



## **The Effects of Culture and Gender on the Recognition of Emotional Speech: Evidence from Persian Speakers Living in a Collectivist Society**

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### **Abstract**

This paper reports on a behavioral study that explores the role of culture and gender in the recognition of emotional speech in an under investigated cultural context (a collectivist society: i.e., Iran). Participants were asked to recognize the emotional prosody of a set of validated emotional vocal portrayals (including the five basic emotions). Findings of the experiment were then compared with the results of a similar study performed on members of an individualist culture. Taken together, our results established that both, gender as a biologically rooted social mechanism and cultural factors modulate the recognition of emotional speech. More specifically, our findings supported the view that with regard to vocal emotions, females are more sensitive compared to males. Additionally, it was revealed that members of a collectivist culture show higher sensitivity to vocal emotional cues compared to their individualist counterparts. These findings imply that cultures that center on group harmony (i.e., collectivist cultures), may thus promote higher default levels of emotional sensitivity.

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## 1. Introduction

Communication of emotions is a fundamental aspect of social life (Ekman, 1992). Taking into account that accurate processing of emotions is crucial in comprehending the social world (Van Rheeën & Rossell, 2013), there is an increasing interest in studying this domain. Humans must encode and decode vocal emotional expressions of others efficiently or risk a breakdown in social communication (Surcinelli, Codispoti, Montebanocci, Rossi, & Baldaro, 2006). Therefore, it is of considerable social relevance to determine which factors affect the encoding and decoding of emotions in interpersonal communication. As a contribution to this literature, the current study investigated the recognition of the five intended emotions (i.e., anger, disgust, fear, happiness, and sadness) from vocal expression as a function of gender and culture. These specific set of emotions were selected because they are known to be recognizable across cultures (Sauter, Eisner, Ekman, & Scott, 2010) while having specific prosodic profiles (Banse & Scherer, 1996).

Vocal expression is a modality that is considered as an effective means of emotional communication (Scherer, 1986). In this modality, emotions are transferred via two channels: (a) lexical content (the emotional meaning of the words and sentences), and (b) emotional prosody (the emotional melody of speech) (Lima & Castro, 2011; Szymanowski, Kotz, Schröder, Rotte, & Dengler, 2007). By carrying a rich source of information about a speaker's emotions and social intentions (Banse & Scherer, 1996; Scherer, 1986; Wilson & Wharton, 2006), emotional prosody plays a crucial role in various aspects of human social communication (Plutchik, 2003).

Gender is one of the individual difference factors which affect cognitive performance (Herlitz & Lovén, 2009). Gender differences in specific cognitive functions are well documented (see Donges, Kersting & Suslow, 2012). One such example is male dominance in mental rotation and female advantage in object location and verbal fluency (Kimura, 1999). However, studies investigating gender differences in other social cognitive functions such as emotion recognition are still few in

number (Bonebright, Thompson, & Leger, 1996; Paulmann, Pell, & Kotz, 2008). So far, only Paulmann, Pell, and Kotz (2008) have exclusively tackled this question in a behavioral study. They reported an overall accuracy rate of 70% (almost close to five times higher than chance level). But they found no significant gender differences in the recognition of emotional speech.

Further, to possible gender effects in the recognition of vocal emotions, it has been noted that due to the motivational and the adaptive communicative functions of emotions, socio-cultural variables mediate, and moderate gender differences in emotional functioning (Brody & Hall, 2008). Considering that expectations, conventions, and the rules to which each speaker is supposed to adhere are idiosyncratic to each particular society with its specific cultural context, Tanaka (2015) notes that the relation between language and gender has to be analyzed within the given society where the language is communicated. Additionally, Pell, Monetta, Paulmann, and Kotz (2009) argue that as a result of the interplay of language and emotion in vocal communication, socio-cultural influences on emotion recognition are specifically conspicuous in the emotional speech. Therefore, acknowledging the above, further experimental studies on members of different cultural background are required to investigate the role of gender and culture on emotional processes.

## 2. Theoretical Framework

It is generally acknowledged that the ability to recognize and express emotions is an initial human potential (Matsumoto, 1989); cross-cultural endeavors concerning recognition of facial and vocal expression of emotions have strengthened theories of universality of human emotional capability specifically concerning the so-called 'basic emotions' such as anger, fear, happiness and sadness (e.g., Ekman, 1973; Ekman, Friesen, & Ellsworth, 1972; Pell, et al., 2009; Pell & Skrup, 2008; Scherer & Wallbott, 1994; Thompson & Balkwill, 2006). Nevertheless, from the view point of cross-cultural psychology and anthropology, the biological perspective is not adequate for a comprehensive understanding of the perception and expression of emotions (Eid & Diener, 2001). As emotions and emotional processes

are largely influenced by culture (Markus & Kitayama, 1991; Matsumoto, 2001), for a full understanding of emotional processes we should consider the cultural context where emotions are perceived, expressed, and experienced (e.g., Kitayama & Markus, 1995; Mesquita & Ellsworth, 2001; Scherer & Wallbott, 1994). In cross-cultural research, culture is typically depicted by country (Matsumoto, Takeuchi, Andayani, Kouznetsova, & Krupp, 1998).

## 2.1. Culture

It is difficult to define the term *culture* as it has been used in different ways within and across disciplines. Roughly speaking, culture designates shared commonalities within groups of people (Matsumoto, 2007; Triandis, 1994). In the context of this study, the term 'culture' refers to shared elements (e.g., rituals and habits, belief and value system, social institutions, and behavior patterns) within any interactive collectivity of people (Scherer & Brosch, 2009) as well as the basis of the individual preferences in daily life (Matsumoto, Grissom, & Dinnel, 2001).

As Consedine, Magai, and Bonanno (2002) note, "through socialization, culture determines the kinds and frequencies of events to which children are exposed; the kinds of reactions that receive scaffolding and support or, conversely, punishment and containment; and the kinds of social expectations for comportment" (p. 217). Likewise, Mesquita (2000) believes that emotion and culture are intermingled with each other. On the one hand emotions are shaped in a way comparable to ideas of the cultures in which they develop. On the other hand emotions reinforce the cultural themes of a given society. As such, in any given cultural context, behaviors and emotional experiences that fit with and enhance the goals of that specific culture are reinforced (Fischer & Manstead, 2000). In support of this perspective, various studies have reported cultural differences in how emotional expressions are decoded (e.g., Fischer & Manstead, 2000; Matsumoto, 1989, 1992; Matsumoto, Kasri, & Kooken, 1999; Mesquita & Markus, 2004), in when and how emotions are expressed (e.g., Ekman, 1972; Matsumoto, 1993; Stephan, Stephan & de Vargas, 1996; Tsai & Chentsova-Dutton, 2003), in the events that elicit emotions

(see Mesquita & Frijda, 1992), in the frequency and intensity of emotional experiences (e.g., Scherer, Matsumoto, Wallbott, & Kudoh, 1988; Soto, Levenson, & Ebling, 2005), and in the way by which emotion-eliciting events are assessed (e.g., Matsumoto, Kudoh, Scherer, & Wallbot, 1988; Roseman, Dhawan, Rettek, Nadidu, & Thapa, 1995; Scherer, 1997).

### 2.1.1. Display Rules

Ekman and Friesen (1969) argue that cultural variation in the perceived importance of social interactions is manifested in norms for decoding and displaying emotions. Cultural differences via these norms regarded as display rules are well established in psychology (Koopmann-Holm & Matsumoto, 2011; Matsumoto et al., 1998; Thompson & Balkwill, 2006). The concept of emotional 'display rules' was introduced for the first time by Ekman and Friesen (1969) as a hypothetical notion in a study on culture and emotion to explain the observed differences between Japanese and Americans. Emotional display rules are cultural norms observed as an important part of any culture; they refer to culturally prescribed rules learnt early in life via socialization (Koopmann-Holm & Matsumoto, 2011). These rules affect the emotional expression of people from any culture depending on what that particular culture has featured as an appropriate or inappropriate expression of emotion (Matsumoto, Kasri, & Kooken, 1999). These culturally shared norms and unwritten codes dictate when, how and to whom individuals should express their emotional experiences (Matsumoto, 1990). Matsumoto (1990) and Koopmann-Holm and Matsumoto (2011) further note that display rules not only encompass the dimension of expression appropriateness but also appropriateness of recognition and evaluation of a behavior.

Violation of any of these rules by displaying (Ekman, 1972) or recognizing (Matsumoto, 1992) an emotion which does not fit the cultural context, can threaten the degree of harmony and disrupt social interactions. So far within- and cross-cultural studies on emotions have produced a wealth of information regarding cultural differences and similarities with regard to display rules in the communication of emotions (see Koopmann-Holm & Matsumoto, 2011; Matsumoto, 1990). For instance, Hall

(1978) argues that to express emotions in vocal communication, members of Asian cultures express less explicit verbal information and rely more on contextual cues to interpret the communication. Likewise, Markus and Kitayama (1991) note that collectivistic cultures (i.e., Asian cultures) are more context-dependent than individualistic cultures. Furthermore, due to the very restrictive emotional display rules within Asian cultures, the contextual cues provided by the interaction partners in these cultures are very subtle (Matsumoto, 1990; Matsumoto, Kasri, & Kooken, 1999). To avoid breakdown in interpersonal communication and maintain interpersonal harmony in such cultural contexts, great sensitivity is needed for in the perception and interpretation of the implicitly conveyed emotional cues (Matsumoto et al., 1999; Safdar et al., 2009). Schirmer and Kotz (2006) argue that this high sensitivity in the perception of implicit emotional vocal cues may be absent in members of Western cultures. If true, this would suggest that besides the culturally independent mechanisms such as gender of the participants (i.e., a biologically rooted social construct), culture also modulates the recognition of emotional speech.

### 2.1.2. Cultural Dimensions Theory

To study emotions within cultural context, Matsumoto (1989) argues that it is essential to make use of stable and meaningful dimensions of cultural variability proposed by Hofstede (1980). Cultural dimensions theory developed by Hofstede (1980) is a framework for cross-cultural communication. Using a structure emanated from factor analysis, the theory explains the influence of a society's culture on the values of its members, and that how these values relate to their behavior. In this context, dimension refers to an aspect of a culture that can be measured relative to other cultures. Cultural dimensions theory is widely used in various fields (e.g., cross-cultural psychology) as a paradigm for research (Matsumoto, 1990). For more explanation on cultural dimensions theory, see Hofstede (1983) and Hofstede, Hofstede, and Minkov (2010).

Dimensions of cultural variability include: (a) Individualism-Collectivism, (b) Power Distance, (c) Uncertainty Avoidance, (d) Masculinity-Femininity, (e) Long Term Orientation-Short

Term Normative Orientation, and (f) Indulgence-Restraint (Hofstede, 2001). Matsumoto (1990) and Matsumoto et al. (1998) note that from among the dimensions of cultural variability, individualism-collectivism which is conceived as two poles of one dimension, is a meaningful predictor of cultural variations in emotional norms (i.e., display rules). Similarly, in an experimental study Mesquita (2000) examines the concept of emotion in two different cultures (Dutch participants as members of individualist society, and Turkish participants as members of a collectivist culture) and claims that individualism-collectivism is not the causal origin of emotions but rather the feature of the signs of which emotions are a part. Likewise, studying cultural differences, several researchers have recognized individualism-collectivism as a stable dimension of cultural variability (e.g., Hofstede, 1980, 1983, 2001; Triandis, 1972, 1994).

#### *a) Individualism*

Individualism is characterized by independent relationships where the priority is on the self (Triandis, 1994). In such cultures, the concept of self is concerned with independence, where the independent individual is believed to contain unique internal features and is expected to behave in accordance with these features (Kitayama & Markus, 1995). Individualists tend to emphasize and enhance their personal goals, interests, and values over the society they belong to (Markus & Kitayama, 1991; Oyserman, Coon, & Kimmelmeier, 2002; Triandis, 1995). Self-enhancement, the need for individual autonomy, detachment from others (Andersen, Reznik, & Chen 1997; Scherer & Brosch, 2009) and functioning based on personal choices (Walsh & Banaji, 1997) are main features of individualistic cultures. Considering these features, individualist cultures regard emotions as essential personal experiences whose expression is any individual's right. In these cultural contexts, individuals tend to consider emotions as inner states vented spontaneously (Matsumoto et al., 1998). Individualist cultures reinforce outward displays of emotion that exaggerate the strength of the feeling (Matsumoto et al., 1998). Similarly, Mesquita (2000) claims that in individualistic cultures, emotions are assumed to amplify and underline a subjective self. It is

to be noted that, although collectivism and individualism characterize cultural groups, not everybody in a given cultural context engages in the same ideas and practices, nor do they try them in identical manners (Markus, Mullally, & Kitayama, 1997). However, across individuals within a collectivist or individualist context, emotions are patterned in discernible ways (Mesquita, 2000).

#### b) Collectivism

In contrast to individualism, collectivism is featured by interdependent relationships which focus on social cohesion and a group's harmony (Triandis, 1994). In a collectivist culture the concept of self is bound to surrounding social context in which the self cannot be split from others and the goal is to keep oneself tied to others (Kitayama & Markus, 1995). Collectivists identify themselves as members of a group they belong to, therefore they emphasize and enhance group goals, interests and values over those of each individual member of the group (Markus & Kitayama, 1991; Oyserman, et al., 2002; Triandis, 1995). Self-transcendence, the need for harmony among the in-group (Markus & Kitayama, 1991; Oyserman et al., 2002; Scherer & Brosch, 2009), attachment to others (Andersen, et al., 1997) and functioning based on group priorities (Walsh & Banaji, 1997) are main features of collectivist cultures. In these cultures emotions are regarded as interactive experiences which mirror the social context rather than the individual's inner self. As Mesquita (2000) argues, in such cultural contexts expression of emotion is controlled, due to the point that it is grounded in evaluation of the relationship between the self and the others. In other words, in collectivist cultures emotions are expected to emphasize and reproduce the self in relation to others and the world (Mesquita, 2000). This issue implies that emotions are conceived as situation-specific clues about the relationship between the individuals. By and large, collectivist cultures reinforce the perpetuation of cohesion within the group and accordingly, control of emotions gains high priority (Potter, 1988).

As culture has been described and explained briefly, what follows pertains to the purpose of the study. So far, the only existing study on gender and emotional speech recognition was

carried out on German speakers living in Leipzig, Germany (Paulmann et al., 2008). According to the Hofstede Model of Cultural Dimensions (Hofstede, 2001), Germany with a relatively high score of 67 ranks 15 among the 53 countries, and is considered as an individualistic society (see Hofstede, 2001).

According to Safdar et al. (2009) and Greenfield, Keller, Fuligni, and Maynard (2003) the Hofstede ranking on individualism-collectivism (which came from Hofstede's (2001) longitudinal study of cultural dimensions from 50 countries and three regions), represents extensive distillations of various socio-psychological phenomena (encompassing social beliefs, values, norms, personality, and behavioral characteristics) that pertain to ways in which human-environment relations are assessed. Similarly, Matsumoto, Yoo, and Fontaine (2008) believe that, the Hofstede Model of Cultural Dimensions (Hofstede, 2001), is a widely accepted model with regard to analyzing a country's culture.

Considering that (1) emotional processes are largely influenced by culture (Markus & Kitayama, 1991), (2) socio-cultural variables mediate and moderate gender differences in emotional functioning (Brody & Hall, 2008), and that (3) due to the interplay of language and emotion in vocal communication, socio-cultural influences on emotion recognition are specifically conspicuous in the emotional speech (Pell et al., 2009), there is a gap in the literature of gender effects in the recognition of emotional speech within the other cultural background (i.e., members of a collectivist society). The present study, therefore, seeks to address this paucity of research by making the first attempt to investigate the potential role of gender on the recognition of emotional prosody in a different and under investigated cultural context (i.e., Persian speakers living in Tehran, Iran).

### 2.3. A Short Overview of Persian and Iranian Culture

Persian (also known as Farsi) is an Indo-Iranian language, a sub-branch of Indo-European family (Anvari & Givi, 1996) spoken by almost 110 million people around the world, while holding official status in Iran, Tajikistan, and Afghanistan (Sims-Williams & Bailey, 2002).

Modern Iran, as a developing Asian country with rich culture and old history, is an exceptional sociolinguistic laboratory for researchers (Modarressi-Tehrani, 2001). As Beeman (1986) argues, personal relations among Iranians are comparable to an art which requires sophisticated skills. Additionally, Ahmadi and Ahmadi (1998) contrast the Iranian *way of thinking* with the Western ways of thinking and argue that in a broad sense Iranian way of thinking is very different from that of Westerners. The phrase 'way of thinking' refers to any individual's thinking in which the characteristic feature of the thinking habits of the culture to which he belongs are revealed (Rosenthal, 1977). Ahmadi and Ahmadi (1998) further add that, for Iranians an individual's value is tied to its relationship with 'other selves'. They further note that in Iran there is a tight link between the good of oneself and that of others, implying that people are highly related to each other. As relatedness between people and saving one's face within a group is highly promoted in Iran (Beeman, 1986), relationships (e.g., employer/employee, teacher/student, parents/children) are regarded as moral terms similar to family link and a major concern for those living in such cultures is being perceived as qualified for relationships (Mesquita, 2000). Taken together, these features make Iranians highly attentive to others' emotions and needs (Ahmadi & Ahmadi, 1998; Beeman, 1976). In Hofstede's (2001) analysis, out of the 53 countries studied, Iran with the score of 41 ranked 24 on the *individualism-collectivism* dimension, marking it a collectivist society.

On the basis of evidence from the existing literature, we suggest that both culture-independent (i.e., biologically rooted factors) and culture-dependent factors influence the recognition of emotion speech. Therefore, we hypothesized that (1) gender affects the recognition of emotional speech, and in particular there will be a female advantage in the recognition of emotional prosody and, (2) compared to the members of an individualist society, members of a collectivist culture show higher sensitivity to vocal emotional cues.

### 3. Methodology

In a vocal emotion recognition task, we asked male and female participants to recognize the

emotional prosody of a set of vocal portrayals (sentences with emotional lexical content articulated in a congruent emotional voice). This study was conducted in Tehran in November and December 2012. The dialect examined in this study is Modern Conversational Persian as spoken in Tehran, Iran.

#### 3.1. Participants

Seventy native speakers of Persian (35 females and 35 males) participated in the experiment. The data for four participants were excluded from the analysis due to their excessively high error rates (i.e., above 36%). Thus the data from 66 participants (33 females) were analyzed. The distribution of age was controlled with regard to the gender of the participants. The mean age of the participants was 25.4 years, SD =4.2, ranging from 18 to 30 years. The mean age of the participants separated by gender was: female: 25.2, SD 4.3; male 25.6, SD 4.1. Participants were roughly equivalent in years of formal education ( $14.9 \pm 1.4$ ). All participants displayed good hearing and normal or corrected-to-normal vision as verified by the examiner. They did not suffer from any psychopathological conditions, had no history of neurological problems, and took no psychoactive medication, as assessed by a detailed questionnaire. At the beginning of the experiment, participants were informed of the conditions of the experiment and gave written informed consent. The study was conducted according to the ethical guidelines of the Declaration of Helsinki and participants gave their written informed consent. Participants received the Iranian Rial equivalent of eight Euros per hour as financial compensation.

#### 3.2. Stimulus Material

In studying emotional speech, researchers have often prepared their own experiment-specific vocal stimuli. Since well-prepared and validated stimuli are prerequisite to study emotional speech (Castro & Lima, 2010), the stimuli used in this experiment were chosen from the Persian Emotional Speech Database (Persian ESD), an inventory of validated vocal stimuli. Persian ESD is the first validated emotional speech database for Persian comprising about 470 vocal utterances.

To establish Persian ESD, first in a series of experiments a set of sentences (lexical content) was generated and then validated. The intensity of the emotion conveyed via lexical content of each sentence may affect the participants' recognition of the intended emotions (Keshtiari, Kuhlman, Eslami, & Klann-Delius, 2015). Therefore, the emotional intensity of each of the sentences was then identified in a separate pilot study. Two native Persian speakers (a male and a female speaker semi-professional in acting) then articulated these sentences in a series of basic emotions through their tone of voice 'prosody'. The emotional categories included, anger, disgust, fear, happiness, sadness, and neutral. These vocal utterances were recorded on digital tapes under identical conditions, using a high-quality fixed microphone (Sennheiser MKH 20 P48). The recordings were digitalized at a 16-bit/ 44.1 kHz sampling rate. The sound files were recorded on digital tapes (TASCAM DA-20 MK II), digitally transferred to a computer and edited to mark the onset and offset of each sentence. Following Pell and Skorup (2008), amplitudes were normalized to a peak intensity of 70dB (with *Adobe Audition* version 1.5) to control for unavoidable differences in the sound level of the source recordings across actors. These processes were performed in a professional recording studio in Berlin, Germany. In a pilot study all the vocal utterances were perceptually validated by 34 (17 males and 17 females) decoders. Decoders were asked to identify the emotional category of the vocal utterances in a seven-choice emotion recognition task (choices: anger, disgust, fear, happiness, sadness, neutral, and none of the above). Those utterances recognized above five times chance performance (71.42%) were selected as valid vocal portrayals. Additionally, acoustic analysis of the valid utterances showed obvious differences in pitch, intensity and tempo which may help listeners to correctly classify the intended emotion. These background data resulted in a controlled selection of utterances effectively conveying the intended emotions (see Keshtiari et al., 2015).

The stimulus material selected for this experiment consisted of 72 vocal utterances (i.e., 12 sentences in each of the five intended emotional categories plus 12 sentences in the neutral category). These vocal utterances were

generated based on a syntactically similar lexical content (i.e., subject + object + prepositional phrase + verb) intoned by a male and a female native speaker of Persian. These vocal utterances were previously matched based on the emotional intensity of their lexical content via *Match*, a program which assists in matching the conditions of factual experiments (Van Casteren & Davis, 2007). Before using *Match* in a separate study, the emotional intensity of each of the sentences (lexical content) were calculated and presented in the form of numerical values (see Keshtiari et al., 2015). For a sample sentence in each of the emotional categories, see Appendix A.

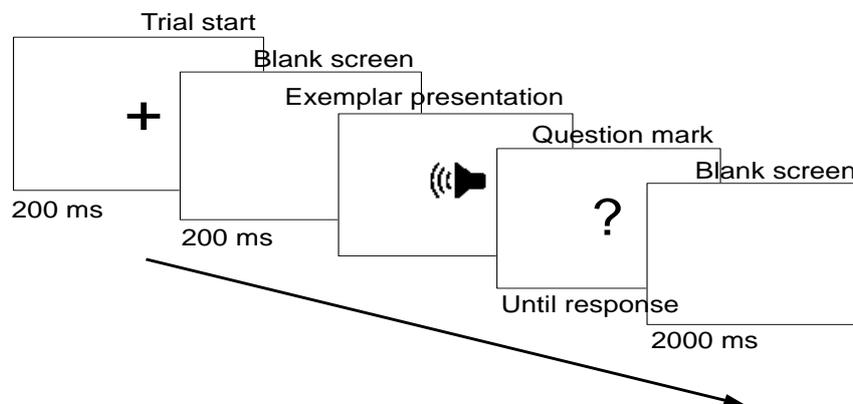
Therefore, the numerical values obtained in the previously mentioned pilot study were analyzed and for each emotional category 12 items were selected which were matched for the intensity of lexical emotional meaning (see Appendix A for the sample of the sentences).

### 3.3. Procedure

Participants were tested individually in a quiet and dim lit room. Each participant was seated in a chair in front of a laptop computer with a six-button answer pad before him/her. They were instructed to listen to the utterances, to focus on the voice of the speaker and to identify the emotional prosody of each vocal utterance based on a six-choice response format corresponding to anger, disgust, fear, happiness, sadness, and neutral. A single practice run including six items (one example for each of the five intended emotions plus one for the neutral mode) was given prior to the start of the experiment. The stimulus set was presented in two blocks in a semi-randomized design to limit fatigue and probable inattention. Both blocks contained an equal number of trials, posed by an equal ratio of female and male speakers. The experiment was run as follows: vocal stimuli were presented from a laptop computer, controlled by E-Prime experimental presentation software (Schneider, Eschman, & Zuccolotto, 2002). The stimuli were played through high quality stereo headphones (Sennheiser HD600) with manual volume adjustment. Each trial sequence consisted of: (1) a centrally-displayed fixation cross for 200 ms, (2) a blank screen for 200 ms, (3) an image of a loudspeaker with audio presentation of an item for the duration of the

item, (4) a question mark indicating that emotion judgment decision should be made presented until response, and (5) a blank screen

for 2000 ms. Figure 1 represents the schematic illustration of the procedure.



**Figure 1**  
*Schematic Illustration of a Trial Presentation*

## 4. Results

### 4.1. Descriptive Statistics

Overall, emotional speech recognition rate was well above chance level (having six response option, chance level was 16.6 %). Table 1 and

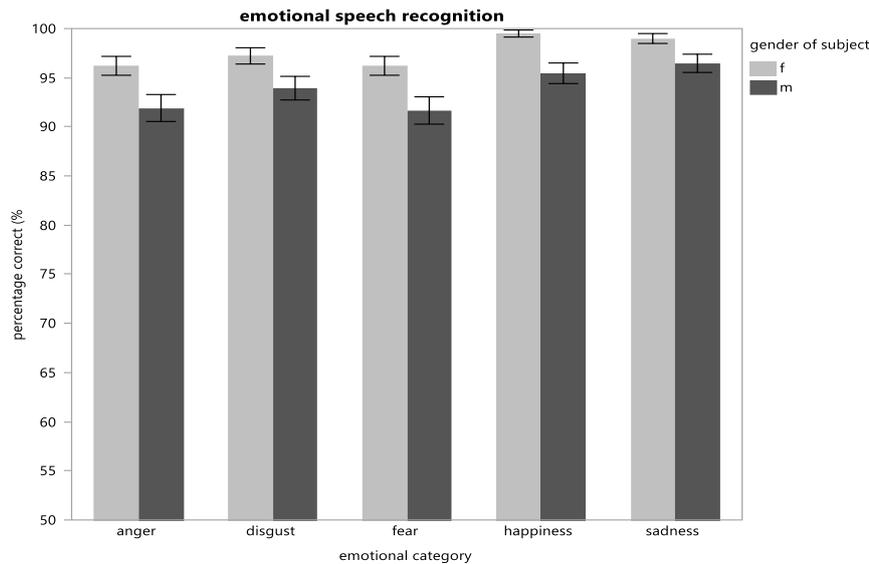
Figure 2 present the mean recognition rates for male and female participants separately. As can be seen in Table 1, mean accuracy rates for sadness (97.8 %) and happiness (97.5 %) were highest, followed by disgust (95.6 %). Expressions of anger (94.1 %) and fear (94%) were recognized with lower accuracy overall.

**Table 1**

*Accuracy Rates of Emotional Speech Recognition According to Gender of Participants*

Emotion	Female	Male	Average
Anger	96.2	91.9	94.1
Disgust	97.2	94	95.6
Fear	96.2	91.7	94
Happiness	99.5	95.5	97.5
Sadness	99	96.5	97.8

Values are the mean correct answers (in %)



**Figure 2**  
Accuracy (in %) of Emotional Speech Recognition According to the Gender of the Participants. Error Bars Represent the Standard Errors

**4.2. Nominal Logistic Regression**

We conducted a logistic nominal regression using the software Jump 11 pro. The regression converged in gradient after 8 interactions with an R square (U) = 0.0480 the effect likelihood ratio test showed highly significant main effect for gender chi-square (1) = 38.56, p < .001; and for emotion chi-square (4) = 30.23, p < .001. However, there was no interaction between

gender and emotion categories chi-square (4) = 4.86, p (n.s).

**4.3. Descriptive Statistics of Errors**

Error patterns are reported in Table 2 for male and female participants separately. The very low rate of errors (< 0.5) implies the use of the validated high quality stimuli.

**Table 2**  
Error Analysis: The Matrix Shows the Confusion Pattern for Errors Made in the Emotional Recognition Task Split by Participants' Gender

Group	Emotion	Intended emotion					
		Anger	Disgust	Fear	Happiness	Sadness	Neutral
Female participants	Anger	0	1.8	0.3	0.3	1.5	
	Disgust	1	0.5	0.8	0.3	0.3	
	Fear	0.8	0	0	3	0	
	Happiness	0	0	0	0.5	0	
	Sadness	0	0	1	0	0	
Male participants	Anger	0.3	2.8	1.5	0.3	3.3	
	Disgust	0.5	1	2	1	1.5	
	Fear	2.8	0.5	0.5	4.9	0	
	Happiness	0	0	0	3.8	0.3	
	Sadness	0	0	4.5	0	0	

Values are the mean incorrect answers (in%)

## 5. Discussion

The present research project investigated the role of gender in the recognition of emotional speech in an under investigated cultural context (Persian speakers living in a collectivist society: i.e., Iran). Taken together, our findings revealed that recognition accuracy rates differ significantly as a function of gender while listening to emotional speech where both the lexical content and the prosody portray a same emotional meaning. Namely, there was an overall recognition advantage for female participants over male participants in our task. Averaging across emotions, an overall accuracy rate of 95 % was perceived. Finally, to compare the recognition rates within two different cultures and to have an over view of the cultural effects, we conducted a content-based comparison with the study of Paulmann et al. (2008). We will elaborate on these findings in the following paragraphs.

*a) Emotional Speech Recognition:* In a previous study (Keshtiyari et al., 2015), acoustic analysis of the emotional vocal portrayals (used as the stimuli of the current study) showed that there were obvious differences in pitch, intensity, and tempo which might have helped participants to correctly classify the intended emotion. In the present study, participants categorized all five intended emotions (anger, disgust, fear, happiness, and sadness) at a very high rate. Averaging across emotions, our results revealed an overall accuracy rate of 95% (which is very close to six times chance performance). As the accuracy recognition rates were very high, error rate were very low. Besides the use of validated stimuli and comprehensive task, this could be due to the high sensitivity of the participants.

*b) Influence of Gender on Emotional Speech Recognition:* Supporting hypothesis 1, our investigations revealed a highly significant effect of gender in favor of females in the recognition of emotional speech. The direction of this effect is in line with general findings on emotion recognition (e.g., Briton & Hall, 1995; Hall et al., 2000; Schirmer & Kotz, 2003) and with particular findings on recognition of emotional prosody (e.g., Bonebright et al., 1996; Schirmer et al., 2002, 2006; Schirmer & Kotz 2003). Our findings are thus consistent with Hall et al. (2000) assumption that females are reliably more accurate in a range of

conceptually comparable tasks of decoding nonverbal emotional cues. This implies that biologically rooted social mechanisms (i.e., gender) may underlie the observed results. In addition, our results further revealed that recognition accuracy rates did not differ significantly as a function of emotional category i.e., females performed better than males in recognizing all of the five intended emotions.

*C) Influence of Culture on Emotional Speech Recognition:* Our investigations further revealed a very high overall accuracy rate of 95% (almost close to six times chance performance). In general, these results are in line with Safdar et al.'s (2009) and Matsumoto et al.'s (1999) findings with regard to the great sensitivity of the members of collectivist cultures as for the perception and interpretation of the emotional cues. To maintain interpersonal harmony and to avoid breakdown in communication this great sensitivity is a vital part of vocal communication in collectivist cultures (Safdar et al., 2009). In particular, these results support Ahmadi and Ahmadi (1998) and Beeman (1976) arguments regarding Iranians' high sensitivity to others' emotions. Considering that Paulmann et al. (2008) have reported an overall accuracy rate of 70% (almost close to five times chance performance) in a similar emotion recognition task, our results indicate a higher sensitivity to emotional vocal emotional cues in the members of a collectivist culture. These findings are, therefore, consistent with Schirmer et al. (2006) argument regarding the lower sensitivity in the perception of emotional vocal cues in members of individualist cultures. Accordingly, our second hypothesis concerning the higher sensitivity to vocal emotional cues by the members of a collectivist culture is supported.

*Limitations of the Study:* In the present study the vocal portrayals were intoned by two speakers (a male and a female). A larger number of speakers will exclude the probable effects of speaker-specific idiosyncrasies and likely artifacts (Pell, 2002). Moreover, having more speakers of both genders also make it possible to investigate the relationship between the gender of the speakers and that of the participants in the recognition of emotional speech. In addition, replication of the present study in other collectivist and individualist

societies would also allow generalization of the findings.

*Final Remarks:* In conclusion, results of the present study which is the first of its kind provides an understanding of human perception in the context of the recognition of emotional speech from the simultaneous presentation of information in prosodic and lexical channels in the context of a collectivist culture. In particular our results established that both, gender as a biologically rooted social mechanism and cultural factors modulate the recognition of emotional speech. More specifically, our results support the view that with regard to vocal emotions, females are more sensitive compared to males. This female advantage was found for all the five emotional categories examined. Additionally, it was revealed that members of a collectivist culture show higher sensitivity to vocal emotional cues compared to their individualist counterparts. This might indicate that cultures that center on group harmony (i.e., collectivist cultures) may thus promote higher default levels of emotional sensitivity. Taken together, this study enlightens our knowledge regarding how cultures exploit the biological differences to different degree and in a different way. Comprehending how emotion judgments are directed by cultural dimensions (i.e., individualism-collectivism) has important implications for cross-cultural communication in various domains, such as education, business and conflict resolution (Thompson & Balkwill, 2006).

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## Appendix A

Sample of the Persian sentences used as the stimuli, along with their glosses, and English translation. Abbreviations used are as follows: Ez: ezafe particle; CL: clitic; CL.3SG third person singular clitic; DOM: direct object marker; 3SG: third person singular

**خنثی :** خانم خونهدار روسری گلدارش رو بعداز شام اتو کرد.

Xānom-e	xunedār	rusari-ye	goldār-eš	ro	baʔdaz	šām	ʔotu	kard.
Lady-Ez	housewife	scarf-Ez	damask-CL-3SG	DOM	after	dinner	iron	did-3SG

Neutral: Ms. Housewife ironed her damask scarf after the dinner.

**عصبانیت :** آقای مهندس همه رو با بوق گوشخراش ماشینش بیدار کرد.

ʔāqā-ye	mohandes	hame	ro	bā	buq-e	gušxarāš-e	māšin-eš	bidār	kard.
Mrister--Ez	engineer	everybody	DOM	with	horn-Ez	ear-irritating-Ez	car-CL-3SG	awake	did-3SG

Anger: Mr. Engineer woke up everybody with the awful sound of his car's horn.

**چندش :** آقای آشپز چند تا کرم سفید تو آش رشته پیدا کرد .

ʔāqā-ye	ʔāšpaz	čand-tā	kerm-e	sefid	tu	ʔāš-e	rešte	peydā	kard.
Mrister-Ez	cook	some-CL	worm-Ez	white	in	soup-Ez	noodle	find	did-3SG

Disgust: Mr. Cook found some white worms in the noodle soup.

**ترس :** دختر شیرینی فروش به رنیل یه وجبی تو تختش پیدا کرد.

Doxtar-e	širinifruš	ye	roteyl-e	ye	vajab-i	tu	taxt-eš	peydā	kard.
Daughte-Ez	confectioner	one	spider-Ez	one	hand size-CL	in	bed-CL-3SG	obvious	did-3SG

Fear: The Confectioner's daughter found a hand-size spider in her bed.

شادی : پسر معدنچی هر دو چشمش رو با موفقیت معالجه کرد.

Pesar-e maʔdanči har do češm-eš ro bā movafaqiyat moʔāleje kard.

Son-Ez miner each two eye-CL-3SG DOM with success treatment did-3SG

Happiness: The Miner's son had treated both of his eyes successfully.

غم : دختر صاحبخونه بچهاش رو بهخاطر سرطان سقط کرد.

Dokhtar-e sāhebxune bačče-aš ro bexāter-e saratān seqt kard.

Daughter-Ez landlord child-CL-3SG DOM for-Ez cancer miscarriage did-3SG

Sadness: The Landlord's daughter suffered a miscarriage due to cancer.