Mate Choices, Matching Voices: An Examination of Matching Romantic Partner Voices

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Abstract

This study examined whether people would be able to match the voices of romantic couples to one another. Voice samples of 20 romantic couples were obtained and presented to 61 independent raters in an experimental task. Raters were able to match the voices of romantic couples with a greater than chance accuracy. The greater the difference in rated vocal attractiveness between couples' voices, the less likely a rater could correctly match the couple's voices. Likewise, the greater the difference in vocal hoarseness between a couple's voices, the less likely raters could correctly match their voice to one another. Several factors regarding the couples' relationship (e.g., relationship length, relationship contentment, and perceived similarities in interests, attitudes, and personalities), as well as differences between self-perceived and partner mate value of couples, and differences in vocal pitch of couples had not predicted whether a rater was more likely to correctly match couples' voices with one another. Further, couples perceived their partner's voice as being more attractive than their own voice, more attractive than their partner's perception of their own voice, and more attractive than how others rated their partner's voice. These findings contribute to our understanding of what the human voice can reveal to others as examined in the field of evolutionary psychology.

Mate Choices, Matching Voices: An Examination of Matching Romantic Partner Voices

A considerable amount of information can be gleaned solely from hearing a person's voice. Hearing a person's voice can allow others to accurately evaluate certain qualities about the speaker, such as a speaker's sex (Lass, Hughes, Bowyer, Waters, & Bourne, 1976; Lass, Tecca,Mancuso, & Black, 1979), age (Hughes & Rhodes, 2010; Krauss, Freyberg, & Morsella, 2002), race (Lass et al., 1979;Walton & Orlikoff, 1994), height and weight (Krauss et al., 2002; Lass & Colt, 1980; Lass & Davis, 1976), body configuration (Hughes, Harrison, & Gallup, 2009), social status (Brown & Lambert, 1976), and emotional and mental states (Ekman, Friesen, & Scherer, 1976; Streeter, Krauss, Geller, Olson, & Apple, 1977). The sound of an individual's voice also can give insight to others about their character, such as an individual's level of dominance, whether the individual is introverted or extroverted, as well as the likeability of an individual (Zuckerman & Driver, 1989; Addington, 1968; Zuckerman, Hodgins, & Miyake, 1990). People seem to be more influenced by a speaker's tone of voice rather than their content of speech in order to decipher personality traits, such as whether one is more calm or excited, passive or active, or gentle or violent (Yogo et al., 2000). Voices can also reveal information about whether a person has cheated on their previous romantic partners, and listeners can determine voices of cheaters from non-cheaters (Hughes & Harrison 2017). Thus, solely hearing a person's voice may aid in distinguishing aspects of that person's attributes and character. The aim of the present research is to examine whether people are able to match the voices of romantic couples to one another by only hearing their voice sample.

Voice Attractiveness

One reason why people may be able to match voices of couples is because of similar levels of voice attractiveness. Voice attractiveness relates to several traits important for mate

selection. For instance, Zuckerman and Driver (1989) had people rate the sound of a speaker's voice as well as their physical appearance and observed that vocal attractiveness and facial attractiveness have similar influence on personality attributes such as judging one's likeability and achievement. In contrast, participants with just attractive faces were not rated as favorably in terms of these personality attributes (Zuckerman & Driver, 1989). Further, voice attractiveness ratings are correlated with personality traits of extraversion and neuroticism (Zuckerman & Driver, 1990).

A woman's voice changes across the menstrual cycle and becomes more attractive sounding during ovulation (Pipitone, 2008). Therefore, voice may be a signal of reproductive viability, and men may be selecting mates with more attractive sounding voices because it is a sign that a woman is fertile. Studies have also shown that those with greater voice attractiveness also have greater bilateral body symmetry (Hughes, Harrison, & Gallup, 2002; Hughes, Pastizzo, & Gallup, 2008), greater facial symmetry (Abend, Pflüger, Koppensteiner, Coquerelle, & Grammer, 2015; Hill et al., 2017), and lower waist- to-hip ratio in women and higher shoulder-to-hip ratio in men (Hughes, Dispenza, & Gallup, 2004). All of these factors play important roles in mate selection; therefore, perhaps voice can be used as a good marker of one's mate value.

Voice attractiveness may also be a factor in terms of reproductive potential. Röder, Fink, and Jones (2013) conducted a study where they examined men's ratings of attractiveness and femininity for facial, body odor, and voice characteristics of young girls, adult women, and menopausal women. The researchers found that men rated the faces and voices (but not body odor) of young girls and adult women as more attractive and feminine than women around the

age of menopause. These findings suggest that facial and vocal cues could signal a women's fertility and reproductive potential (Röder, Fink, & Jones, 2013).

Voice attractiveness is also correlated with facial attractiveness. Collins and Missing (2003) found that visual and vocal attractiveness were related in women. They found that men were in strong agreement on which was an attractive voice and face and that women with attractive voices also had attractive faces. The ability to associate attractive faces with attractive voices may not develop fully until puberty; Saxton, Caryl, and Roberts (2006) found that adult women, but not female children, judge men with more attractive faces as having more attractive voices.

Further, individuals seem to pair attractive faces to attractive voices, a stereotype known as "what sounds beautiful looks beautiful" (Hughes & Miller, 2015). Zuckerman and Sinicropi (2011) found that when facial and vocal attractiveness are mismatched, participants are more likely to rate the mismatch as less attractive than matched attractiveness. Therefore, couples' voices may be matched to one another if they share a similar level of voice attractiveness.

Sex Differences in Voice Pitch

Voices of couples may also be matched based upon vocal pitch. The voices of men and women are different particularly when it comes to voice pitch, and each sex shows sex-specific preferences for pitch when selecting mates. Several studies have shown that men tend to find women with higher-pitched voices more attractive than women with lower-pitched voices (Collins & Missing, 2003; Feinberg, DeBruine, Jones, & Perrett, 2008; Re et al., 2012; Fracco et al, 2011). However, other studies have demonstrated that men rate lower-pitched female voices as sounding "sexier" (Hughes, Mogilski, & Harrison, 2014). Both Hughes et al. (2014) and Tuomi and Fisher (1979) found that when women try and manipulate their voice to sound "sexy"

they do so by lowering their voice pitch, sounding more breathy, and slowing their speech rate. These findings may suggest that people unconsciously manipulate their voices to become more breathy when trying to appear as sounding "sexier" to others (Tuomi & Fisher, 1979). However, other findings have shown men's preference for pitch is trumped when a women appears to be romantically interested in the listener as opposed to when she is uninterested in the listener (Jones, Feinberg, DeBruine, Little, & Vukovic 2008). Therefore, pitch may mean little if the content of what a woman says to a man indicates sexual interest.

Women generally find lower-pitched male voices as more attractive and prefer deeper voices to higher ones (Apicella, Feinberg, & Marlowe, 2007; Collins, 2000; Feinberg, Jones, Little, Burt, & Perrett, 2005; Riding, Lonsdale, & Brown, 2006; Re, O'Connor, Bennett, & Feinberg, 2012), especially during the most fertile time of the menstrual cycle (Puts, 2005). Higher levels of testosterone are significantly associated with lower-pitched voices among men (Dabbs & Mallinger, 1999). Men with lower-pitched voices have more reproductive success and thus, have more children as opposed to men with higher-pitched voices (Apicella, Feinberg, & Marlowe, 2007).Women who do not use any hormonal birth control and rate themselves as being more attractive prefer men with even lower-pitched masculine voices (Vukovic et al, 2008). Thus, it seems that women with higher mate value are even more discriminating in selecting higher mate value men with lower-pitched voices. It may be that couples' voices are matched by sex-specific, attractive levels of pitch.

Vocal Changes in Romantic Contexts

A person may slightly change the sound of their voice depending upon their audience, particularly in romantic contexts. This vocal modulation may be particularly important in romantic contexts to express one's feelings toward one's partner. For instance, it has been shown

that when a person is interacting with a romantic partner compared to a friend, the person uses a faster speech rate, has a more engaged posture during conversation, and more frequent smiles (Cappella & Palmer, 1990). Further, the degree to which these factors are expressed depends on the relationship satisfaction and level of attraction. The nonverbal communication that occurs between romantic couples as compared to between friends is characterized by close proximity, touch, gaze, general interest, less fluency, longer response latencies, and more silence when conversing with their partner (Guerrero, 1997). Romantic partners often engage in "babytalk," or speech that is high-pitched and melodious, which functions to create an intimate psychological connection between partners (Bombar, 1996).

Voices directed toward romantic partners as compared to a friend were rated as sounding more pleasant, sexier, and reflecting a greater romantic interest (Farley, Hughes & LaFayette, 2013). Also, Farley et al. found that men tended to raise their voice while women lowered their voice when talking to their romantic partner as opposed to a friend. However, some changes in pitch frequency when speaking to a partner can be an indicator of couple distress. For instance, couples that show higher incongruent pitch levels have been linked to higher levels of negative communication behavior within their relationship (Weusthoff, Baucom,& Hahlweg, 2013). Thus, vocal changes that occur within romantic relationships seem to be a reflection of how partners feel about one another.

Partner attachment style also influences vocal expression in romantic contexts. For example, more dominant, and secure attachment style women exhibit greater vocal expressiveness when engaging with their partner. In contrast, more feminine, and pre-occupied attachment style men (i.e., partners who are more anxious and have less positive views about

themselves) exhibit less non-verbal behavior and vocal expressiveness, as well as feelings of less contentment within the relationship (Le Poire, Shepard, & Duggan, 1999).

Even outside of romantic relationships, men and women modify their voices when trying to attract the opposite sex. Both men and women tend to slow their speech when trying to sound more attractive/sexy and women also lower the pitch of their voices to sound sexier (Hughes, Mogilski & Harrison, 2014). Both men and women also experience a heightened physiological response as well as lower the pitch of their voices when speaking to a more attractive person than an unattractive person (Hughes, Farley, Rhodes, 2010). Further, this study showed that independent raters were able to detect these vocal pitch changes of others speaking to either attractive or unattractive targets and found the voice samples directed toward the attractive targets as more pleasant sounding.

Vocal Mimicry

Couples often tend to mimic one another especially in terms of voice (Manusov, 1995; Stel & Vonk, 2010; van Straaten, Engels, Finkenauer, & Holland, 2008; Karremans & Verwijmeren, 2008; Weidman, Breen, & Haydon, 2016; Farley, Hughes, & LaFayette, 2013). For instance, Manusov (1995) found that romantic partners who communicated with each other about upcoming plans showed reciprocity in gaze behavior, facial and body orientation, and postural leaning, which further contributed to the communication exchange between the partners Mimicking may act as form of bonding where couples tend to become more in tune with one another, and couples report that their interactions are smoother and more engaging (Stel & Vonk, 2010).

People tend to mimic those to whom they are attracted. For instance, men tend to display more behavioral patterns of mimicry when communicating with a woman they find physically

attractive, whereas women tend to display more mimicry when communicating with a man of high social status (van Straaten, Engels, Finkenauer, & Holland, 2008). Individuals who are closer to their partner in a romantic relationship seem to engage in non-conscious mimicking toward opposite-sex attractive individuals at a lesser extent than individuals who are single (Karremans & Verwijmeren, 2008). These findings may suggest that these lower levels of mimicry seen in individuals who are in a committed relationship may serve a function in buffering the potential threat of attractive alternatives. In addition to behavioral mimicry, vocal mimicry between couples also seems to occur. Romantic couples demonstrate speech entrainment with one another, where they take on certain aspects of speech, such as pitch, voice quality, and speech rate, that coincide with the patterns of their romantic partner (Weidman, Breen, & Haydon, 2016). The entrainment of speech to a romantic partner can occur both during an argument and when agreeing (Weidman, Breen, & Haydon, 2016). During an argument, couples who entrain their speech patterns to one another were more likely to resolve the conflict (Weidman, Breen, & Haydon, 2016). When couples entrained their speech during an agreement, these couples were judged by independent raters as being better communicators and have healthier relationships (Weidman, Breen, & Haydon, 2016). Romantic partners also tend to alter the sound of their voices when speaking to their intimate partner and tended to match the pitch of their partner, resulting in women lowering their pitch and men raising their pitch when talking to a romantic partner as opposed to a friend (Farley, Hughes, & LaFayette, 2013). Thus, vocal mimicry seems to be an important component of romantic relationships.

Perhaps couples who spend more time speaking with one another may be more likely to display this vocal mimicking. Behavioral mimicry is a result of learning or associations made by others (Chartrand & van Baaren, 2009). Therefore, the longer one is exposed to another, the

more likely they are to pick up similar behaviors. However, vocal mimicry may be innate and due to mirror neurons being established early in development and thus does not require learning (Chartrand & van Baaren, 2009).

The Matching Hypothesis

People tend to find mates that have similar characteristics to themselves, a phenomenon coined as "the matching hypothesis" (Berscheid, Dion, Walster, & Walster, 1971). Several studies have found that romantic couples tend to match one another in terms of physical attractiveness (Price &Vandenberg, 1979). Feingold (1988) found that couples tend to self-rate themselves similarly in terms of physical attractiveness. Individuals are more attracted to others that have similar attitudes and beliefs to them as well as date those that match in social desirability and attractiveness (Sachs, 1975). People may interact more frequently with those of the opposite-sex that share similar levels of attractiveness to them as way to lower the chances of rejection **(**Berscheid, Dion, Walster, and Walster, 1971). Couples even tend to find mates with similar levels of attractiveness to them even though similarity was not specifically apparent when searching for their partners (Jia,Spivey, Szymanski, & Korniss, 2015).

Not only do couples tend to match in overall attractiveness, but they also seem to find partners who match in body weight. For instance, obese men and women tend to find other obese individuals as romantic partners (Carmalt, Cawley, Joyner, & Sobal 2008). Obese men and women may have a lower probability of attracting a physically attractive romantic partner as compared to healthy weight individuals.

If couples tend to match in level of physical attractiveness, perhaps they also match in their level of voice attractiveness. Further, people tend to match attractive-sounding voices to attractive faces and unattractive voices to unattractive faces (Hughes & Miller, 2016). Therefore,

if couples tend to match one another in physical attractiveness, people may assume that couples also match in their level of voice attractiveness.

Current Study

This study examined whether people would be able to match the voices of romantic couples to one another by only hearing their voice sample. I hypothesized that there are several reasons why raters may be able to match couples' voices:

Hypothesis 1: I predicted that couples will be matched by voice if they possess a similar level of voice attractiveness as judged by independent raters.

Hypothesis 2: I predicted that couples who have similar self-perceived mate value have chosen partners with similar vocal qualities (i.e., vocal homogamy), and therefore would be matched due to similarity.

Hypothesis 3: I predicted that raters will match voices based upon pitch and will match attractive, sex-specific pitches to one another (i.e., match lower-pitched male voices with higher-pitched female voices).

Hypothesis 4: I predicted that couples who report having higher perceived relationship quality will tend to tend to speak similarly to one another, and are matched due to similarity.

Hypothesis 5: I predicted that couples who spend more time speaking with one another tend to show vocal mimicking of one another and therefore will be matched due to their vocal mimicry patterns.

To test these hypotheses, voice samples from romantic couples who were in exclusive, committed relationships were collected. The couples also completed a questionnaire that asked about their relationship length, relationship quality, time spent speaking to one another, and they rated both their partner's voice attractiveness and their own voice attractiveness. In addition,

couples were asked to complete the MVI-7 (Mate Value Inventory; Kirsner et al. 2003) to assess their self-perceived mate value as well as that of their perception of their partner's mate value. Then, independent raters judged the voice samples collected from the couples for voice attractiveness as well as participated in an experimental task where they selected which voice samples were matched as a romantic couple.

This study could contribute to our understanding of what the human voice can reveal to others as examined in the field of evolutionary psychology. Unlike previous investigations, this study aimed to determine whether people were able to match couples' voices to one another and examined the possible reasons why raters may be able to do so by examining the couples' perceived mate value, relationship length, pitch analysis, vocal attractiveness, and couples' perceived relationship quality.

Method

Participants

There were a total of 101 undergraduate students (57 women and 44 men) who participated in this study. Participation in the study was voluntary, and participants could receive extra credit in their psychology classes for their participation in this study at the discretion of their professors. All procedures were approved by the local Institutional Review Board.

Speakers. This study involved two sets of participants. The first set of participants were couples who were in heterosexual, committed, romantic relationship who provided voice samples that served as the stimuli for the study. These 20 couples (20 women and 20 men) were obtained through word of mouth and by snowballing email announcements of acquaintances and friends of the investigator to sign up to participate. The mean age of all the couples was 21.05 (*SD* = 1.19, range 19-25). The mean reported length of the couples' relationship was about 16

months (*M* = 16.49 months, *SD* = 12.22, range = 2-48 months). All couples (100%) reported that English was their native language. The majority of the speakers reported being Caucasian (90%), followed by African American (7.5%) and Hispanic/Latino (2.5%). Most of the speakers indicated they were raised on the east coast, primarily in the state of Pennsylvania (55%) followed by New Jersey (17.5%), and none of the speakers sounded like they had a discernable accent foreign to the Northeast region of the US. Further, none of the speakers indicated that they smoked, had oral modifications, had a cold, had throat or auditory surgery, or had hearing or speech impairments that could have affected their speech.

Table 1 presents paired sample t-tests examining sex differences in relationship length and contentment, time spent together, perceived similarities in interests, attitudes, and personalities, and perceived self and partner voice attractiveness. There were no sex differences in how attractive they thought the sound of their voice was, how attractive they thought their partner's voice was, how often they spent time in person with their partner, the amount of hours they spent talking on the phone with their partner, how content they were in their relationship, and how similar they perceived their interests, attitudes, and personalities were to their partner.

Raters. The second set of participants (61; 37 women and 24 men) were undergraduate students solicited from the Psychology Department Participant Pool at Albright College using a participant pool online software system. The mean age of the raters was 19.96 years old, (*SD* = 1.53, range = 18-23). There were 49.2% of the raters who reported being in an exclusive, committed, romantic relationship. Most raters reported that English was their native language (83.6%) followed by Spanish (8.4%), Chinese (2.8%), Cantonese (1.4%), Mandarin (1.4%), and Tagalog (1.4%). The majority of the participants reported being Caucasian (63.9%) followed by African American (13.1%), Hispanic/Latino (13.1%), Asian/Pacific Islander (8.2%), and other

(1.6%). Most of the participants indicated they were raised on the east coast, primarily in the state of Pennsylvania (57.6%) followed by New Jersey (18.2 %), and New York (7%). None of the participants reported that they suffered from a hearing impairment or had auditory surgery that could have affected their ratings of the voices.

Materials and Procedure

First, the vocal stimuli were collected from the first set of participants, who were couples in a committed relationship. Couples were first given an informed consent. Then couples were asked to complete a demographic questionnaire privately (without seeing one another's answers) that included questions concerning their gender, age, native language, fluency in other languages, area raised, ethnicity, and other features that may affect their speech or hearing as reported above. Participants were also asked to answer questions about their relationship length, relationship quality, time spent speaking to their partner, and rated both their partner's voice attractiveness and their own voice attractiveness. In addition, they completed the MVI-7 (Mate Value Inventory; Kirsner et al. 2003) that assessed their self-perceived mate value and their perceived partner's mate value.

Next, the couples were asked to provide a voice sample by reciting a number count from 1 to 10 at approximately one numeral per second. Speakers were told that their voices would be heard and rated by others but their identity would remain confidential to the raters. Voices were recorded using the Voice Recorder and Audio Editor application from the iPhone 6s Smartphone, and the device was held approximately a foot away from their mouth while recording. Once all the voices were collected from the 20 couples, the voice samples were cropped so there was a number count of 1 to 3, and these voice samples were then embedded into a PowerPoint presentation and presented to the second set of participants, who served as the raters.

These voice samples were later analyzed using the Praat 6.0.37 software to measure specific acoustics: mean pitch (i.e. fundamental frequency), standard deviation of pitch, jitter (local), shimmer (local), and noise to harmonics (NTH). Measures of jitter and shimmer contribute to our perception of vocal hoarseness, and NTH is a measure of vocal clarity (Teixeira, Oliveira, & Lopes, 2013). Table 2 compares sex differences for each of these acoustic measures. There were sex differences in mean pitch, standard deviation of pitch, and jitter. However, there were no significant sex differences in shimmer and noise to harmonics (NTH).

For the second set of participants who served as raters, after giving informed consent, these raters were also asked to complete a brief demographic questionnaire concerning their gender, age, ethnicity, native language, sexual orientation, relationship status and length, and if they suffered from any hearing impairment that would not allow them to properly hear the voice samples, as reported above. They were presented with an experimental task using a PowerPoint presentation. Each presentation screen displayed an audio file icon of a target voice sample, and underneath the target, there were three more audio file icons of opposite-sex voice samples. One of the voices was the romantic partner of the target voice, and the other two voices were collected from the other speakers. Raters were asked to select which of the three options they thought was the romantic partner of the target voice. Raters could listen to each voice as much as they wanted before making their selection and were asked to write which of the three voices they selected on a rating sheet before proceeding to the next presentation screen. Altogether, there were 43 presentation screens shown during the experimental task. Stimuli were presented as a block of 20 male target voices and a block of 20 female target voices. The order of the blocks was counterbalanced for each participant. The presentation slides were also counterbalanced for each participant, using 4 versions of the presentation. After partaking in this experimental task,

the participants were played all 40 voices (20 female speakers, 20 male speakers) again by the investigator in a counterbalanced order in blocks of 20 female voices and 20 male voices and they were asked to rate the attractiveness of the voices using a scale from 1 (very unattractive) to 10 (very attractive). Raters were not told that the voices were the same as the previous experimental task and were asked evaluate the attractiveness the voices of same-sex speakers as the opposite sex would. At the conclusion of the study, all participants were debriefed about the purpose of the study and were told to complete information in order to gain extra credit for a psychology class.

Analyses

Difference scores between couples' answers to the questionnaire (i.e., perceived voice attractiveness, relationship length, relationship contentment, time speaking to one another, perceived similarities in interests, attitudes, and personalities, as well as self-perceived MVI-7, and perceived partner MVI-7) were calculated, as well as difference scores between the couples' ratings for voice attractiveness made by independent raters. Absolute values of these difference scores were used to correlate with the percent of raters that could accurately match a couple's voices to one another.

Results

Accuracy

In order to examine whether listeners could match target voices correctly with the voice of their partner in the experimental task, a one sample *t*-test was conducted. Raters had 1/3 chance of correctly matching the target voice to their partner out of the 40 experimental trials (i.e., 13.33). Raters were able correctly match voices ($M = 14.92$, $SD = 3.07$) at a greater likelihood than chance ($M = 13.33$), $t(15) = 4.04$, $p < .001$.

Similar Voice Attractiveness

To examine Hypothesis 1, I found that the greater the difference in voice attractiveness as rated by all raters, the less likely all raters were able to correctly match a couple's voice sample, $r(38) = -.38$, $p = .015$ (see Table 3). Additionally, when considering the sex of the rater, there were similar results. The greater the difference in voice attractiveness as rated by males, the less likely the male rater was able to correctly match a couple's voice samples, $r(38) = -.36$, $p = .024$ (see Table 3). Similarly, the greater the difference in voice attractiveness as rated by females, the less likely the female rater was able to correctly match a couple's voice samples , $r(38) = -.33$, $p = .039$, as seen in Table 3.

Speakers' perception of their own voice attractiveness ($M = 4.98$, $SD = 1.56$) was significantly lower than independent raters' evaluation of their voices ($M = 5.65$, $SD = .15$), $t(39) = -2.62$, $p = .013$. Speakers' perception of their partner's voice attractiveness was significantly higher ($M = 7.85$, $SD = .24$) than independent raters' evaluation of their partner's voice attractiveness ($M = 5.65$, $SD = .15$), $t(39) = 8.51$, $p < .001$. Male romantic partners' perception of their female partners' voice attractiveness was significantly higher ($M = 7.70$, $SD = 1.59$) than the female's evaluation of her own voice attractiveness ($M = 4.90$, $SD = 1.65$), $t(19) = -5.54$, $p < .001$. Additionally, the female perception of their male partners' voice attractiveness was significantly higher ($M = 8.00$, $SD = 1.52$) than the male's evaluation of his own voice attractiveness ($M = 5.05$, $SD = 1.50$), $t(19) = 6.31$, $p < .001$.

Self-Perceived Mate Value

To examine Hypothesis 2, Table 4 lists Pearson correlations that examined the relationship between percentage of raters accurately matching a couple's voices and difference of the couples' independently rated voice attractiveness, difference of couple's partner independent

ratings of voice attractiveness, self-perceived mate value (self- MVI-7 score), perception of partner's mate value (MVI-7 score), as well as the difference scores between self-perceived mate value (MVI-7 score) and perception of partner's mate value (MVI-7 score). As seen in Table 4, there were no significant correlations found between any of these variables and the ability for raters to accurately match the couple's voices to one another.

A 2(self vs. partner voice attractiveness) X 2(self-mate value vs. partner mate value) repeated measures ANOVA was used to see the effects of voice attractiveness on mate value ratings. There was a main effect for voice attractiveness, $F(1, 39) = 83.12$, $p < .001$, $\eta^2 = .681$, whereby speakers' perception of their own voice attractiveness ($M = 6.4$, $SE = 0.2$) was rated significantly lower than their perception of their partner's voice attractiveness ($M = 1.2$, $SE = 3.9$). There was also a main effect for perceived mate value, $F(1, 39) = 85.15$, $p < .001$, $\eta^2 = .686$, with speakers' perception of their self-perceived mate value ($M = 6.4$, $SE = 0.2$) rated significantly lower than their perception of their partner's mate value ($M = 8.1$, $SE = 0.1$). Additionally, there was a significant interaction between voice attractiveness and mate value, $F(1, 39) = 70.03$, $p < .001$, $\eta^2 = .642$. A post hoc paired sample t-test showed that speakers' perceptions of their own voice attractiveness ($M = 4.98$, $SD = 1.56$) was rated significantly lower than their perceptions of their self-perceived mate value ($M = 7.88$, $SD = 0.80$), $t(39) = -13.15$, $p < .001$. However, speakers' perception of their partner's voice attractiveness ($M = 7.85$, $SD = 1.55$) was not rated significantly lower than speakers' perception of their partner's mate value ($M = 8.31$, $SD = 0.74$), $t(39) = -1.86$, $p = .071$.

Pitch

To examine Hypothesis 3, Pearson correlations were performed to examine the relationship between differences in the five voice acoustic measures taken between romantic

partners' voices and the percentage correct in which raters were able to match couples' voices to one another. The only acoustic measure that related to accuracy in matching a couples's voice ws shimmer (i.e., vocal hoarseness); the greater the difference in shimmer (i.e., hoarseness of voice) among partners, the less likely all raters were able to correctly match a couple's voice samples, $r(38) = -.38$, $p = .015$ (see Table 5). Male raters, in particular, were also less likely to match a couple's voice samples when there was a greater difference in shimmer among partners $r(38) = -.37$, $p = .019$ (see Table 5).

As listed in Table 6, Pearson correlations were performed to examine the relationship between male and female acoustics measures and independent ratings of voice attractiveness. The higher the male speaker's pitch, the lower the ratings of voice attractiveness when made by male raters, $r(38) = -.56$, $p < .001$, by female raters, $r(38) = -.55$, $p < .001$, and by all raters, $r(38) = -.57$, $p < .001$. The higher their voice pitch was, the lower their independent ratings were on voice attractiveness, $r(38) = -.38$, $p = .015$. Additionally, the higher the pitch SD measure, the lower the ratings of voice attractiveness made by male raters, $r(38) = -.51$, $p = .001$, by female raters, $r(38) = -.55$, $p < .001$ and by all raters, $r(38) = -.57$, $p < .001$. There were no significant correlations between male speakers' jitter, shimmer, and NTH acoustic measures and voice attractiveness. Additionally, there were no significant correlations between any of the female acoustic measures and voice attractiveness ratings (also listed in Table 6).

Relationship Contentment, Similarity, and Time Spent Together

To examine Hypotheses 4 and 5, Table 7 shows Pearson correlations between the percent that raters correctly matched the voice samples of the couples with the couples' relationship length, time speaking in person to one another, how often the couple spoke daily to each other, length of time speaking on the phone to each other, relationship length, and the similarities

between the couple's interests, attitudes, and personalities. Opposite to what was predicted, the more couples spoke to one another, the less their voices were correctly matched to one another by raters, $r(38) = -.32$, $p = .048$, (see Table 7). In addition, the more that couples indicated that they talked on the phone, the less their voices were matched by raters, $r(38) = -.35$, $p = .026$ (see Table 7).

There was no significant correlation between the length of a couple's relationship and the ability for raters to accurately match their voices to one another, $r(38) = -.17$, $p = .308$ (see Table 7. This was also the case when examining only ratings made by men, $r(38) = -.06$, $p = .732$, and by women, $r(38) = .26$, $p = .109$. There was also no other significant correlations between the couple's relationship factors and the accuracy of raters ability to match the couple's voices (Table 7).

Discussion

Matching Couples' Voices

This study demonstrated that individuals were able to match the voices of romantic couples who were in committed relationships in an experimental task with a statistically greater than likelihood chance. I examined several factors that could be responsible for this phenomenon and were able to provide some clues as to how this task was possible.

First, in support of Hypothesis 1, I found that the greater the difference in perceived voice attractiveness as rated by independent raters, the less likely the independent raters were able to correctly match a couple's voice sample. Along with previous research, individuals seem to pair attractive faces to attractive voices with one another, a stereotype known as "what sounds beautiful looks beautiful" (Hughes & Miller, 2015). Additionally, people tend to find mates that have similar characteristics to themselves, a phenomenon coined "the matching hypothesis"

(Berscheid, Dion, Walster, & Walster, 1971). In particular, several studies have found that romantic couples tend to match one another in terms of physical attractiveness (Price &Vandenberg, 1979). Perhaps, just as people find mates with similar physical attractiveness, they also find mates with similar vocal attractiveness. Therefore, raters may have thought that the greater the difference in perceived vocal attractiveness of a couple's voices, the less likely they would be matched as a couple.

I also found that, the greater the differences in shimmer (hoarseness/breathiness of voice) in a couple, the less likely independent raters were able to correctly match a couple's voice to one another. In line with past research, both men and women agree that a breathy voice combined with other individual characteristics may be perceived as sounding "sexier" to others (Tuomi & Fisher, 1979). The "matching hypothesis" states that people tend to find mates that have similar characteristics to themselves (Berscheid, Dion, Walster, & Walster, 1971). Perhaps independent raters thought couples should also match in vocal attributes of having a sexy, breathier voice.

Surprisingly, in contrast to what was predicted for Hypothesis 5, the more couples spoke to one another, the less their voices were matched by raters. In addition, the more that couples indicated that they talked on the phone, the less their voices were matched by raters. There was also no significant correlation between relationship length and whether voices were correctly matched by raters. Previous research has found that romantic couples demonstrate speech entrainment with one another, where they take on certain aspects of speech, such as pitch, voice quality, and speech rate, that coincide with the patterns of their romantic partner (Weidman, Breen, & Haydon, 2016). Therefore, I predicted that couples who spend more time speaking with one another may be more likely to display this vocal mimicking. However, our data suggest this

is not the case, and independent raters may not have used cues of vocal mimicking to pair the couples or the voice samples were not long enough to determine vocal mimicking between the pair.

There were several factors that I believed would have influenced the ability to match couples' voices accurately, but they seemed to have little influence on the task. For instance, I hypothesized that couples who had similar self-perceived mate value had chosen partners with similar vocal qualities (i.e., vocal homogamy) but found no evidence for self-perceived and partner mate value (MVI-7) on whether a rater was more likely to correctly match couples' voices with one another. Perhaps raters were not able to distinguish vocal similarity in mate value due to the brevity of the voice samples used. Perhaps more vocal information was needed to make this determination. I also hypothesized that raters would match voices based upon sex-specific attractive pitch, (i.e., would match lower-pitched male voices with higher-pitched female voices), but also found no evidence for differences in vocal pitch and whether raters were more likely to correctly match couples' voices with one another. Additionally, I hypothesized that couples who had higher self-perceived relationship quality tend to speak similarly to one another and would match due to similarity, but I found no evidence for couples' relationship contentment and perceived similarities in interests, attitudes, and personalities on whether raters were able to accurately match the partners' voice samples with one another.

Voice Attractiveness

Speakers' perception of their own voice attractiveness was much lower than independent raters' evaluation of their voices. Reinfeldt et al. (2010) found that during vocalization the perception of one's own voice may sound different from how others hear our voice because we hear it internally via both bone and air conduction. Therefore, individuals may not be able to

accurately assess their own voice attractiveness since their perception is distorted as compared to hearing the voices of others transmitted through only air conduction. Hughes and Harrison (2013) found that individuals perceive their own voices as sounding more attractive than others had when rating their own voice sample, but this was only when they were unaware that they were listening to their own voice sample. However, when made aware that they are listening to their own voice recording, they can react negatively and dislike the sound of it (Holzman and Rousey 1966). Further, speakers' perception of their partner's voice attractiveness was much higher than independent raters' evaluation of their partner's voices. Swami et al. (2009) found that people appear to perceive their romantic partners as being significantly more attractive than themselves on a range of bodily components including overall physical attractiveness. Perhaps individuals put their partners on a pedestal and view their partners through positive illusions-misconceptions that are self-enhancing in some way (Murray, Holmes, & Griffin, 1996). Additionally, couples may be biased in their perception of their partner's voice attractiveness since they hear their partner's voices more often than others, in line with mere exposure effect (Zajonc, 1968). As such, the mere exposure affects perceptions of physical attractiveness, and people prefer regular photos of their friends to mirror-images of their friends, but prefer mirror image photos of themselves because the mirror image is more familiar (Mita et al., 1977)

Speakers' perception of their own voice attractiveness was rated significantly lower than their perception of their partner's voice attractiveness. Further, speakers' perception of their self-perceived mate value was rated significantly lower than their perception of their partner's mate value. These findings are similar to past research presented in which individuals view their partner in a positive light sometimes including positive illusions (Barelds, & Dijkstra, 2009). Additionally, speakers' perceptions of their own voice attractiveness were rated significantly

lower than their perceptions of their self-perceived mate value. When hearing one's own voice in a recording, individuals tend to react negatively to their voice as compared to hearing other people's voice recordings (Holzman & Rousey 1966). Perhaps this explains why speakers rated their own voice attractiveness much lower than they rated their own mate value.

Limitations

There were several limitations and confounds that could have affected these results. First, while a sample of 20 couples used as stimuli was adequate, perhaps a larger sample size used as stimuli would provide more statistical power and would be more sensitive to detecting significant differences; indeed, many of our correlations were in the predicted direction but just did not reach statistical significance. Second, past literature has emphasized the unreliability of using difference scores in analyses, which could result in summation of measurement errors (Edwards,1994; Griffin, Murray, & Gonzalez, 1999). Further, an alternative to the use of difference scores in analysis is the use of regression model. However, regression models were preformed but not reported due to violations of high collinearity. Third, although the experimental task for raters was straightforward, the task may have been too difficult in terms of having to select among the three voice options. Perhaps having two voice options to choose from would make it easier for raters to accurately match the voice samples of couples. Fourth, while the voice samples were intentionally cropped to a number count from 1 to 3, independent raters may not have had enough voice information from the speakers to accurately assess their voice and, therefore, to match the voice samples to one another. Fifth, although most of the couples reported they were content within their relationship, some of the couples reported only being in their relationship for a few months; perhaps examining couples who have been together for far

longer time would show different patterns of mimicry that could be used to identify a match. Sixth, since the majority of speakers were Caucasian, perhaps raters are more likely to match two people as a couple if they sound like they are of the same ethnicity as one another. Seventh, although raters were able to match voices of romantic couples with a statistically greater than likelihood chance, overall, this effect was small and did not demonstrate high levels accuracy, so one should view these data with caution. Lastly, while I did counterbalance the presentation slides and voice samples given to the raters in 4 versions, I did not administer the 4 versions of the presentation equally among all raters.

Future Directions

Future investigations that continue this line of work could consider using longer phrases taken from natural conversations to use as stimuli as a way to give independent raters more vocal information to better assess for the task of matching couples' voice samples to one another. Additionally, future studies could focus on gathering a larger sample size of different ages and having couples who have been together for a longer period of time. The voice samples of couples that were used were mostly voices from the Northeast region. Therefore, future studies could examine the effect of accents and other cultural factors that may be influential in determining whether people can match couples' voices to one another. The current research also focused specifically on heterosexual couples and whether independent raters could match the couples' voices to one another. Perhaps future studies could explore the voices of those in same-sex relationships.

Conclusion

The findings presented in the current study are among the first to examine empirically that individuals are able to match the voices of romantic couples with a greater than chance

accuracy. This study demonstrated that independent raters were less likely to match couples' voices to one another if there were greater differences in rated vocal attractiveness and vocal hoarseness between the couples. This finding suggests that raters were using some cues of vocal similarity to match a couple's voice. Additionally, ratings of one's own voice attractiveness were much lower than independent ratings of one's voice attractiveness, as well as their partner's ratings of one's voice attractiveness. Further, speakers' perception of their partner's voice attractiveness was much higher than independent raters' evaluation of their partner's voice attractiveness. These findings contribute to our understanding of what the human voice can reveal to others as examined in the field of evolutionary psychology.

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Table 1

Paired Sample t-tests Examining Sex Differences in Relationship Length and Contentment, Time Spent Together, Perceived Similarities in Interests, Attitudes, and Personalities, and Perceived Self and Partner Voice Attractiveness (n = 40)

Variable	Sex	Mean	*SD*	*T*	*df*	*p*
Reported Relationship Length				1.46	19	.161
	Men	16.66	12.30			
	Women	16.33	12.39			
Reported Time Speaking in Person to Partner				-1.37	19	.186
	Men	7.80	1.11			
	Women	8.10	1.21			
Reported Amount of Time Speaking Daily				-1.61	19	.124
	Men	7.80	1.54			
	Women	8.40	1.43			
Reported Phone Talking Length				1.20	19	.244
	Men	58.80	114.76			
	Women	27.65	41.28			
Relationship Contentment				-.58	19	.569
	Men	8.85	1.27			
	Women	9.05	1.05			
Reported Similar Interests with Partner				1.14	19	.267
	Men	7.95	1.36			
	Women	7.65	.99			
Reported Similar Attitudes with Partner				0.00	19	1.000

	Men	7.50	1.88			
	Women	7.50	1.47			
Reported Similar Personality with Partner				-.19	19	.844
	Men	7.10	1.65			
	Women	7.20	1.67			
Perceived Own Voice Attractiveness				-.28	19	.782
	Men	4.90	1.65			
	Women	5.05	1.50			
Perceived Partner Voice Attractiveness				.60	19	.554
	Men	8.00	1.52			
	Women	7.70	1.59			

Note. *$p < .05$; **$p < .01$; ***$p < .001$

Table 2

Paired Sample t-tests Examining Sex Differences in Vocal Acoustic Measures (n = 20)

Variable	Sex	Mean	*SD*	*t*	*df*	*p*
Mean Pitch				-10.39	19	<.001***
	Men	122.57	20.34			
	Women	199.72	24.32			
Pitch SD				-2.27	19	.035*
	Men	18.14	21.92			
	Women	30.07	13.91			
Jitter				2.98	19	.008**
	Men	175.71	86.85			
	Women	122.29	60.23			
Shimmer				0.27	19	.788
	Men	1.07	0.29			
	Women	1.05	0.26			
NTH				0.34	19	.739
	Men	0.19	0.12			
	Women	0.18	0.11			

Note. *$p < .05$; **$p < .01$; ***$p < .001$

Table 3

Pearson Correlations between Voice Attractiveness and Percent of Correctly Matching Couples' Voices (n = 40)

Variable	1	2	3	4	5
1. Difference of All Rater Attractiveness	--				
2. Difference of Male Rater Attractiveness	.92**	--			
3. Difference of Female Rater Attractiveness	.97**	.80**	--		
4. Percent Correct Made by All Raters	-.38*	-.31	-.38*	--	
5. Percent Correct made by Male Raters	-.33*	-.36*	-.28	.72**	--
6. Percent Correct made by Female Raters	-.31	-.19	-.33*	.90**	.34*

Note. *$p < .05$; **$p < .01$; ***$p < .001$

Table 4

Pearson Correlations between Percentage of Raters Accurately Matching a Couple's Voices and Difference of Couples Voice Attractiveness, Difference of Couple's Partner Voice Attractiveness, Self-Perceived Mate Value (Self- MVI-7 score), Perception of Partner's Mate Value (MVI-7 score)(n = 40)

Variable	1	2	3	4	5	6	7	8	9
1. Percent Correct Made by All Raters	--								
2. Percent Correct made by Male Raters	.72**	--							
3. Percent Correct made by Female Raters	.89**	.34*	--						
4. Difference between Couples Ratings of Own Voice Attractiveness	-.02	-.19	.09	--					
5. Difference between Couples Ratings of Partner Voice Attractiveness	.11	-.08	.20	.25	--				
6. Difference between Target Own Voice Attractiveness and Partner's Perception of Target Voice	.04	.16	-.05	.04	.04	--			
7. Self-Perceived Mate Value (MVI-7) Score	-.02	-.10	.03	-.16	.04	-.44**	--		

8. Partner Mate Value (MVI-7) Score	-.13	-.11	-.10	-.05	-.08	-.23	.60**	--	
9. Difference of Self MVI-7	.01	-.04	.04	.09	-.28	.01	-.07	.04	--
10. Difference of Partner MVI-7	.17	-.02	.24	.227	-.01	.07	-.46**	-.39*	.07

Note. *$p < .05$; **$p < .01$; ***$p < .001$

Table 5

Pearson Correlations between Percentage of Raters Accurately Matching a Couple's Voices and Acoustics Measures (n = 40)

Variable	1	2	3	4	5	6	7
1. Percent Correct Made by All Raters	--						
2. Percent Correct Made by Male Raters	.72**	--					
3. Percent Correct Made by Female Raters	.89**	.34*	--				
4.Difference in Mean Pitch of Couple	.18	.07	.21	--			
5.Difference in Pitch SD	.04	-.13	.13	-.06	--		
6.Difference in Jitter	-.07	-.02	-.08	-.09	.12	--	
7.Difference in Shimmer	-.38*	-.37*	-.28	-.01	-.28	.25	--
8.Difference in NTH	-.20	-.25	-.12	-.16	.39*	.59**	.29

Note. *$p < .05$; **$p < .01$; ***$p < .001$

Table 6

Pearson Correlations between Male and Female Acoustics Measures and Independent Ratings of Voice Attractiveness (n = 40)

Variable	1	2	3	4	5	6	7	8
1. Mean Pitch	--	**.63****	**.03**	**.10**	**.19**	**-.57****	**-.56****	**-.55****
2. Pitch SD	-.24	--	**.32***	**.33***	**.41****	**-.52****	**-.51****	**-.51****
3. Jitter	-.70**	.33*	--	**.79****	**.94****	**.15**	**.03**	**.20**
4. Shimmer	-.45**	.39*	.60**	--	**.85****	**.08**	**.01**	**.11**
5. NTH	-.62**	.41**	.93**	.71**	--	**.04**	**-.05**	**.10**
6. Attractiveness Ratings (All Raters)	-.16	.02	.07	.03	.11	--	**.96****	**.99****
7. Attractiveness Ratings (Male Raters)	-.11	.01	-.01	-.05	.04	.96**	--	**.90****
8. Attractiveness Ratings (Female Raters)	-.18	.02	.11	.07	.145	.99**	.90**	--

Note. The upper right table data in bold represents male voices, and the lower left data represent female voices.

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 7

Pearson Correlations between Percentage of Raters Accurately Matching a Couple's Voices and Different Relationship Factors (n = 40)

Variable	1	2	3	4	5	6	7	8	9
1. Percent Correct Made by All Raters	--								
2. Percent Correct Made by Male Raters	.72**	--							
3. Percent Correct Made by Female Raters	.90**	.89**	--						
4. Relationship Length	.17	-.06	.26	--					
5. Time Speaking in Person	-.10	-.15	-.04	.00	--				
6. Time Spent Speaking Daily	-.32*	-.25	-.27	.29	.52**	--			
7. Phone Talking Length	-.35*	-.26	-.31	-.11	-.12	.17	--		
8. Perceived Similar Interests	.01	.08	-.04	-.01	.44**	.23	-.06	--	
9. Perceived Similar Attitudes	-.20	-.09	-.22	.01	.20	.19	.05	.40**	--
10. Perceived Similar Personality	-.07	.10	-.15	.04	.32*	.29	.14	.45**	.45**

Note. *$p < .05$; **$p < .01$; ***$p < .001$