

Determining a subset of discrete emotion-evoking images from the international affective picture system in a Turkish sample

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Keywords

IAPS, discrete emotions, categorical approach, dimensional approach, cultural differences

Anahtar kelimeler

UDRS, ayrık duygular, kategorik yaklaşım, boyutsal yaklaşım, kültürel farklılıklar

Abstract

The International Affective Picture System (IAPS), widely utilized in emotion research, is based on a dimensional approach. It includes 1196 colored static images depicting different semantic categories, with valence, arousal, and dominance ratings determined for each. However, the specific discrete emotions evoked by these images within the IAPS has remained unclear. Therefore, numerous investigations have been conducted in different cultural contexts to address this matter. This study aimed to determine a subset of images from the IAPS that elicit discrete emotions. To achieve this goal, an image was selected for each semantic category within the IAPS, employing specific criteria, and the elicited discrete emotions were subsequently examined in a Turkish sample. Additionally, valence ratings for these images were obtained within the Turkish culture, facilitating cross-cultural comparisons. Sixty Turkish students (43 female) aged between 19-25 participated in this study. The participants rated the valence, discrete emotion category, and the intensity of the determined discrete emotion (1 = none; 9 = very strongly) for 231 selected images from the IAPS, respectively. Valence ratings were obtained using the paper-pencil version of the Self-Assessment Manikin. Accordingly, 76 images, of which intensity ratings above six were classified into a single discrete emotion with the agreement of 70% and above among the participants. Furthermore, the obtained data were compared with the results of studies conducted in different cultural settings to explore potential cultural differences. Overall, the results highlighted the importance of selecting culture-specific stimuli in emotion studies.

Öz

Uluslararası duygusal resim sisteminde ayrık duygu uyandıran görüntülerin Türk örnekleminde bir alt kümesinin belirlenmesi

Duygu araştırmalarında yaygın olarak kullanılan Uluslararası Duygusal Resim Sistemi (UDRS), boyutsal yaklaşıma dayanmaktadır. Set içerisinde farklı semantik kategorilere ait 1196 renkli statik görüntü bulunmaktadır ve her bir görüntü için değerlik (*valence*), uyarılmışlık (*arousal*) ve baskınlık (*dominance*) değerleri belirlenmiştir. Ancak, UDRS içindeki bu görüntülerin hangi ayrık duyguları uyandırdığı tam olarak bilinmemektedir. Bu nedenle, bu konuyla ilgili birçok kültürde araştırmalar yapılmıştır. Bu çalışmada, UDRS içindeki görüntülerden ayrık duygu uyandıranların bir alt kümesinin belirlenmesi amaçlanmıştır. Bu amaç doğrultusunda, UDRS'deki her bir semantik kategori için belirli kriterlere göre bir görüntü seçilmiş ve bu görüntülerin Türk örnekleminde hangi ayrık duyguyu uyandırdığı incelenmiştir. Bununla birlikte, farklı kültürlerle karşılaştırma yapabilmek amacıyla bu görüntülerin Türk kültüründeki değerlik ölçümleri alınmıştır. Çalışmaya 19-25 yaş aralığındaki 60 Türk öğrenci (43 kadın) katılmıştır. Katılımcılar UDRS'den seçilen 231 görüntünün sırasıyla değerliğini, hangi ayrık duygu kategorisine ait olduğunu ve belirledikleri ayrık duygunun şiddetini (1 = hiç; 9 = çok güçlü) değerlendirmiştir. Değerlik ölçümleri Öz Değerlendirme Mankeninin kağıt kalem versiyonu kullanılarak elde edilmiştir. Buna göre, duygu şiddeti altının üzerinde olan 76 görüntü, katılımcıların %70 ve üstünün fikir birliği ile tek bir ayrık duygu içerisinde sınıflanmıştır. Elde edilen veriler, farklı kültürlerde yapılan çalışmaların sonuçlarıyla karşılaştırılarak potansiyel kültürel farklılıklar incelenmiştir. Sonuç olarak, duygu çalışmalarında kültüre özgü uyarıcılarının seçiminin önemli olduğunu gösteren bulgular elde edilmiştir.

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Emotions, which play a crucial role in various cognitive processes (for a review, see Blanchette & Richards, 2010) are the result of simultaneous change in multiple components including subjective experience, physical arousal, motivation, and motor responses (Scherer, 2000). According to Izard (2010), emotion is a state of feeling or a process that shapes, motivates, and directs the internal experiences of a person. Furthermore, emotions have a functional significance in terms of providing information to the individual based on their prior and ongoing cognitive appraisals and regulating the individual's responses (e.g., approach-avoidance) in order to maintain their social and relational existence. Due to its functional significance, research in the field of emotions utilizes different sets of stimuli, such as pictures (e.g., Dan-Glauser & Scherer, 2011; Lang et al., 2008; Marchewka et al., 2013), words (e.g., Bradley and Lang, 2017), sounds (e.g., Bradley and Lang, 2007; Yang et al., 2018), and facial expressions (e.g., Ekman and Friesen, 1976; Lundqvist et al., 1998; Tottenham et al., 2009), to examine the relationship between cognition and emotion.

There are two major approaches on how emotions are distributed in the emotional space: categorical and dimensional. The categorical approach asserts that emotions consist of a limited number of distinct types, each characterized by specific properties, rather than existing on a continuum of emotional states. Ekman and Friesen (1969, 1971), pioneering the categorical approach, carried out a series of studies to determine basic emotions such as sadness, anger, fear, surprise, disgust, and happiness. Many researchers have suggested that basic emotions are universal and biologically inherited (Darwin, 1872; Ekman, 1970, 1994), and are associated with distinct physiological and neural patterns (Russell, 2003; Vytal and Hamann, 2010). On the other hand, the dimensional approach proposes that emotions arise from combinations of primarily three dimensions: valence (ranges from pleasant to unpleasant), arousal (intensity of the emotional experience), and dominance (feeling strong or weak). These dimensions are accompanied by cognitive processes such as appraisal and attribution of meaning (Lang et al., 2008; Russell, 2003). Although categorical and dimensional approaches may seem contrasting to each other, recent accounts suggest that both theoretical perspectives have important contributions to emotion research (Harmon-Jones et al., 2017).

Using dimensional approach, Lang et al. (2008) developed The International Affective Picture System (IAPS), which is one of the most widely used stimulus sets in emotion research. It consists of 1196 color static images that have been normatively rated for valence, arousal, and dominance. The normative ratings are obtained using the Self-Assessment Manikin (SAM), a schematic self-assessment scale developed by Lang (1980). The current study aimed to examine the categorical structure of emotional experience

evoked by the IAPS images in a Turkish sample and compare the results with previous studies conducted in different cultural contexts.

Dimensional characteristics of emotions provide extensive knowledge. However, literature has demonstrated that they may not fully capture the breadth of emotions experienced in daily life (Harmon-Jones et al., 2017; Keltner et al., 1993; Levenson, 2003; Springer et al., 2007). For instance, Levenson (2003) stated that *fear* and *anger*, despite both being negatively valenced emotions, can differ in terms of arousal levels as measured by heart rate and body temperature. Similarly, Springer et al. (2007) found that *fearful* and *happy* facial expressions did not differ in terms of startle reflex despite differing in valence. Thus, these findings emphasize the complementary role of categorical approaches to understand emotions.

Indeed, to address the limitations of the dimensional approach, some researchers have carried out studies aimed at examining the emotional category membership of stimuli within datasets originally created using the dimensional approach, such as the IAPS (for U.S. norms, see Davis et al., 1995; Libkuman et al., 2007; Mikels et al., 2005), and the Affective Norms for English Words-ANEW (for U.S. norm, see Stevenson et al., 2007; for Turkish norm, see Kapucu et al., 2021). Accordingly, the most comprehensive study that has examined IAPS images using a categorical approach is the study by Libkuman et al. (2007). They examined various emotional dimensions of the stimuli, such as consistency, meaningfulness, familiarity, distinctiveness, and memorability, in addition to discrete emotional categories. Studies that re-examine existing datasets from this integrated perspective are contributing to the body of research that enables a better understanding the complex structure of emotions.

One of the focal points of the current study is the emphasis on the significance of selecting culture-specific stimuli. The relationship between culture and emotions is a complex and intriguing subject. Ekman (1970) stated that emotions are universal, however, the factors affecting their emergence are cultural. For instance, in Western societies, children are usually motivated by their parents to be more autonomous and independent, which is interpreted as being individualistic (Kağıtçıbaşı, 2005). This cultural difference might motivate Western children to experience more ego-oriented emotions such as *anger* and *pride* that enable them to defend themselves and protect their individuality (Wang, 2001). On the other hand, cultural norms in Eastern societies give importance to respect for elders, loyalty to the family, social cohesion and group interests, which encourage individuals toward collectivism. Accordingly, while the expression of ego-oriented emotions such as *anger*, which may disrupt interpersonal bonds, is controlled in Eastern children; expression of emotions such as *sympathy*, which strengthens interpersonal sensitivity, is reinforced (Mesquita et al., 2007). In summary, cultural

differences can reveal different emotional experiences for the same events (Miyamoto et al., 2010). In this context, individuals in Eastern societies perceive positive and negative emotions in a more balanced way by experiencing emotional events more critically (dialectical thinking) whereas Western societies tend to exalt positive emotions and downplay negative emotions (Peng & Nisbett, 1999).

A growing body of research has ventured into the cross-cultural exploration of emotional categorization to IAPS images in addition to norms developed in the U.S. (Davis et al., 1995; Libkuman et al., 2007; Mikels et al., 2005). Studies were conducted in different cultural contexts such as, German (Barke et al., 2012), Chilean (Moreno et al., 2016), Colombian (De La Torre et al., 2019), and Australian (Wei et al., 2020). In the study conducted by Barke et al. (2012), a total of 298 IAPS images were rated by utilizing the valence, arousal, and category rating dimensions of the SAM. The results showed that German participants reported lower levels of arousal compared to the arousal ratings reported in the original study by Lang et al. (2008). Moreno et al. (2016) identified fear-evoking images from the IAPS within a Chilean sample using a procedure similar to German study. They reported that, 30 out of the 64 images evoked the same discrete emotions in both the German and Chilean studies. However, their findings revealed that the Chilean sample rated images with higher valence and arousal ratings when compared to the ratings from the German study. Moreover, in a study by De La Torre et al. (2019), a total of 200 IAPS images were rated using a 7-point emotion rating scale (1 = not at all; 7 = very much) employing a categorical approach. In their study, they followed a similar procedure to Mikels et al. (2005), examining images that elicited both binary-triplet (complex) and single discrete emotions. The results showed that more images were rated as complex images in the Colombian sample compared to Mikels and colleagues' (2005) study, suggesting cultural differences influence participants' interpretation of IAPS images. These studies have also implied that when examining emotions in different cultures, it is critical to utilize culture-specific stimuli.

The IAPS has been the subject of numerous validation studies conducted in diverse cultural contexts worldwide (for a recent systematic review, see Branco et al., 2023). These validation studies are crucial for ensuring the cross-cultural applicability and generalizability of the IAPS dataset in emotion research. In Turkey, a validation study was conducted by Tok et al. (2010) on young athletes, using 224 IAPS images. They assessed the dimensions of valence and arousal using SAM and found significant correlations between Turkish and US samples. Additionally, the IAPS is widely used in diverse emotion studies in Turkey, both from a dimensional approach (Baran et al., 2014, 2015) and a categorical approach (Boğa et al., 2021,

2022; Utku, 2011). For instance, Utku (2011) compared the emotional memory of individuals with obsessive-compulsive disorder and healthy participants using 24 IAPS images categorized as disgust, fear, and neutral. Likewise, Boğa et al. (2022) evaluated the effectiveness of three emotion induction methods (film, IAPS, imagery) in eliciting fear, disgust, and happiness using a set of 30 IAPS images representative of these emotional categories.

Although the categorical ratings of IAPS images were carried out in different cultures, to our knowledge, it has not been tested in a Turkish culture for six discrete (happiness, anger, sadness, fear, disgust, and surprise) emotions. Thus, the primary goal of this study was to identify the subset of images that elicit specific discrete emotions with a high level of agreement among Turkish participants. The second aim of this study was to examine participants' valence ratings to understand the differences and similarities across cultures in the emotional responses to standardized stimuli.

METHODS

Participants

A total of 60 volunteer undergraduate volunteers (47 female, 13 male) aged between 19-25 ($M = 20.42$, $SD = 1.39$) took part in the study. The minimum sample size was determined by considering the number of participants who rated each stimulus in the set in similar categorical rating studies (e.g., Kapucu et al., 2021; Libkuman et al., 2007)¹. All participants had a normal or corrected-to-normal vision and did not have any psychiatric/neurological medication or diagnosis. Before the experiment, written consent was obtained from the participants after they were provided with detailed information about the experimental procedure. The study received approval from the Ethics Committee of Hacettepe University. At the end of the session, participants were debriefed.

Apparatus and Materials

Materials. The IAPS images included in this study were determined based on specific criteria as follows: 1) An image was selected if its' valence rating was equal to or less than 3.50 for the negatively valenced category and equal to or greater than 6.50 for the positively valenced category from the original IAPS study (Lang et al., 2008). 2) From each semantic category (e.g., baby, romance) only one image was included representing that specific category. If a particular semantic category was negatively valenced, then the image with the lowest ratings was selected. Similarly, if a particular semantic category was positively valenced, the image with the highest ratings was selected. 3) In parallel to the previous study by Mikels et

al. (2005), images depicted a) erotic themes, b) elements foreign to Turkish culture (such as individuals from other races, games specific to other countries, foreign country flags, religious/ideological symbols, etc.), and c) brands were not included in this study in order to control socio-cultural factors. 4) Finally, the images with low resolution and with low technical quality or images which were edited copies were not included.

A total of 231 images were selected according to the aforementioned criteria. To control for fatigue, the images were divided into two subsets with 115 images in Set 1 and 116 images in Set 2 which was a similar procedure in previous research (Libkuman et al., 2007). Positive and negative images were equally distributed in each subset. Half of the participants were presented with Set 1, and the other half were presented with Set 2. Participants who rated Set 1 and Set 2 were similar regarding their demographic characteristics such as age (Set 1: $M = 20.13$, $SD = 1.25$; Set 2: $M = 20.7$, $SD = 1.49$), gender (Set 1: 23 Female, 7 male; Set 2: 24 Female, 6 Male) etc. (see raw data for more detailed information in open platform called OSF (<https://osf.io/hz8q3/>). Data collection for Set 1 and Set 2 was done simultaneously. The images were presented to participants in randomized order for each subset.

Apparatus. E-prime 2.0 Professional Psychology Software Tools Inc. (Pittsburg, USA) was used for image presentation.

Procedure

The participants were tested in groups of up to 10 people in a classroom setting, and the images were presented by projecting them onto a wall-mounted screen with a resolution 1024 x 768. The data collection procedure was determined based on the original study by Lang et al. (2008) and the previous studies (De La Torre et al., 2019; Libkuman et al., 2007; Mikels et al., 2005). Before the experiment began, a training session on the rating procedure was presented to enlighten the participants about the procedure. Participants were first presented six representative images (three negative and three positive images) which were not included in the main session. Participants were instructed that they had the option to leave the study at any time if they felt extremely disturbed by the images. One participant left the study during this training session. Following the training session, the main experiment began with either Set 1 or Set 2.

During the main session, each image was presented alone for 6 seconds (s) following the protocol of Lang et al. (2008). Participants were instructed to provide three separate ratings for each image: 1) a valence rating on a 9-point scale using the paper-and-pencil version of the SAM (Lang, 1980), 2) identification of the discrete emotional category that best corresponded to image from a list of options (anger, fear, disgust, hap-

piness, surprise, sadness, or other). The option of "Other" was added to discrete emotion category to determine images that do not belong to any specific categories. 3) an intensity rating for the chosen emotion on a scale from (1 = *none*; 9 = *very strongly*). The rating procedure for each image took 15 s (5 s each). Participants were shown images on the screen during the rating procedure. Before moving on to the next image, a blank screen was presented for 1 s . Participants marked their ratings on the response sheet. The entire experiment session lasted approximately 45 minutes.

Data Analyses

Discrete Emotion Categories. Discrete emotional categories were determined based on two criteria. First, images were identified that had been rated in a particular discrete emotion category with an agreement of 70% or more among the participants. This criterion was chosen on the basis of the previous studies (Dailey et al., 2003; Wei et al., 2020) (see Table 1). Second, of the images that met this criterion, those that had an intensity mean rating of 6.00 or higher were classified within that discrete emotion category.

Valence. We calculated mean valence of each image for the whole sample. We also compared our findings with the previous IAPS studies in different cultures, such as US (Ito et al., 1998; Lang et al., 2008; Libkuman et al., 2007) German (Barke et al., 2012), Chilean (Moreno et al., 2016), and Australian (Wei et al., 2020). Since IAPS images that were used in these studies differ, we first identified images in each comparison study which correspond to the ones that were used in the current study (the number of IAPS images can be seen in Table 2 and 3). Second, we divided selected images into two categories (positive and negative). The procedure used for stimulus selection was not followed for the positive-negative distinction (3.50 or lower for the negatively valence category and 6.50 or higher for the positively valence category). Although images with valence ratings between 3.50 and 6.50 were not selected from the original study (Lang et al., 2008), images with valence ratings in this range were observed in the rating results of both our study and the comparison studies (e.g., Barke et al., 2012; Libkuman et al., 2007; Moreno et al., 2016; Wei et al., 2020). In order to include these images in the comparison, images with a mean valence below 5.00 were categorized as negative and images with a mean valence above 5.00 were categorized as positive. Then, we conducted 2 (Comparison Study) x 2 (Valence) ANOVA in order to examine the interaction between Valence and Comparison Study. However, we did not distinguish valence for studies of Barke et al. (2012) and Moreno et al. (2016) since they only used negative images. Therefore, we conducted independent samples t -tests to examine the main effect of Comparison Study.

Table 1. Additional Information Regarding Current Study and the Other Studies

Study	<i>N</i>	Sample	Country	Age Mean ± <i>SD</i>	Number of rated pictures	Number of ratings per pictures	Dimensional ratings	Procedure of data collection	Discrete emotions	Scales	Data analysis
Mikels et al. (2005)	60	university students	USA	18.7 ± n.r.	203 (negative)	60	none	In groups (<i>n</i> = 4-15)	amusement, awe, contentment, excitement	7-point rating scales	Confidence interval
				18.8 ± n.r.	187 (positive)				Fear, disgust, sadness, anger		
Libkuman et al. (2007)	1302	university students	USA	> 18 yrs.	703	25-93 Mean ± <i>SD</i> (32.6 ± 11.0)	valence arousal + additional ratings	In groups (<i>n</i> = 2-20)	happiness, fear, anger, sadness, disgust, surprise	9-point rating scales	Confidence interval
Barke et al. (2012)	191	university students	Germany	23.6 ± 2.8	298	191	valence, arousal	individually	fear	none	Category selection (criterion of a simple majority)
Moreno et al. (2016)	60	university students	Chile	22.3 ± 3.2	146	60	valence, arousal, dominance	individually	fear	none	Category selection (criterion of a simple majority)
De La Torre et al. (2019)	447	university students	Colombia	20.36 ± 2.74	200	n.r.	none	In groups (<i>n</i> = 5-45)	anger, anger-sad	7-point rating scales	Confidence interval
Wei et al. (2020)	103	university students + public in Australia	Australia	24.40 ± 9.99	118; Experiment 1	103	valence, arousal	online /individually	fear, happy, sad, neutral	none	Category selec- tion (criterion of a %70 agree- ments)
	117			30.41 ± 10.25	28; Experiment 2	117			Happiness, fear, anger, sadness, disgust, surprise	10-point rating scales	
Current Study	60	university students	Turkey	20.42 ± 1.39	231	30	valence	In groups (<i>n</i> = 2-10)	Happiness, fear, anger, sadness, disgust, surprise	9-point rating scales	Category selection (criterion of a %70 agreements)

Note. n.r = not reported.

Table 2. Comparisons of Valence in the Current Study and the Other Studies with 2x2 ANOVA

Comparison	Study	Comparison Study						Comparison Study x Valence							
		Total		<i>df</i>	<i>F</i>	<i>p</i>	η^2_p	Positive		Negative		<i>df</i>	<i>F</i>	<i>p</i>	η^2_p
		<i>N</i> ^a	<i>M (SD)</i>					<i>N</i> ^a	<i>M (SD)</i>	<i>N</i> ^a	<i>M (SD)</i>				
Current Study x Lang et al. (2008)	Current Study Lang et al. (2008)		4.71 (2.08)					123	6.54 (0.07)	108	2.62 (0.07)				
		231		458	39.61	.000	0.08					458	44.27	.000	0.09
			5.11 (2.39)					124	7.27 (0.05)	107	2.60 (0.06)				
Current Study x Ito et al. (1998)	Current Study Ito et al. (1998)		4.92 (1.99)					75	6.41 (0.67)	48	2.60 (0.73)				
		123		242	20.31	.000	0.08					242	18.11	.000	0.07
			5.47 (2.36)					76	7.23 (0.71)	47	2.62 (0.77)				
Current Study x Libkuman et al. (2007)	Current Study Libkuman et al. (2007)		4.85 (2.06)					91	6.50 (0.67)	66	2.57 (0.73)				
		157		310	5.09	.025	0.02					310	0.27	.602	0.00
			4.50 (2.18)					85	6.34 (0.74)	72	2.33 (0.95)				
Current Study x Wei et al. (2020)	Current Study Wei et al. (2020)		4.45 (2.37)					11	6.98 (0.80)	14	2.47 (0.47)				
		25		46	1.17	.286	0.03					46	0.00	.968	0.00
			4.63 (2.35)					11	7.17 (0.57)	14	2.64 (0.48)				

Note. ^anumber of IAPS images.

Table 3. Comparisons of Valence in the Current Study and the Other Studies with the Independent Samples T-Tests

Comparison	Study	<i>N</i> ^a	<i>M</i> (<i>SD</i>)	<i>df</i>	<i>t</i>	<i>p</i>	<i>d</i>
Current Study x	Current Study		2.61 (0.54)				
Barke et al. (2012)	Barke et al.	51	2.90 (0.54)	100 ^b	-2.74	.007	0.54
Current Study x	Current Study		2.39 (0.53)				
Moreno et al. (2016)	Moreno et al. (2016)	17	3.26 (0.77)	32 ^b	-3.89	.000	1.32

Note. ^anumber of IAPS images. ^bequal variances assumed.

RESULTS

Data were analyzed using the statistical package IBM SPSS Version 20.0 software (IBM Corp., US). The rating scores obtained for valence, discrete emotion, and intensity of discrete emotion of 231 IAPS images can be found in supplementary material (<https://osf.io/hz8q3/>). Results from discrete emotions and valence are presented below.

Discrete Emotion Categories

Based on aforementioned criteria, images classified in the discrete emotion categories of happiness ($n = 39$), sadness ($n = 27$), anger ($n = 1$), disgust ($n = 7$), and fear ($n = 2$) were determined. No image met the criteria that were classified in the categories of "Surprise" and "Other". The means and standard deviations, and the discrete category for each categorized image in the current study and the comparison studies can be found in Table 2. Also see Table 3 for images assigned to different emotional categories in the current study and the comparison studies.

Valence

In order to analyze the effect of valence between the current study and the comparison studies (i.e., Ito et al., 1998; Lang et al., 2008; Libkuman et al., 2007; Wei et al., 2020), four separate 2 (Comparison Study) x 2 (Valence) ANOVAs were carried out. Results showed that the main effect of Comparison Study was statistically significant in all comparisons, except the study by Wei et al. (2020). Furthermore, the interaction effect of Comparison Study x Valence was only found significant when comparing the current study with Ito et al. (1998) and Lang et al. (2008). *F*s, *p*s, η^2 , *p*s for all ANOVAs were summarized in Table 4. Bonferroni corrected pairwise comparisons revealed that when the IAPS images were negative, there was no significant difference between current study and the study by Lang et al. (2008) ($MD = 0.02$, $SE = 0.08$, $p = .806$), or the study by Ito et al. (1998) ($MD = 0.02$, $SE = 0.15$, $p = .873$). However, when the IAPS images were positive, a significant difference between current study and the study by Lang et al. (2008) ($MD = 0.73$,

$SE = 0.07$, $p = .000$), and the study by Ito et al. (1998) ($MD = 0.82$, $SE = 0.12$, $p = .000$) was observed.

In order to compare valence ratings of the current study with the studies of Barke et al. (2012) and Moreno et al. (2016), two separate independent samples *t* tests were carried out, and significant differences were observed for both analyses. *t*s, *p*s, Cohen's *d*s, for both analyses were summarized in Table 5.

DISCUSSION

Discrete emotion categories

The main objective of the present study was to examine of discrete emotion-evoking images in a Turkish sample. A total of 231 images from IAPS were analyzed, 76 of which were categorized as a single discrete emotion. Based on the categorical ratings, most of the images were categorized as happiness, sadness, and disgust. Images of happiness consisted of family, couple, nature (e.g., sunset, sea), and pretty animals (e.g., giraffes, kittens). Images of sadness included people or animals that had suffered damage (e.g., assault, starving child, dead cow), and disasters (e.g., plane crash, fire). Images of disgust featured insects (e.g., roach on pizza, spider), and dirtiness (e.g., vomit, teeth).

The IAPS has been widely studied due to its high-power emotional induction. However, in some experimental settings, the dimensional approach may be insufficient to understand the behavioral and cognitive effects of discrete emotions. In particular, a number of studies have demonstrated that discrete emotions, such as sadness, fear, anger, and disgust can affect numerous processes in distinct manners, even they have similar valence, arousal, and dominance ratings. For instance, studies have revealed that *anger* and *fear* (Finucane, 2011; Lerner & Keltner, 2000, 2001; Wu et al., 2019), *fear* and *disgust* (Chapman, 2018; Chapman et al., 2013; Moeck et al., 2021; Xu et al., 2016), and *sadness* and *anger* (Keltner et al., 1993) can provoke divergent effects on both cognitive functions (e.g., risk perception, episodic memory, selective attention) and physiological responses (e.g., heart rate), regardless of their dimensional characteristics. Therefore, research-

Table 4. Comparisons of The Current Study and The Other Studies According to The Means and Standard Deviations, and The Discrete Emotional Category for Each Categorized Image

Discrete Emotions	Description	IAPS#	Current Study		Mikels et al. (2005)	Libkuman et al. (2007)	Barke et al. (2012)	Moreno et al. (2016)	De La Torre et al. (2019)	Wei et al. (2020)	
			<i>M (SD)</i>	% ^b	<i>M (SD)</i>	<i>M (SD)</i>	% ^b	% ^b	<i>M (SD)</i>	Exp. 1 % ^b	Exp. 2 <i>M (SD)</i>
Happiness	Women	1340	7.00 (1.91)	100.00		7.20 (1.80)		-		-	-
	Ferret	1410	6.10 (2.34)	70.00		-		-		-	-
	PolarBears	1441	7.33 (1.30)	100.00		-		-		-	-
	Kittens	1463	7.57 (1.45)	93.33		7.65 (1.51)		-		91.26	7.67 (2.77)
	Giraffes	1601	6.30 (2.07)	90.00		5.86 (2.10)		-		-	-
	Fawn	1630	6.38 (2.16)	70.00		-		-		-	-
	Puppies	1710	6.89 (1.55)	93.33		8.08 (1.50)		-		89.32	7.39 (2.84)
	Lion	1721	7.18 (1.40)	73.33		7.16 (1.61)		-		-	-
	Bunnies	1750	6.63 (2.04)	90.00		7.40 (1.32)		-		-	-
	Monkeys	1811	7.17 (1.54)	96.67		6.09 (2.47)		-		-	-
	Porpoise	1920	6.85 (1.93)	86.67		6.08 (2.67)		-		-	-
	Baby	2040	7.39 (1.45)	93.33		7.50 (2.11)		-		-	-
	Father	2057	6.11 (1.85)	90.00		6.83 (2.47)		-		-	-
	Baby	2070	6.62 (2.38)	70.00	-	7.52 (1.98)	-	-	-	-	-
	Girls	2091	7.83 (1.20)	96.67		7.08 (2.22)		-		-	-
	Pregnant	2155	6.38 (1.77)	70.00		-		61.67 ^a		-	-
	Bride	2209	6.08 (2.19)	80.00		7.12 (1.81)		-		83.50	4.81 (3.22)
	Binoculars	2314	7.30 (1.54)	90.00		-		-		-	-
	Chef	2331	6.12 (1.90)	83.33		6.64 (2.18)		-		-	-
	Family	2340	7.32 (1.70)	93.33		1.48 (1.05) ^a		-		94.17	6.14 (3.09)
	Children	2347	7.72 (1.73)	96.67		-		-		94.17	5.67 (3.12)
	Kids	2388	6.17 (1.64)	76.67		-		-		-	-
	El-derlyWoman	2510	6.19 (1.52)	90.00		7.00 (1.76)		-		-	-
	Couple	2530	7.34 (1.37)	96.67		6.08 (2.43)		-		-	-
AttractiveMan	4574	6.96 (1.95)	86.67		-		-		-	-	
Wedding	4626	6.52 (2.29)	83.33		-		-		-	-	

	Nature	5780	6.04 (2.01)	76.67		6.12 (2.32)	-	-	-	-	
	Sea	5825	6.00 (1.98)	73.33		-	-	-	-	-	
	Sunset	5829	6.72 (2.09)	83.33		-	-	-	-	-	
	Seagulls	5831	6.89 (1.95)	93.33		5.80 (2.24)	-	-	-	-	
	Beach	5833	6.44 (2.45)	83.33		-	-	-	-	-	
	Watermelon	7325	6.66 (1.72)	96.67		7.17 (1.83)	-	-	-	-	
	IceCream	7330	6.08 (2.13)	86.67		6.36 (2.00)	68.33		74.76	4.84 (3.21)	
	Cupcakes	7405	6.24 (1.51)	70.00		-	63.33		71.84	4.84 (3.04)	
	Castle	7502	6.37 (2.08)	90.00		5.22 (2.33)	-	-	-	-	
	Winner	8330	6.08 (2.30)	86.67		3.92 (2.18) ^a	-	-	-	-	
	TennisPlayer	8350	6.27 (2.44)	86.67		6.20 (2.27)	-	-	-	-	
	HappyTeens	8461	6.54 (1.99)	93.33		5.16 (2.66)	-	-	91.26	5.42 (3.19)	
	WaterSlide	8496	6.77 (1.89)	100.00		7.62 (1.39)	86.67		-	-	
Sadness	Baby	2053	6.70 (1.61)	76.67	4.95 (1.80)	5.92 (2.72)	-	-	4.85 (2.23)	-	-
	GrievingFem	2141	7.14 (1.86)	93.33	4.45 (1.67)	7.00 (2.47)	-	-	4.85 (2.04)	86.41	5.06 (3.04)
	Hospital	2205	7.08 (1.67)	86.67	5.30 (1.59)	7.38 (1.84)	-	-	5.22 (1.95)	88.35	6.53 (3.03)
	KidCry	2301	6.52 (1.93)	90.00	-	-	80.10	-	-	-	-
	SadGirls	2455	6.65 (1.65)	86.67	-	-	-	-	-	77.67	3.97 (2.62)
	Man	2490	6.33 (2.27)	90.00	2.95 (1.86)	4.24 (2.70)	72.25	-	3.57 (2.14)	-	-
	DrugAddict	2710	6.62 (1.50)	70.00	3.45 (1.91) ^a	5.00 (2.46)	36.64 ^a	-	-	-	-
	Bum	2750	6.09 (1.77)	73.33	4.08 (2.08) ^a	6.08 (2.23)	-	-	4.13 (2.08)	-	-
	CryingBoy	2900	7.15 (1.87)	86.67	4.47 (1.70)	7.32 (1.86)	-	-	4.39 (2.24)	-	-
	DisabledChild	3300	6.61 (1.71)	93.33	4.15 (1.83)	6.29 (2.39)	-	78.33	4.83 (2.04)	-	-
	InjuredChild	3301	8.12 (0.86)	86.67	4.83 (1.67)	6.85 (2.36)	-	-	5.74 (1.64)	-	-
	StarvingChild	9040	7.24 (1.48)	83.33	5.47 (1.50) ^a	7.24 (1.96)	-	65.00	5.63 (1.71)	-	-
	PlaneCrash	9050	7.04 (1.37)	83.33	4.93 (1.76)	6.46 (1.94)	55.49	-	4.91 (2.09)	59.22	-
	Seal	9180	7.11 (1.55)	90.00	3.97 (2.07) ^a	6.45 (2.28)	-	-	-	76.70	4.48 (3.29)
	DeadCows	9181	7.42 (1.61)	80.00	4.10 (1.95)	7.67 (1.86)	-	-	-	-	-
	HurtDog	9183	7.27 (1.52)	73.33	-	-	-	-	-	-	-
	DeadDog	9185	6.89 (1.66)	93.33	-	-	-	-	-	-	-
Assault	9254	7.29 (1.63)	80.00	-	-	62.30	-	-	-	-	

	CryingWoman	9332	6.62 (1.70)	96.67	-	-	-	-	-	-	-
	Soldier	9410	8.33 (1.13)	80.00	5.77 (1.43)	8.20 (1.35)	-	71.67	-	-	-
	Handicapped	9415	6.34 (1.74)	96.67	4.48 (1.91)	7.00 (2.47)	71.20	66.67	5.07 (1.98)	-	-
	Mastectomy	9432	6.14 (1.93)	73.33	-	5.28 (2.46)	-	-	-	-	-
	DeadMan	9433	7.38 (1.28)	70.00	4.57 (1.79) ^a	6.12 (2.31)	-	-	4.67 (2.25)	-	-
	Boys	9530	7.08 (1.67)	86.67	4.85 (1.77)	5.85 (2.81)	81.15	70.00	-	70.87	5.68 (2.97)
	SickKitty	9561	7.33 (1.30)	90.00	4.87 (1.89)	7.49 (1.78)	-	90.00	5.95 (1.48)	91.26	7.23 (2.75)
	Cat	9571	7.76 (1.16)	83.33	4.75 (2.00) ^a	7.08 (2.26)	-	-	-	-	-
	Fire	9921	7.62 (1.07)	70.00	4.73 (1.81)	6.82 (2.49)	-	-	-	52.43	-
Anger	AngryFace	2120	6.76 (1.61)	70.00	2.38 (1.80) ^a	3.29 (2.61) ^a	19.37 ^a	-	2.29 (1.94) ^a	-	-
	Snakes	1111	6.75 (2.01)	80.00	4.22 (2.13) ^a	5.24 (2.91)	74.34	-	4.44 (2.27)	-	-
	Spider	1202	6.14 (2.50)	70.00	-	-	52.83	41.67 ^a	-	-	-
	RoachOnPizza	7380	7.72 (1.58)	96.67	5.13 (1.86)	6.88 (2.39)	95.81	76.67	5.68 (1.78)	-	-
Disgust	Teeth	9043	6.00 (2.13)	76.67	-	-	-	-	-	-	-
	Dirty	9300	8.14 (1.04)	93.33	6.00 (1.19)	7.64 (2.06)	-	91.67	6.38 (1.38)	-	-
	Vomit	9325	8.47 (0.68)	100.00	-	-	-	88.33	-	-	-
	SlicedHand	9405	7.95 (0.84)	73.33	5.82 (1.66)	4.29 (2.92) ^a	-	-	5.11 (1.96)	-	-
Fear	AttackDog	1525	6.73 (1.71)	86.67	-	-	81.67	66.67	-	-	-
	Knife	6300	6.38 (1.83)	70.00	3.62 (1.91) ^a	2.84 (6.64) ^a	67.01	53.33	4.80 (2.08)	-	-

Note. ^a IAPS images assigned to different emotional categories in current study and the comparison studies. The means, standard deviations, and percentages of these images, were given according to the ratings in the comparison studies corresponding to the discrete emotional category to which they were assigned in the current study. ^b Percentage of participants choosing that discrete emotional category.

Table 5. Comparisons of IAPS Images Assigned to Different Emotional Categories in the Current Study and the Other Studies

Description	IAPS	Emotion Category					De La Torre et al. (2019)
		(Current Study)	Mikels et al. (2005)	Libkuman et al. (2007)	Barke et al. (2012)	Moreno et al. (2016)	
Pregnant	2155	happiness				ffective love	
Family Winner	2340 8330	happiness happiness		sadness-fear undefined			
DrugAddict	2710	sadness	undefined		disgust-sadness		
Bum	2750	sadness	undefined				
StarvingChild	9040	sadness	disgust-sadness				
Seal	9180	sadness	anger-disgust-sadness				
DeadCows	9181	sadness	disgust-sadness				
DeadMan	9433	sadness	disgust-sadness				
Cat	9571	sadness	anger-disgust-sadness				
AngryFace	2120	anger	undefined	undefined	fear		fear
Snakes	1111	disgust	disgust-fear				
Spider	1202	disgust				fear	
SlicedHand	9405	disgust		sadness-anger			
Knife	6300	fear	undefined	undefined			

ers should consider both dimensional and categorical approaches in order to better understand how different emotions influence our thoughts, feelings, and actions in various contexts. Overall, our data are important as they enable emotion researchers to explore how the discrete versus dimensional emotions affect cognition and behavior.

In general, our data and the data from the comparison studies showed a high degree of agreement (see Table 4). This suggested that our classification system was reliable and consistent with previous studies. On the other hand, Table 2 demonstrates that there were also some images that were not classified into the same discrete emotional category across studies. Notably, three images (IAPS: #2340, #2120, and #1202) showed significant differences. To give an example, image #2340 which was categorized as *sadness-fear* in the study by Libkuman et al. (2007), was categorized as *happiness* in our study. Similarly, image #2120 was included in the category of *anger* in our study whereas it was obtained in the category of *fear* in the studies by Barke et al. (2012) and De La Torre et al. (2019). Additionally, image #1202 was classified as *disgust* in our study, however, it was categorized as *fear* in the study by Moreno et al. (2016). Furthermore, Table 2 indicates that the other observed differences arise from the fact that the images were not included in a single discrete emotion category in the

comparison studies, but in a blended emotion category consisting of two or three discrete emotions.

Valence

The second objective of this study was to determine the valence ratings of IAPS images in a Turkish sample. In order to determine cultural differences, we compared our valence data with the previous IAPS studies. According to this, except for the comparison with the study by Wei et al. (2020), comparing our valence ratings with previous IAPS studies revealed some notable differences. These differences highlighted the potential influence of cultural differences on emotional experiences and expressions, as well as the interpretation of emotional stimuli. Accordingly, it was evident that same emotional events can yield disparate effects across different cultures or individuals (Miyamoto et al., 2010). As an illustration, an image portraying a large house surrounded by greenery (#IAPS: 7530) can evoke feelings of peace and tranquility, but also a sense of solitude. Likewise, an image representing a marriage (#IAPS: 4626) or a family (#IAPS: 2340) may have a negative influence on someone, who is not romantically involved or who lack familial connections.

Additionally, the comparisons of our data with the studies by Ito et al. (1998), and Lang et al. (2008) demonstrated that valence differences are only valid

for positive images. In these two studies the images were rated more positive than in our study. These findings broadly supported the literature indicating that people from Western cultures tend to reduce the negative and exalt the positive, while people from Eastern cultures tend to view positive and negative emotions as equally important with a dialectical perspective (Grossman et al., 2014). For example, people from Western cultures may be more presumably to pay attention to individual feelings and expressions of happiness, whereas people from Eastern cultures may be more presumably to focus on social relationships and the interconnectedness of emotions.

Furthermore, emotion literature has revealed that negative emotions are more resistant to suppress (Baumeister et al., 2001). For instance, receiving negative feedback from parents have a greater impact on people than positive ones. Similarly, negative impressions depending on negative experiences tend to occur faster and be more permanent. From an evolutionary perspective, the universality of negative stimuli associated with survival is more understandable (Cosmides & Tooby, 2000). For example, *anger* and *fear* make people alert to dangers. However, our data showed that negative images were rated more negatively in our study than in the studies by Barke et al. (2012), and Moreno et al. (2016). This finding is consistent with previous research suggesting that cultures differ in their response to negative emotions (e.g., Garret Peters and Fox, 2007; Miyamoto et al., 2010; Peng & Nisbett, 1999). For example, researchers have observed that negative emotions have a lesser effect on people from collectivist cultures than on those from individualistic cultures (Matsumoto et al., 2008). It may be because the value placed on emotional expressiveness and self-regulation differ across cultures. In collectivist cultures, prioritizing social harmony and the regulation of negative emotions is more significant, whereas in individualistic cultures, emphasis is placed on personal autonomy and the expression of emotions. Hence, cultural differences in emotion regulation may influence how negative emotions are perceived and experienced. Consequently, our findings suggested that cultural and individual differences should be considered when selecting and interpreting emotional stimuli, as well as designing and conducting emotional studies. By doing so, researchers can acquire a more comprehensive and accurate understanding of how culture, cognition, and emotion interact.

Limitations and Future Directions

The current study has some limitations to be noted. First, since the primary aim was to create a subset of IAPS images that evoke a discrete emotion, a limited number of images (one image from each semantic category) were rated, resulting in a restricted number of images for each discrete emotion category. Nevertheless, the results revealed the significance of culture-

specific stimulus selection. Therefore, it is advisable that future studies explore the discrete emotion elicited by a more extensive selection of images from the entire IAPS dataset to ensure a more comprehensive understanding.

Second, it's crucial to acknowledge the gender distribution within the sample, with a majority of participants being female. The literature on emotions suggests that various factors such as gender roles, cultural norms regarding emotional expression, social motives, power dynamics, and status significantly shape how men and women experience emotions. These factors contribute to distinct perceptions, cognitive processing, and emotional reactions based on gender (Brody et al., 2016). For instance, in a study using IAPS images, Bradley et al. (2001) found that men and women exhibited similar responses to high-arousal images, such as those depicting threats, injuries, and death. However, women tended to exhibit heightened responses to aversive images, while men showed greater responsiveness to erotic images. Furthermore, there is substantial evidence that women experience greater fear and anxiety than men throughout their lives (for a review, see McLean & Anderson, 2009). This can lead women to be more sensitive and reactive to negative stimuli than men are (Fan et al., 2022; Yuan et al., 2009). Therefore, the higher proportion of women in the current study necessitates cautious interpretation of the findings concerning their generalizability.

Third, the participants of the current study were university students. Therefore, the findings should be interpreted within the context of this sample and generalization should be approached with caution. Given the limitations, it is suggested that further research is needed to compare the results more comprehensively by selecting more images from the IAPS and incorporating the dimensions of arousal and dominance as well as age and gender variables.

Overall, despite its limitations, the present study is the first to attempt to identify the IAPS images associated with discrete emotions in a Turkish sample. It emphasizes the significance of considering the cultural context when studying emotions and underlines the necessity for further research to select culture-specific stimuli in emotion studies.

DECLARATIONS

Note In the study by Libkuman et al.'s (2007), which is one of the most comprehensive studies identifying discrete emotion categories in IAPS, each image was rated by 25 to 93 ($M = 32.36$) participants. Similarly, the Affective Norms for English Words (ANEW) dataset was rated regarding arousal, valence, and discrete emotion categories by 28 to 42 ($M = 37.24$) participants in a study conducted in Turkey (Kapucu et al., 2021). Therefore, in our study, it was decided that each subset should be rated by at least 30 participants.

Furthermore, the overall variability of valence ratings is an important criterion for comparing of normative data sets, as reported in the study by Mikels et al. (2005). According to this criterion, the overall variability of our valence ratings ($SD = 2.07$) showed that the variability of our data set is comparable with the study of Libkuman et al.'s (2007), and Lang et al.'s (2008) valence ratings ($SD_{\text{Libkuman et al. (2007)}} = 2.12$ and $SD_{\text{Lang et al. (2008)}} = 2.38$).

Compliance with Ethical Standards Ethical permission was obtained from the Ethics Committee of Hacettepe University in Turkey (Date: 17.12.2019, Number: 35853172-900).

Conflicts of Interest The authors declare that they have no conflict of interest.

Availability of Data and Material Raw data and supplementary material of this study can be found in official website of OSF (<https://osf.io/hz8q3/>)

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