

IMPRESSIONS OF PERSONALITY FROM INTENTIONAL VOICE QUALITY IN ARABIC-SPEAKING AND NATIVE FINNISH-SPEAKING LISTENERS

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Abstract

Objectives. The present study aimed to investigate whether there are differences between Arabic-speaking and Finnish-speaking listeners in the impressions of a speaker's personality as evoked by various intentional voice qualities.

Study design. This is an experimental study.

Methods. Samples (N=55) were gathered from native Finnish-speaking males (N=4) and females (N=5), who read a text passage of 43 words using eight different voice qualities: (1) habitual speaking voice, speaking with (2) a forward or (3) backward placement of the tongue, or a (4) breathy, (5) tense, (6) creaky, (7) nasalized, or (8) denasalized voice. Native Arabic-speaking participants (34 males, 12 females; N=46) were asked to evaluate the speech samples on a 7-point polarized scale by choosing 1–5 from a total of 18 contrasting pairs of personality traits. The listening tests were presented via Windows Media Player and a Genelec Biamp loudspeaker. Traits that had evaluations of 30 percent or more were selected for the final analysis. The results were compared to the results of native Finnish-speaking listeners (12 males, 38 females; N=50). Statistical analyses were carried out using IBM SPSS Statistics 25.

Results. On the whole, both listener groups perceived the speakers' voice qualities similarly, although the Finnish-speaking listeners linked many voice qualities, especially nasal and denasal voices, with unpleasant and other negative personality traits. Moreover, somewhat opposing evaluations were given by the two language groups for voices with forward and backward placements of the tongue, and breathy and tense voices. In many cases, the evaluations by the Arabic-speaking listeners were more scattered. The speakers' sex also seemed to affect perceptions of personality.

Conclusions. There seem to be similar stereotypical tendencies to relate certain voice qualities with certain personality traits, which is explainable by how the voice types are produced and used to express emotions. Some opposing trends found between the two language groups may be related to

language and cultural differences. A further study with larger listener groups and including also samples from Arabic language speakers is needed to confirm the results of the present study.

Key words: Voice quality, personality traits, impression, language backgrounds, perceptual evaluation

Introduction

Voice quality has been broadly defined as those characteristics that are present more or less all the time when a person is talking; it is a quasi-permanent quality running through all the sound that issues from the speaker's mouth [1]. Laver (1980) also favors the broad definition of voice quality as the characteristic auditory coloring of an individual speaker's voice [2]. Both laryngeal and supralaryngeal, resonance-related aspects contribute to it. Voice quality can be seen as a speaker-characterizing feature that represents, e.g., an individual speaker's identity, personality, and to some extent age and gender. It may also differentiate groups of individuals along dimensions, such as a social group or culture, for instance [2], [3], [4], [5]. Voice quality also varies situationally to signal mood and state of health.

Earlier studies have addressed the relationship between voice quality parameters and perceptions of the speaker's personality through many variables. This relationship has been approached through a large variation of more or less relevant angles as listed by Kramer (1963) [6], such as assessment of the speaker's age, body type, brain damage, intelligence (IQ), personality traits, and psychopathologies; the elimination of the verbal content of speech; the use of listeners with different socio-economic backgrounds; and the analysis of the acoustic characteristics of the speech signal. Brown et al. (1973; 1974) and Smith et al. (1975) have reported that ratings of competence increased with an increased speech rate and conversely decreased with a decreased speech rate [7], [8], [9]. According to Ray (1986) [10], a faster rather than slower speech rate combined with a high pitch variation enhances the perception of the speaker's competence (see also [11]). Additionally, upon speeding up the speech rate, the speakers were rated as less benevolent [9]. The highest benevolence ratings were scored with a normal speech rate [9]. Wide pitch variation associated with low loudness also increased the perception of benevolence [10]. In accordance with the previous findings, Brown et al. [8] found that an increased F0 (fundamental frequency) variation was perceived as reflecting

greater benevolence and competence, while a decreased F0 variation had the opposite effect. Scherer (1978) has reported that a speaker's loud voice is associated with extroversion. In his conclusion, he stated that when the voice is loud and sharp, lacking gloom and breathiness, the speaker is perceived of as extroverted and assertive [12]. Furthermore, when the voice is resonant and low-pitched, the speaker is interpreted as conscientious and emotionally stable. Speakers using high-pitched voices were judged to be less truthful, less emphatic, less potent, and more nervous [13]. In Apple et al.'s study [13], slow-talking speakers were judged to be less truthful, less fluent, less persuasive, and more passive, but also more potent. Zellner Keller (2004) has suggested that dominant speakers with a slow speech rate and high use of breathing pauses showed good control of the temporal organization of their speech [14].

Polzehl et al. (2010) exploited the theory of the Big Five personality traits (Fiske, 1949) in an examination where they studied automatic assessments of personality from speech using human raters and an automatic classifier for extracting prosodic and acoustic properties [15]. The five personality traits studied were Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism. According to their results, extroversion and neuroticism could be classified best. Extroversion and agreeableness tended to be carried by more tonal (cf. melodicality) expression compared to the other personality traits studied (see also [16], [17]). Additionally, vocal loudness was related to the perception of neuroticism. The assessment of openness was the least successful in the study. Furthermore, Mohammadi et al. (2012) used APP (Automatic Personality Perception) to rank people according to the Big Five personality traits attributed by human listeners [18]. The results suggested that the personality traits can be automatically ranked with an accuracy of 80%.

McAleer et al. (2014) have published an article reporting an experiment of personality traits perceived from a single word, "Hello" [19]. In female voices, valence (i.e., trustworthiness and likeability) was related to vocal attractiveness. A rising intonation was associated with a positive valence (i.e., greater trustworthiness and likeability), while a falling intonation was associated with a negative valence. In male voices, a higher pitch level was related to a positive valence. According to the results, increased attractiveness may increase trustworthiness. Perceived dominance in male voices was associated with a decreasing pitch, formant dispersion (how scattered the lowest formants from F1 to F4 were from each other), and decreasing alpha ratio (stronger overtones in the voice) and HNR (harmonic-to-noise ratio), whereas in female voices, increased dominance was associated with a higher average pitch. The researchers concluded that vocal attractiveness may be related to perceived warmth and trustworthiness in females and to perceived strength in males. Thus, valence and dominance may be

the personality traits upon which people base their first impressions of an unfamiliar speaker, but this result could be dependent on the context and time.

Language and culture affect the characteristics of voice and speech quality, and also the evaluation of these characteristics. Perceptions are learned interactions within a cultural context [17], [20], [21], [22]. Perceivers may connect voice quality characteristics to assumed social or personal characteristics, or to occupation-related vocal stereotypes [6], [14], [23], [24], [25], which are generally thought to be learned and connected to our socio-linguistic consciousness [23]. Hence, it may also be hypothesized that the same voice qualities may be interpreted to signal different personality features in different cultures. Such voice parameters as speaking pitch variations and loudness are particularly impactful [8], [9], [11], [18], [26]. Additionally, voice quality may be related to gender: the same voice quality may be considered positive or negative depending on whether the speaker is male or female [23].

Addington (1968) investigated the relationship between vocal characteristics and personality perception using 40 contrasting pairs of personality traits [23]. For the present study, we chose and updated some of the personality traits Addington used. We decided to study 18 contrasting pairs of personality traits in relation to perception of voice quality. We aimed to investigate whether there are differences between Arabic-speaking and Finnish-speaking listeners in the impressions of the speaker's personality invoked by the various voice qualities. Arabic-speaking listeners were chosen as participants for the present study since recently there has been a large influx of Arabic-speaking people to European countries. Undoubtedly, a lack of language skills in a foreign country causes difficulties in communication. Additionally, there may also be unexpected speech issues related to prosody (including e.g., pitch variation, stress, pausing, tempo, loudness, and voice quality) that may hamper interpersonal communication. Thus, we wanted to study whether there were differences between natives and foreigners – in this case Finnish-speaking and Arabic-speaking people – in the perception of personalities based on the speaking voice.

Materials and methods

Stimuli

The samples used in the present study were gathered from an earlier study by Lukkarila et al. [25]. Nine native Finnish speakers (males N=4; females N=5) read aloud a text passage with 43 words derived from a philosophical text with a neutral content. The speakers used eight different voice qualities: habitual speaking voice, speaking with a forward or backward placement of the tongue, or

a breathy, tense, creaky, nasalized, or denasalized voice. The recordings were made in a soundproof studio using Sound Forge Software and a Brüel & Kjær microphone that was placed 40 cm from the speaker's lips. The readers were instructed to keep all other variables the same and to vary voice quality only. The samples were pretested by four experienced vocologists to make sure that they represented the targeted voice qualities, and that no other prosodic elements changed perceptibly together with the voice quality. If they did, e.g., the tempo was clearly slower or faster, the sample was excluded from the final set of test stimuli. The total number of samples produced was 216, of which the 55 most successful in representing the targeted voice quality were chosen for the listening test (25 samples from male speakers and 30 from female speakers).

Participants

Forty-six Arabic-speaking immigrants (34 males, 12 females) from Iraq participated voluntarily in the listening tests at educational centers during their classes. Their occupational background was not asked. Each participant had to possess literacy skills in order to be able to participate in the test. The age of the Arabic-speaking listeners ranged from 17 to 57 years, the mean age being 27.3 years. The results of the listening evaluation completed by the Arabic-speakers were compared with the results of Finnish-speaking peers (N=50; 12 males, 38 females) who had earlier participated in the same listening test in classroom conditions. The mean age of the Finnish-speaking listeners was 41 years.

Design

The test was arranged in a normal classroom for the Arabic-speaking listeners, who all participated at the same time and without any breaks. The listening conditions were similar to the conditions of the listening test arranged for the Finnish-speaking participants in an earlier study [25]. The participants' hearing was not evaluated, but it was ensured that everybody could properly hear the samples during the test. The audio files were presented via Windows Media Player and a Genelec Biamp loudspeaker, which was placed in the front of the classroom. The present study was approved by an ethics board.

Measures

The participants were asked to evaluate the speech samples by choosing 1–5 personality traits on a 7-point polarized scale [23], with a total of 18 contrasting pairs of personality traits [23], [25]. The 18 contrasting pairs of personality traits were:

- masculine – feminine,
- pleasant – unpleasant,

trustworthy – untrustworthy,
attractive – unattractive,
honest – dishonest,
emotional – unemotional,
determined – undetermined,
artistic – unartistic,
extroverted – introverted,
dominant – submissive,
hard-working – lazy,
balanced – unbalanced,
enthusiastic – unenthusiastic,
empathetic – unempathetic,
convincing – unconvincing,
cooperative – uncooperative,
friendly – unfriendly,
brave – timid.

The answer sheets were translated into Arabic as the participants did not speak or understand Finnish. The instructions were read aloud and recorded by a native Arabic-speaker, and they were replayed to the Arabic-speaking participants at the beginning of the test.

Analyses

Statistical analyses for the data were carried out using IBM SPSS Statistics 25. In order to increase the clarity of the results, the answer scales (1–7) were recoded: scores of 1–3 were set to 1, scores of 5–7 were set to -1, and scores of 4 were set to 0 (neutral). All answers were then split according to the voice quality of the samples. After that, cross-tabulation was performed between personality traits and the language group of the listeners. To exclude the inclusion of random choices and to focus better on real trends, only those cases where the voice quality–personality trait combination yielded evaluations in at least one third of the cases were taken into account. For those cases, the chi-squared test was used to study whether the language groups differed significantly from each other in their evaluations. Significant difference was set at $p \leq 0.05$. Bonferroni correction was performed by regarding significant only those p -values that were ≤ 0.000347 (i.e., obtained by the calculation $0.05/(8*18)$). Additionally, the distributions of the answers were studied to see whether there were real qualitative differences between the language groups or whether the significant difference was

only “arithmetic” (i.e., due to the uneven number of choices made or by a larger scatter of evaluations in one of the groups).

Results

Table 1 summarizes the voice quality and personality trait pairs that were most often chosen as answers. In many cases, the chi-squared test results showed a significant difference between the language groups, but in most cases the difference was either related to a variance in the quantity of answers or to the fact that the answers in one of the language groups were more scattered than in the other (see Figure 1). Clearly opposing trends were found only for those pairs that are marked by an asterisk in Table 1.

Habitual	Forward	Backward	Tense	Breathy
pleasant	pleasant*	pleasant*	pleasant*	pleasant*
trustworthy	attractive	trustworthy	unattractive	trustworthy*
honest	emotional	determined	unemotional	emotional
determined	enthusiastic	enthusiastic?	determined	balanced*
	(friendly)	(dominant)	dominant	enthusiastic?
	(convincing*)	(unemotional)	(unfriendly)F	(artistic)
			(uncooperative)F	(timid)
				(attractive) A
	Creaky	Nasal	Denasal	(undetermined)F
	unenthusiastic	pleasant*	pleasant*	(submissive)F
	(introvert)	unattractive	attractive*	(unbalanced)F
	(lazy)	(trustworthy*)	honest A	(unconvincing)F
	(unattractive)	unconvincing F	determined A	
	unconvincing F	unenthusiastic F	unenthusiastic F	
	(unfriendly)F		unconvincing F	

Table 1. Voice quality and personality trait pairs that were chosen as an answer in at least 30% of the cases in both language groups.

() = pairs were chosen only in at least 25% of the cases.

F or A = pairs were chosen to a sufficient % only by Finnish speakers or Arabic speakers, respectively.

? = pair chosen to a sufficient %, but a large scattering in both language groups.

* = qualitative difference between the language groups, e.g., forward placement was regarded as pleasant by the Arabic-speaking group and unpleasant by the Finnish-speaking group.

See the text for further explanations.

Habitual voice. Both language groups found the habitual voice quality to be pleasant and trustworthy, reflecting an honest and determined personality (Figure 1 a).

Forward placement of the tongue. Both language groups evaluated the voice with forward placement of the tongue to be reflect an attractive, emotional, enthusiastic, and friendly personality. The Arabic-speaking listeners also linked this type of voice with pleasant and convincing traits, while the evaluations of the Finnish-speaking listeners linked it with the unpleasant and unconvincing traits.

Backward placement of the tongue. Both language groups associated this voice quality with a trustworthy, determined, dominant, and unemotional personality. Additionally, the Arabic-speaking listeners linked this quality with pleasantness, while the Finnish-speaking listeners linked it with unpleasantness. Both groups linked backward placement and enthusiasm, but the answers were scattered.

Tense voice. Both language groups associated a tense voice with an unattractive, unemotional, determined, and dominant personality. The Finnish-speaking listeners linked this voice quality with an unpleasant personality, while the Arabic-speaking listeners' answers were more scattered. Additionally, the Finnish-speaking listeners found the tense voice to signal an unfriendly and uncooperative personality (in 25.6% and 18.4% of the cases, respectively), but the Arabic-speaking listeners gave few answers to these voice quality–personality trait pairs in general (10% and 17%, respectively, and of these, unfriendliness and uncooperativeness were chosen only in 7.8% and 4.8% of the cases).

Breathy voice. Both language groups linked a breathy voice with an emotional, artistic, and timid personality. The Finnish-speaking listeners considered breathy voices to signal an unpleasant, unbalanced, and untrustworthy personality, while the opposite was true of the Arabic-speaking listeners. The latter also linked a breathy voice with attractiveness. Finnish-speaking listeners, instead, further related breathy voices with undetermined, submissive, and unconvincing personalities, while the evaluations of the Arabic-speaking listeners were more scattered for these traits. In both language groups, the pairing of breathy voice and enthusiasm was scattered (Figures 1 b, 2 a, and 2 b).

Creaky voice. This voice quality was linked with a lack of enthusiasm, introversion, laziness, and unattractiveness by both language groups. Additionally, the Finnish-speaking listeners regarded a

creaky voice as signaling an unconvincing and unfriendly personality. The Arabic-speaking listeners did not choose these personality trait pairs to a sufficient extent for creakiness (less than 23% or 19% of the cases, respectively, and in these cases the answers were also scattered).

Nasal voice evoked impressions of an unattractive personality in both listeners groups. The Finnish-speaking listeners linked nasality with an unpleasant and untrustworthy personality, while the opposite was true for the Arabic-speaking listeners. Additionally, the Finnish-speaking listeners related nasality with an unconvincing and unenthusiastic personality, while the Arabic-speaking listeners gave few answers for these voice quality–personality trait pairs, and the results were more scattered.

Denasal voice. The Arabic-speaking listeners related the denasal voice with pleasant, attractive, honest, and determined personality traits, while for the Finnish-speaking listeners, the denasal voice quality evoked impressions of unpleasant, unattractive, unenthusiastic, and unconvincing personalities.

Figure 1 a.

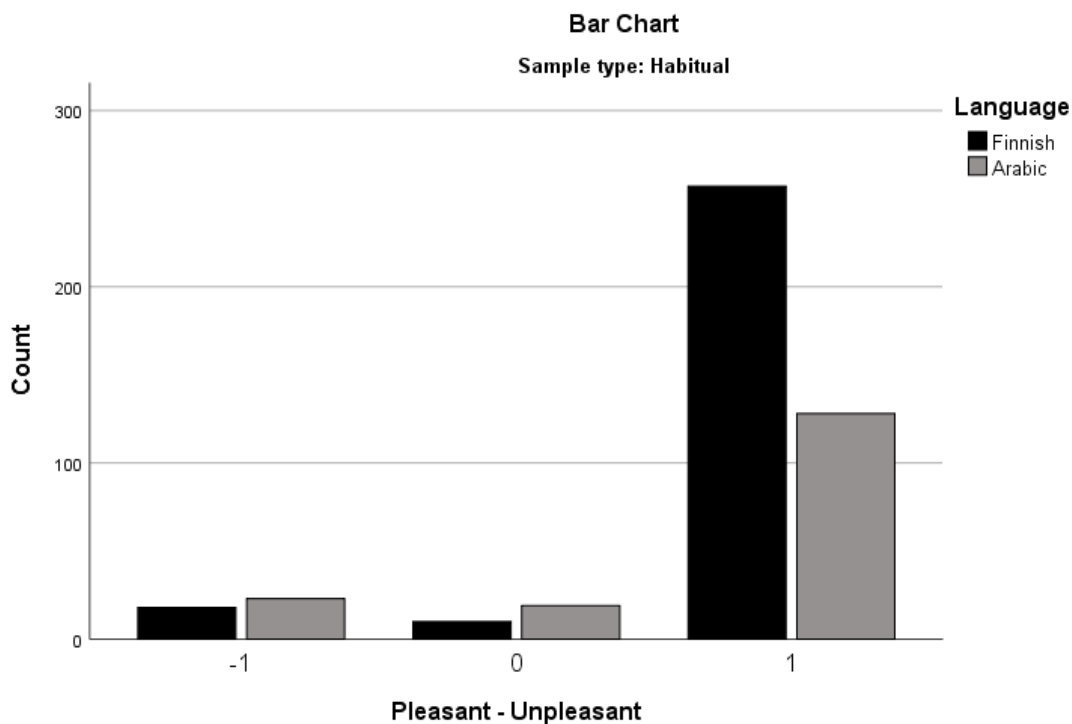
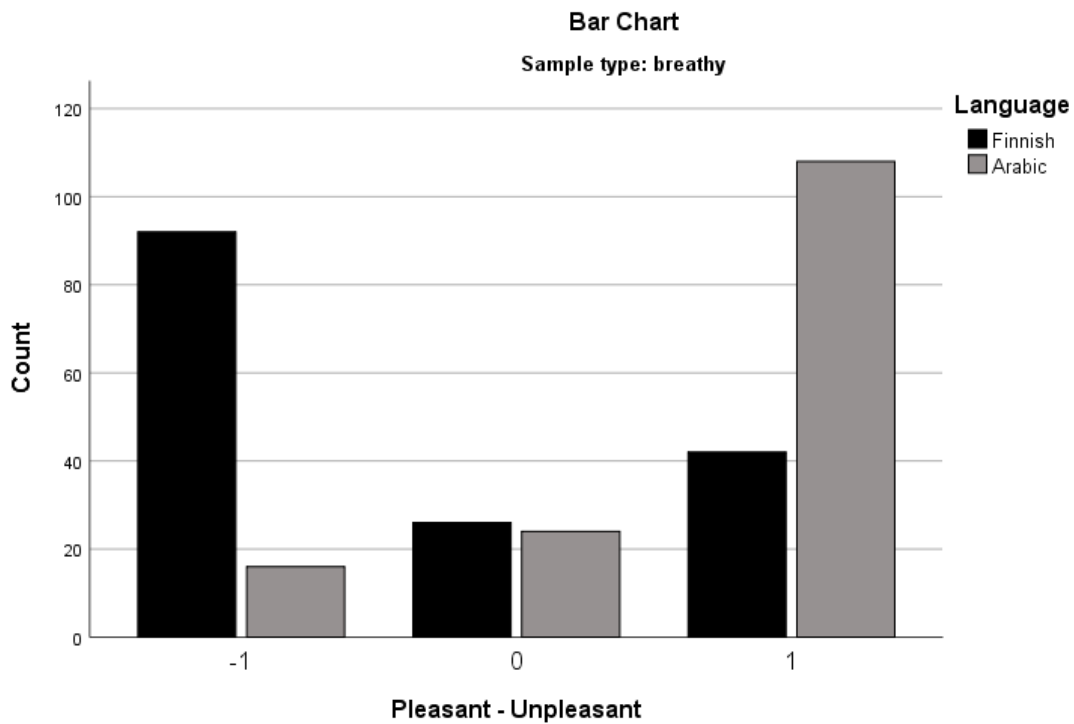


Figure 1 b.



Figures 1 a and 1 b. Examples of the distribution of voice quality and personality traits in the two language groups. -1 = unpleasant, 0 = neutral, 1 = pleasant. In both examples, the language groups differed significantly from each other in the Pearson's chi-squared test results. However, only in the distribution in Figure 1 b is the result related to a real qualitative difference between the answers of the language groups.

Figure 2 a.

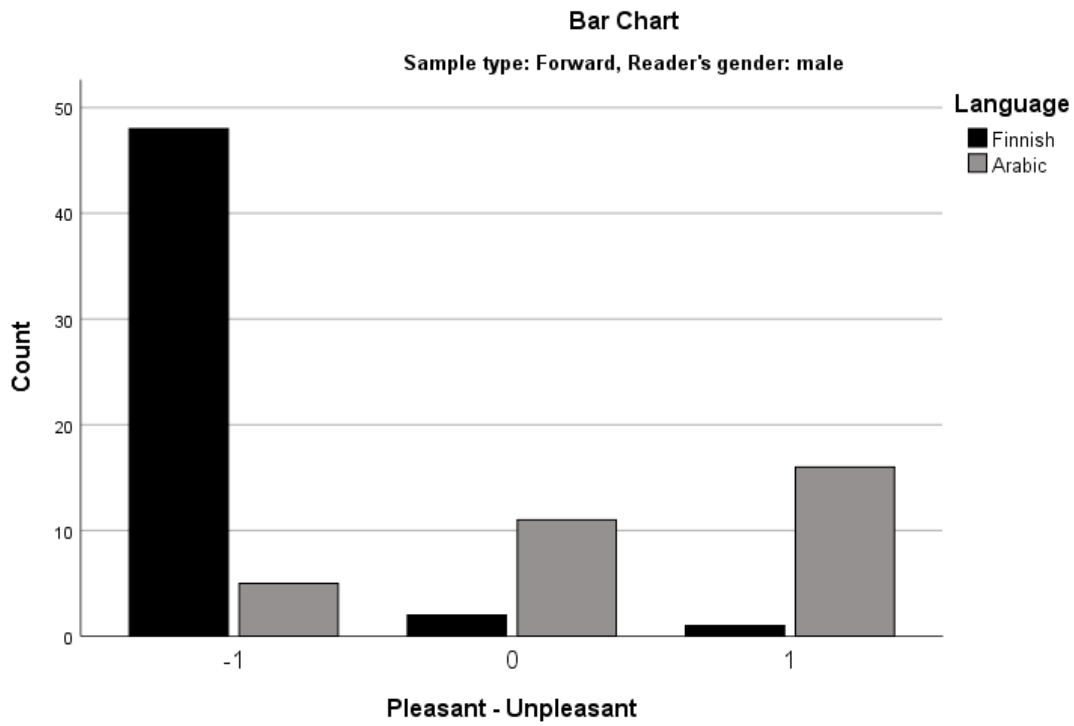
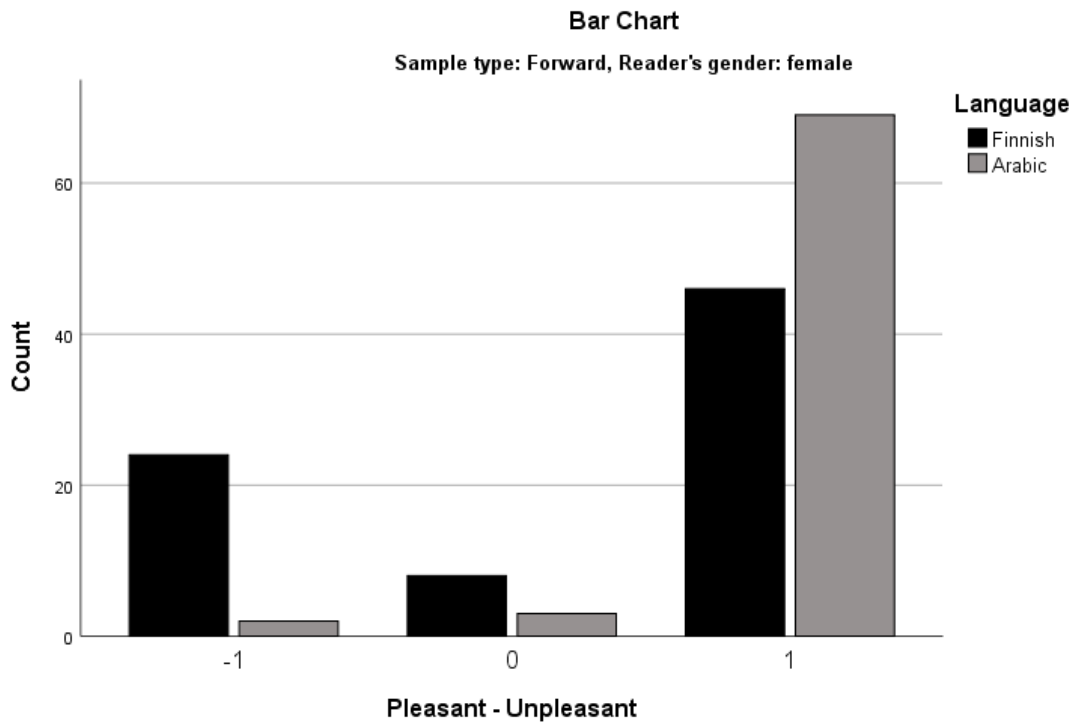


Figure 2 b.



Figures 2 a and 2 b. Examples of differences in voice quality and personality traits according to the speaker’s gender. Forward placement of the tongue in male speakers evoked mainly the evaluation of an unpleasant personality in the Finnish-speaking listeners (top), but the same voice quality in female speakers was linked with the evaluation of a pleasant personality in both language groups (Figure 2 b).

Forward	Value	df	Asymptotic Significance (2-sided)
pleasant*	63.444b	2	0.000
(convincing*)	40.472b	2	0.000
Backward			
pleasant*	18.185b	2	0.000
Tense			
pleasant*	51.849b	2	0.000
Breathy			
pleasant*	82.259b	2	0.000
trustworthy*	29.128b	2	0.000
Nasal			
unpleasant*	133.197b	2	0.000
(trustworthy*)	24.503b	2	0.000
Denasal			
pleasant*	124.368b	2	0.000
attractive*	93.130b	2	0.000

Table 2. Pearson’s chi-squared results for those evaluations in which the language groups differed significantly and qualitatively from each other. () = the pair of the voice quality % and the personality trait that was chosen only in > 25% and < 30% of the cases.

In some cases, the perception of the voice quality seemed to be related to the speakers’ gender. Figures 2 a and 2 b give an example of this. However, these differences were not statistically significant due to the low number of cases where the voice quality (forward placement of the tongue) – personality trait pairs were chosen.

Discussion

The results of the perception of personality traits from voice quality differed statistically significantly between the Arabic-speaking and the Finnish-speaking listeners in many trait pairs. However, there were far fewer real qualitative differences in the distributions of the answers. Both language groups

linked the habitual voice quality with a pleasant, trustworthy, honest, and determined personality. This result may be due to the fact that a healthy voice (i.e., relatively neutral, neither tense nor breathy, and without any particular deviations in voice timbre) is generally perceived more positively than a dysphonic (e.g., hoarse, rough, or creaky) voice. A dysphonic voice has been found to elicit more negative responses in terms of the speaker's personality in listeners [27], and even to hamper understanding of the message [28], [29], [30].

Forward placement of the tongue heightens formant frequencies (vocal tract resonances), especially the second formant (F2). As formant frequencies rise, the voice timbre becomes brighter as, e.g., with smiling [31], [32]. Thus, the result that samples produced with a forward placement of the tongue were evaluated as reflecting an attractive, emotional, enthusiastic, and friendly personality was to be expected. However, there seemed to be some differences between the language groups. The Arabic-speaking listeners linked this type of voice with pleasant and convincing traits, while the Finnish-speaking listeners did the opposite. Related to this, it was interesting to find some tendency among the Finnish-speaking listeners to evaluate forward placement differently in the male and female samples. Forward placement seemed to be evaluated as a pleasant trait in females but an unpleasant one in males. This may reflect some gender-related stereotypes about voices, according to which a darker voice sounds more masculine. Some similar underlying stereotypes may explain the finding that both language groups linked backward placement with a trustworthy, determined, dominant, and unemotional personality. Backward placement of the tongue lowers formant frequencies and darkens the voice quality [31], [32].

A tense voice evoked evaluations of an unattractive, unemotional, determined, and dominant personality in both language groups. This is hardly surprising, as a tense voice may be related to a higher psycho-physiological activity level, and it is often used to signal anger. This may explain why the Finnish-speaking listeners seemed to link a tense voice with an unpleasant, unfriendly, and uncooperative personality. The answers of the Arabic-speaking listeners were more scattered.

Both language groups linked a breathy voice with an emotional, artistic, and timid personality. These kinds of stereotypical results have been reported earlier as well [12], [23]. They seem to fit with the fact that a breathy voice production is related to a lower level of glottal adduction and lower sound pressure level of the signal. A breathy voice may also signal tenderness or fear [33], [34], [35]. Clear qualitative and statistically significant differences were found between the language groups. While the Finnish-speaking listeners regarded breathy voices as signaling an unpleasant, unbalanced, and

untrustworthy personality, the Arabic-speaking listeners seemed to regard the voice as having the opposite connotations. The latter group also associated the breathy voice with attractiveness. The Finnish-speaking listeners instead associated breathy voices with undetermined, submissive, and unconvincing personalities, which may also explain why they linked the breathy voice with an unpleasant personality. We can only speculate on the underlying reasons for the differences between the language groups.

Both language groups linked a creaky voice with a lack of enthusiasm, introversion, laziness, and unattractiveness. These results are to be expected, as it is possible to produce a creaky voice with low subglottic air pressure, and it is related to a low sound pressure level [2], [36].

Although a nasal voice gave impressions of an unattractive personality in both listener groups, the Arabic-speaking listeners tended to be more tolerant to nasality, as they linked it to a pleasant and trustworthy personality, unlike the Finnish-speaking listeners, who related nasality with an unconvincing and unenthusiastic personality. The relation between a lack of enthusiasm and nasality is understandable, as low general muscle activity in the speech organ may result in an open velopharyngeal port, which in turn causes nasality [23], [36], [37]. Results for denasality also differed between the language groups. A denasal voice was related to a pleasant, attractive, honest, and determined personality by the Arabic-speaking listeners, while the Finnish-speaking listeners seemed to link it with unpleasant, unattractive, unenthusiastic, and unconvincing personalities.

It seems that to a large extent, there are globally similar stereotypical tendencies linking certain voice qualities with certain personality traits. These tendencies seem to be explainable by how certain voice types are produced, how loud a sound they typically result in, and how they are used to express emotions. On the other hand, clearly opposing trends were found between the language groups in the present study. In general, compared to the Finnish-speaking listeners, the Arabic-speaking listeners evaluated the voices to reflect more positive personality traits. The Finnish-speaking listeners used a larger variety of negative personality traits in their evaluations. There may be many reasons for the clearly opposing trends, but at this point, we can only speculate.

Differences in the structure of a language (e.g., whether it uses certain voice qualities as distinctive features between speech sounds and what the prevalence of certain speech sounds is in the language) may affect the connection between voice quality and aspects of personality. The reason why a certain voice quality would be linked, e.g., with an unconvincing and untrustworthy personality by Finnish-

speaking listeners and not by speakers of another language may potentially be due to the fact that native speakers are obviously better able to judge the degree to which a certain voice quality is more ordinary in the culture and thus may be regarded as normal without any particular connotations with personality. Cultures may differ in the voice qualities or personality traits that are considered socially desirable. This in turn would also result in the more accurate recognition of preferred voice qualities or personality traits. According to Brownell [20], the effectiveness of voice perceptions depends on aspects of hearing, understanding, remembering, interpreting, evaluating, and responding. In the present study, the cultural influence was observed in the manner the two language groups responded to the samples. The answers given by the Finnish-speaking listeners were more concentrated, and the Finnish-speaking listeners therefore had greater cohesion in their answers compared to the Arabic-speaking listeners, whose answers tended to be more spread, perhaps reflecting uncertainty in choosing the answers. Scherer (1972) and Scherer et al. (2001) have stated that it is reasonable to assume that socially desirable personality traits are recognized more accurately from the voice quality than less desirable traits [38], [39]. The use of an open choice questionnaire in addition to a forced choice questionnaire as used in the present study could be helpful in confirming the results and potentially also in exploring the reasons underlying the choices. On the other hand, one reason for a larger scatter in the answers may be due to the different evaluation of male and female voices. It has been found in earlier studies that voice qualities may be evaluated differently depending on whether the speaker is male or female [40] and also depending on the sex of the listener. To confirm the findings of the present study and to explore the potential reasons related to different evaluations, a further study with a larger number of listeners is warranted. In addition, a study based on Arabic samples would further shed light on cultural similarities and differences.

Conclusions

The results of the perception of personality traits from voice quality by the Arabic-speaking and the Finnish-speaking listeners suggest that the relations between voice quality and personality traits may be global to a large extent. However, there also tend to be opposing trends between the language groups in personality evaluation from voice, which may be related to language structure and the speech sounds desired/undesired in the culture. A follow-up study with voice samples produced by Arabic language speakers in turn is needed in order to confirm the results of the present study.

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