Size matters: vocabulary knowledge as advantage in partner selection

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Size Matters: Vocabulary Knowledge as Advantage in Partner Selection

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Abstract: Partner selection can be studied from different disciplines, such as psychology, sociology, and economics. However, linguistic perspectives have been neglected. That is why we need an interdisciplinary approach that includes language. The present article investigates how important the vocabulary size of a potential partner is for marital choice. Our theoretical framework is mainly that of biological markets which are still being widely used. This framework assumes that human decisions are made on a rational basis, e.g., about the characteristics that a potential partner brings into a marriage such as economic assets (wealth, education), psychological traits (intelligence, kindness, fairness), or signs that show physical and mental health. Partner selection takes place on a biological market where assets are displayed and are part of the negotiation for the best partner. We argue that vocabulary knowledge is such an asset, which is acquired through lengthy and costly education and distinguishes potential partners (or their parents) who can afford the accumulation of this form of human capital. Markets are not fully transparent and our knowledge about a potential partner might be incomplete or even distorted through false information or even cheating as one can clearly see from advertisements in online dating. However, we cannot pretend, at least not over a longer period of time, to know words that are not at our disposal. This present study is based on data from 83 couples after more than 15 years of marriage. Their vocabulary scores correlate highly and it is possible that this correlation is the result of accommodation through marriage. However, through partialling out statistically the years of marriage we conclude that the vocabulary size of each partner was an important factor already right at the beginning of their relationship. Those with higher human capital in vocabulary attract similar partners, and this holds for males and females as well as vice versa. Our participants are all Turkish–English sequential bilinguals and the question is whether it is vocabulary knowledge in the first or the second language that plays a crucial role in partner selection. Our results show that both languages are important. We argue that it is not knowledge of words at the surface level but that it is knowledge of conceptual concepts underlying both languages that serve as a display of human capital on the biological market of partner selection.

Keywords: vocabulary size; infrequent vocabulary knowledge; partner selection

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1. Introduction

The present article investigates how important the vocabulary size of a potential partner is for marital choice. Our theoretical framework is mainly that of biological markets (Becker 1976, et passim), which are still being widely used (Becker et al. 2023). This framework assumes that human decisions are made on a rational basis, e.g., about the characteristics that a potential partner brings into a marriage such as economic assets (wealth, education), psychological traits (intelligence, kindness, fairness), or signs that show physical and mental health (see Becker 2007). To make decisions about a partner we need to know which assets or traits are brought into a potential marriage. However, biological markets are not fully transparent and our knowledge about a potential partner

might be incomplete or even distorted through false information or even cheating, as one can clearly see from advertisements in online dating (see, for example, Ranzine and Lutz 2017; Toma and Hancock 2010; Nascimento et al. 2024).

In biology, the concept of an honest signal is used to show how distortion of information is avoided. A classic example is the peacock's tail. It shows the fitness of the male and is used as a biological market of partner selection. It is honest, as the peacock cannot fake it and show feathers that it does not have. We argue that the appropriate use of infrequent vocabulary is a similar honest signal and one cannot lie about word knowledge that one does not possess. The acquisition of infrequent vocabulary is time-consuming and costly through education and its correct display cannot be fabricated, at least not over a longer period of time. Vocabulary knowledge as human capital (see also Bourdieu 2018) is a proxy for the potential assets of the partner.

Our sample consists of 83 sequential Turkish couples who were raised in Turkey but moved to the UK and use English on a day-to-day basis. These couples were used in an earlier study (Daller and Ongun 2018) about the relationship between the vocabulary sizes of parents and their children. We had only access to mixed-sex partners with children. The reason for selecting bilingual parents and children in the earlier study was to obtain further insight into the cognitive advantages or disadvantages of vocabulary knowledge in two languages. In this present study, the use of bilingual participants can give us insights into whether the market value of a potential partner is reflected in both languages or only in one (for details, see Section Hypotheses).

We use a yes–no format test (X-lex, Meara and Milton 2003), that includes non-existing words to control for dishonest signals by candidates who claim to know these non-words. We administered tests in both languages of the participants to be able to draw a fine-grained picture of their vocabulary knowledge.

If potential partners use their vocabulary in mutual selection, correlations between their test scores at least in one language of our bilingual sample can be expected. This could be explained in two different ways: (a) the couples made their decision to select each other at the beginning of their relationship based on the vocabulary sizes displayed or (b) they made their decision based on other criteria and adapted to each other's vocabulary size over the years of marriage. A decision about these two explanations can be made by partialling out statistically the length of marriage[1]. This can give us further insights in how quickly decisions about partner selection are made.

2. Literature Review

2.1. Theories of Partner Selection

According to Becker (1976, 2007, 2009) and Becker et al. (2023) all human behaviour can be explained with economic models, which is a view that is still widely held (see Heckman et al. 2018; Barclay 2013, 2016) but has also been criticised (see the end of this section). It has been argued in favour of Becker's framework that "the constraints of life force every organism to behave economically" (Noë et al. 2001, p. ix.). This means that partner choice can also be explained in economic terms, where, according to Noë and Hammerstein (1995, p. 336), decisions on cooperation and sexual selection are made on a biological market.

In the present context, we focus entirely on human marital partner selection, but we are aware that the concept of biological markets is used in a large variety of other contexts, i.e., partner choice in economic games (Eisenbruch and Roney 2017), in the choice of campmates in hunter–gatherers in Tanzania (Smith and Apicella 2020), or in a variety of partner selection in mammals (Dunbar 2001), to name a few.

Becker suggests that two principles are the basis of marital choice: (a) it is a voluntary decision either made by the partners or their parents based on the assumption that marriage would increase the available assets of the partners, and (b) that "since many men and women compete . . . a market in marriages can be presumed". (see Becker 1976, p. 206). Each person tries to find the best mate on that market. Becker (1976, p. 217) calls this

assertive mating where a set of traits such as intelligence, education, height, and tendency to nurture (see Becker 2009) are displayed.

According to Becker, the main driving force behind marriage is that it "maximizes total household commodity" (Becker 1976, p. 217), which also includes "commodities" such as companionship and health. One has to bear in mind that Becker's view on commodities is general in nature and goes beyond resources that are traditionally considered in economics. In a more traditional view, "love" is not seen as an economic commodity, but it can be argued that "caring" has an economic aspect, which can be easily seen when one considers the cost of a caring home. Becker argues in economic terms but these commodities cannot always be expressed directly in a financial way. In economics, the success of a business can be qualitatively measured in the turnover of the company, which is a result of the trust of the customers or partners in this business. Trust in a partnership is also an asset for the success of a relationship but a monetary quantification would be more complex, although it would be measurable in principle.

Becker's theoretical framework has been criticised as neo-liberal, and alternative explanations of human behaviour are discussed in economic science (see Lavoie 1992; Deane 2020). Becker's work has also been criticised because it applies explanations in areas that fall in the realm of other disciplines, such as sociology (see Coleman 1993). It has been argued that human behaviour is not entirely based on economic determinants only but also on the influence of culture (see Taylor 1994). The concept of a biological market is linked to the rational choice theory, which assumes that humans can make rational decisions based on the evaluation of the costs and benefits of their choices (see Scott 2000). Within economics, this theory is not uncontroversial. Hodgeson (2012) argues that this theory is too abstract and that we "have to consider the real social and psychological determinants of human behaviour" (Hodgeson 2012, p. 94). Hodgeson (2003) describes in detail how economic decisions, i.e., to buy something, can be manipulated and influenced by persuasion. We agree that real people are more than a homo economicus and that many aspects play a role in their decision making, but it is very unlikely that humans make their decisions at random. It is just that we do not understand every determinant of the decision-making process. According to the efficient market theory (for a critical discussion, see Delcey 2019), in an ideal market, all information is available to every participant and the market is totally transparent, which is of course only an ideal without undue manipulation or insider knowledge, which might be a criminal offence (see Ahern 2017).

It is beyond the scope of the present article to discuss the economic theories mentioned above in detail, but any behavioural science, including applied linguistics, can learn from other disciplines. An important factor in human decision making is trustworthy knowledge about the potential partner and its contribution to a possible relationship. Potential partners will try to avoid manipulation and cheating and this means that the biological market, as every functioning market, needs to be as transparent as possible.

2.2. The Process of Partner Selection on a Biological Market

Noë and Hammerstein (1995) compare potential partners with traders that try to outbid their competitors in a market. In a similar vein, and in line with Becker's theoretical framework, Barclay (2013) argues that when potential partners can choose with whom they can interact, a biological market is created and individuals will try to outbid their rivals (Barclay 2013, p. 164). The question is how this "outbidding" works in practice. Barclay (2016, p. 33) argues that cooperation is crucial to social success and that we avoid "bad partners" and try to associate with "better ones". This creates a biological market where people try to appear to be able to confer more benefits than others to their partner "causing an arms race over any behaviour that signals these traits" (Barclay 2016, p. 33). In this "arms race" misleading and cheating is a possibility, as can be seen in false information in online dating, e.g., about one's own age, education, or wealth (see Ranzine and Lutz 2017; Toma and Hancock 2010). The discussion about the psychological aspects of partner selection is ongoing (Devenport et al. 2023) but the concept of biological markets is certainly an

important aspect of human decision making in this field. The question is how a transparent market can be created where the possibilities of cheating are avoided.

2.3. Transparency through Honest Signals

The concept of "honest" or "costly" signaling can give us some insights into mate selection in animals (and humans) (see Pentland 2010). According to Zahavi and Zahavi (1999), a peacock's tail can act as a signal about the health and genetic fitness of the animal. This is because "Unhealthy, unfit peacocks can't afford big, bright tails" (Miller 2000, p. 64), as they are very "costly" and lots of energy and food are necessary to develop such a tail that is not necessary for the survival of the individual bird.

A peacock cannot make a conscious decision about the number of feathers or their form. It cannot deceive the peahen who makes her mating decision based on this honest signal. Human language traits such as fluency and automaticity can be linked to the theory of honest signaling. The comparison with a peacock is of course a simplification, but, in our view, it remains a useful metaphor. Adults can still increase their vocabulary knowledge and fluency over time, whereas a peacock probably cannot increase the number of its feathers. However, what is relevant here is the vocabulary knowledge at the time of partner selection where one cannot deceive and speak more fluently than one's own abilities allow. General intelligence can also be linked to honest signals in humans (Luxen and Buunk 2006). One cannot convincingly appear more intelligent than one is, at least not over a longer period.

Vocabulary knowledge is related to crystallised intelligence (see, for example, Stamenković et al. 2019). It is about knowing things as opposed to fluid intelligence, which is needed for solving tasks in new situations, e.g., pattern recognition. Crystallised intelligence distinguishes the speakers from those (or their parents) who did not have the resources to develop this human capital (see Bourdieu 2018) through (costly) schooling and education (see also Brown 2010; Milton and Treffers-Daller 2013).

Language can be used to cheat and convey false information. In fact, lying is in many cases only possible with language (for a discussion about lying, see García-Carpintero 2023). Cheating with vocabulary **knowledge**, however, is difficult, as it is not possible to pretend to know unknown words convincingly over a longer period. Vocabulary display is therefore comparable to a peacock, which cannot "cheat" about the richness of its feathered tail at will, nor can humans cheat about their knowledge of infrequent words. This is why vocabulary tests based on the yes–no format include non-existing words. If a candidate claims that they know a non-word, they are probably cheating, and their test scores are adjusted accordingly in this format, e.g., in the X-lex test format that we use in this present study (see Meara and Milton 2003).

One question is why we develop large vocabularies that are not strictly necessary in everyday life. According to Miller (2000), the development of large vocabularies is an evolutionary process. "Over many generations, those with quicker wits and more generous spirits may have attracted more sexual partners" (Miller 2000, p. 10). To be wittier, one needs to have a greater variety in one's vocabulary. According to Miller (2000, p. 133), larger vocabularies have led to higher mating success in our ancestors, and "they would have benefited by evolving larger vocabularies, just as peacocks evolved larger tails" (Miller 2000, p. 373). According to Miller, both female and male partners are involved and "verbal courtship is mutual" (Miller 2000, p. 383). In summary, the display of real vocabulary knowledge is an honest signal about one's own human capital and it is important in mating success on the biological market of partner selection.

2.4. Empirical Studies in Partner Selection

In the following section, we will discuss previous studies that investigate the process of partner selection on an empirical basis. There are two principal empirical approaches to investigate mate preferences: (a) large-scale studies based on databases or questionnaires and (b) experimental designs. Haandrikman and van Wissen (2012) carried out a study

with 326,000 people who, according to the Dutch population register, had recently started living together. In their study, they show that several factors are important for partner selection, including similar education, income level, dialect or language, and the same social class. This is in line with other large-scale studies on databases (i.e., Kalmijn 1991). In fact, dissimilarities between partners increase the risk of divorce (Dupont et al. 2020). Such (dis)similarities can be determined through questionnaires about partner preferences, as in Buss et al. (1990), who carried out a study in 37 different cultures with 9474 participants in total. Their aim was to identify psychological traits that are identical across cultures for partner choice. They asked the participants to rate personal characteristics according to their importance for partner selection (one 18-item and one 72-item questionnaire). With several hierarchical regressions, they identified characteristics that are more culture-specific and characteristics that are important across cultures. An example for culture-specific characteristics is religious preferences. There are also aspects that are more relevant within certain clusters of cultures, such as chastity with no previous experience in sexual intercourse. China or India, for example, place great value on this characteristic, whereas it was seen as unimportant, for example, in (then) West Germany in this study. More important for a general view are those characteristics that are relevant across cultures. Income and education seem to be more important in males, and physical attractiveness in females, which is in line with general stereotypes about mate choices and mate retention strategies (see also Nebl et al. 2021). But across cultures, males and females place the first four characteristics in the same order: kind and understanding, intelligent, exciting personality, and health (see Buss et al. 1990, p. 18).

Fisman et al. (2006) investigate partner choice in a speed dating experiment at a Western university. The 392 undergraduate and postgraduate students who took part in the study provided judgements on a series of characteristics of their preferred interlocutors. The authors come to the conclusion that males look more for physical characteristics in females, whereas females find males that are intelligent more attractive (Fisman et al. 2006, pp. 682–83). One other aspect that is important for both genders is ambition. This might, however, be a specific characteristic of a student sample. Pawlowski and Koziel (2002) analysed 2008 personal advertisements for partner choice. They found that for men, the best indicator for the number of responses to the advertisements is their educational level. Education is assumed to be related to intelligence (i.e., Deary et al. 2007; Hegelund et al. 2020) and socio–economic status. Personal advertisements on online dating apps were also investigated by Van der Zanden et al. (2020). They found that spelling mistakes on dating websites have a negative effect on the recipient, whereas the use of metaphoric and therefore varied language has a positive one.

Education and intelligence are clearly important in human mating selection (see also Geher et al. 2020). This then leads to the question of how a person can judge the intelligence of their interlocutor. Further insights into the ways in which individuals display their market value can be obtained from Rosenberg and Tunney (2008), who first primed 83 (33 males, 53 females) undergraduate students with a set of photos from the opposite sex (younger and older faces) and then asked their participants to describe their first romantic encounter at the university (not with the person in the photo; this was just a prime). Males used significantly more rare words when they were primed with a younger female face than with an older face. Females judged showed a similar picture but the difference was only a statistical trend. However, this seems to be an indication that vocabulary is important in mutual partner selection.

This is an indication that males display their vocabulary in romantic encounters (see Miller in the previous section). Rosenberg and Tunney explain their findings with the assumption that "vocabulary is a direct indicator of intelligence" and therefore an important criterion in partner selection (Rosenberg and Tunney 2008, p. 539).

The question is how fast decisions about these aspects can be made in a potential partner. Part of the design of speed dating (see Fisman et al. 2006) is the short time that the participants are given to make their decision, as each encounter lasts only four minutes

in this study. It is even possible that the decisions were made at the beginning of this four-minute period. Humans can obviously make decisions about their interlocutor in a short period of time. This is also relevant in contexts other than partner selection, such as job interviews. Frieder et al. (2016) analysed 691 applicants at a university career centre. The interviews were scheduled for 30 min, but 30.4% of the interviewers reported that they made the decision by the fifth minute in the interview, and 40.1% reported that they made the decision around the fifteenth minute. Likewise, there does not seem to be a relationship between job interview length, interview reliability, and validity (Thorsteinson 2018). To our knowledge, there are no studies that investigate the role of vocabulary in judgements on interlocutors in these contexts. Some evidence can be found in studies on teacher judgements of language learners. Meara and Babi (2001), for example, presented assessors of English with text written by native speakers and non-native speakers. The assessors saw the texts one word at a time in a cumulative manner. They were then asked to indicate at what point they felt confident to make a judgement on the texts. Typically, they said that they were confident whether a text was written by a native or non-native speaker after they read 30 words, and some of them needed even fewer words. However, Meara and Babi also admit that it is unclear how the assessors arrived at their decisions in such a short time (Meara and Babi 2001, p. 80). Although this study investigates written texts, some conclusions can be drawn for the evaluation of speech. According to Meara and Babi (2001, p. 82), about 30 written words are the equivalent of 10 s of speech, which means that it is possible to judge a speaking person after a very short period.

In our sample (see below), we have sequential bilinguals who use their two languages on an everyday basis. This makes the research design more complex, as vocabulary in the first language might indicate different traits than vocabulary in the second language, e.g., intelligence, which might be closer related to the first language and early cognitive development (Clark and Casillas 2015) versus economic success, which is hardly possible without profound knowledge of the language of the environment that is the second language of the participants. Vocabulary in the first language will differ from that in the second, according to the complementary principle (Grosjean [1982] 2001, 2015), as bilinguals use their languages in different domains and "balanced" bilinguals with equal vocabularies in both of their languages hardly exist (see Treffers-Daller and Silva-Corvalán 2016). However, there are indications that at least the receptive vocabularies of a bilingual are related and that there are some common psychological traits underlying vocabularies in both languages (see Cummins 1976, 1991). These common underlying traits are related to factors such as conceptual knowledge or crystallised intelligence, which is world knowledge based on experience and education (for a summary of the discussion on a common underlying proficiency see (Daller and Ongun 2018). The focus of this present paper is partner selection and not a detailed discussion of the complex, psychological relationship between the vocabularies of bilinguals. However, this present study gives us deeper insights into the role of bilingual vocabulary displays as indicators of the market value of a bilingual.

Overall, the literature overwhelmingly shows that intelligence, education, and socio–economic status are important factors on the biological market of partner selection across a range of different cultures. Decisions in a partner selection process might be short-termed, but even if there is more time available, it is difficult to evaluate fully which assets or commodities (in Becker's terms) are offered by a candidate as markets are normally not fully transparent, and there is the possibility of false information or even cheating. Market transparency can be sought by using honest signals that cannot be faked. The appropriate use of infrequent vocabulary is such an honest signal and the use of a varied vocabulary is an important factor on the biological market of partner selection.

3. Research Questions

3.1. Is the market value of males more important than those of females in partner selection or is partner selection a mutual process between both partners, as suggested by Miller (2000, p. 383)?[2]

3.2. In successive bilinguals, one language (usually called the first language) is the main means of education, and this language might be the main indicator of the market value of a partner. However, it can be assumed that there are some psychological traits underlying both languages, e.g., conceptual knowledge as an indicator of experience and education. Daller and Ongun (2018) discuss this research field in more detail and come to the conclusion that in bilinguals, vocabulary in both languages combined reflect common underlying traits such as education and conceptual knowledge. The question in this present study is whether the first language, the second language, or both are indicators of the market value of a potential partner.

3.3. As the literature shows, judgements about the characteristics of a possible interlocutor are made quite quickly, e.g., in job interviews, speed dating, or teacher judgements (Frieder et al. 2016; Meara and Babi 2001; Thorsteinson 2018). We, therefore, assume that in partner selection, judgements are also made quite quickly at the beginning of a relationship. To obtain deeper insight into this decision-making process, we need to know whether similarities in vocabulary sizes are the result of accommodation through marriage or if they have existed already at the time of partner selection as the basis for a possible judgement.

Hypotheses

H1: *Vocabulary size does not play a role in partner selection and therefore there will be no correlation between the vocabulary sizes of the couples in our sample.*

H1 alternative: *There will be a high correlation in the vocabulary sizes of the participants because vocabulary size reflects intelligence, education, and the market value of a person (see Geher et al. 2020), and mutual courtship is assumed (see Miller 2000, p. 383).*

H2a: *In the same couple, the male displays a larger vocabulary than the female partner. This assumption is based on some literature findings that indicate that males adopt their speech more with rare vocabulary when primed with younger female faces (Rosenberg and Tunney 2008).*

H2b: *In the same couple, the female displays a larger vocabulary than the male partner.*

H2 alternative: *In the same partnership, both sexes have similar vocabulary sizes because on a biological market, traits such as intelligence and education (see Becker 2009) are selected based on mutual courtship (see Miller 2000, p. 383).*

H3: *Only vocabulary size in one language correlates between the two partners.*

H3 alternative: *Vocabulary in both languages of the two partners correlates positively as there are common underlying psychological traits between the languages of a bilingual (see Cummins 1976, 1991; Daller and Ongun 2018).*

H4: *The length of marriage correlates with the vocabulary sizes of both partners.*

H4 alternative: *The length of marriage (partialled out statistically) does not correlate between the vocabulary sizes of the partners because the judgement on a potential partner is made quickly (see summary in Section 2.3) and any possible accommodation through marriage is no longer relevant for the initial partner selection.*

4. Methodology

4.1. Participants

The participants in this study are 83 Turkish–English bilingual married couples living in the UK. Originally, they were selected as parents for a larger study on the bilingual advantage in children (see Daller and Ongun 2018). In this earlier study, we studied the

vocabulary of 100 children of the 83 married couples, but now the focus is on the parents only. The length of the marriages ranges from 9 to 23 years with a mean of 15.46 years (*St.Dev.* 3.46). Their ages varied between 27 and 57 (M = 31, *St.Dev.* = 1.21). They are from the middle class (SES) as at least one partner of each couple has a higher education degree (college or university). All participants have Turkish as their first language. They were born in Turkey and had come to the UK after finishing their education in Turkey. They use English in their daily life, but in many cases, the home language is still Turkish.

4.2. Measures

The vocabulary size of the participants was measured with an X-lex test in English and in Turkish. The X-lex is a receptive vocabulary size test developed by Meara and Milton (2003), designed in a yes–no format. The test comprises 100 real words and 20 pseudo or non-words. From each frequency band from 1 k to 5 k, 20 real words are selected at random. The frequency list that the authors used is drawn from Nation's (1984) and Hindmarsh's (1980) frequency lists.

The pseudo- or non-words resemble real words but do not exist. These are included to reduce the effect of guesswork and overestimation. Examinees are required to tick the words that they know; each tick for a real word is counted, multiplied by 50, and added to the score, but each tick for a pseudo or non-word is multiplied by 250 and deducted from the total score. This means that if all real words but no pseudo-words are accepted the maximum score will be 5000. In the case of pure guessing, the score will tend to become zero. The Turkish X-lex test was developed by the second author of this study according to the existing X-lex format in English. Pseudo-words were included that are phonologically plausible in Turkish but do not exist. We used a random number allocator to determine the distribution of the pseudo-words in the test. In a pilot study, it turned out that the original Turkish test was too easy for native speakers and that there was a clear ceiling effect with almost 100% correct scores. We therefore included more infrequent words from frequency bands up to 15 k. Again, the maximum score was 5000.

4.3. Procedure

We decided to start always with the English test and two weeks later with the Turkish test without any specific reason for this order, keeping the test setting constant. The English and Turkish X-Lex tests were administered to the partners separately, and the other partner was not in the same room when the test was taken. The informants were provided with a clear oral instruction regarding the format of the test and the purpose of the task in English and Turkish to avoid priming effects. Each test took 10 min to complete.

5. Results

First, we show the score percentages of the participants in the two languages.

Table 1 shows the mean scores for both sexes are lower for Turkish, which reflects the fact that this test was more difficult (included more infrequent words). To test whether the data are normally distributed, we computed the Sapiro–Wilk test in SPSS. For both sexes, the scores are significantly different from a normal distribution at $p < 0.001$ for Turkish and for English at $p < 0.01$. For both languages, the distribution of the data is left-skewed and higher scores are more frequent than lower scores. We therefore use only non-parametric tests in the following computations.

One of the main questions of this present study is the relationship between the vocabulary sizes of male and female partners. Table 2 shows the correlations between the vocabulary sizes as measured with the Turkish and the English X-lex tests for the partners (between and within participants).

Table 1. Test scores (in percentages, n = 83).

	Min	Max	Mean	St.Dev
Male Eng	55	94	79.6	10.23
Male Turk	40.67	96.67	65.71	18.36
Female Eng	56	94	78.8	9.98
Female Turk	40	98	65.73	18.59

Table 2. Correlations (Spearman) between vocabulary sizes (n = 83).

	Male English	Male Turkish	Female English	Female Turkish
Male English	-	−0.722 **	0.956 **	−0.705 **
Male Turkish		-	−0.702 **	0.950 **
Female English			-	−0.672 **
Female Turkish				-

* = 0.05; ** = 0.01 (two tailed).

All correlations are significant with rho = 0.956 for the vocabulary sizes of the couples in English, and rho = 0.950 for the vocabulary sizes in Turkish. There is a reverse picture for the vocabulary sizes within participants in both languages. Participants with a higher vocabulary in English have lower vocabulary sizes in Turkish and vice versa. This is in line with the expectation that the languages of bilinguals follow a complementary principle (Grosjean [1982] 2001).

In the following, we computed partial correlations with controlling for the years of marriage to show whether accommodation during the length of marriage is the reason for the high correlations between the partners (see Table 3).

Table 3. Partial correlations (Spearman) between the scores of males and females (controlling for the years of marriage, n = 83).

	Male English	Male Turkish	Female English	Female Turkish
Male English	-	−0.822 **	0.959 **	−0.817 **
Male Turkish		-	−0.812 **	0.991 **
Female English			-	−0.798 **
Female Turkish				-

* = 0.05; ** = 0.01 (two tailed).

The correlations are almost similar to the correlations in Table 2. This means that it is not accommodation during the marriage that leads to similar vocabulary sizes, but that vocabulary played a crucial role at the time of the partner selection, probably in a very short period. This also indicates that humans can estimate the vocabulary size of an interlocutor unconsciously as the partners certainly did not administer a formal language test when they first met.

The findings are significant, which means that they are generalizable towards the population. However, as always in inferential statistics, you have to argue what the population might be but you cannot show what it is mathematically. To attain some further insight into a possible wider population, we rearranged the data by reallocating the partners of our sample on a random basis. If this leads to similar findings as the original data, we are more confident that our results are not just restricted to a narrow population.

As expected, the correlations between the vocabulary sizes of these randomly selected pairs are not significant (rho = 0.025 for English, and rho = 0.056 for Turkish), as shown in Table 4. Only the within participants correlations are strongly negative, as explained before.

The non-significant correlations between re-arranged partners are a clear indication that it is the vocabulary sizes of the original real partners that are relevant for partner selection.

Table 4. Spearman correlations between vocabulary sizes with re-arranged partners (within and between participants, n = 83).

	Male English	Male Turkish	Female English	Female Turkish
Male English	-	−0.722 **	−0.025 n/s	0.038 n/s
Male Turkish		-	−0.038 n/s	−0.056 n/s
Female English			-	−0.688 **
Female Turkish				-

* = 0.05; ** = 0.01 (two-tailed).

6. Discussion and Conclusions

From the literature review, it is evident that intelligence, education, and wealth are important assets for the value of a person on the biological market of partner selection. These psychological and economic traits cannot be judged directly but need to be inferred by a proxy, such as the vocabulary size. Vocabulary size cannot be manipulated at will and is therefore an honest signal for these traits. The format of our language tests provides valid information about participants' vocabulary sizes because of corrections for guessing. In other words, the test forces participants to use an honest signal only. Our findings show that there is a high correlation between the test scores of our participants and thus their vocabulary sizes. Therefore, (alternative) Hypothesis 1 is supported, which assumes high correlations in the test scores and that vocabulary is a proxy for the market value of potential partners. Of course, one has to bear in mind that correlations are not necessarily causations, and therefore our conclusions in general have to be taken cum grano salis.

In our sample, it is not the male or the female partner that has a larger vocabulary, but both partners have equal sizes with very high correlations between the partner that approach the maximum value for correlations. This supports (alternative) Hypothesis 2, that it is indeed a mutual decision made on a biological market where the best mate is chosen according to the "value" of a participant and that selections are made between likes, that is between people with a similar "value" on the market. The specific aspect of our sample is that the participants are sequential bilinguals with a complementary distribution of their vocabulary knowledge according to (Grosjean [1982] 2001). Indeed, there are high negative correlations between the two languages among participants (Table 2), which is in line with the complementary principle. However, there are high correlations between participants in both languages (Table 2), which indicates that both languages play a positive role in the display of the market value of our participants, which supports (alternative) Hypothesis 3. This is an indication that there are psychological or other traits underlying both languages (see Grosjean [1982] 2001; Daller and Ongun 2018) although this assumption cannot be proven directly. An important question in partner selection is how quickly decisions are made (see research question 3).

We partialled out the years of marriage in our sample to find out whether accommodation during marriage leads to similar vocabulary sizes in the partners or whether the vocabulary sizes already played a crucial role at the time of partner selection. Table 3 shows that years of marriage or time do not play a role in the similarities in vocabulary sizes between the partners. Independent of the years of marriage, the correlation between the vocabulary sizes in Table 3 is as high as in Table 2. Alternative Hypothesis 4 is therefore supported, and it is most likely that the judgement on the characteristics of a potential partner is made very quickly. How quickly this judgment is transferred into a real decision for partner selection will of course depend on various other variables that our out of the focus of this present study, e.g., potentially the influence of parents in different cultures. We are aware that these other factors, including belonging to similar social groups and many more, might be important for the decision-making process, but it is difficult to quantify

this without in-depth background information. This is certainly a limitation of this present study but does not contradict our conclusion that similarities in vocabulary sizes are a factor in partner selection.

In marriages that are arranged by the parents, this selection process might be slightly different, but still, the vocabulary size and the market value of a potential partner will be important. Finally, we rearranged our couples and allocated females to the male partners at random. The picture is clear from Table 4 that in this case, no significant correlations can be found and that the original not re-allocated partnerships are relevant. This gives us some indication that our findings are not only valid for our specific sample but to a potential wider population.

Overall, to our knowledge, we show for the first time how vocabulary size is important in marital partner selection. This is also in support of the assumption in evolutionary psychology (see Miller 2000) that the development of a large vocabulary is an advantage in mate selection. Miller argues that "verbal courtship is mutual" (Miller 2000, p. 383), and that is exactly what we find in our data—it is both males and females who display their market value through vocabulary on the biological market of partner choice. Although our findings are only based on middle-class participants, they support Miller's theoretical framework on human evolution in general. Our findings might therefore be generalizable in a wider context than originally thought.

A further limitation of our study is that we measured vocabulary size only with a receptive vocabulary test. However, there are strong correlations between productive and vocabulary knowledge (see Ha and Nguyen 2023; Milton and Fitzpatrick 2017; Roghani and Milton 2017; Webb 2008; Zhang and Zhang 2022) and we therefore accept that our test can be used as a proxy in the present research setting. A larger test battery would have been desirable and might be used in further studies.

We acknowledge that it is a massive leap to draw conclusions from the present correlations about a decision-making process years ago when the partners met. However, we still claim that knowledge of infrequent vocabulary, be it productive or receptive, is human capital that is acquired through a lengthy and costly process of education. It is of course only one asset amongst many others that are important in partner selection. A further limitation of our study is certainly the fact that we have only data from a certain socio-economic background, and it might be the case that other assets that are not so closely related to education as vocabulary are more important in other settings. We agree that our findings are just a first step for future research in partner selection that certainly will have to include many other variables, which would then allow researchers to sketch a more fine-grained picture of the processes that are involved in partner selection.

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Notes

[1] We used SPSS version 27 to carry out a partial correlation (command: correlate > partial . . . controlling for . . .''). This removes the influence of the variable that is not of interest ("years of marriage") in the model (see also Aloe and Thompson 2013).

[2] In principle, it might be possible that the market value of the females is more important than the market value of the males, but there is no indication from the literature that this might be an option (see Miller 2000), and we did not consider this possibility so as to keep our design as simple as possible.

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