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Exploring Affective Properties of Emoji's: Identifying the Persian Emoji Lexicon

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ABSTRACT

The present study aimed to validate the Persian Emoji Lexicon (PEL) and examine gender and cultural differences in the perception of the affective properties of selected emoji's. The study consisted of two phases: emoji selection and an online survey. First, we identified the 109 most frequently used emoji's on Twitter. In the second phase, we assessed emotion and valence ratings from a sample of 200 X users (140 females; 27.3 ± 3.5 years). Of the 109 selected emoji's, 90 were perceived as having a positive valence. Gender comparisons revealed that women rated significantly higher emotional intensity across all eight emotion dimensions compared to men. We also compared our findings with a similar database validated among Canadians. The inter-rater reliability for emoji valence ratings between Iranian and Canadian participants showed a fair level of agreement (Kappa coefficient = 0.357), while also highlighting significant cultural differences in emotion perception. This database serves as a valuable resource for sentiment analysis of social media texts containing emoji's, as well as for practical applications where emoji's function as emotional cues to influence behavior (e.g., in marketing and education).

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Introduction

Communication has been reshaped by the advent of new digitalized social media (e.g., social apps, messaging apps, online forums) in the last few decades (Rodrigues et al., 2018). Face-to-face communication has been supplanted by online chat and texting, which are generated using verbal symbols and graphical interfaces. Verbal symbols (e.g., words, phrases, sentences) are the primary element of textual communications, lacking the traditional features of non-verbal cues and emotional expression that are often emphasized in face-to-face conversations. With the increasing prevalence of online social communication platforms, the way people communicate with each other has evolved (Lin & Luo, 2023). New tools have been developed to enrich reciprocal communication and facilitate the perception of emotional meaning conveyed through text. One such novel means is the graphical interfaces, encompassing emoticons and emojis. Emoticons, the first developed graphical interfaces, are generated with letters, numbers, and punctuation (e.g., ;-D) indicating a prototypical version of facial expressions. In contrast, emojis (e.g., 😀) are more evolved interfaces that serve as visual representations of a more comprehensive set of concepts, including facial expressions, activities, inanimate objects, living beings, and symbols (Bai et al., 2019). Although emoticons are still used in text-based communication, emojis are more preferred and popular among users (Fernández-Gavilanes et al., 2018; Rodrigues et al., 2018). One possible reason could be their similarity to facial expressions and their ability to convey emotions even faster and more accurately than faces (Dalle Nogare et al., 2023).

Given the popularity of emojis and the socioemotional functions they serve in conveying emotion (Godard & Holtzman, 2022; Lin & Luo, 2023), several studies have explored different aspects of these symbols. Some studies investigated the emotional features (e.g., valence, emotion) of emojis perceived by users, while others explored their communicative functions within different online contexts. While the latter line of research investigates the similarities between emojis and emotional cues (e.g., words, facial expressions) (Gantiva et al., 2020), and the communicative contributions they may yield to the content (e.g., clarifying sender's intention, emotion, attitude) (Bai et al., 2019; Choi et al., 2023), the majority of studies in the former group focus on the emotional profile of emojis in different cultures. For example, Kutsuzawa and colleagues evaluated 74 facial emojis in terms of valence and arousal, categorizing them into six clusters that align with human emotional states (Kutsuzawa et al., 2022). Meanwhile, two recent studies generated lexicons for German (Scheffler & Nenchev, 2024) and Spanish (Ferré et al., 2023) speakers (Emoji-SP), encompassing 107 human face emojis and 1,031 emojis from various categories (e.g., faces, sports, food), respectively. These emojis were rated on dimensions including visual complexity, familiarity, frequency of use, clarity, emotional valence, and emotional arousal. Additionally, Rodrigues et al. (2018) created the Lisbon Emoji and Emoticon Database (LEED), which includes 153 emojis primarily focused on facial expressions with fewer symbols and hand gestures. It was evaluated based on dimensions such as aesthetic appeal, familiarity, visual complexity, clarity, valence, arousal, and meaningfulness in a sample of Portuguese speakers (Rodrigues et al., 2018). None of these studies incorporated specific emotions into the emoji profiles. In contrast, the Canadian Multidimensional Lexicon of Emojis (MLE) is more developed than the previous datasets in terms of variations in emoji categories and the rated affective dimensions (i.e., eight basic emotions). While it is the most comprehensive dataset, it does not account for gender differences in the perception of emotions in emojis (Godard & Holtzman, 2022).

Gender differences have been inconsistently shown to affect emotion comprehension for both real and emoji-based facial expressions. Some studies suggest an advantage for females in nonverbal sensitivity, including emotion recognition (Chen et al., 2024; Hampson et al., 2006; McClure, 2000; Thompson & Voyer, 2014), while others argue that there are no gender-related differences (Fischer et al., 2018). Several potential explanations have been proposed to support

the female superiority in emotion recognition tasks. One such explanation is the "primary caretaker hypothesis," which highlights women's historically predominant role in caring for and raising infants, making them more attuned to emotional cues (Babchuk et al., 1985). Another is the negativity bias, which is more pronounced in women and increases their sensitivity to negative facial emotions compared to men (Connolly et al., 2019). Moreover, the findings appear to be quite heterogeneous when comparing women and men in recognizing specific emotions (e.g., sadness, anger) (Forni-Santos & Osório, 2015). For example, studies by Abbruzzese et al (Abbruzzese et al., 2019) and Sullivan et al (Sullivan et al., 2017), showed that women are more likely to identify emotions by focusing on the eyes, while men are more attuned to the mouth. This finding highlights that emotion recognition may vary depending on whether the emotions are conveyed primarily through the upper (eyes) or lower (nose and mouth) parts of the face. Other studies suggest that females are more accurate in identifying subtle emotions (e.g., fear, disgust) as they perceive emotions in a gestalt fashion, making quick and automatic judgments (Dalle Nogare et al., 2023). Therefore, gender differences in emotion recognition may be due to various mechanisms that still need to be explored. Given the similarity between the processes of emotions conveyed through real faces and emojis (Liao et al., 2021), some studies have begun examining how gender may influence emotion interpretation in the context of online communication. For example, chen et al (Chen et al., 2024) conducted a cross cultural survey on 523 participants asking them to recognize 24 facial emojis based on six emotions (happy, sad, angry, surprised, fearful, disgusted). They found higher accuracy of classification for happy, fearful, sad, and angry emojis for women than men, but not for surprised or disgusted ones. Again in the study by Nogare et al (Dalle Nogare et al., 2023), women and men were compared in their ability to recognize emotions from facial expressions in human and emoji faces. They found that while females were better at recognizing all emotions in human faces, males outperformed females in identifying emotions conveyed by emojis, except for fear. This may be because males are more inclined to use emojis to express their emotions in online communication (familiarity). Although this evidence supports gender differences in recognizing emotions conveyed by emojis, there is a lack of studies examining how gender may influence the perception of emotion intensity in emojis.

Another factor that may influence emotion recognition in human faces, and subsequently in emojis, is cultural differences. For example, people from Western cultures, which emphasize individualism and overt emotional expression, generally tend to focus on the mouth when identifying emotions. In contrast, people from Eastern cultures, which are more collectivistic in nature, tend to focus on the eyes (Gao & VanderLaan, 2020; Viola, 2024). It is noteworthy that studies on cultural differences in emotion recognition often highlight in-group advantages or out-group biases when recognizing emotions from human faces. However, this may not apply to emojis, as their appearance is not culturally limited to specific facial features or expressions but instead follows standardized designs that are widely recognized across cultures. The most important factor that could explain cultural differences in emoji identification is the extent to which a certain culture uses emojis in their communications (familiarity) as well as the specific meaning they assign to these emojis based on cultural norms and context (Bai et al., 2019). For example, different studies showed that Chinese people are less familiar with emojis and less accurate in emotion recognition as they used emojis in different ways compared to other Western cultures (Chen et al., 2024; Guntuku et al., 2019). Investigating and comparing emoji-based emotion recognition across diverse cultures represents an emerging area of research that warrants further exploration.

Given the massive use of emoji for communication within each cultural context, having a database specifically characterizing the emotional features of emojis as they are perceived by users in that culture is critical. In this study, we present the Persian Emoji Lexicon (PEL), which includes subjective norms of 109 frequently used X (former Twitter) emojis in terms of valence

and the emotion, as rated by a sample 200 participants. We used the X platform to conduct our study for three primary reasons. First, this study is part of a larger project aimed at examining the role of emojis in emotional contingency when used in text messages (e.g., tweets). Specifically, it explores how the congruence or incongruence between the affective properties of text and emojis can influence the emotional contingencies of a posted tweet on receivers across two separate study days (described later in the method section). Second, emojis are commonly cues embedded within the written posts shared by X users, making it a highly suitable platform for this research. It is also important to note that while the types of emojis are relatively consistent, their appearance varies notably across social media platforms (e.g., Telegram vs. X). Given that X has currently over 400 million active users worldwide (Statista, 2022), it is more globally representative than other platforms such as Telegram, WhatsApp, and Facebook. Moreover, X users primarily consist of adolescents and young adults, who are the predominant users of emojis in their social communications (Herring & Dainas, 2020; Koch et al., 2022).

Given the widespread use of emojis in online communication, both within and across cultures, it is essential to explore this partially global language further. While some similarities exist, there are also notable differences shaped by both inter- and intra-individual factors. The aim of the current study is to provide a database of 109 emojis evaluated by Iranian participants who were familiar with use of emojis, in terms of emoji's emotion and valence. Similar to previous studies (Godard & Holtzman, 2022; Mohammad & Turney, 2013; Plutchik, 1960), we focused on eight basic emotions including anger, anticipation, disgust, fear, joy, sadness, surprise, and trust to categorize emotions. Moreover, we aimed to examine gender differences in the intensity of emotions perceived by Iranian men and women from each emoji assuming women perceive higher intensity of emotion rather than the men. And lastly, we aimed to compare the Iranian emoji database with a Canadian database (Godard & Holtzman, 2022) to explore both cross-cultural similarities and differences in emoji perception in terms of valence and emotion.

Method

The current study consisted of two phases: emoji selection and an online-based survey. The following sections describe each phase in detail.

Emoji Selection: Phase 1

In the first phase, we selected the most frequently used emojis from two sources. First, similar to previous studies, we checked Emojitracker (http://emojitracker.com/), a website that monitors emojis usage on Twitter in real-time (Aduragba et al., 2022; Kralj Novak et al., 2015; Paggio & Tse, 2022). From this source, we selected the top 100 most frequently used emojis. Since this study is part of a larger project investigating the role of emojis in emotional contingencies on Twitter, we also analyzed two separate datasets, each containing 1,000 impactful tweets collected on different days. Impactful tweets were defined as those with a high engagement rate, measured by the number of likes and retweets. One of these days was chosen as the "main day," during which a tragic event occurred (the collapse of an important building), significantly affecting the emotions of Iranian people. The second day served as a control, with no notable social events taking place. After identifying the most frequently used emojis on these two days, we found 10 additional emojis that were not present in the Emojitracker dataset. Consequently, we compiled a final set of 110 emojis. To culturally adapt the dataset for the Iranian population, we removed the 💩 emoji from the final selection. Figure 1, depicts the list of emoji included in our database.

Figure 1: List of included emoji (n=109), according to EmojiTracker.com Emojis named as: (1) Face with tears of joy, (2) Loudly crying face, (3) Smiling face with heart eyes, (4) Grinning face, (5) Grinning squinting face, (6) Grinning face with sweat, (7) Rolling on the floor laughing, (8) Slightly smiling face, (9)Winking face, (10) Smiling face with smiling eyes, (11) Smiling face with halo, (12) Star struck, (13) Face with raised eyebrow, (14) Smiling face with sunglasses, (15) Astonished face, (16) Face with stream from nose, (17) Pensive face, (18) Pouting face, (19) Face with medical mask, (20) Face blowing a kiss, (21)Winking face with tongue, (22) Face with peeking eye, (23) Face holding back tears, (24) Face with diagonal mouth, (25) Sneezing face, (26) Dotted line face, (27) Melting face, (28) Saluting face, (29) Face with open eyes and hand over mouth, (30) Sad but relived face, (31) Neutral face, (32) Face screaming in fear, (33) Hugging face, (34) Expressionless face (35) Zipped face, (36)Thinking face, (37) Face with hand over mouth, (38) Unamused face, (39) Grimacing face, (40) Flushed face, (41) Confounded face, (42) Angry face, (43) Sleeping face, (44) Persevering face, (45) Downcast face with sweat, (46) Smiling face with hearts, (47) Weary face, (48) Face savoring food (49)Squinting face tongue, (50) Heart on fire (51) Green heart, (52) Sparkling heart (53) Revolving hearts, (54) Purple heart, (55) Growing heart, (56) Pink heart, (57) Black heart, (58) Red heart, (59) Broken heart, (60) Heart with arrow, (61) See no evil monkey, (62) Speak no evil monkey, (63) Sweat droplets, (64) Dizzy, (65) Skull, (66) Smiling face with Horns, (67) Hundred points, (68) Kiss mark, (69) New moon, (70) Cyclone, (71) High voltage, (72) Sun, (73) Fire, (74) Star struck, (75) Sparkles, (76) Party popper, (77) Rose, (78) Four leaf clover, (79) Hibiscus, (80) Round pushpin, (81) Money bag, (82) Crown, (83) Camera, (84) Musical notes, (85) Person tipping hand, (86) Palms up together, (87) Heart hands, (88) Handshake, (89) Flexed biceps (90) Folded hands, (91) Backhand index Pointing up, (92) Victory hand, (93) Pinched fingers, (94) Ok hand, (95) Waving hand, (96) Raised back of hand, (97) Thumbs up, (98) Clapping hands, (99) Raising hands, (100) Oncoming fist, (101) Backhand index pointing down, (102) Backhand index pointing right, (103) Eyes, (104) Double exclamation mark (105) Left arrow, (106) Play button, (107) Minus, (108) Check mark button, (109) Large red circle.

Emoji Validation: Phase 2

Participants

A sample of 200 participants (140 females and 60 males; average age = 27.3, SD = 3.5) was randomly recruited online through leaflets distributed on social media (e.g., Instagram, Telegram, X). Volunteer participants contacted a research member (ZR) via the phone number provided in the leaflet, sending her, their email address and phone number to screen for eligibility before gaining access to the survey link. All participants were X users, familiar with emojis, and frequently used them in their online interactions. The final sample comprised 47 participants (23.5%) with a diploma, 62 (31%) with a bachelor's degree, 76 (38 %) with a master's degree, and 15 (7.5%) with a doctoral degree.

Procedure

This phase was conducted via a survey-like system on the website specifically designed for the current study. Eligible volunteers accessed the survey through a link sent to them via both SMS text messaging and email. After reading and accepting the online consent form, participants were automatically directed to the instruction page, and once they clicked the “Ready” button, the online survey was initiated. At the onset of the survey, participants completed a demographic form asking for information such as age, gender, education, being X users, and frequency of emoji usage. Next, the selected emojis were sequentially and randomly presented at the top of the screen against a white background. Participants were asked to look at the emojis and pay attention to the valence and intensity of the emotions they perceived. For each emoji, participants were initially asked to identify whether the emoji induced a

positive or negative emotion (valence) using binary choices (positive indicated with "+" and negative indicated with "-"). Following the valence identification, a screen with a response scale appeared, and participants were asked to rate the intensity of each emotion (anger, anticipation, disgust, fear, joy, sadness, surprise, and trust) perceived by them. The emotional intensity was rated using a 5-point Likert scale ranging from 1 to 5 (1 = very low, 2 = low, 3 = neutral, 4 = high, and 5 = very high. The highest score among the eight dimensions of emotions was considered the dominant emotion induced by the emoji. The participants were required to make a choice and could not skip any part without answering. When they made their choice for each emoji, the next page with the subsequent emoji was shown. There was no time limitation for responses; however, participants were asked to respond to emojis as accurately and quickly as possible and if they did not respond within 60 min, the survey was stopped. The entire survey process took approximately 30–45 minutes for each single participant, depending on their response speed. Figure 2 shows the schematic representation of the experimental procedure. The study procedure adhered to a protocol approved by the ethics committee of the Institute for Cognitive Science Studies (ICSS), with approval number [IR.UT.IRICSS.REC.1402.021]. Participant's contact information was kept confidential and anonymous (identified by a code), and only a member of the research team (ZR) had access to this data. After completing the survey, participants received a discount code to purchase a book from an online store as compensation for their time.

Statistical analysis

The analysis of the data was performed with the software IBM SPSS Statistics 26.0.0.1. Descriptive analysis was used for frequency, percentages, mean scores and standard deviation. To evaluate the association between variables, we used the Chi-square test. It is noteworthy that scores for each emoji on valence and eight dimensions of emotion were generated by averaging the ratings provided by raters.

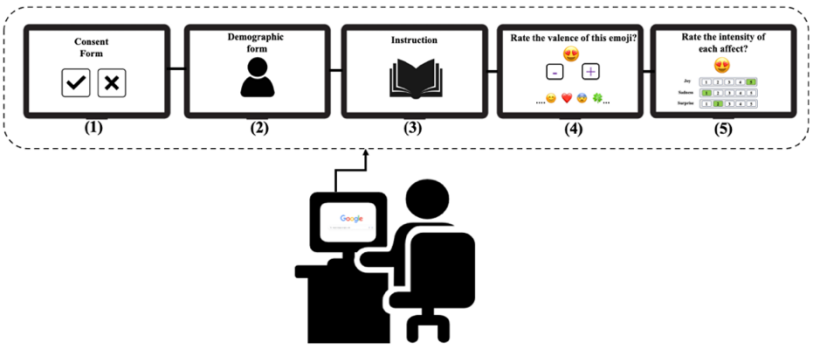

Figure 2: Study design. (1) Informed Consent: participants were provided with an informed consent form; (2) Demographics: After giving consent, participants completed a demographic questionnaire (e.g., age, gender); (3) Instructions: participants then received clear instructions on how to respond to the subsequent emojis; (4) Valence Rating: participants were presented with each of the 109 emojis one at a time. For each emoji, they recognize its valence (positive or negative); (5) Emotional Intensity Rating: each emoji was presented again and participants rated the intensity of eight dimensions of emotions (fear, anger, sadness, anticipation, joy, surprise, disgust, and trust) perceived from emojis.

Results

Affective Properties

A total of 109 emojis were assessed by 200 raters in terms of valence and emotion. Of these, 68 (62.4%) emojis represented smileys and faces, 19 (17.4%) represented people, 9 (8.3%) represented animals, 6 (5.5%) represented symbols, 5 (4.6%) represented objects, and 2 (1.8%) represented activities (Fig 3). This categorization is adopted from https://emojipedia.org/ . Out of 109 emojis, participants rated 90 (82.6%) emojis as inducing positive valence and 19 (17.4%) emojis as inducing negative valence (Fig 4). Overall, the highest percentage of emojis was categorized as indicating joy (n=36, 33%), while the lowest percentage was categorized as indicating disgust (n=2, 1.8%). Trust (n=20, 18.3%), anticipation (n=16, 14.7%), surprise (n=11, 10.1%), sadness (n=10, 9.2%), anger (n=8, 7.3%), and fear (n=6, 5.5%) followed, respectively (Fig 5). Table S1 indicates the descriptive characteristics separated by each emoji.

Figure 3: Honeycomb diagram, emoji classification based on the indicator emotion: (1) Joy: Represented by the color green, this category encompasses 36 emojis. (2) Trust: Represented by the color blue, this category includes 20 emojis. (3) Anticipation: Represented by the color cyan, this category comprises 16 emojis. (4) Surprise: Represented by the color yellow, this category includes 11 emojis. (5) Fear: Represented by the color orange, this category encompasses 6 emojis. (6) Sadness: Represented by the color brown, this category includes 10 emojis. (7) Anger: Represented by the color red, this category comprises 8 emojis. (8) Disgust: Represented by the color purple and includes 2 emojis.

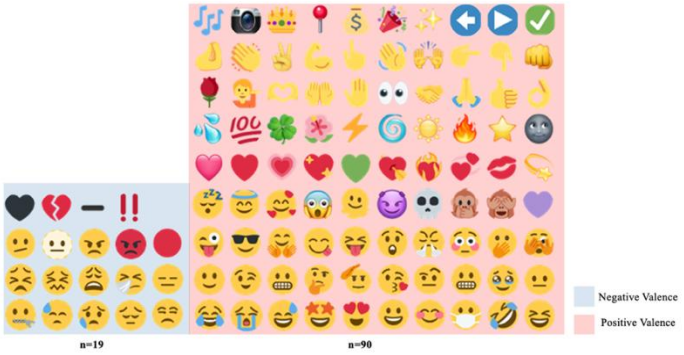

Figure 4: Distribution of emojis based on positive and negative valence

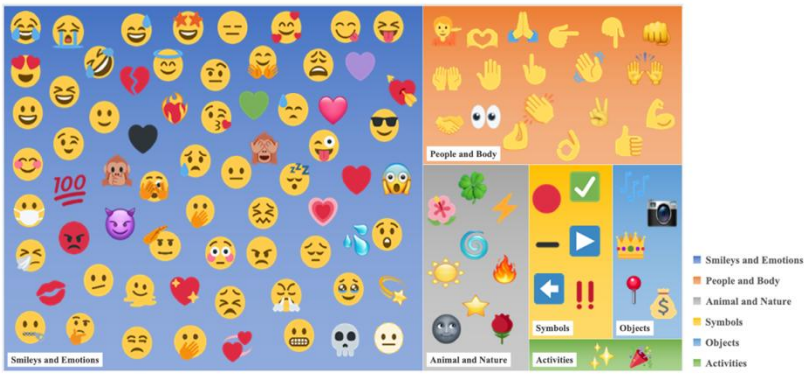

Figure 5: Tree map plot represent hierarchical distribution of emojis based on the semantic categories

According to the mean number of raters on perceived valence in each category of emotional emojis (joy, trust, anticipation, surprise, fear, sadness, anger, disgust), all emojis in the joy and trust categories were totally rated as positive, and all emojis in the disgust category were rated as negative. For other categories, some similarities were found. A Chi-square test indicated that there is a significant difference in terms of perceived valence (positive vs. negative) for the anticipation category [$\chi 2$ (1, $N = 16) = 12.25$, $p < 0.001$], while no significant differences were found for surprise, fear, sadness, and anger (**Fig** 6). We conducted this analysis because there are some variations in valence perception for emojis categorized under each emotion. For example, for the emotion of fear, which is perceived with both positive and negative valence, participants rated some fear-associated emojis (e.g., face with medical mask) as positive rather than negative. Notably, while these dimensions revealed differences between the mean number of positive and negative ratings, the chi-square test's sensitivity to sample size and expected frequencies can undermine its ability to accurately capture the significance of these

differences. When sample sizes are small and expected frequencies are low, the limitations of the chi-square test may lead to inaccurate results, including a heightened risk of Type II errors (Cochran, 1954; McHugh, 2013).

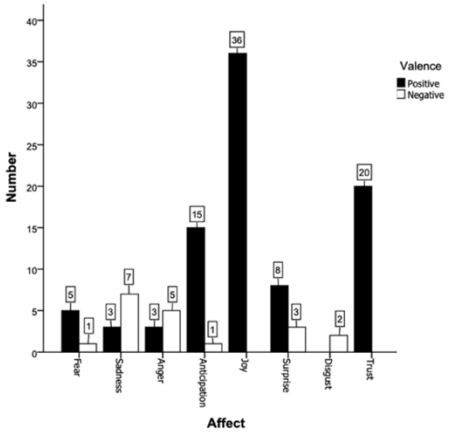

Fig 6. Distribution of types of valences across eight emotions

Gender Comparison

The general results of the comparison between men and women regarding the perceived intensity of emotions, is shown in Table 1, indicating in all types of emotions, women perceived higher intensity then men.

Table 1. Mean and SD statistics of emojis by gender

Emotion	Number	Total (n=200)	Women (n=140)	Men (n=60)	T	*p*	95%CI
		M (SD)	M (SD)	M (SD)			
Fear	6	2.85 (0.39)	2.95 (0.42)	2.19 (0.40)	11.89	< 0.001	0.63 - 0.88
Sadness	10	3.56 (0.82)	3.64 (0.84)	3.30 (0.81)	2.65	< 0.001	0.08 - 0.59
Anger	8	3.39 (1.04)	3.51 (0.96)	3.03 (1.38)	2.82	< 0.001	0.14 - 0.81
Anticipation	16	2.11 (0.43)	2.23 (0.40)	1.71 (0.57)	7.36	< 0.001	0.38 - 0.65
Joy	36	3.17 (0.70)	3.26 (0.71)	2.91 (0.71)	3.19	< 0.001	0.13 - 0.56
Surprise	11	3.44 (0.66)	3.47 (0.62)	3.24 (0.95)	2.03	0.04	0.006 - 0.45
Disgust	2	2.91 (0.74)	3.02 (0.74)	2.56 (0.43)	4.49	< 0.001	0.25 - 0.66
Trust	20	3.14 (0.62)	3.13 (0.67)	2.90 (0.71)	2.18	0.030	0.02 - 0.43

Semantic Categories Comparison

Another interesting finding is related to the semantic categories of emojis. Chi-square tests revealed significant differences between specific semantic categories and the valence induced by emojis. The category of smileys and faces significantly induces positive valence, while the categories of people, animals, objects, and activities consistently induce positive valence. Symbol-related emojis were equally rated as positive and negative, which could be presumed to be more neutral (Table 2). The test results also showed that the category of *smileys and faces* significantly induced joy, while the *people and body* category induced the emotion of trust. For other categories, no significant results were found (Table 3).

Table 2. Differences in the distributions of the valence between semantic categories (Chi-squared test)

Valence	Semantic Categories					
	Smileys and faces (n = 68)	People and Body (n = 19)	Animals (n = 9)	Symbols (n = 6)	Objects (n = 5)	Activities (n = 2)
Positive	52	19	9	3	5	2
Negative	16	0	0	3	0	0
$\chi 2$	19.05	NA	NA	0.000	NA	NA
Df	1	NA	NA	1	NA	NA
P	<0.001	NA	NA	1	NA	NA

Table 3. Differences in the distributions of the emotions between semantic categories (Chi-squared test)

Emotion	Semantic Categories					
	Smileys and faces (n = 68)	People and Body (n = 19)	Animals (n = 9)	Symbols (n = 6)	Objects (n = 5)	Activities (n = 2)
Fear	6	0	0	0	0	0
Sadness	9	0	1	0	0	0
Anger	6	1	0	1	0	0
Anticipation	5	5	2	3	1	0
Joy	24	2	4	0	4	2
Surprise	9	1	0	1	0	0
Disgust	2	0	0	0	0	0
Trust	7	10	2	1	0	0
$\chi 2$	36.47	15.47	2.11	2.000	1.8	NA
Df	7	4	3	3	1	NA
P	<0.001	0.004	0.55	0.57	0.18	NA

Cross Cultural Comparison

Due to the similarities in methodology between our study and the study conducted by Godrad and Holtzman in assessing the emotional content of emojis, we compared their results with ours to identify cultural differences in the affective perception of common emojis (n = 95) between the two cultures (Godard & Holtzman, 2022). Table S2 shows the results. We found that both cultures similarly identified four emojis—Pouting Face, Expressionless Face, Unamused Face, and Angry Face—as negative, whereas Canadians perceived the remaining emojis as positive. Regarding emotion perception, we found that both cultures shared the same dominant emotion perception for 29.47% (28 out of 95) of the emojis, specifically for joy (n = 17), trust (n = 9), and anticipation (n = 2). Notably, Canadians perceived these three emotions as the dominant affect for all the common emojis, while Iranians also perceived other emotions such as anger, surprise, sadness, fear, and disgust. Moreover, to assess the consistency of emoji valence perception between the Canadian and Iranian datasets, Cohen's Kappa was calculated. The resulting Kappa coefficient of 0.357 falls within the range of fair agreement (Landis & Koch, 1977). This suggests that while there is moderate consistency between the two datasets, the agreement remains limited, implying potential cultural differences in how emojis are interpreted in terms of positive and negative valence

Discussion and Conclusion

The present study aimed to provide subjective ratings for 109 emojis in terms of valence and emotional intensity across eight dimensions: anger, anticipation, disgust, fear, joy, sadness, surprise, and trust. Besides gender comparisons in terms of emotional intensity, we also compared our data with a similar emoji dataset developed and validated by Godard et al. to highlight cultural differences in emoji perception between the Iranian and Canadian samples (Godard & Holtzman, 2022).

Overall, of the 109 selected emojis, 90 were perceived as having a positive valence, while 19 were perceived as having a negative valence. This is consistent with various previous studies, which indicated that many emojis convey a positive or neutral emotional valence rather than a negative one (Riordan, 2017; Rodrigues et al., 2018). This issue is because people typically think that emojis are fun in essence and can loosen up their conversations (Fischer & Herbert, 2021). Regarding individual emoji valence, some parts of our findings align with previous research, while some heterogeneities exist in terms of emoji selection and the tools used to

evaluate their valence (Kutsuzawa et al., 2022). For example, compared to the study by Jaeger et al., who selected 33 facial emojis and used a Likert scale to assess valence sentiment, we selected 109 emojis from various categories and used a binary question (positive versus negative) to evaluate their valence (Jaeger et al., 2019).

Our results showed that all emojis with the highest scores in joy or trust emotions induced positive valence, while those with the highest scores in disgust were rated as negative valence. These results indicate a high level of agreement for these types of emotions, which is consistent with the study by Godard et al. (2022). Ratings for emojis perceived as expressing anticipation indicated a significant level of positive valence rather than negative. For the remaining emotions, including sadness, fear, anger, and surprise, no significant differences were observed, and they were interpreted as both positive and negative. The fact that all joy-induced emojis were rated as having positive valence may be due to distinct and agreeable elements embedded in emojis, such as hearts, smiling eyes, open smiles, pink cheeks, clapping hands, V signs, celebration poppers, stars, the sun, fire, crowns, money, and music notes. All trust-induced emojis were interpreted as having positive valence. Interestingly, the majority of emojis in this group depicted *body parts*, particularly hands, and included green-colored elements such as hearts, check marks, and leaves, which conveyed positive feelings. These results contrast with a large body of literature highlighting the role of facial features and cues (e.g., open eyes, smiling mouth) in forming first impressions of trust, even at a subliminal level (Bar et al., 2006; Mo et al., 2022; Willis & Todorov, 2006).

Regarding the anticipation-perceived emojis, which were also rated as having positive valence, the most prominent elements were *directional symbols*, represented by hands or other symbols. The two disgust-rated emojis, characterized by narrowed eyes, raised lips, and a nose crinkle, were associated with negative valence. Although no significant differences were found between positive and negative ratings for anger, fear, sadness, and surprise, some prominent features were identified among these groups. For the anger-induced emojis, features such as clenched fists, furrowed brows, tense jaws and lips, flared nostrils, and the color red were prominent, likely contributing to the more negative valence ratings assigned to this group. For the sadness-perceived emojis, the negative valence rating was higher than the positive, possibly due to prominent affective elements such as lowered corners of the mouth, descended eyebrows, dropped eyelids, crying faces, black hearts, broken hearts, and hearts with arrows. For the fear-induced emojis, it was interesting that more participants assigned positive rather than negative valence. This may be due to prominent facial expressions, such as open eyes and mouths, which can induce a comic perception of the emojis. Surprise perceived emojis were mostly rated as positive, characterized by prominent features such as raised eyebrows, wide-open eyes, and O-shaped or straight-line mouths. Another point deserving mention is that, regarding semantic categories, we found that for all categories, excluding symbols, the average number of positive valence attributions was higher than the negative ones. The group of smileys and faces significantly induced joy, while people and body emojis induced trust emotions. This corresponding relationship between semantic categories and perceived emotions is likely culturally bound and varies across different social contexts due to their diversity in communication styles (e.g., language) (Neel et al., 2023).

Another important result concerns gender differences in perceiving the intensity of emoji emotions. We found that women significantly perceived higher intensity in all eight dimensions of emotions compared to men. This result aligns with previous studies indicating higher sensitivity of females to affective stimuli (Ferré et al., 2023), likely due to developmental mechanisms (e.g., primary caretaker hypothesis) or emotional biases that make women more emotionally sensitive than men.

Last but not least, the interesting findings indicated cultural differences between Iranian and Canadian participants in perceiving the affective features of common emojis. The inter-rater

reliability for emoji valence ratings between Iranian and Canadian participants indicated a fair level of agreement between the two cultural groups, suggesting that while there is some overlap in emoji interpretation, cultural differences are still present. The differences in emoji interpretation between Iranians and Canadians highlight significant cultural variations in emotional expression. For instance, the pensive face emoji, which may be perceived as a neutral or thoughtful expression in Canadian culture, was viewed more negatively by Iranian participants, possibly reflecting cultural tendencies to associate introspection with worry or sadness. Similarly, the sneezing face emoji, generally seen as a natural response to illness in Canada, was considered negative in Iran, where it may induce feelings of discomfort. Additionally, emojis such as the persevering face and the weary face were interpreted differently across cultures. In Canadian culture, these emojis might symbolize resilience and determination, potentially perceived positively as signs of persistence. In contrast, Iranian participants may associate these expressions with exhaustion or emotional fatigue, leading to a more negative interpretation. The broken heart emoji, widely associated with sadness and emotional distress, was similarly seen as negative in both cultures. However, its meaning can vary in depth. While it likely symbolizes pain and grief universally, in Canada, it may also signal a more normalized emotional process of healing, whereas in Iran, it could evoke a more profound sense of loss and sorrow. These examples show how cultural contexts shape the interpretation of emotions conveyed through emojis particularly in on-line communications which lack of traditional non-verbal cues. Differences in emotional expression, social norms, and even language nuances play a crucial role in how individuals perceive and respond to these digital symbols. Understanding such cultural nuances is essential for researchers and practitioners in cross-cultural communication and digital psychology.

Regardless of the novelties of our study in terms of using emojis from various categories, comparing men and women in emotional perception, as well as analyzing cultural differences, we must address some of our limitations. First, we used a binary rating for valence perception instead of a continuous scale. Although we acknowledge the advantages of a more precise evaluation using a Likert scale for valence interpretation, we intentionally used binary classification to simplify the analysis and focus on the clear emotional polarity of the emojis, which is more preferred in Iranian culture. Another reason for this choice is that the present study was part of a larger project in which we needed to categorize the sentiment of texts as either positive or negative; therefore, we applied the same approach to emojis to align with the text sentiment analysis. Our second limitation was that our study asked participants to rate the affective profile of emojis in isolation, whereas the results might have been different if the emojis were presented in context (Ferré et al., 2023). Third, we did not collect or examine additional demographic characteristics such as level of education or specific personality traits (e.g., extraversion, autism, depression, anxiety), which could moderate the interpretation of affective features (Kennison et al., 2024; Mohan et al., 2021). Finally, we selected the limited number of the most frequently used emojis on the X platform, while the number of available emojis are now reached over 3500 (Unicode version 15.1: https://unicode.org/emoji/charts/full-emoji-list.html) and their appearance varies across different platforms (Fernández-Gavilanes et al., 2018). Future studies should include a more comprehensive and updated set of emojis to expand this novel tool of communication and explore how individual and cultural factors influence emoji interpretation.

In the present study, we have provided the Persian Emoji Lexicon (PEL), which includes the affective profiles of 109 face and non-face emojis frequently used on X (former Twitter) in terms of valence and emotion dimensions. We collected subjective ratings from 200 participants through an on-line survey and examined gender and cultural differences in the perception of their affective features. This database could serve as a valuable resource for other studies analyzing the sentiment of content posted on social media, as well as for applied studies using

emojis to evoke specific emotions that may influence certain behaviors in marketing, training, or other professional contexts.

Declarations

Author Contributions

TR: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft. ZR: Data curation, Formal analysis, Software, Methodology, Writing – original draft. JH: Conceptualization, Methodology, Funding acquisition. HK: Formal analysis. KM: Data curation. All authors participated in the revising of the manuscript.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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Ethical considerations

This study was conducted in full compliance with ethical guidelines and principles. All participants provided informed consent, and their confidentiality and anonymity were strictly maintained. The research protocol was reviewed and approved by the relevant ethical committee, ensuring adherence to ethical standards throughout the study.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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