lange, Schwarz, & Euler, 2013; Miller, 1998, 2000a, 2000b; Miller & Todd, 1998 for an overview) are skeptical about the extent to which the evolution of the human mind can be explained by natural selection alone. Instead, these researchers claim that the costly products of the human mind (e.g. language, literature, and humor) are favored in mate choice as they signal mate quality and are thus beneficial in terms of reproduction. Indeed, it can be argued that language is far too complex to be merely the result of natural selection (Burling, 1986; Miller, 2000a).

In intersexual selection, that is, the actual mate choice, the sexes are in a different position. A bad mate choice potentially imposes higher costs on the sex with the higher obligatory costs in reproduction, as shown in the parental investment theory (Trivers, 1972). In humans, as in all mammals, this sex is female because women must bear the costs of pregnancy, lactation, and the other responsibilities of raising their young. It is thus assumed and empirically

verified (cross-culturally) that women are more selective in mate selection, especially in short-term mating (Buss, 1989, 2016; Buss & Schmitt, 1993; Feingold, 1992; Schwarz & Hassebrauck, 2012). In contrast, men should be relatively indiscriminate regarding mate choice as long as their costs remain low (i.e. in uncommitted/short-term mating). This means, however, that men should also be choosy when entering a committed long-term relationship (Buss, 2016). Both sexes then should try to gain access to the best possible mate. The result of this kind of choice can be termed *mutual mate choice* (Miller, 2000a, 2013). Indeed, human males invest more in their offspring than males of most other species, although not as much as women (Buss & Schmitt, 1993; Fernandez-Duque, Valeggia, & Mendoza, 2009).

Still, women might be considered the slightly more selective sex after all. Focusing on female choosiness, a question arises about what male traits should be favored, for which there are two simple answers: male genetic quality and male ability to provide the woman and the offspring with resources (Gangestad & Simpson, 1990, 2000). High genetic quality can be obtained by short sexual liaisons, especially during the fertile menstrual cycle phase (ovulation) when conception is most likely, while resources are relatively more important in a committed long-term relationship (Buss, 2016).

Language is genetically very complex and linguistic abilities are highly heritable (Jenkins, 2000; Stromswold, 2005). Many genes are involved in creating a proper language phenotype (Jenkins, 2000; Miller, 2000a), so the so-called mutational target size of language is rather high, which means that good language competence signals a low mutation load and thus genetic quality (Miller, 2000a). Moreover, verbal skills are highly heritable. That is, a large proportion of inter-individual phenotypic differences in verbal proficiency (VP) is explained by inter-individual genotypic (that is, allelic) differences (Stromswold, 2001, 2005). For instance, two thirds of inter-individual differences in vocabulary size are attributable to genetic differences among the respective individuals (Bratko, 1996). High heritability estimations of a trait illustrate that the respective trait might be or has been under sexual selection in particular (Miller, 1998, 2000a, 2000b; Miller & Todd, 1998).

Hence, high verbal proficiency (VP) could be favored by women in short-term mating as an indicator of good genes. This would mean that – *ceteris paribus* – a verbally proficient man has a quantitatively higher mating success than a less verbally proficient man. Indeed, the production of verbal displays is correlated with mate number (Lange & Euler, 2014). Verbally proficient men should then be especially favored by ovulating women, that is by women in the fertile phase of their menstrual cycle, because it is this very short phase when intercourse most likely leads to conception. As good genes might be the only benefit women can gain in such a situation, traits signaling genetic quality should be favored in such a context. Following the above rationale, language competence could be such

a trait. It should be noted, though, that attempts to show that verbally proficient men are particularly favored by fertile women compared to non-fertile women have failed so far (Lange, 2012; Lange, Schwarz, Zaretsky, & Euler, 2014). These null findings indicate that verbal proficiency might be a less important trait in short-term compared to long-term mating. Indeed, verbal proficiency is not only genetically complex but also indicative of resources (via being correlated with intelligence, formal schooling, and income; Ceci & Williams, 1997; Kanazawa, 2007; Kemper & Sumner, 2001), which are particularly important when it comes to a long-term relationship (Buss, 2016; Feingold, 1992). For instance, the correlation between intelligence and verbal skills is high with a correlation coefficient of around .7 (Ramsay & Reynolds, 2003). Verbal proficiency might thus be rather favored by women in long-term mating, when resources and traits signaling resource acquisition abilities are relatively more important than genetic quality (Buss, 2016; Gangestad & Simpson, 1990, 2000).

Despite the importance of language in everyday life, empirical research on the role of language in mate choice is relatively scarce. Rosenberg and Tunney (2008) showed that human vocabulary might be partially the result of sexual selection. Lange, Zaretsky, Schwarz, and Euler (2014) provided experimental studies examining the role of verbal proficiency (VP), including vocabulary, grammar, and speech fluency, in mate choice from an evolutionary psychological perspective. In two studies, they found that high verbal proficiency increases attractiveness (main effect of VP). They also found a higher female than male choosiness, in that female participants were more reluctant to give high ratings compared to men (main effect of sex), as expected given the potentially higher female costs. However, this should specifically be expected in a short-term context, where female costs are particularly high compared to male costs. More importantly, in one of their two studies Lange, Zaretsky, Schwarz, and Euler (2014) found that male attractiveness was increased significantly more by verbal proficiency than was female attractiveness (interaction effect between VP and speaker's sex), as sexual selection theory and parental investment theory would predict. The rationale behind this prediction was that if women are choosier in mate choice decisions than men are, women should treasure high verbal proficiency in a mate more highly than men should. However, Lange, Zaretsky, Schwarz, and Euler (2014) found this effect to be very small (less than 2% explained variance). The very small effect size and the fact that such an effect was only found in one of their two studies raises a question about whether such an interaction effect actually exists and whether it is replicable. The objective of the current research was to replicate and extend this former research (Lange, Zaretsky, Schwarz, & Euler, 2014). Also, we intended to increase the quality and the number of stimuli compared to previous research (see Methods).

We had three hypotheses and four research questions. The hypotheses could be derived directly from our theoretical background as well as from former

research (e.g. Lange, Zaretsky, Schwarz, & Euler, 2014). Apart from the hypotheses, some questions remained. As we could not be sure what to expect, we did not formulate further hypotheses regarding these questions but simply stated research questions instead. Our hypotheses were:

Hypothesis 1: Verbal proficiency increases attractiveness ratings (main effect of VP on attractiveness). This was hypothesized based on the assumption that verbal proficiency might signal several aspects of mate quality.

Hypothesis 2: As women are choosier in their mate selection than men (Buss, 2016), women are expected to give lower attractiveness ratings than men (main effect of sex). Due to higher costs in short-term mating, this effect is more evident in a short-term than in a long-term mating context.

Hypothesis 3: Male attractiveness is affected by verbal proficiency more than female attractiveness (interaction effect between VP and speaker's sex). This was hypothesized based on the higher female than male choosiness in mate selection.

Our research questions were:

Research Question 1: Is a person's verbal proficiency more important in long-term than in short-term mating? If so, we would expect to find that verbal proficiency is relatively unimportant for deciding whether to go on a date with this person or to visit her / him at her / his apartment or to go to bed with her / him, as all those scenarios are (in ascending order) rather short-term scenarios. If so, we would also not expect to find female menstrual cycle effects on the perception of a verbally more or less proficient man, because cycle effects are also more a matter of short-term than of long-term mating (see above). This led to our next research question:

Research Question 2: Is there an effect of the female menstrual cycle on attractiveness ratings?

If the answer to RQ 1 is yes, we would not expect to find a correlation between verbal proficiency and the estimated number of mates, because a high mate number is more likely the result of short-term rather than long-term mating. However, we would expect to find a correlation between verbal proficiency and estimated future net income, as income is a prototypical resource in today's world that should especially be treasured when seeking a long-term relationship (see above). This led to our final research questions:

Research Question 3: Is verbal proficiency considered to be predictive of future net income (in ten years time)?

Research Question 4: Is verbal proficiency considered to be predictive of the total number of sexual mates in the future (in ten years time)?

Methods

Participants

We had a total of 1,023 non-homosexual participants, mainly university students (83.5%), who rated one randomly selected opposite-sex audio clip on mating-related attributes (see below). Participants were recruited by advertising on social network sites and by emailing students at the university where the study was conducted (Bavaria, Germany).

Participants were 765 women (age: $M = 23.4$, $SD = 5.2$, $Mdn = 22.0$, mode = 21.0) and 258 men (age: $M = 25.0$, $SD = 6.1$, $Mdn = 24.0$, mode = 21.0). Thus, the sex ratio of our sample was imbalanced. This imbalance resulted from the fact that we conducted an online study in which it is generally difficult (if not impossible) to control who participates (convenience sample). Nevertheless, we decided to conduct an online study to reach as many participants as possible to extend further research that had been conducted with a much smaller number of participants. Moreover, it is a common phenomenon that women are more likely to participate in (psychological) studies than men (see Curtin, Presser, & Singer, 2000; Singer, van Hoewyk, & Maher, 2000).

Twenty-eight participants (2.7%) were homosexual. Due to the theoretical background (intersexual selection; see above) and the fact that the participants had to listen to opposite-sex verbal presentations and rate them with respect to mate-choice-relevant aspects (see below), those 28 participants were excluded from the data set before the main statistical analyses, thus leaving only heterosexual and bisexual participants in the sample. For RQ 2, only women who met specific requirements (i.e. regular menstrual cycle, not pregnant, not breast-feeding, not taking any hormonal contraceptives) were used as a sub-sample ($n = 524$ see below). As we knew that many women would have been excluded due to these requirements, we focused on advertising for and recruiting female participants who did not take hormonal contraceptives. The conduct of this study followed the ethical rules of the American Psychological Association.

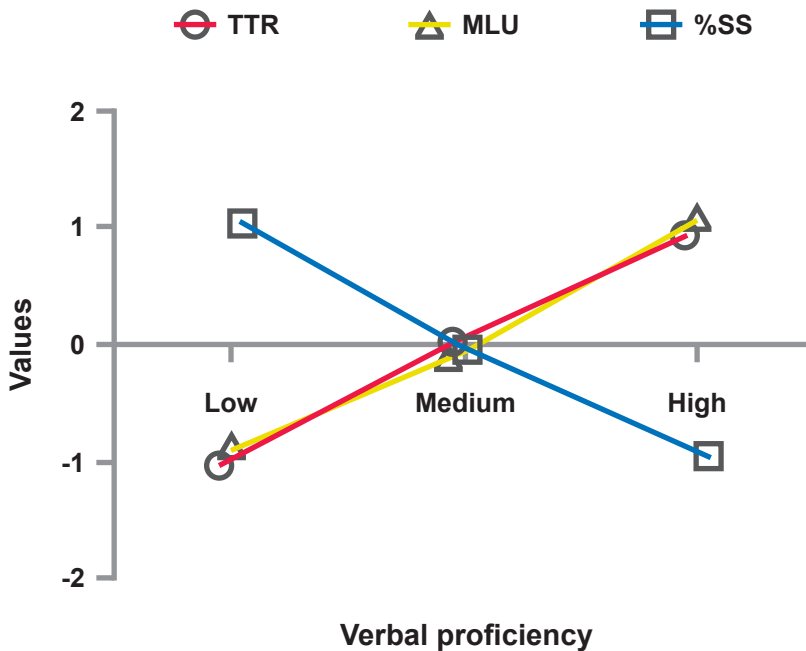
Materials and procedure

The materials and procedure in this study were similar to those used in the other experimental study on verbal proficiency (VP) in a mate-choice context (Lange, Zaretsky, Schwarz, & Euler, 2014; see also Lange, 2012). Accordingly, audio clips of people of the opposite sex performing verbal self-presentations were played to our participants. The content of the self-presentations was scripted beforehand by the first author (see Appendix) to ensure that they were always the same. Three male and three female volunteers acted as presenters who read from their respective scripts to give information about education, income, hobbies, attitudes, career, and future prospects. The study was conducted in German and all presenters spoke in standard German. The presenters were all between 20 and 26 years old and gave written consent that allowed us to use the audio recordings as stimuli in our study.

Verbal proficiency was experimentally manipulated in the clips on three levels, resulting in a 2 (speaker's sex: male, female) x 3 (levels of VP) design. For instance, on the lowest level of verbal proficiency there were only active sentences, while on the highest level there were also sentences in the passive mode (for more details on the experimental manipulation of VP, see Appendix). Our three female and three male speakers created 18 audio clips, providing three times more stimuli than the previous study by Lange, Zaretsky, Schwarz, and Euler (2014). The audio clips were recorded in a professional sound studio under the supervision of a sound engineer.

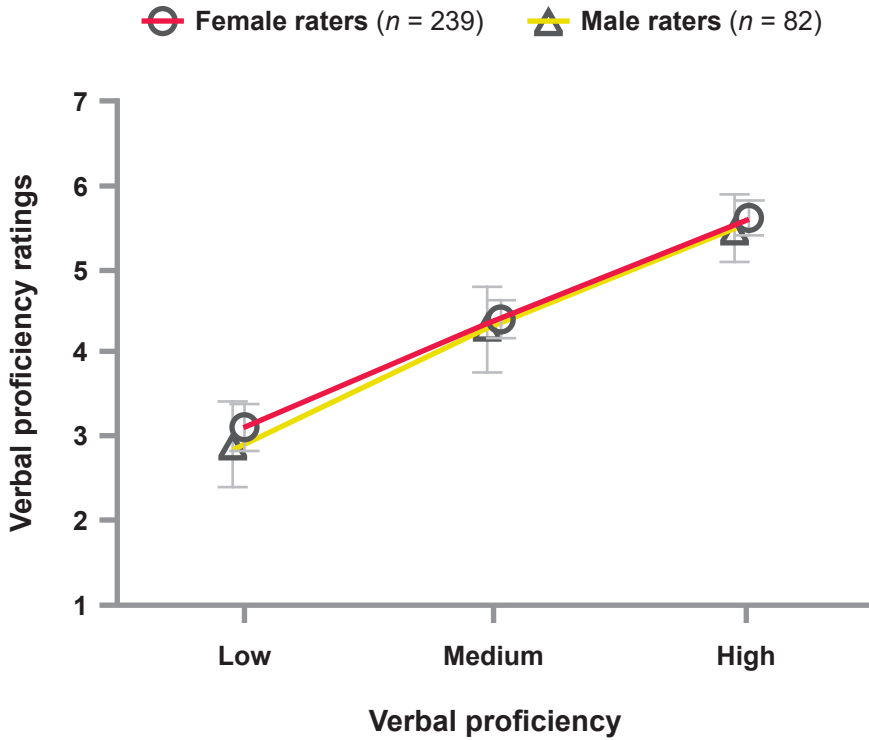
As shown in Figure 1, the three levels of verbal proficiency were almost perfectly put into practice regarding lexical (type-token-ratio, TTR), grammatical (mean length of utterance, MLU), and speech-fluency-related features (percentage of stuttered/disfluent syllables, %SS). Comparing the results of this linguistic

Figure 1. Differences between the three levels of verbal proficiency with respect to lexical (TTR), grammatical (MLU), and speech-fluency features (%SS).



Note. Z-transformed values are given for type-token ratio (TTR), mean length of utterance (MLU), and percentage of stuttered (i.e. disfluent) syllables (%SS). Data units are nudged to prevent overlap.

Figure 2. Results of the pre-ratings of the audio files for verbal proficiency from 1 (*low*) to 7 (*high*), by sex of the rater.



Note. Mean values and error bars showing 95.0% CI of mean are given. Data units are nudged to prevent overlap.

analysis of our stimuli with the linguistic characteristics of the stimuli used by Lange, Zaretsky, Schwarz, and Euler (2014), we can conclude that we had not only more stimuli than the other study but also that our stimuli sufficiently covered all linguistic domains, including grammatical features (cf. Lange, Zaretsky, Schwarz, & Euler, 2014, Fig. 1; cf. also Lange, 2012).

Figure 2 shows the results of an online pre-rating. In order to ensure that verbal proficiency was properly operationalized and transformed into stimuli, we conducted a pretest of the stimuli for verbal proficiency on a 7-point Likert-type scale from 1 (*low*) to 7 (*high*) ($N = 321$ volunteers as pre-raters, 239 women). Results showed that the three levels of verbal proficiency were perceived as such ($F_{(2, 318)} = 137.11$, $p < 0.001$, $\eta_p^2 = 0.46$), with sufficient inter-rater reliability (Cronbach's $\alpha = 0.73$, $p < 0.001$). Thus, the stimuli were perceived as intended.

The linguistic features (TTR, MLU, %SS; see above) correlated highly with the results of the pre-rating ($r_s > .67$, all $p_s > 0.001$). There were no significant differences between the three levels of verbal proficiency in terms of pitch ($p = 0.91$). As this study was about the role of linguistic (e.g. grammatical) and not para-linguistic features (e.g. voice pitch) in mate choice, and considering that it is well known that pitch affects attractiveness perceptions (e.g. Apicella & Feinberg, 2009; Re, O'Connor, Bennett, & Feinberg, 2012), it was important to prevent confounding linguistic features with para-linguistic features.

The main experiment was conducted online. Participants were randomly assigned to one opposite-sex audio clip. After listening to the clip, participants rated the person they had listened to on short-term attractiveness (affair, liaison, one-night stand, non-committed sexual contact) and long-term attractiveness (committed steady relationship) using a 7-point Likert-type scale from 1 (*low*) to 7 (*high*). In addition to the short-term ratings and contrary to the former studies, three more items tested sexual receptivity using the same scale. Those items were inspired by the famous social psychological campus experiment by Clark and Hatfield (1989). Accordingly, participants were asked to rate the respective speaker by means of the following questions: Would you (1) go out with him/her tonight? (date), (2) ... come over to his/her apartment tonight? (apartment), and (3) ... go to bed with him/her tonight? (bed) (see above). Participants also had to estimate the net income and total number of sexual mates of the respective speaker after ten years time.

Female participants were further asked to provide information on their menstrual cycle for indirectly assessing menstrual cycle phase (fertile vs. non-fertile; cf. Lange, Schwarz, Zaretsky, & Euler, 2014). They were asked how regular their menstrual cycle was (very regular – within one day – within one week – very irregular). This was done in order to be able to exclude all women whose cycle was too irregular (only within one week or very irregular) for proper calculations. Also, female participants were asked whether they were currently pregnant, breast-feeding or taking any hormonal contraceptives. As all these factors might influence the menstrual cycle, women who answered yes were excluded as well.

Most importantly, female participants were asked when they expected their next menstrual cycle to begin, in number of days. Thus, fertility could be estimated by the so-called reverse-cycle day method by assuming that ovulation is 15 days prior to the next menstruation (e.g. Brinsmead-Stockham, Johnston, Miles, & Macrae, 2008; Haselton & Miller, 2006). We further asked our female participants to email us after their next menstruation had started to tell us the date of that actual menstruation onset in order to make our data more precise. Forty-three women wrote such an email. For the other women, we used the information they had provided in the online questionnaire when originally participating in our study.

Results

For hypotheses 1 to 3 (VP increases attractiveness; women give lower attractiveness ratings; male attractiveness is more affected by VP) and research question 1 (Is VP more important in long-term mating?), two-factorial ANOVAs with the between-subject factors of VP level (low vs. moderate vs. high) and speaker sex (male vs. female) and the respective attractiveness/sexual receptivity rating as the dependent variable were performed. Also, post-hoc tests (Bonferroni) were conducted. For research question 2 (Is there a cycle effect on the attractiveness ratings?), the factors were verbal proficiency and cycle phase. For research questions 3 and 4 (Is VP considered predictive of income and mate number?), correlation coefficients (non-parametric Spearman correlations) were calculated.

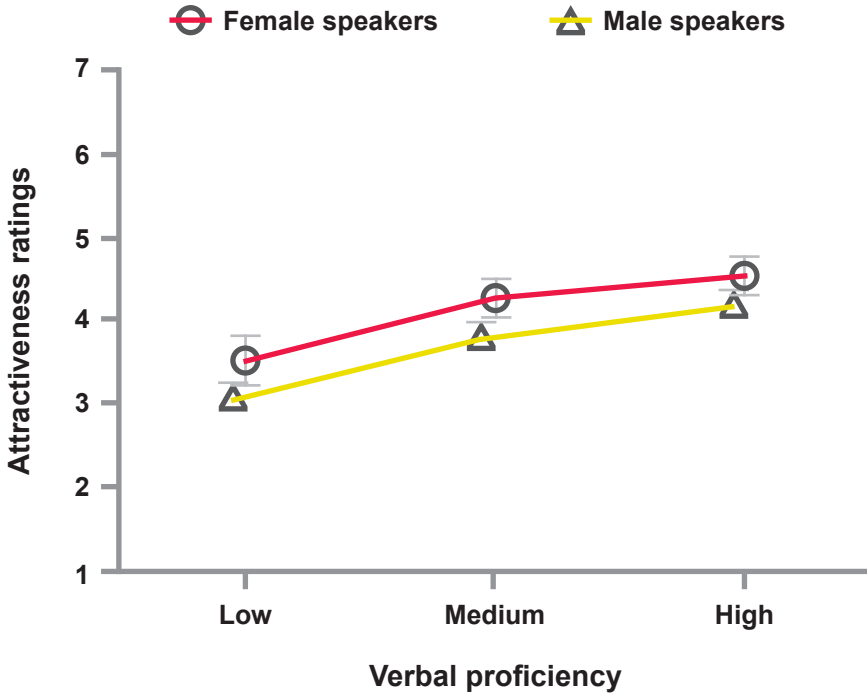
First, we conducted a MANOVA. We chose this procedure as we had several inter-correlated DVs ($r_s \geq 0.25$; Field, 2013). VP level and sex entered the MANOVA as the two between-subject factors. The following six ratings entered the MANOVA as DVs: short-term attractiveness, long-term attractiveness, total attractiveness (mean of short-term and long-term ratings), likelihood of having a date with this person, of visiting her / him at her / his apartment and of going to bed with her / him. MANOVA effects were significant for VP level (Pillai's trace $V = 0.13$, $F_{(10, 2028)} = 14.45$, $p < .001$, $\eta_p^2 = 0.07$) and participant sex (Pillai's trace $V = 0.34$, $F_{(5, 1013)} = 103.85$, $p < 0.001$, $\eta_p^2 = 0.34$). The interaction effect between VP level and sex was non-significant (Pillai's trace $V = 0.01$, $F_{(10, 2028)} < 1.0$, $p = 0.82$, $\eta_p^2 < 0.01$). This means that women and men benefit equally when being verbally proficient. To further examine the effects of VP level and participant sex, univariate ANOVAs were performed.

ANOVAs require certain assumptions. Levene's tests indicated that for 3 out of 6 DVs (see above), the assumption of variance homogeneity was violated. Given equal sample sizes in each cell, ANOVA is considered robust against this violation (cf. Eid, Gollwitzer, & Schmitt, 2010; Hussy & Jain, 2002; cf. also Field, 2013). In our case, however, samples sizes were unequal due to a higher proportion of female than male participants (see above). Following Gollwitzer and Schmitt (2010), we then calculated ratios for the largest to the smallest variance of the experimental cells, because when ratios do not exceed four, the F-ratio can still be trusted (cf. Eid, Gollwitzer, & Schmitt, 2010; Hussy & Jain, 2002; cf. also Field, 2013). Our calculations showed that the ratio between the largest variance and the smallest variance was ≤ 3 , so we decided to employ ANOVAs to analyze our data. Below we report the results from the ANOVAs and other analyses by the respective hypothesis or research question.

Hypothesis 1: Main effect of verbal proficiency on attractiveness

As shown in Table 1, the ANOVA yielded a significant moderate effect of verbal proficiency on total attractiveness (mean of long-term and short-term attractiveness

Figure 3. Results of the total attractiveness (mean of short-term and long-term) ratings from 1 (*low*) to 7 (*high*), by sex of the rated person (male and female speakers).



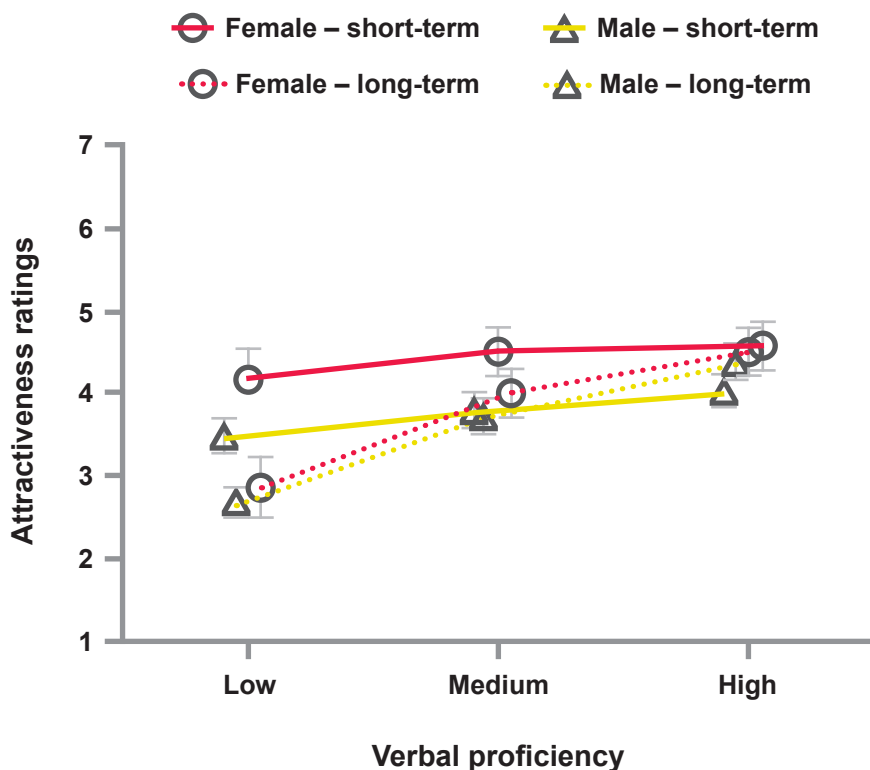
Note. Mean values and error bars showing 95.0% CI of mean are given. Data units are nudged to prevent overlap.

ratings). As shown in Figure 3, speakers with higher verbal proficiency were perceived to be more attractive (M s: low = 3.19, medium = 3.91, high = 4.28; all p s $\leq .001$).

Hypothesis 2: Main effect of sex

There was no significant main effect of sex in long-term mating (i.e., overall, male and female participants gave equally high ratings), although the data revealed a significant but small main effect of sex on short-term ratings (female participants gave lower ratings; M s = 3.78 vs. 4.41; $p < .001$; $\eta_p^2 = 0.03$; Cohen's $d = 0.39$; see Table 1), as shown in Figure 4. For the sexual receptivity items ("date", "apartment", "bed"; see above), the main effects of sex were even larger. Effect sizes increased as the situations moved closer and closer to sexual intercourse (date: $M_{\varphi} = 3.55$ vs. $M_{\sigma} = 4.34$; apartment: $M_{\varphi} = 2.55$ vs. $M_{\sigma} = 4.65$; bed:

Figure 4. Results of the attractiveness ratings (short-term and long-term mating) from 1 (*low*) to 7 (*high*), by sex of the rated person (male and female speakers).



Note. Mean values and error bars showing 95.0% CI of mean are given. Data units are nudged to prevent overlap.

$M_{\phi} = 1.88$ vs. $M_{\sigma} = 4.21$; see Table 1 for effect sizes). Male ratings, however, were always almost equally high, independent of mating context.

Hypothesis 3: Interaction effect between verbal proficiency and sex

There were no significant interaction effects (verbal proficiency contributed equally to male and female attractiveness, all F s < 1.0; see Table 1 and Figures 3 and 4).

Research Question 1: Is verbal proficiency more important for long-term attractiveness?

We found a moderate to large effect on long-term attractiveness, but only a small effect on short-term attractiveness. As shown in Table 1, both of these

Table 1. Overview of all data obtained by the two-factorial ANOVAs

Relationship type / Mating context	Main effects		Interaction effect
	Verbal proficiency	Sex	Verbal proficiency x Sex
Total ¹	$F_{(2, 1017)} = 41.96^{***}$ $\eta_p^2 = 0.08$	$F_{(1, 1017)} = 19.34^{***}$ $\eta_p^2 = 0.02$	$F < 1$
Long-term	$F_{(2, 1017)} = 70.99^{***}$ $\eta_p^2 = 0.12$	$F_{(1, 1017)} = 3.35$ $\eta_p^2 = 0.003$	$F < 1$
Short-term	$F_{(2, 1017)} = 5.55^{**}$ $\eta_p^2 = 0.01$	$F_{(1, 1017)} = 30.57^{***}$ $\eta_p^2 = 0.03$	$F < 1$
Would you go out with him/her tonight? (date) ²	$F_{(2, 1017)} = 33.58^{***}$ $\eta_p^2 = 0.06$	$F_{(1, 1017)} = 54.35^{***}$ $\eta_p^2 = 0.05$	$F < 1$
... come over to his/her apartment tonight? (apartment) ²	$F_{(2, 1017)} = 16.34^{***}$ $\eta_p^2 = 0.03$	$F_{(1, 1017)} = 324.53^{***}$ $\eta_p^2 = 0.24$	$F < 1$
... go to bed with him/her tonight? (bed) ²	$F_{(2, 1017)} = 2.34$ $\eta_p^2 = 0.005$	$F_{(1, 1017)} = 418.13^{***}$ $\eta_p^2 = 0.29$	$F < 1$

** $p < 0.01$, *** $p < 0.001$; ¹ mean of short-term and long-term ratings; ² sexual receptivity items inspired by Clark & Hatfield (1989)

effects were statistically significant (see Figure 4). As to sexual receptivity items, also shown in Table 1, verbal proficiency became less important as the situations became more sexually explicit (i.e. date, apartment, bed). See Table 1 for an overview of the results.

Research Question 2: Does female cycle phase affect the attractiveness ratings?

The data of 524 out of 765 female participants matched the requirements for indirect fertility measurements (regular menstrual cycle, no intake of hor-

monal contraception, not pregnant or breast-feeding). We divided those female participants into a fertile group ($n = 168$; conception probability $\geq 10.5\%$; cf. Haselton & Miller, 2006) and a non-fertile group ($n = 356$). All interaction effects between cycle phase group and verbal proficiency on the attractiveness ratings were non-significant ($ps \geq 0.06$).

Research Questions 3 and 4: Verbal proficiency and estimated future net income and estimated total number of sexual mates

As verbal proficiency was an ordinal variable, we employed non-parametric Spearman correlations. Verbal proficiency showed a small but significant correlation with estimated future net income ($\rho_s > 0.22$, $ps < 0.001$), but not with estimated total number of sexual mates ($\rho_s < 0.1$, $ps > 0.22$).

Discussion

The objective of the current experimental study was to replicate and extend recent experimental research on verbal proficiency as a mate-choice criterion. Replicating the former research, we found that verbal proficiency affects how attractive a person is perceived to be, especially when it comes to a committed long-term relationship. In accordance, verbal proficiency correlated with estimated income, which is particularly important in long-term relationships (Buss, 2016). Furthermore, as suggested by previous research (Kanazawa, 2007), verbal proficiency did not correlate with estimated total number of sexual mates, which is more a marker of successful short-term mating. Attempts to identify cycle effects failed (Lange, 2012; Lange, Schwarz, Zaretsky, & Euler, 2014). As cycle effects are more important in short-term mating than in long-term mating, the results of the current study are coherent, as they all clearly point to the importance of verbal proficiency as a trait preferred when seeking a committed long-term relationship.

Most importantly, we could not replicate the interaction effect between verbal proficiency and sex, according to which men should benefit more than women in mate choice when being verbally proficient. Also, the interaction effect in the former research (Lange, Zaretsky, Schwarz, & Euler, 2014) was not found in all of their studies, and was very small when found. Combining the results of the present study with those of previous studies (e.g. Lange, Zaretsky, Schwarz, & Euler, 2014), we can conclude that men and women benefit equally from being verbally proficient. Since verbal proficiency is thus more or less equally preferred by both sexes in mate selection, it can be referred to as mutual mate choice (Miller, 2000a, 2013).

The importance of verbal proficiency is highest when committed long-term relationships are the main scope. Indeed, if a man enters a long-term relationship, his costs drastically increase compared to pursuing only short-term sexual

liaisons. He should then be (almost) as choosy as women (Buss, 2016). In line with this, we found no main effect of sex in a long-term context (where men and women were equally choosy), but did find evidence of this in a short-term context (women were choosier than men and thus more reluctant to give high ratings). Our results are thus conclusive and coherent in themselves, as they also match predictions made by the parental investment theory (Trivers, 1972), particularly when looking at the main effects of sex because we did not find that men and women were always equally choosy. Women were more selective when their costs were, according to the sexual selection and parental investment theory, higher than men's costs, namely when short-term mating was concerned (Trivers, 1972).

Some questions remain unanswered though. For instance, what does verbal proficiency actually signal? Is it general intelligence, resources, or genetic quality? From the current state of research, the possibly unsatisfactory answer must be: all of them, although not to the same degree. These traits are presumably correlated with each other so that verbal proficiency might generally signal several different qualities. However, based on our data we can conclude that verbal proficiency is more a signal for the ability to acquire resources than a signal for genetic quality. This conclusion can be drawn because several studies (Lange, 2012; Lange, Zaretsky, Schwarz, & Euler, 2014), including the present study, have shown that verbal proficiency is more important in long-term mating where a mate's genetic quality is relatively less important than in short-term mating.

Also, although language qualifies as an evolved trait (Pinker, 1994), certain cultural factors might also influence how verbal proficiency is perceived and judged. Future research should try to identify those factors. For instance, what is the role of social context when it comes to the evaluation of one's verbal skills? How are different sociolects or dialects perceived in a mate choice context? Still, despite the possibility that cultural aspects play their part too, we know that verbal skills cross-culturally enhance one's status (Brown, 1991), which supports the notion that language is an evolved phenomenon (Lange, Zaretsky, Schwarz, & Euler, 2014).

Another open question concerns why men are more prone than women to the production of (creative) verbal displays (e.g. Lange, 2011; see also Lange, Zaretsky, & Euler, 2016) when male attractiveness is not more significantly increased by verbal proficiency than female attractiveness. As this male proneness is especially salient after having been primed with mate choice cues (Griskevicius, Cialdini, & Kenrick, 2006; Rosenberg & Tunney, 2008), it must have something to do with mate choice after all. One answer could be that male verbal displays are more a matter of intrasexual than of intersexual selection. This would make sense, as men must succeed in intrasexual selection before intersexual selection can be operative (Buss, 2016; Puts, 2010). In this scenario, male verbal proficiency would be a helpful trait to successfully compete against same-sex rivals. This might include the tendency to produce costly verbal or other creative displays

(cf. Kanazawa, 2003; Lange & Euler, 2014). Future studies should shift the perspective to the role of verbal proficiency in male-male competition.

There is another option for interpreting the data in a broader mate choice framework with a larger focus on parenting. Both the actual mating and the parenting belong to reproduction. Still, trying to gain access to mates, on the one hand, and parental investment in offspring, on the other hand, are two distinct efforts (mating effort vs. parenting effort; Kaplan & Gangestad, 2005). Further, parental investment in our species is comparatively as important as mate choice is because, from an evolutionary perspective, mating without having children who survive long enough to reproduce themselves could not have been favored by selection. As a matter of fact, humans heavily invest in their offspring (Buss & Schmitt, 1993), which might include providing sufficient linguistic input during the child's language acquisition.

Considering that women are the main caregivers, it is no surprise to find terms like "mother tongue" for the particular language we speak (Fitch, 2004). It is also not a surprise, from this perspective, that women have slightly higher verbal skills than men (Hyde & Linn, 1988). However, human males particularly invest more in their offspring than males in any other mammal species (Buss & Schmitt, 1993). It is therefore true that not only women but also men play an essential role in the development, including the language development, of their children. Following this logic, women should highly treasure a verbally proficient man, not only because he is a good (for instance, intelligent) mate but also because he might be a good parent, providing proper linguistic input for their children. In a similar vein, men should favor a verbally proficient woman as a mate for similar reasons. This not only matches our results but it also seems to explain why there is assortative mating regarding language, that is why two people in a relationship tend to have similar verbal skills (Mascie-Taylor, 1988; Watson, Klohnen, Casillas, Nus Simms, Haig, & Berry, 2004).

Verbal proficiency could then be a signal to both sexes about whether a person is capable of providing sufficient parental investment for children (Fitch, 2004). Our findings also fit in the evolutionary scenario, according to which anthropogenesis was mainly characterized by serial monogamy with heavy investment in children, including substantial investment by men too. This explanation not only matches our data but also the most recent evolutionary psychological approaches on *mutual mate choice* (Miller, 2013). So, actual long-term mate choice and parenting abilities, including intense parent-infant interactions, might have jointly been some of the driving forces behind language evolution. This view on language evolution is also consistent with approaches considering parent-infant interactions as one potential nucleus of human art (Dissanayake, 2009, 2014). Indeed, verbal proficiency is a necessary prerequisite of verbal art like literature (Lange & Euler, 2014).

Practically, in accordance with former research (Lange, Zaretsky, Schwarz, & Euler, 2014), men and women should both try to appear verbally proficient

in all kinds of language-based communication, whether face-to-face or digitally like when writing an email. High verbal proficiency, however, might not help much to increase one's desirability as a short-term mate. So men whose sociosexual orientation (Penke & Asendorpf, 2008) is rather unrestricted, that is men who are prone to having many mates, probably do not benefit a lot from being verbally proficient in their mate choice. When seeking a committed long-term relationship, however, verbal proficiency seems to be crucial for both men and women.

Future research should try to replicate these findings using a different language, for instance English. Not only is English the *lingua franca*, but it is also an analytic language, whereas German is a synthetic language. An analytic language consists of more unbound morphemes (i.e. separate words) and more function words than a synthetic language, and it is characterized by more word order restrictions. An analytic language uses fewer suffixes and endings and has fewer grammatical cases, often replaced with function words, than a synthetic language. Overall, analytic languages demonstrate a lower morpheme-per-word ratio. The question remains about whether similar research conducted in a different language would yield similar results. If so, we would have to conclude that there is a robust effect of verbal proficiency on attractiveness, independent from specific characteristics of a certain language. Moreover, conducting such research in a non-western culture would also help determine whether the pattern presented here is universal across cultures.

It might also be interesting to see how one's own verbal proficiency influences the attractiveness perceptions of another person based on her / his verbal proficiency. Considering assortative mating with respect to verbal proficiency (Watson et al., 2004), one could expect to find that the better the verbal proficiency of one person is perceived, the higher one's own verbal proficiency is. Future research should try to shed light on these questions.

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Appendix

Scripts representing different levels of verbal proficiency (English translations and notes in parentheses in bold; cf. Lange, 2012):

Level 1:	Level 2:	Level 3:
Hallo, ich bin Christian/e. Ich bin 21 Jahre alt. Äh („uh“ or „um“) ... Ich lebe ... äh ... im Süden von ... äh ... Deutschland. Ich bin Student/in. Ich bin Single.	Hallo, ich heiße Christian/e. Ich bin 26 / 21 Jahre alt und lebe in Süd- deutschland. Äh ... Dort studiere ich. Ich bin Single.	Hallo, mein Name ist Christian/e. Ich bin 26 / 21 Jahre alt und lebe in Südde- utschland, wo ich studiere. Ich bin Single.
Ich find' so das Leben auf der Uni ganz toll ... äh ... auch mit den ganzen andern Studenten und so. Aber ich bin ja auch ... äh ... noch ganz am ... äh ... <i>Amfang</i> (≈ “in the bebeginning” ; „Amfang“ is an example for a cacoepey which is here the result of a total progressive assimilation).	Ich finde das Leben an der Uni ganz toll – auch wegen den Mitstudierenden und so weiter. Aber ich bin ja auch ... äh ... noch ganz am Anfang.	Mir gefällt das Leben an der Uni sehr gut – auch wegen der Kommilitonen und dergleichen. Aber ich bin ja auch noch ziemlich am Anfang.
Meine Professoren haben mich bisher meistens gut gefunden. Also ... äh ... Das macht mich ... äh ... mir Hoffnung für die Zukunft.	Meine Professoren haben mich bisher insgesamt gut bewertet ... Äh ... Das stimmt mich zuversichtlich.	Bisher wurde ich von meinen Professoren über- wiegend positiv bewertet, was mich zuversichtlich stimmt.

Ich bin wahnsinnig gerne unter Leute (**wrong congruency; nominative „Leute“ is used, although accusative “Leuten” would be correct; no English equivalent**). Und ich gehe gerne viel weg oder ...äh... mach Sport. Ich komm ganz gut mit andere Leute klar und ... äh ... weil ich so ganz offen bin. Und Musik mach ich auch ... äh ... mit Klavier.

Ich bin also ... äh ... schon auch ... äh ... kulturell interessiert. Und ... äh ... ich besuch' verschiedene Veranstaltungen ... Aber so total viel (**„that very much“**) davon muss ja auch nicht ... äh ... sein, ne?! (**„ne?!“** ≈ **„ya‘ know?!“**)

Ich bin nett und ... äh ... witzig und hab' ... äh ... Verständnis. Ich glaub', ich bin auch ... äh ... kreaktiv (= **„creactive“ instead of „creative“**).

Ich bin wahnsinnig gesellig und gehe gerne viel mit Freunden weg oder mache auch Sport. ...Äh... Ich komme ganz gut mit anderen Leuten zurecht. Ähm... und bin insgesamt sehr offen. Musikalisch bin ich auch ... Äh ... ich spiele nämlich Klavier.

Ich bin also ... äh ... schon kulturell interessiert und besuche verschiedene Veranstaltungen. Aber so übertrieben viel (**(extremely much)**) muss ja ... äh ... auch nicht unbedingt sein.

Ich bin freundlich, humorvoll und verständnisvoll. Ich denke, dass ich auch ganz kreativ bin.

Ich bin ausgesprochen gesellig und gehe gerne häufig mit Freunden weg oder treibe Sport. Ich bin sehr tolerant und offen anderen Menschen gegenüber. Außerdem bin ich musikalisch, denn ich spiele Klavier.

Ich bin demnach schon auch kulturell interessiert und besuche dementsprechend diverse Veranstaltungen, wobei exorbitant viele (**(exorbitantly much)**) müssen es ja auch nicht unbedingt sein.

Ich zeichne mich durch Freundlichkeit, Humor und eine verständnisvolle Art aus. Zudem, so denke ich, bin ich kreativ.