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Validity Study of an Emotional Face-Database in Iranian Community

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Abstract

Objective: To investigate the accuracy of facial emotion recognition in the Iranian community, a face database validated in this community is required. To do this, we conducted a validation study on the Radboud face database. The primary objective of this study was to evaluate the accuracy of recognizing emotions through faces in an Iranian sample and then to choose the pictures with high agreement in terms of detecting emotions.
Method: This is a cross sectional study recruiting a total number of 142 males and females aged between 20 and 50 years old (Mean ± SD of age 31.7 ± 7.07). The participants were instructed to detect the type of emotion of each face as well as its valence and arousal. The percentage of participants' agreement on evaluating each picture was assessed. To evaluate the effect of different variables on participants' accuracy, one way and repeated measure ANOVA analyses were also used.
Results: Emotional faces were recognized by around 84% of the participants. The highest accuracy belongs to happy (Mean ± SD of 98 ± 6.1%) and the lowest one to neutral (75 ± 18.06%) faces. The accuracy for detecting other emotions were as follows: sad (91 ± 8.7%), surprised (87 ± 10.64%), angry (77 ± 15.6%), and fearful (76 ± 15.26%). Additionally, we found no differences between male and female participants in terms of recognizing emotions. Then we selected the pictures with high agreement (above 85 percent) in labeling emotions among the participants.
Conclusion: The current study provided a valid emotional face database based on Iranian participants' responses in terms of recognizing basic emotions. The selected pictures can be used in designing tasks to evaluate emotion recognition ability in clinical and nonclinical populations. It can also be used in designing applications to improve detecting emotion in clinical samples such as individuals with autism spectrum disorder.

Key words: *Facial Expression Recognition; Facial Emotion Recognition; Face Expressions; Iranian People; Validation*

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Emotion is an internal state in reaction to stimuli. It can be pleasant or unpleasant. Emotion is expressed through body, speech, and face. Based on Ekman's study (1), there are six basic emotions including happiness, sadness, anger, fearfulness, surprise, and disgust. This categorization is relatively universal and it is adjacent from too early age in all cultures (2). Emotions are commonly grasped through facial expressions. Facial emotion recognition (FER) permits us to understand others' feelings and then react appropriately to them. Adults are very sensitive at reaching an inference regarding people's facial expressions and physical states to realize their emotional states and intentions as well as to empathize. Facial emotion expression conveys our emotional information to others and affects their emotional perception. It is also one of the major social stimuli in communication and interpersonal relationship. To empathize with others, we first need to detect their emotions through their faces. Therefore, emotion recognition plays an important role in interpersonal relationships and prediction of others' social behaviors (3). The importance of facial emotion recognition has caused vast usage of face with emotional inputs in various investigations investigating emotion processing (4). To study emotion recognition in the Iranian population, we need a face database which has been validated in this population.

Numerous emotional face databases exist, such as the Ekman-Friesen Pictures of Facial Affect (5), Karolinska Directed Emotional Faces database (KDEF) (6), FACES (7), Amsterdam Dynamic Facial Expression Set (ADFES) (8), the Chicago Face Database (9), the EU-emotion stimulus set (10), Tsinghua facial expression database (11), and the Radboud Faces Database. Some limitations of previous databases include potential interfering technical variables such as positions of facial point of interest lighting conditions, head orientation, gaze direction, as well as the lack of a sensible number of female and male models of both image backgrounds; thus, to address these limitations, we utilized the Redbud face database in our research (12).

Langner *et al*. (12) found that 82 percent of adults precisely recognized the expressed emotions using the RaFD database. Moreover, they indicated that adults considerably were superior in realizing happiness (98%) and notably worse in contempt recognition (50%), compared to other emotions. In comparison, this recognition ranged from 93% (happiness) to 43% (fear) with an average accuracy of 72% for the KDEF (6); for the FACES database, it ranged from 96% (happiness) to 68% (disgust) (3); for the Tsinghua facial expression database, it ranged from 98% (happiness) to 63% (fear) with an average accuracy of 79% (Yang *et al*, 2020); and for the ADFES it ranged from 91% (happiness) and 68% (contempt) with an average accuracy of 81% (8). Additionally, each emotion of RaFD was recognized relatively clear, although contempt was perceived somewhat less clearly. Further, in terms of valence evaluation, the only clear positive emotion was happiness, while surprise and neutral were evaluated as relatively neutral, and the remaining emotions were evaluated as negative (refer to the additional online resources for details of rating). Based on participants' agreement on the clarity and valence of images and attractiveness, Langner (12) indicated that the RaDF has recognition rates as high as or higher compared to other databases and is a valuable instrument for diverse areas of studies utilizing facial inputs.

Across all ages, a main dispute exists over whether there are gender differences in facial emotion recognition (13). It has been found that women are more accurate in recognizing facial expressions than men. Rotter & Rotter (14) in their study found that females had a better performance on recognizing emotional faces. Thayer & Johnsen (15) also showed more accuracy in detecting emotional faces in females compared to males. On the other hand, some investigators reported no difference between men and women in identifying emotions through faces (16, 17).

In Iran, four databases containing images of Iranian individual faces have been already created which are as follows:

1. The Iranian Face Database (IFDB), which was the primary database of Middle Eastern faces (18), contains 616 faces of individual in various ages ranging from 2-85. It has two categories that includes two emotions: frown and smile.
2. Hamidi, Nejati, and Shahidi (19) developed an emotional face database using Iranian pictures and validated it in 120 children and adolescents.
3. The Iranian Kinect Face Database IKFDB (20) is a primary dynamic RGB-D database of Middle Eastern faces, distributed recently. The dataset consists of over 100,000 color and depth frames captured by the Kinect V.2 sensor. These frames were recorded from forty participants who were in different head positions while expressing the six fundamental facial emotions, along with 4 micro-expressions. This database has been specifically designed for computer vision applications and does not offer any validation research.
4. The Iranian Emotional Face Database (IEFDB) includes 248 images capturing forty individuals containing 6 distinct high-resolution emotions. The gathered photos were validated across an online survey completed by persons from Iran (21).

The question of whether Iranian women and men are different in recognizing facial emotions remains unresolved.

Since we need to use a valid database for Iranian samples, one way is to validate the existing database in the Iranian population. As mentioned above, among the comprehensive database of emotional faces, the Radboud Face Database has some advantages: first, it covers all fundamental emotional states (happiness,

sadness, surprise, anger, fear, disgust) and a neutral expression; second, the database relies on prototypes of the facial action coding system; and third, it contains highly standardized pictures, devoid of make-up, facial hair or glasses. Based on the mentioned characteristics, we decided to use the RaFD adult emotional face database for validation in the Iranian population in our study.

The primary objective of the current investigation was to assess the accuracy of the Iranian adult male and female population in recognizing the emotions presented by different faces and selecting the pictures with highest agreement among the participants. Moreover, we decided to assess the valence and arousal of each picture.

Materials and Methods

Participants

Based on reviewing previous studies (19), a total number of 142 adults (82 females and 60 males) with a mean age of 31.7 years (SD = 7.07) participated in this study. Participants consisted of volunteers selected among a web-based advertisement and university students. The subjects had normal or corrected-to-normal vision and had no history of psychiatric or neurological disorders according to an interview done by a clinical psychologist.

Measure

The RaFD consists of high-quality face pictures of sixty-seven individuals, including Caucasian children, women, and men, and Moroccan-Dutch men. Additionally, it includes the eight emotions (happiness, sadness, surprise, anger, fear, disgust, and contempt) and a neutral state, based on prototypes of the facial action coding system (FACS; 13). The RaFD is highly standardized (no facial hair, make-up, or glasses) and includes models with neutral clothing and modern haircuts. It is comparable to the Ekman-Friesen Pictures of Facial Affect, and it considers both camera position and eye gaze. These characteristics of the RaFD enhance its frequent utilization (with over 1000 citations since its publication), thereby positioning it as a strong candidate for additional validation research (22). Each picture was shown with three different gaze directions and was taken from five camera angles simultaneously. For more information and detail about stimulus materials see www.rafd.nl.

The Radboud emotional faces database was validated for the first time in 2010 by RadBoud University in the Netherlands and presented on the official website of the university.

Thirty-nine models which contained just the front-faced straight gaze images of Caucasian and Moroccan adult models (19 females and 20 males) were applied in this study. We exclusively utilized six expressions, namely sad, surprised, fearful, angry, happy, and neutral. All images were cropped as an oval which consisted of the main facial features with no hair, glasses, make up, and jewelry (see Figure 1). The total number of pictures used in this research was 234. All pictures were presented using the Power Point tool. A practice block consisting of six pictures of three males and three females was presented before the main task.

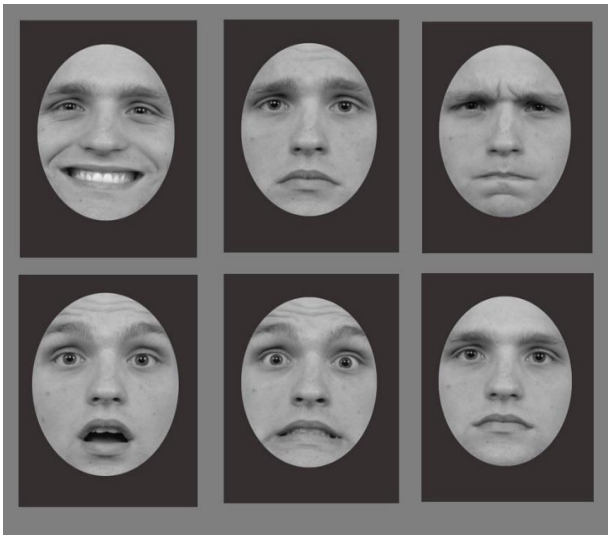

Figure 1. Example Expressions, from Top Left: Happy, Sad, Angry, Surprised, Fearful, and Neutral

Procedure

The participants sat in front of a screen with the distance of 50 centimeters in a quiet room in neurocognitive laboratory at Research Center for Cognitive and Behavioral Sciences (Roozbeh Psychiatry Hospital). Each participant was presented with pictures one by one in a random order of different emotions and asked to evaluate each picture in terms of its type of emotion, valence, and arousal. They were instructed to respond to three questions in an answer sheet: 1) “Which type of emotion is being conveyed by this image?” (fear, happiness, sadness, anger, neutral, surprise); 2) “To what extent do you recognize this picture as pleasant?” (5-point SAM scale [1: unpleasant - 5: pleasant]) 3) “To what extent are you aroused by this picture?” (5-point SAM scale [1: calm - 5: excited]).

The Self-Assessment Manikin (SAM) five points scale (23, 24) was used to measure the valence and arousal related to emotional faces. The SAM is an assessment technique that utilizes non-verbal pictures to directly evaluate a person's emotional response to a wide range of stimuli, including valence, arousal, and dominance. In the valence scale the Manikin shows smiling face at one side and unhappiness at the other side (5: pleasant, 4: pleased, 3: neutral, 2: unsatisfied, 1: unpleasant). An excited image at the far end of one side of the scale and a calm image at the opposite side display arousal (5: excited, 4: wide awake, 3: neutral, 2: dull, 1: calm). The participants were asked to make a mark on the square provided below each of the emotional face. Overall, each session took approximately two hours (Figure 2 shows

the SAM figure with valance and arousal scales, respectively). There were three main variables including the percentage of correct responses in terms of detecting the type of emotion, the numbers generated by the participants regarding the valence, and arousal.

In terms of scoring, first the correct responses to recognizing each emotion were calculated. The highest score was equivalent the total number of pictures, which was 234. Then the percentage of correct responses was calculated for total emotions as well as for each emotion. The higher percentage, the better emotion recognition. With regard to the scoring of valence and arousal, the average score of each emotion for each participant and then for all participants was calculated. The scores ranged between one and five.

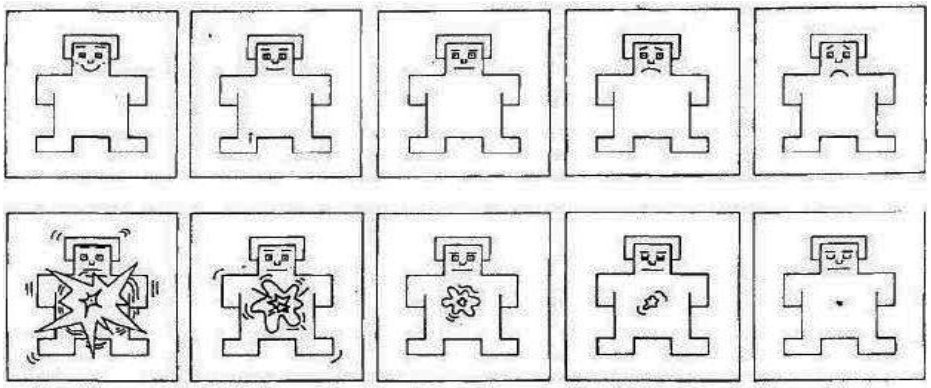

Figure 2. Self-Assessment Manikin (SAM) Scale on a Five-Point Scale to Assess the Valence and Arousa. Copy Right; Bradly,1994.(23)

Statistical Analysis

The statistical analyses were conducted utilizing IBM SPSS version 24. The normality of distribution was confirmed applying the Kolmogorov Smirnov test. Reliabilities were assessed using the Cronbach's Alpha coefficient (0.83). Means, standard deviations, and percentages were calculated based on the descriptive analysis. Demographic, and gender difference were compared between the groups applying one-way ANOVA test. A repeated measure analysis of variance was used to assess the differences between the 6 types of emotion face expressions, valance, and arousal parameters. The significance level for statistical tests is typically set at $P < 0.05$.

Ethical Consideration

The research received approval from the Ethical Committee at Tehran University of Medical Sciences. (IR.TUMS.MEDICINE.REC.1399.1063). Each participant was informed of the aim of the study and his or her role during the experiment, and then signed a written consent form before entering the study.

Results

Participants

The responses of a total number of 142 adults (82 females and 60 males) with a mean age of 31.7 years (SD = 7.07) were analyzed. All participants possessed a high school diploma as their minimum educational qualification. Additionally, the participants were employed and engaged in various work arrangements, including full-time and part-time, as well as being university students.

Emotion Recognition

Primarily, we accounted the percentage of correct recognition based on the mean number of times the facial expressions were correctly recognized by the participants per each face picture. We selected pictures with the correct responses of 85 percent of the participants to have a reasonable agreement of recognition among them. This same criterion had been applied in creating other databases, e.g., Dartmouth Database and Ebner database. The remaining analyses were performed with selected face images.

For each picture, we computed the number of individuals who chose the intended emotion. In general, there was an 84% agreement rate between the selected and targeted emotions (average: 89%, standard deviation: 12%). Table 1 presents the average recognition rates for each specific emotion. Descriptive analysis revealed that there was a notable disparity in agreement levels among different expressions. Happy received a significantly higher agreement (mean: 98%, SD: 6%), while Neutral had a significantly lower agreement (mean: 75%, SD: 18%), in contrast to all other expressions (means ranging from 76 to 91%). The other emotions showed different levels of agreement: Sad (mean; 91%, SD: 8.7 %), Surprised (mean; 87%, SD: 10.64%), Angry (mean: 77%, SD: 15.6%), and Fearful (mean: 76%, SD: 15.26%). A careful examination of the findings makes it evident that the distribution of responses varied for certain expressions. Notably, expressions depicting intended surprise were occasionally misinterpreted as fear (5%), while intended fear was sometimes misunderstood for surprise (7%) or anger (5%). Furthermore, intended happy was

occasionally confused with surprise (5%) and sometimes with neutral (4%).

Table 1. Averages (SDs) of Agreement, Valance, and Arousal, for Each Expression Separately and Comparison between the RaFD* Adult Validation and Our Database Validation.

	Emotion					
Measure	**Happiness**	**Sadness**	**Angry**	**Surprise**	**Fear**	**Neutral**
Our study						
Agreement	98 (6.1)	91 (8.7)	77 (15.6)	87 (10.64)	76 (15.26)	75 (18.06)
Valance	4.04 (0.35)	1.75 (0.63)	1.84 (0.64)	2.06 (0.36)	1.81(0.76)	2.1 (0.37)
Arousal	3.98 (0.56)	1.51 (0.66)	1.55 (0.7)	3.33 (0.56)	1.45 (0.83)	2.90 (6)
RaFD study						
Agreement	97 (6)	75 (25)	89 (14)	91 (8)	79 (13)	84 (16)
Valance	4.2 (0.3)	2.0 (0.2)	1.9 (0.2)	2.8 (0.2)	2.2 (0.2)	3.0 (0.2)
Arousal	NA	NA	NA	NA	NA	NA

*Radboud Face Database

For the statistical analysis of expression, valance, and arousal evaluations, three distinct analyses of variance (ANOVAs) were done with the factor of gender (male, female) as the between-subjects variable, and expression (happy, neutral, sad, angry, fear, surprised) was used as the within-subjects variable (Table 2).

Table 2. Performance on Face Emotion Variables in the Male and Female Groups Based on the Repeated Measure Analysis.

	Source of Variation	Some of Squares	Mean of Squares	df	F	P
Emotion Recognition	**Between subject**					
	Gender	129.84	129.84	1	2.89	0.09
	Within subject					
	Expression	973.84	194.57	5	77.54	0.001***
	total					
	Gender * Expression	109.81	21.93	5	0.87	0.05
Valance	**Between subject**					
	Gender	2.28	2.28	1	1.62	0.2
	Within subject					
	Expression	362.02	73	5	549.13	0.001***
	total					
	Gender * Expression	1.52	0.30	5	2.29	0.05
Arousal	**Between subject**					
	Gender	4.07	4.07	1	3.14	0.07
	Within subject					
	Expression	230.40	0.046	5	194.35	0.001***
	total					
	Gender * Expression	0.88	0.16	5	0.68	0.63

*P < 0.05, **P < 0.01, ***P < 0.001.

A one-way repeated measures ANOVA was conducted on the total raw hit rates score, with gender (male and female) as the between-subjects factor and emotion (surprised, sad, neutral happy, fearful, and angry) as the within-subjects factor. Significant deviations from sphericity for the emotion factor were detected by Mauchly's test, with a W value (6) = 0.35 and P-value less than 0.001. Greenhouse-Geisser corrections were applied to the expression factor ($\varepsilon = 0.76$). There was a notable overall impact of expression [$F (5, 140) = 77.59$, $P < 0.001$, $\eta_p^2 = 0.36$] along with non-significant group effect [$F (1, 140) = 2.89$, $P > 0.05$, $\eta_p^2 = 0.02$] and interaction between group and expression [$F (5, 140) = 0.87$, $P > 0.05$, $\eta_p^2 = 0.00$]

Regardless of the gender variable, post-hoc Bonfroini analysis revealed no significant difference (all $P > 1.00$) for recognizing angry, fearful, and neutral expressions. On the other hand, significant differences were found among recognition of happy ($P < 0.001$, $d = 0.81$), sad ($P = 0.001$, $d = 0.80$), and surprised ($P < 0.002$, $d = 85$) expressions. For each picture, we also calculated the average ratings for valance and arousal.

Valence analysis. The expected evaluation of all expressions revealed the anticipated valence, in which the happy expression emerged, as the sole expression with a distinct positive feeling (mean: 4.04, SD: 0.35). The neutral expression turned out to be truly neutral (mean: 2.1, SD: 0.37). The surprised expression was evaluated relatively close to neutral (mean: 2.06, SD: 0.63). The rest of emotions were clearly negative: angry (mean: 1.84, SD: 0.64), fearful (mean: 1.81, SD: 0.76), and sad (mean: 1.75, SD: 0.63).

A one-way repeated measures ANOVA was carried out with gender (female and male) as the between-subjects factor and emotion (surprised, sad, neutral happy, fearful, and angry) as the within-subjects factor. Significant deviations from sphericity for the emotion factor were detected by Mauchly's test, with a W value (6) = 0.38 and P-value less than 0.001. Greenhouse-Geisser corrections were applied to the expression factor ($\varepsilon = 0.58$). There was a notable overall impact of expression, $F (5, 140) = 549.13$, $P < 0.001$, $\eta_p^2 = 0.80$). However, no significant effect of gender, $F (1, 140) = 1.62$, $P > 0.20$, $\eta_p^2 = 0.01$, and interaction between gender and expression was found, $F (5, 140) = 2.29$, $P > 0.05$, $\eta_p^2 = 0.01$.

Post-hoc Bonferoni's analysis indicated that there were no significant differences in valence ratings among expressions of angry, fearful, and neutral (all $P > 0.05$). On the other hand, significant differences were found among recognition of happy ($P < 0.001$, $d = 0.93$), sad ($P = 0.001$, $d = 0.90$) and surprised ($P < 0.002$, $d = 92$) expressions.

Arousal analysis. Arousal analysis was also calculated for all pictures. The arousal of all expressions was evaluated as anticipated, with happy as the obviously excited expression (mean: 3.98, SD: 0.56). The neutral expression turned out to be truly neutral (mean: 2.90, SD: 0.46), the surprised was evaluated relatively close to neutral (mean: 3.33, SD: 0.56). All other emotions including fearful (mean: 1.45, SD: 0.83), sad (mean: 1.51, SD: 0.66), and angry (mean: 1.55, SD: 0.70) were clearly calm and dull. A one-way repeated measures ANOVA with gender as the between-subjects factor and expression (surprise, sad, neutral happy, fear, and angry) as the within-subjects factor was performed. Significant deviations from sphericity for the emotion factor were detected by Mauchly's test, with a W value (6) = 0.39 and P-value less than 0.001. Greenhouse-Geisser corrections were applied to the expression factor ($\varepsilon = 0.59$). There was a notable overall impact expression, $F (5, 140) = 194.35$, $P < 0.001$, $\eta_p^2 = 0.58$), along with no significant effect of gender, $F (1, 140) = 3.14$, $P > 0.07$, $\eta_p^2 = 0.02$, and interaction between expression and gender, $F (5, 140) = 0.68$, $P > 0.63$, $\eta_p^2 = 0.005$).

Post-hoc Bonfroini analysis revealed significant differences in arousal ratings across expressions: Happy ($P < 0.001$, $d = 0.79$), Surprised ($P = 0.002$, $d = 0.87$), and Angry ($P < 0.001$, $d = 78$) expressions. However, arousal evaluation for fearful, neutral, and sad were not significantly different (all $P > 0.001$)

Discussion

The primary objective of this investigation was to assess the validity of the RaFD face database in the Iranian population. We evaluated the degree of agreement among participants in recognizing basic expressed emotions including sadness, happiness, fearfulness, anger, surprise, as well as the neutral expression. The valence and arousal of each image were also measured. Moreover, the differences among females and males in emotion recognition were also assessed. The results showed no difference between men and women in emotional facial recognition.

There was an overall 84% agreement among participants in recognizing all expressions. This rate is close to what was found in an RaFD validation study which was 82% (12). In that study it was found that happiness was the most recognized expression along with surprise, anger, neutral, fear, disgust, sadness and contempt, respectively. They also found that the rates of contempt and happiness recognition were notably different from the remaining emotions. It was found in our study that happiness was the best recognized emotion followed by sadness, surprise, anger, fear and neutral, respectively. We also found that only happiness and neutral rates differed significantly. It should be noted that the contempt expression was not considered in this research.

Particularly, the agreement for neutral expressions was significantly lower compared to all other expressions. Neutral pictures were also the only expression that subjects repeatedly recognized as the other expressions such as sadness and happy. Investigations have indicated that neutral and contempt expressions are not universally

recognized expressions among different cultures (26, 27).

Matsumoto and Ekman (29) proposed that decreased agreement for some expressions may arise not from problematic issues with the expression itself but rather with the expression label. Additionally, for anger, fear, and surprise, we determined consistent patterns of deviating choices. For all these three emotions, the majority of participants often selected alternative expressions that had morphological similarities with the intended emotion. These patterns aligned with ones discovered by Goeleven *et al*. (6), Lanner *et al*. (12) and Verpaalen *et al*. (30).

We detected that the agreement rate exhibited by the Iranian participants across all emotion categories (84%) was in contrast to the findings of other studies, such as Lanner *et al*. (12), 82% in the European culture, Mishra *et al*. (31), 88% in an Indian sample, Yang and *et al*. (11), 79% in the Eastern culture, and others studies. Based on these studies, happiness was the most correctly recognized expression according to mean agreement rates as well as the valence and arousal. In terms of arousal and valence as the factors measuring emotional dimensions, there is a similarity in valence between our findings and Langer's results (2010). Moreover, the arousal rate in our study was comparable with Mishra's (31). Happiness had the greatest similarities in terms of valence and arousal across different studies. These findings support the universality of emotion recognition across different cultures.

With regard to gender differences, a number of literature reviews and meta-analyses have reported that females generally have better performance than males in accurately recognizing facial emotions (32, 33). However, we did not find any significant differences among females and males in labeling emotions and rating their valence and arousal. This finding is consistent with some studies including Hoffmann *et al*. (17), Becker *et al*. (2007), Mishra *et al*. (31) and Verpaalen *et al*. (30). Some researchers observed that minimal effect sizes are generally reported for this gender distinction. For instance, a meta-analysis conducted by Thompson and Voyer (33) demonstrated a minimal effect size of Cohen's d = 0.19 from the literature. They concluded that the underlying small effect size may contribute to non-statistically significant findings in several investigations. The difference between our findings and those of other studies may be due to the sample size.

Limitation

First, it should be mentioned that the participants had to respond to many images which took more than one hour and this could affect their responses. To minimize the fatigue, we took breaks during the study. Moreover, the study focused on the recognition of basic expressed emotions and did not explore more complex emotional states or cultural factors that may influence emotion recognition. Future research should consider investigating a wider range of emotional expressions especially complicated emotions such as disgust and prude and incorporate cultural factors specific to the Iranian context. Another limitation is that the study primarily relied on self-report measures of valence and arousal, which may introduce subjective biases. The inclusion of physiological measures or behavioral indicators could provide a more comprehensive assessment of emotional responses. Lastly, it is worth noting that this study did not consider other demographic variables, such as age or socioeconomic status, which may play a role in emotion recognition. Future studies could explore the influence of these factors to obtain a more comprehensive understanding of emotional facial recognition in the Iranian population. Overall, while this study provides valuable insights into emotion recognition and the validity of the RaFD face database in the Iranian population, these limitations should be considered when interpreting the findings and extrapolating them to real-world contexts.

Conclusion

In conclusion, based on the results of the current investigation, adult Iranian people can recognize emotional faces and rate their valence and arousal on the Radboud database very well and these pictures can be used in related studies among the Iranian population. Our findings did not show any difference between males and females in recognizing emotions. The present investigation has numerous advantages, including an adequately powered sample size and the evaluation rating of more than one parameter per image. The pictures selected by this study can be used in designing and developing tasks, tests, and games which need to use emotional faces in the Iranian population. These tasks can be used in all studies on normal and clinical populations such as individuals with autism spectrum disorder who have some impairment in detecting emotional faces. Moreover, to improve recognizing emotion in clinical populations, we need to have some applications using emotional faces as a cognitive rehabilitation tool.

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Conflict of Interest

None.

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