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Emoji meanings (pleasure–arousal–dominance dimensions) in consumer research: Between-country and interpersonal differences

Joachim J. Schouteten[1] | **Fabien Llobell**[2] | **Sok L. Chheang**[3] | **David Jin**[3] | **Sara R. Jaeger**[3]

[1]Department of Agricultural Economics, Ghent University, Gent, Belgium

[2]Addinsoft, XLSTAT, Paris, France

[3]The New Zealand Institute for Plant & Food Research Limited, Mt Albert Research Centre, Auckland, New Zealand

Correspondence
Sara R. Jaeger, The New Zealand Institute for Plant & Food Research Limited, Mt Albert Research Centre, Private Bag 92169, Auckland 1142, New Zealand.
Email: sara.jaeger@plantandfood.co.nz

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Abstract: In line with the increasing popularity of emoji, the need for methodological research into these pictorial representations of emotion remains. The present research contributes to this goal by continuing to establish the meaning of emoji and exploring these according to between-country and interpersonal differences. The emoji (n = 12) were selected to span the valence × arousal emotion space, and the PAD model (*Pleasure–Arousal–Dominance*) was used to establish emoji meaning for the three dimensions, operationalized as measurement on 6 × 3 semantic differentials. Participants in the main study came from three countries—Germany, Singapore, and Malaysia (n = 2465), and a supplementary study included the United Kingdom and New Zealand (n = 600) (subset of four emoji). The results confirmed that emoji meanings according to the PAD model were largely similar between countries (albeit not identical). There were multiple minor significant differences for individual emoji, and where these existed, they often related to the dimension of *Arousal*, prompting a need for further investigation. Interpersonal differences were examined for gender (men and women), age group (18–45 and 46–69 years old), and frequency of emoji use. Again, significant differences were smaller rather than larger and supported the notion that emoji are generally applicable for multicountry research. However, caution regarding the participants who use emoji infrequently may be warranted.

KEYWORDS
arousal, dominance, emoji, emotion, food and beverage, valence

Practical Application: The findings from this research will help academics and practitioners who are interested in using emoji for sensory and consumer research (or are already doing so) with more robust interpretations of their findings. For a set of 12 emoji that provide broad coverage of the valence × arousal emotional space, meanings are provided on the three dimensions of the

PAD model. The data is collected in five countries and contributes to increased confidence that emoji meanings are by and large similar in these countries.

1 | INTRODUCTION

Emotion measurements are becoming more and more embedded in sensory and consumer research as a means for understanding how products make consumers feel (Meiselman, 2021; Meiselman et al., 2022). The inclusion of emotional product associations provides the information "beyond liking" (Meiselman et al., 2022; Schouteten, 2021) and can help to better predict food choice compared to using product liking only (Dalenberg et al., 2014; Giacalone et al., 2022). While the initial focus lay on the use of verbal methods (i.e., word-based) using self-report questionnaires (Lagast et al., 2017), there has been a growing interest in using emoji, as these are graphical representations that convey emotions and feelings (Jaeger et al., 2021a; Riordan, 2017).

In contrast with word-based emotion questionnaires, emoji are nonverbal and allow consumers to express nonverbal emotions or emotions which might be expressed differently when using words (Ares & Jaeger, 2017). Since most consumers nowadays use emoji for communications on social media platforms and in digital communications, participants in sensory and consumer research may have more experience expressing their emotions related to foods and beverages by means of emoji than words. This improves ecological validity of research using emoji (Bai et al., 2019; Jaeger et al., 2013; Jaeger et al., 2021b). Another advantage of emoji is that these are a standardized set of icons, which are said to be beneficial in cross-cultural research given the lack of translation which often causes difficulties in such research when using emotional words (Jaeger et al., 2021b). A recent study by Jaeger, Jin, et al. (2021) found that the emoji meanings of 24 emoji in New Zealand and the United Kingdom were highly similar, although a direct statistical comparison between countries was not performed. Earlier research by Jaeger et al. (2021a) showed that the emoji meanings of 33 emoji were rather similar between the consumers of USA and China. In light of these limited between-country comparisons, more research regarding emoji meanings in different countries is needed.

Although emoji are increasingly used in sensory and consumer research, several hurdles have been identified for their uptake. Among these, the most important is the limited knowledge of emoji meanings (Jaeger et al., 2021a). Beyond their verbal meaning—that is, the emotion words that each emoji are associated with—emoji also need to be understood in relation to the main dimensions of emotions and core affect. These are valence (spanned between positive and negative) and arousal (spanned between activated and deactivated) (Russell, 1980; Russell et al., 1989; Yik et al., 2011). The dimension of dominance or power (spanned between the poles of dominance and submission) is also recognized (e.g., Scherer et al., 2013) but has been given much less attention than valence and arousal and the two-dimensional emotional space these spans. While Jaeger et al. (2021a) and Jaeger, Jin, et al. (2021) contributed insights on the semantic meanings of emoji, it was limited from the perspective of not focusing on "dimensional meanings" and not including emoji that spanned valence × arousal space well. The present research contributes to a closing of this gap.

It does so by focusing on a recent variant of the circumplex-inspired emotion questionnaire (CEQ) (Jaeger et al., 2020) that was introduced by Schouteten et al. (2022) and replaced emotion words with emoji (shown in Part 1 of Supporting Information). Seeking to overcome a documented limitation of many existing word-based emotion questionnaires (Cardello & Jaeger, 2021), one of the defining features of the word-based CEQ is that it spans the valence × arousal space well. The emoji variant of the CEQ was developed to do the same as far as possible, in acknowledgement of i) the importance of these dimensions for human core affect, and ii) underpinning empirical studies showing that explicit inclusion of the arousal dimension in the CEQ can improve product differentiation in applied research (Jaeger et al., 2020; Jaeger, Roigard, & Chheang, 2021). The development of the emoji CEQ rested on a study in which participants were asked to select the one emoji that they considered to be a good representation for each word pair. The emoji CEQ has also been applied to 15 written food stimuli, illustrating that the emoji CEQ is suitable for applied research (Schouteten et al., 2022). Moreover, emotional product profiles were largely similar to those obtained from the word-based CEQ variant, although some differences were established for certain food stimuli.

Besides contributing new knowledge by way of the emoji included in the research, additional knowledge is gained by focusing on "dimensional meaning" of emoji, which is lacking. This essentially means measuring where on the dimensions of valence and arousal individual emoji are placed. Furthermore, for a more complete dimensional

characterization, there is merit in also considering the dominance dimension (dominant to submissive), which is sometimes referred to as a "power" dimension as it indicates to what extent a person is in control of a situation. Up to now, the dominance dimension is largely neglected in current food emotion research with adults (Scherer et al., 2013; Jaeger, Roigard, & Chheang, 2021). To gain these insights, the research draws on the PAD model and measurement instrument (*Pleasure, Arousal* and *Dominance*; Mehrabian & Russell, 1974). Since it incorporates the three aforementioned dimensions and has been validated for use in food-related settings (Jang & Lee, 2019; Jang et al., 2011), it is well suited for the emoji from the emoji CEQ and determining their meanings.

1.1 | Aims of the research and empirical overview

Given the need for more multicountry research on emoji meanings, the present research first seeks to determine emoji meanings based on the three-dimensional PAD model for 12 emoji used in the emoji CEQ (Objective 1). Such data is currently lacking for most emoji of the emoji CEQ and in the present research data is obtained from three countries (Germany, Singapore, and Malaysia) where emoji meanings regarding valence, arousal and dominance have not yet been established for any emoji, to the best of the authors' knowledge. To strengthen the between-country comparison of emoji meaning on the PAD dimensions, data from prior research carried out in New Zealand and the United Kingdom (Jaeger, Jin, et al., 2021) was included and enabled a five-country comparison for four emoji on the three PAD dimensions of meaning.

Second, this paper examines the heterogeneity in emoji meaning for each of the PAD dimensions with respect to the 12 emoji in the emoji CEQ (Objective 2). Focus was directed to whether interpersonal differences with respect to the frequency of emoji use, age, and gender modulated emoji meaning. Prior research found that Chinese consumers interpreted 33 facial emoji quite similarly using a check-all-that-apply (CATA) question regardless of gender and frequency of emoji/emoticon use in computer-mediated communications, while some age-related differences existed for a few emoji (Jaeger et al., 2018). Furthermore, Sick, Monteleone, et al. (2020) and Sick, Spinelli, et al. (2020) also found differences in emoji meanings based upon gender and age in a study with preadolescents. To date, there has been no multicountry study (to the authors' knowledge) examining the impact of frequency of emoji use, age, and gender on the *Pleasure*, *Arousal*, and *Dominance* meanings of emoji.

2 | MATERIALS AND METHODS

2.1 | Participants

2.1.1 | Main study

Participants were adults from Germany (DE) (n = 618), Singapore (SG) (n = 618), and Malaysia (MY) (n = 1229), who had self-registered with an ISO-accredited web panel provider (International Organization for Standardization, 2019). Quota sampling was used in each country, with proportional interlocking criteria for gender (man or woman) and two age groups (18 to 45 or 46 to 69 years old). Full geographical coverage was obtained in each country, but the samples were not nationally representative. To be eligible for participation, participants had to be involved in household grocery shopping at least once a week. Part 2 of Supporting Information has full participant details.

2.1.2 | Supplementary study

Data from adults in the United Kingdom (UK) (n = 438) and New Zealand (NZ) (n = 162) enabled an extension to Objective 1. Participant recruitment and inclusion criteria were the same as above and described in full in Jaeger, Jin, et al. (2021).

2.1.3 | Human ethics

A general approval for sensory and consumer research from the Human Ethics Committee at the New Zealand Institute for Plant and Food Research Limited (PFR) covered the research. Participants gave informed consent and were assured that their responses would be kept confidential. As compensation, the participants were awarded reward points that could be used for online purchases.

2.2 | Methodology

2.2.1 | Emoji included in the study

The 12 emoji included in the study were those from Schouteten et al. (2022) who developed an emoji variant of the valence × arousal circumplex-inspired emotion questionnaire (CEQ) (Jaeger et al., 2020). Thus, the number of evaluated emoji in this study were lower than other recent studies (e.g., Jaeger et al., 2019; Sick et al., 2020), but they provided a good coverage of the valence × arousal emotional space by virtue of stemming from the emoji CEQ.

TABLE 1 The semantic differentials included in the pleasure–arousal–dominance (PAD) scale

PAD dimension	PAD code	Left anchor (1)	Right anchor (9)
Pleasure (pleasure–displeasure)	P1	Happy	Unhappy
	P2	Pleased	Annoyed
	P3	Satisfied	Unsatisfied
	P4	Contented	Melancholic
	P5	Hopeful	Despairing
	P6	Amused[a]	Bored
Arousal (arousal–non-arousal)	A1	Stimulated	Relaxed
	A2	Excited	Calm
	A3	Frenzied	Sluggish
	A4	Jittery	Dull
	A5	Wide-awake	Sleepy
	A6	Aroused	Unaroused
Dominance (dominance–submissiveness)	D1	Controlling	Controlled
	D2	Influential	Influenced
	D3	In control	Cared-for
	D4	Important	Awed
	D5	Dominant	Submissive
	D6	Autonomous	Guided

Note: Responses obtained on a 9-point scale.

[a]Changed scale anchor relative to Mehrabian and Russell (1974), in accordance with Detandt et al. (2017).

The emoji were: confounded face (😖), face with steam from nose (😤), grinning face (😀), star-struck face (🤩), hugging face (🤗), shushing face (🤫), pensive face (😔), relieved face (😌), worried face (😟), person in lotus position (🧘), warning (⚠️), and yawning face (🥱). The four emoji included in both the main and Supporting Information were: face with steam from nose (😤), person in lotus position (🧘), warning (⚠️), and yawning face (🥱). See also Part 1 of Supporting Information for a depiction of the emoji CEQ.

2.2.2 | Scales for measuring emoji meaning

An established measurement tool valid for the scientific study of human emotions was used to measure emoji meaning in the present study, namely the PAD scale from Mehrabian and Russell (1974). This approach evaluates each stimulus—emoji in this case—on three emotion dimensions: *Pleasure* (P), where low anchor (1) is associated with pleasure and high anchor (9) is associated with displeasure; *Arousal* (A), where low anchor (1) is associated with arousal and high anchor (9) is associated with non-arousal; and *Dominance* (D), where low anchor (1) is associated with dominance and high anchor (9) is associated with submissiveness. Table 1 lists the items in the PAD instrument, where six semantic differentials underpin each of the three dimensions. There was one minor change for item P6, based on Detandt et al. (2017): the right anchor (9) was retained as "bored," while the left anchor (1) was changed from "relaxed" to "amused."

2.3 | Data collection

Participants from Singapore and Malaysia completed the survey in English. They were self-declared proficient in this language. The German language was used in Germany. Translation of the English survey version was performed by the online web provider and revised by an experienced bilingual consumer researcher. Part 3 of Supporting Information has the German translation of the 18 PAD scales.

In a location of their choosing, participants completed the study using a desktop/laptop computer or tablet. The data were obtained as part of surveys/research sessions that included task other than those described here (not considered further due to lack of relevance). Requirements related to these other tasks prevented participants from completing the study on a mobile phone. Demographic and socioeconomic information was obtained as the final part of the survey.

Participants evaluated 6 of the 12 emoji (Germany or Singapore) or 3 of the 12 emoji (Malaysia). This difference was motivated by consideration for overall survey length

and the other tasks also completed by participants. In each country, each emoji was evaluated by ~308 participants (307 to 310), and these subsets of people were similarly defined and comprised 25% of participants from each of the gender/age group profiles specified by the quota sampling approach.

To complete the task, the participants were asked to look at an emoji and adjust the marker on each scale to provide their responses. Emoji were presented in randomized order, and responses for the 18 PAD scales were obtained before participants proceeded to the next emoji. The 18 PAD scales were presented horizontally, and emoji were shown individually (Part 4 of Supporting Information). The iOS14.2 rendition (120 × 120 pixels) was used to represent the emoji, which were shown onscreen in sizes that clearly showed the facial features of the emoji. The actual size depended on the data collection device used by each participant (e.g., 2.5 × 2.5 cm on a 27-in. screen and smaller on a 15-in. screen) but was constant for all emoji on the same device.

Background questions were collected after the task, as was general frequency of emoji use (Objective 2). For the latter, the participants were asked how often they used emoji when sending messages, emails, etc. The five answer options were: 1 = "Never or very infrequently (< 10% of my messages/conversations)," 2 = "Infrequently (generally not, but on occasion, 10–35% of my messages/conversations)," 3 = "Sometimes (not all the time, but neither rarely, 35–65% of my messages/conversations)," 4 = "Frequently (more often than not, 65–90% of my messages/conversations)," and 5 = "Always or almost every time (> 90% of my messages/conversations)."

Data collection in the Supporting Information proceeded similarly to above. Refer to Jaeger, Jin, et al. (2021) for full details.

2.4 | Data analysis

All analyses were performed in XLSTAT v.2022.1 (Addinsoft, 2022) and R software version 3.6.0 (R Core Team, 2019) using a 5% significance level.

2.4.1 | Objective 1

Drawing on the approach in Jaeger, Jin, et al. (2021), Cronbach alpha values were computed for the six semantic differential scales in each of the three PAD dimensions. In all instances, these exceeded the 0.7 threshold (Tavakol & Dennick, 2011) and values for α for, respectively, *Pleasure*, *Arousal*, and *Dominance* were: Germany—0.95, 0.85, and 0.77; Singapore—0.95, 0.83, and 0.79; Malaysia – 0.94, 0.80, and 0.75. Principal components analysis (PCA) of the correlation matrix was performed next to establish that the 18 semantic differential scales grouped as expected with six scales for each of the three PAD dimensions. Using three principal components (PCs), RV coefficients (Robert & Escoufier, 1976) were calculated to determine the similarity between the PCA loadings matrixes of the emoji and the PAD dimensions for Germany, Singapore, and Malaysia.

Having confirmed the appropriateness of doing so, each emotion dimension (P, A, and D) was reduced to one variable by averaging the six semantic differentials composing it. These calculations were performed separately for each emoji and on an emoji-by-emoji basis followed by one-way ANOVA for each of the P, A, and D dimension scores (dependent variable) using country as the fixed factor (supplemented with Tukey's HSD post-hoc tests; Abdi & Williams, 2010). Following Cohen (1988), effect sizes were calculated and graded as follows: $\eta^2 > 0.01$ is "small," $\eta^2 > 0.059$ is "medium," and $\eta^2 > 0.138$ is "large." The computation of effect sizes was pertinent given the large number of observations [product × consumer (11,103 for global analysis, and between 924 and 927 for each emoji)].

Using data from the main and Supporting Information, it was possible to perform one-way ANOVA and Tukey's post-hoc tests on the each of the P, A, and D dimension scores (dependent variable) for four emoji (😤, 🧘, ⚠️, 🤒) with country as the fixed factor.

2.4.2 | Objective 2

The analyses followed the same pattern as Objective 1. First, ANOVAs were performed with each dimension (P, A, and D) as a response variable and participants' frequency of emoji use, gender, and age as factors. As before, given the very large number of observations (11,103), we drew conclusions based on effect size. In a second step, these ANOVAs were carried out emoji by emoji in order to determine whether heterogeneity did not occur within some of the emojis. Post-hoc analyses were performed to determine if any trends existed between PAD dimensions and person-related factors.

3 | RESULTS AND DISCUSSION

3.1 | Emoji meaning on PAD dimensions and country comparison (Objective 1)

3.1.1 | Meaning of 12 emoji in three countries according to the PAD scores

The appropriateness of calculating averages for *Pleasure*, *Arousal*, and *Dominance* was confirmed. The PCA results

(Part 5 of Supporting Information has full details) showed that the 18 semantic differential scales appropriately placed in three groups of six P, A, or D variables regardless of country (PC2 vs. PC3). Moreover, the first PC showed that the six variables within each PAD dimension were positively correlated which supported the calculation of dimension averages. RV coefficients based on loadings confirmed agreement in the country results regarding perceived similarities and differences in emoji meaning: SG-DE = 0.85, SG-MY = 0.90, and DE-MY = 0.74.

On this basis, the means for each emoji were calculated by country on the three PAD dimensions. Figure 1 shows similar values across countries for individual emoji, providing initial support for the hypothesis that cross-cultural differences in emoji meanings would be smaller rather than larger. The formal hypothesis test began with a test for an overall effect between countries. It involved performing ANOVAs on the three dimensions (P, A, and D) with the countries as factors without differentiating the emojis. The *p*-values pointed to a significant difference between countries for the *Dominance* dimension ($p = 0.034$), although likely due to the large sample size. For this reason, effect size calculations were performed, yielding $\eta^2 < 0.01$ for all three PAD dimensions, hereby indicating "no effect size" (Table 2). This paved the way for performing similar analyses on the individual emoji, also summarized in Table 2. Among the 36 effect size calculations, it was found that $\eta^2 < 0.01$ (i.e., "no" effect size) in 16 instances (44%) and $\eta^2 < 0.059$ (i.e., "small" effect size) in 19 instances (53%). There was only a single instance—*face with steam from nose* (😤) on the *Arousal* dimension—where the effect size was classified as "medium" based on $\eta^2 = 0.0601$ (a value for η^2 that was only just above the threshold of 0.059 in Cohen, 1988).

With respect to emoji meaning, clear patterns were evident in the mean values. Foremost among these was the observation that the range of mean scores across the 12 emoji included in the main study was largest for *Pleasure*, followed by *Arousal*. The emoji were perceived as being most similar regarding *Dominance* (Figure 1). Refer to Part 6 of Supporting Information for supporting tables including post hoc results.

Considering *Pleasure*, the three emoji perceived most positively were *grinning face* (😀), *star-struck face* (🤩), and *hugging face* (🤗). Conversely, the four most negatively perceived emoji were *pensive face* (😔), *worried face* (😟), *confounded face* (😖), and *face with steam from nose* (😤) (Figure 1a). There were four emoji—*hugging face* (🤗), *pensive face* (😔), *worried face* (😟), and *face with steam from nose* (😤)—where the effect size for cross-cultural differences for *Pleasure* were "small" (Table 2), and in all instances, the mean score for Malaysia was different to the mean scores for Germany and Singapore (Figure 1). The Malaysian respondents perceived *hugging face* (🤗) as less positive, while the other three emoji were perceived as less negative.

For the *Arousal* dimension, the most activated emoji were *star-struck face* (🤩), *face with steam from nose* (😤), *grinning face* (😀), and *hugging face* (🤗) (Figure 1b). However, the rank ordering of these four differed between the three countries, largely due to the differences in perceptions of *face with steam from nose* (😤). German participants perceived this emoji as higher in emotional arousal than did participants from Singapore, who in turn perceived it as more activated than did the participants from Malaysia (Figure 1b). The emoji perceived as most deactivated was *yawning face* (🥱); then followed *person in lotus position* (🧘), *pensive face* (😔), and *worried face* (😟) (Figure 1b). Overall, it was for the *Arousal* dimension that the 12 emoji were perceived most differently, and in only two instances—*warning* (⚠️) and *shushing face* (🤫)—was the effect size for country negligible (Table 2).

For *Dominance*, the range of means were constricted compared to the *Pleasure* dimension, but still fitted expectations. The emoji perceived as most dominant were *warning* (⚠️), *star-struck face* (🤩), *grinning face* (😀), and *face with steam from nose* (😤). Conversely, the emoji perceived as most submissive were *pensive face* (😔), *worried face* (😟), *yawning face* (🥱), and *confounded face* (😖) (Figure 1c). For six emoji, the effect size linked to country was "small," while the effect was negligible for the other six emoji (Table 2).

Figure 2 shows the mean PAD scores for the 12 emoji in another representation—by country and arranged in accordance with the emoji CEQ (Schouteten et al., 2022) (Part 1 of Supporting Information). This helps to focus on the evolution of scores within the valence × arousal emotion space, and it can be seen that the values for *Pleasure* and *Arousal* evolve as expected based upon prior research of the emoji CEQ (Schouteten et al., 2022). For *Pleasure*, this is most obvious, and in all three countries, the shape of the blue line tracks lower scores (i.e., more positive) in the right-hand side of Figures 2a–c (tending towards a more pronounced effect for emoji that are also emotionally activated [i.e., 🤩, 🤗, 😀]). Conversely, the mean scores for *Pleasure* were higher in the left-hand side of Figures 2a–c (i.e., more negative), especially also in combination with emotional activation (i.e., 😟, 😤, 😖). Emotional deactivation was higher in the lower parts of Figures 2a–c (seen as higher mean scores), and notably less so for *shushing face* (🤫) than its immediate neighbors (🧘 and 🥱). There

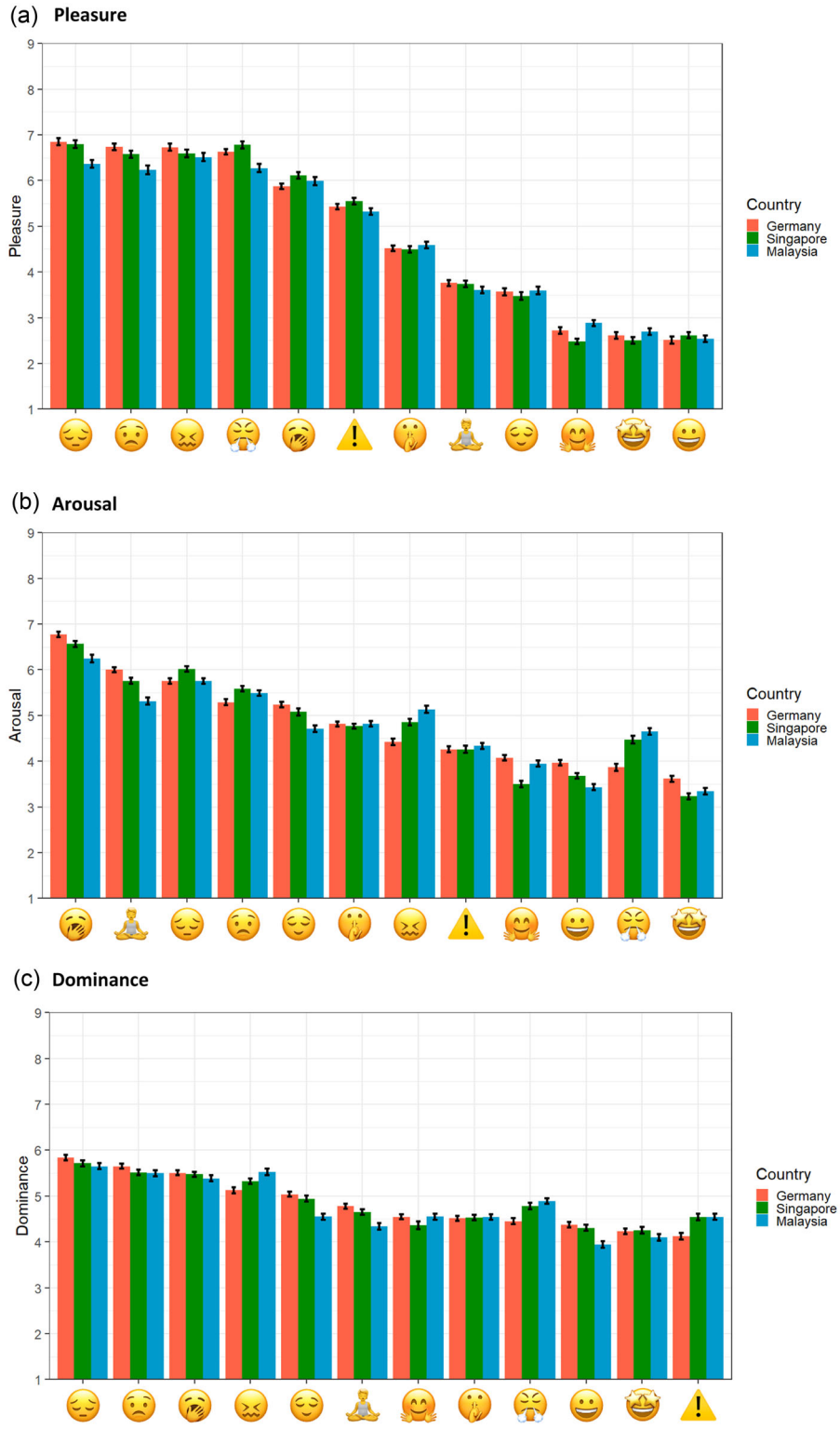

FIGURE 1 Emoji characterization by PAD dimensions (main study) for: (a) *Pleasure* (P), where low anchor (1) is associated with pleasure and high anchor (9) is associated with displeasure; (b) *Arousal* (A), where low anchor (1) is associated with arousal and high anchor (9) is associated with non-arousal; and (c) *Dominance* (D), where low anchor (1) is associated with dominance and high anchor (9) is associated with submissiveness. Values shown are means, with standard error as error bars. Within PAD dimension, emoji are sorted from the highest to lowest mean values for Germany, and this order of the emoji is kept for the other two countries

TABLE 2 The results (main study) from ANOVA with country (Germany, Singapore, and Malaysia) as explanatory variable to investigate cross-cultural differences in emoji meanings according to PAD scores (P: pleasure, A: arousal, D: dominance)

Response	F-value[a]	*p*-value	η^2	Effect size[b]
Global analysis				
P	2.9	0.055	0.0005	None
A	2.4	0.089	0.0004	None
D	3.4	0.034	0.0006	None
Confounded face (😖)				
P	1.7	0.179	0.0037	None
A	25.0	<0.0001	0.0512	Small
D	9.9	<0.0001	0.0209	Small
Face with steam from nose (😤)				
P	11.7	<0.0001	0.0247	Small
A	29.4	<0.0001	0.0601	Medium
D	11.4	<0.0001	0.0241	Small
Grinning face (😀)				
P	0.6	0.566	0.0012	None
A	17.8	<0.0001	0.0371	Small
D	12.1	<0.0001	0.0255	Small
Hugging face (🤗)				
P	8.9	0.00014	0.0190	Small
A	22.1	<0.0001	0.0458	Small
D	2.6	0.076	0.0056	None
Pensive face (😔)				
P	10.1	<0.0001	0.0215	Small
A	5.9	0.003	0.0127	Small
D	2.3	0.100	0.0050	None
Person in lotus position (🧘)				
P	1.4	0.239	0.0031	None
A	28.0	<0.0001	0.0571	Small
D	14.6	<0.0001	0.0306	Small
Relieved face (😌)				
P	0.6	0.550	0.0013	None
A	15.5	<0.0001	0.0325	Small
D	16.4	<0.0001	0.0344	Small
Shushing face (🤫)				
P	0.60	0.552	0.0013	None
A	0.30	0.745	0.0006	None
D	0.1	0.939	0.0001	None
Star-struck (🤩)				
P	1.9	0.154	0.0040	None
A	8.3	0.00026	0.0178	Small
D	1.4	0.242	0.0031	None
Warning (⚠)				
P	2.6	0.074	0.0057	None
A	0.4	0.704	0.0008	None
D	12.0	<0.0001	0.0254	Small

(Continues)

TABLE 2 (Continued)

Response	F-value[a]	*p*-value	η^2	Effect size[b]
Worried face (😟)				
P	9.8	<0.0001	0.0208	Small
A	5.8	0.003	0.0125	Small
D	2.0	0.142	0.0042	None
Yawning face (🥱)				
P	2.6	0.077	0.0055	None
A	14.0	<0.0001	0.0294	Small
D	1.1	0.334	0.0024	None

Note: Results shown for a global analysis including the 12 eligible emoji and subsequently for individual emoji.
[a]The degrees of freedom for F-tests were 2, and the total number of observations was 11,104 for the global analysis and between 924 and 927 for individual emoji.
[b]Effect sizes were graded according to Cohen (1988) where $\eta^2 > 0.01$ is "small," $\eta^2 > 0.059$ is "medium," and $\eta^2 > 0.138$ is "large."

was no discernible pattern in mean scores for *Dominance* across the 12 CEQ emoji, which was seen in Figures 2a–c as red lines that were mostly circular.

3.1.2 | Meaning of four emoji in five countries according to PAD scores

An analysis across five countries was performed on the four emoji included in both the main and the Supporting Information (i.e., *face with steam from nose* (😤), *person in lotus position* (🧘), *warning* (⚠️), and *yawning face* (🥱)). The analysis strategy was the same as that used for the main study, and for the global analysis, effect size calculations yielded $\eta^2 < 0.001$ for all three PAD dimensions, hereby indicating "no effect size" (Table 3). However, at the level of the individual emoji, the significant differences in mean scores were found in all instances except for *yawning face* (🥱) on the Dominance dimension ($p = 0.269$, $\eta^2 = 0.0048$). For the *Arousal* dimension, the effect sizes were "medium" for three of the four emoji (*face with steam from nose* (😤), *person in lotus position* (🧘), *and yawning face* (🥱)) (Table 3). Despite these differences, it was evident that cross-cultural differences in meaning across the five countries were, on average, rather small. Figure 3 visually shows this, while also identifying New Zealand (and Malaysia) as the countries that most often differed from the others, occupying the highest and/or lowest mean PAD dimension scores. Refer to Part 7 of Supporting Information for supporting tables including post hoc results.

3.1.3 | Objective 1 discussion

To further facilitate their uptake in consumer research, a better understanding of the meanings of emoji that cover the valence × arousal space in a multicountry context is necessary. Therefore, the present research characterized the emoji meaning of 12 emoji, selected based upon the emoji CEQ, against three dimensions (*Pleasure, Arousal*, and *Dominance*) for three countries (Germany, Singapore, and Malaysia) (main study). The study found multiple between-country differences for the 12 emoji meanings of the PAD dimensions, but effect size calculations showed these to almost exclusively be "small." Predominantly "small" between-country differences were also confirmed for four emoji when including data from two additional countries (New Zealand and UK) obtained in a prior study. These findings are in line with research from Barbieri et al. (2016), Jaeger et al. (2021a), and Jaeger, Jin, et al. (2021), and further support the application of emoji in cross-cultural consumer studies. However, it is important to stress that the present research does identify many "small" and some "medium" between-country differences. Hence, the appropriate conclusion is not that no differences exist but rather than many smaller differences exist, and we accept that some scholars may interpret this as lack of evidence for cross-cultural similarity. However, from an applied perspective, we suspect that these differences do not threaten application, although evidence hereof in the form of further empirical research would be welcome.

Regarding such possible future research, it would be interesting to further explore why "medium" effect sizes only occurred for the *Arousal* dimension (main and supplementary study). Why this result occurred is unclear, but cross-cultural differences may exist. According to Lim (2016), Westerners experience high arousal emotions more than low arousal emotions, while Easterners (or more collectivist cultures) value low arousal emotions more. An alternative explanation could be that people have less experience with expression and scaling of *Arousal* than *Pleasure*, which may contribute to greater differences. The 12 emoji differed the least on the *Dominance* dimension, which might be due to the selection criteria for the emoji in this study. But the low span of average scores on the

TABLE 3 The results (main study and supplementary study) from ANOVA with country (Germany, Singapore, Malaysia, UK, and New Zealand) as explanatory variable to investigate cross-cultural differences in emoji meanings according to PAD scores (P: pleasure, A: arousal, D: dominance)

Response	F-value[a]	*p*-value	η^2	Effect size[b]
Global analysis				
P	3.7	0.005	0.0034	None
A	4.4	0.001	0.0040	None
D	4.5	0.001	0.0042	None
Face with steam from nose (😤)				
P	8.4	<0.0001	0.0304	Small
A	18.2	<0.0001	0.0639	Medium
D	6.9	<0.0001	0.0251	Small
Person in lotus position (🧘)				
P	6.2	<0.0001	0.0225	Small
A	20.3	<0.0001	0.0703	Medium
D	9.0	<0.0001	0.0325	Small
Warning (⚠️)				
P	3.1	0.016	0.0114	Small
A	3.3	0.010	0.0123	Small
D	9.5	<0.0001	0.0344	Small
Yawning face (🥱)				
P	4.9	0.001	0.0179	Small
A	19.5	<0.0001	0.0679	Medium
D	1.3	0.269	0.0048	None

Note: Results shown for a global analysis including the 4 eligible emoji, and subsequently for individual emoji.

[a]The degrees of freedom for F-tests were 4, and the total number of observations was 4301 for the global analysis and between 1071 and 1080 for individual emoji.

[b]Effect sizes were graded according to Cohen (1988) where $\eta^2 > 0.01$ is "small," $\eta^2 > 0.059$ is "medium," and $\eta^2 > 0.138$ is "large."

Dominance dimension compared to the *Pleasure* and *Arousal* dimensions are in line with prior findings by Jaeger, Jin, et al. (2021) suggesting that the *Dominance* dimension might be less crucial for emotion research when adults are involved. In contrast, the *Dominance* dimension seems to be of more importance when working with preadolescents (Sick et al., 2020, 2022), as they are potentially more focused on the control of the situation than on physiological activation (Barrett, 2006).

The decision to only include 12 emoji was a limitation of the present research, but it was nonetheless a deliberate decision as the emoji were chosen based on the emoji CEQ (Schouteten et al., 2022) to achieve good coverage of the valence × arousal space. Although the means for *Pleasure* and *Arousal* evolved clockwise as expected by the CEQ (Figure 2), the range of the average scores was higher for the *Valence* than the *Arousal* dimension. The fact that emoji are less able to span the *Arousal* dimension has previously been raised as a concern (Jaeger et al., 2021a), and this research confirmed that there is room for improvement in *Arousal* dimension coverage as also recommended by Schouteten et al. (2022).

The present research used the averaged PAD dimension scores as its primary response variables. Considering that each of these were calculated as averages of six semantic differentials, scholars interested in more detailed insights about emoji meanings could further explore these 18 variables. The two-dimensional variables plots following PCA of PAD ratings of 12 emoji (Part 5 of Supporting Information) suggested that such more in-depth analysis could yield further insights. We encourage this on a need-to basis, but also acknowledge the benefit of only having to consider the three PAD dimensions (i.e., avoid information overload). Tentatively, the latter may be a benefit in much applied research.

Status as *lingua franca* in Singapore and Malaysia (https://en.wikipedia.org/wiki/Lingua_franca) justified conducting the survey in English in these two countries. However, it is a possibility that participants were not native English speakers, which may have limited fluency and depth in emotional language. Thus, confirmation of the current results in other languages spoken in these countries is pertinent (e.g., Malay and Mandarin). In Germany, people with another other primary language (e.g., Turkish)

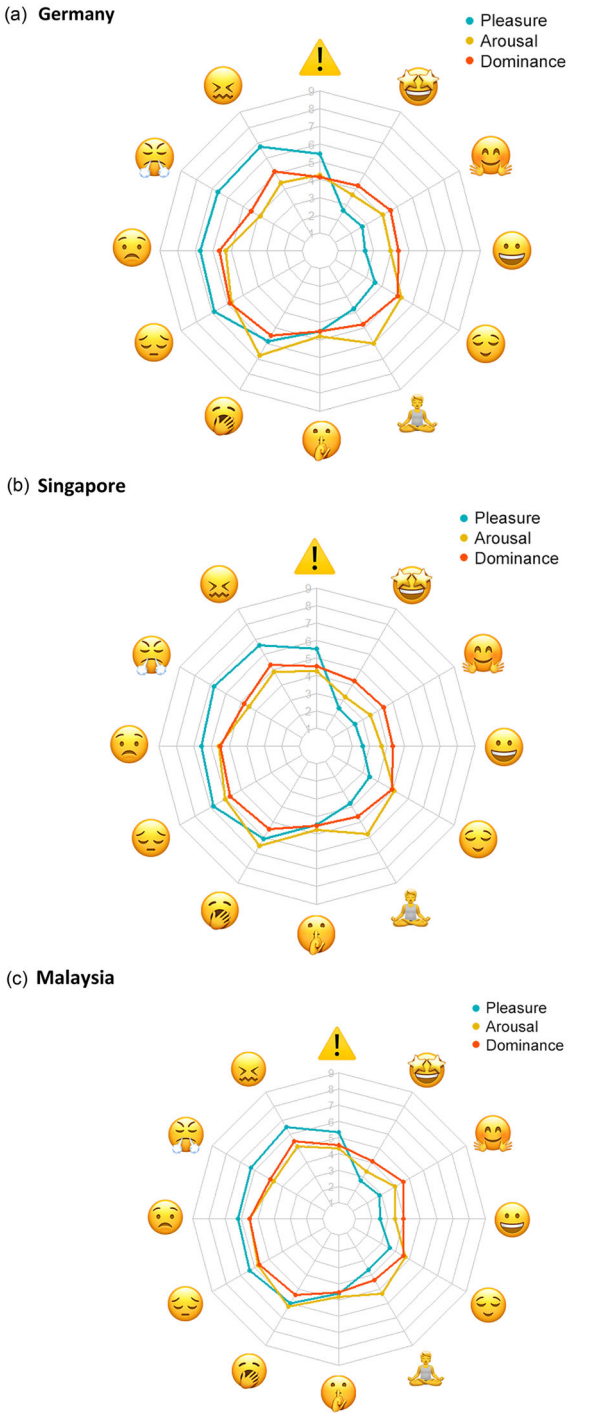

FIGURE 2 Spider plots of mean PAD dimension scores for emoji shown by country (main study): (a) Germany, (b) Singapore, (c) Malaysia. Within country, the 12 emoji are visually arranged to resemble the emoji version of the circumplex-inspired valence × arousal emotion questionnaire (CEQ). For *Pleasure* (P: blue line), low anchor (1) is associated with pleasure and high anchor (9) is associated with displeasure; for *Arousal* (A: yellow line), where low anchor (1) is associated with arousal and high anchor (9) is associated with non-arousal; and for *Dominance* (D: red line), where low anchor (1) is associated with dominance and high anchor (9) is associated with submissiveness. For visual clarity, error bars are not shown

also warrant accommodation for a more complete national representation.

3.2 | Emoji meaning on PAD emotion dimensions by emoji frequency of use, gender, and age (Objective 2)

3.2.1 | Objective 2 results

The results for Objective 1 pointed to considerable consensus in emoji meaning on the PAD dimensions among participants from multiple countries. However, heterogeneity in emoji meaning may exist nonetheless, and Objective 2 explored this in relation to participants' frequency of emoji use, gender, and age group. ANOVA was performed for each emoji on each of the three PAD dimensions, using one of the three factors as the explanatory variable. The results are presented in turn, starting with frequency of emoji use.

Mirroring the approach from Objective 1, the first test pooled data from all emoji to determine an overall effect of frequency of emoji use. Effect size calculations yielded $\eta^2 < 0.01$ for all three PAD dimensions (i.e., "no" effect size), and for individual emoji, the "small" effect size result ($\eta^2 < 0.059$) was replicated in 50% of all instances. Table 4 summarizes this by PAD dimension, identifying the focal 7 of 12 emoji for *Pleasure*, 6 of 12 emoji for *Arousal*, and 5 of 12 emoji for *Dominance* (refer to Part 8 of Supporting Information for supporting tables including post hoc results). There was a notable overlap in the listed emoji with *hugging face* (🤗), *relieved face* (😌), *shushing face* (🤫), and *star-struck face* (🤩) identified for each of the three PAD dimensions. Furthermore, small effect sizes were identified for *grinning face* (😀) and *warning* (⚠️) for two of three PAD dimensions. The strongest effects were found for *star-struck face* (🤩) with $\eta^2 = 0.0486$ for *Pleasure* and $\eta^2 = 0.0469$ for *Arousal*.

Using the emoji *star-struck face* (🤩) as the exemplar, the relationship between mean PAD ratings and frequency of emoji use is shown in Figure 4a (*Pleasure*) and Figure 4b (*Arousal*) and, respectively, show that increased frequency of emoji use is associated with higher *Pleasure* and *Arousal* mean scores. This pattern was confirmed for other emoji also when $\eta^2 > 0.01$. The effect sizes were smaller for *Dominance*, and the relationship between mean scores and frequency of use was less systematic.

Gender and age group (18–45 or 46–69 years old) influenced mean PAD scores much less than frequency of emoji use and in all instances the effect sizes for individual emoji were "small" (Table 4), corresponding to the global analysis all three PAD dimensions indicating "no effect" size. Furthermore, the differences in PAD mean scores were

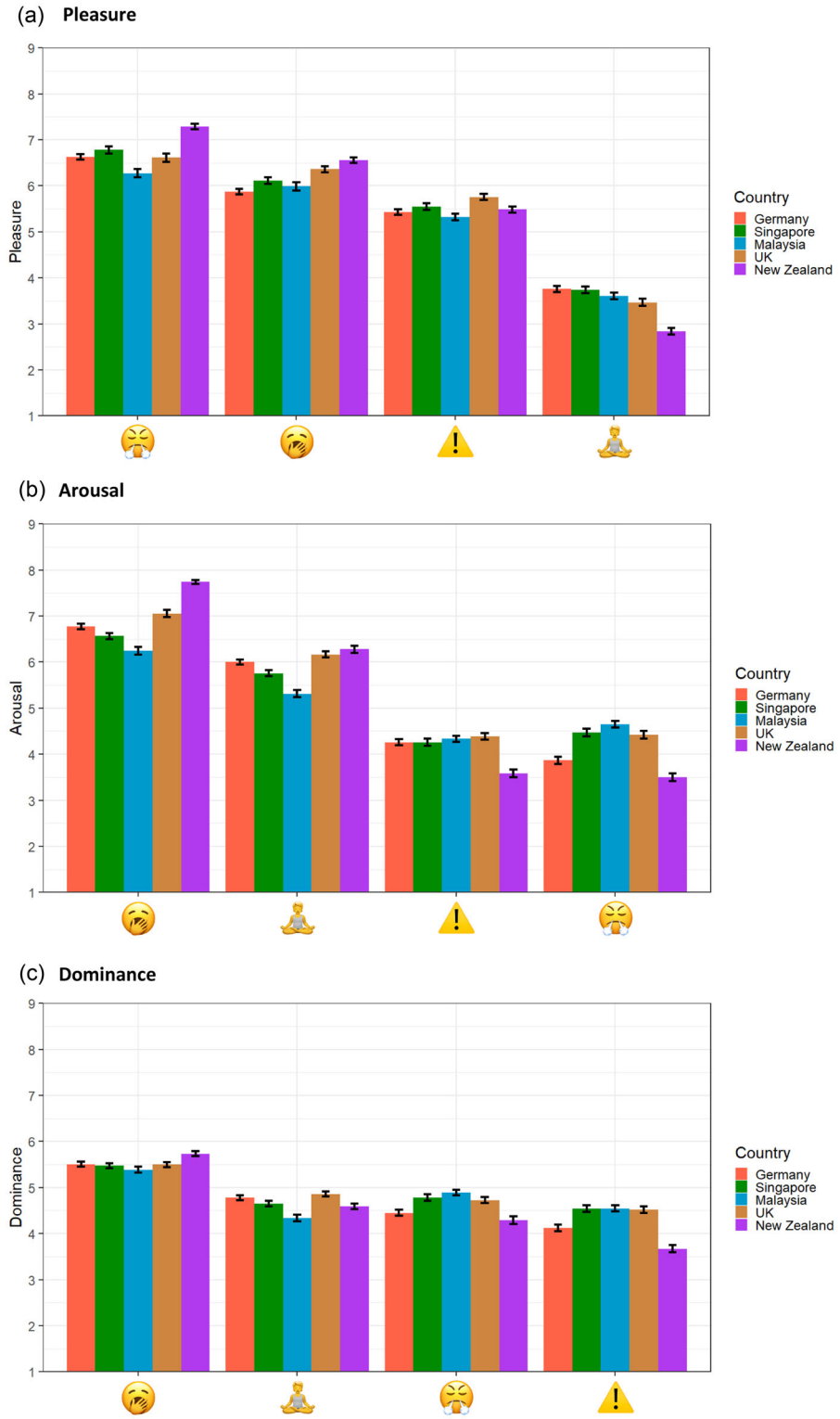

FIGURE 3 Emoji characterization by PAD dimensions (main study and Supporting Information) for: (a) *Pleasure* (P), where low anchor (1) is associated with pleasure and high anchor (9) is associated with displeasure; (b) *Arousal* (A), where low anchor (1) is associated with arousal and high anchor (9) is associated with non-arousal; and (c) *Dominance* (d), where low anchor (1) is associated with dominance and high anchor (9) is associated with submissiveness. Values shown are means, with standard error as error bars. Within PAD dimension, emoji are sorted from the highest to lowest mean values for Germany, and this order of the emoji is kept for the other four countries

TABLE 4 The results (main study) from ANOVA with frequency of emoji use, gender and age group (18–45, 46–69 years old) as explanatory variables to investigate differences in emoji meanings according to PAD scores (P: pleasure, A: arousal, D: dominance)

	Frequency of emoji use	Gender	Age group
Pleasure (P)	Grinning face (😀) Hugging face (🤗) Person in lotus position (🧘) Relieved face (😌) Shushing face (🤫) Star-struck face (🤩) Yawning face (🥱)	Star-struck face (🤩)	Confounded face (😖)
Arousal (A)	Grinning face (😀) Hugging face (🤗) Relieved face (😌) Shushing face (🤫) Star-struck face (🤩) Warning (⚠)		Start-struck face (🤩)
Dominance (D)	Hugging face (🤗) Relieved face (😌) Shushing face (🤫) Star-struck face (🤩) Warning (⚠)	Confounded face (😖) Person in lotus position (🧘)	

Note: The listed emoji were those where the effect sizes (η^2) following ANOVA were "small" (in all other instances $\eta^2 < 0.01$). Effect sizes were graded according to Cohen (1988) where $\eta^2 > 0.01$ is "small," $\eta^2 > 0.059$ is "medium," and $\eta^2 > 0.138$ is "large."

smaller than those linked to frequency of emoji use (due to smaller η^2 values). Figure 4c,d shows this for *star-struck face* (🤩) where $\eta^2 = 0.0130$ for gender (*Pleasure*) and $\eta^2 = 0.0148$ for age group (*Arousal*).

3.2.2 | Objective 2 discussion

The results of the Objective 2 showed that emoji usage, gender, and age group did not largely impact the global PAD mean scores for the emoji. When looking to individual emoji, it appeared that emoji usage might influence emoji meanings to a smaller than larger extent since only "small" or "no" effect sizes were found for individual emoji when considering differences for gender or age group. Prior research examining the emoji meaning of 33 facial emoji using a CATA task with words suggested that the emoji meanings were largely similar regardless of emoji usage, gender, and age group (Jaeger et al., 2018). The results of this research further extend these findings for the PAD dimensions with other emoji and data obtained in a multicountry context.

While many people interface with and are exposed to emoji through digital communications, advertisements, entertainment, etc., not everyone uses emoji frequently. Therefore, it is interesting to note that the frequency of emoji usage can have an impact on the mean PAD ratings with an increased frequency of use associated with more positive valence and higher arousal mean scores for some emoji. It has been reported that consumers use a higher number of CATA terms to describe emoji if they reported to use emoji "always," although only significant differences in emoji meanings were found for a single emoji (*relieved face* (😌)) (Jaeger et al., 2018). As a result, caution about including people who infrequently use emoji as participants in emoji-based studies can be warranted.

Women use emoji more often and have more positive attitudes towards emoji (Prada et al., 2018). Despite these reported differences in usage and attitudes, the results of the present study found that emoji meanings were highly similar across gender which is in line with earlier findings (Jaeger et al., 2018). A study by Herring and Dainas (2018) showed that males and females also interpreted the emoji function of several emoji similarly, but the "other" gender differed from the males and females. Thus, future research might go broader and also include an "other" or "nonbinary" category for gender.

For age, variations in emoji usage have also been reported in several publications (Koch et al., 2022; Prada

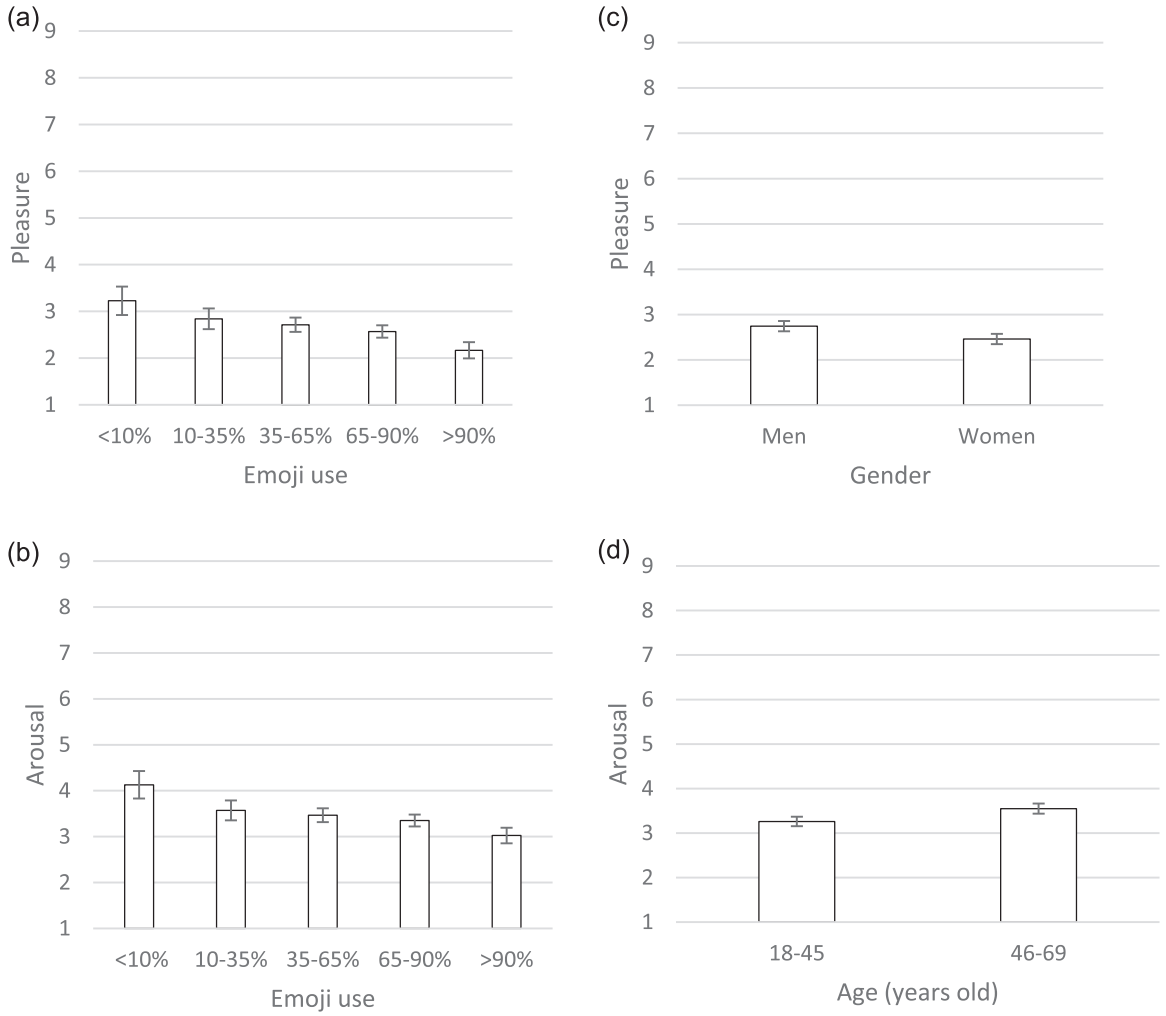

FIGURE 4 The results (main study) for *star-struck face* (🤩). (a) Mean scores for *Pleasure* by frequency of emoji use in electronic messages/conversations ($p < 0.001$), (b) Mean scores for *Arousal* by frequency of emoji use ($p = 0.001$), (c) Mean scores for *Pleasure* by gender ($p = 0.001$), and (d) Mean scores for *Arousal* by age group ($p < 0.001$). For *Pleasure* (P), low anchor (1) is associated with pleasure and high anchor (9) is associated with displeasure; For *Arousal* (A), where low anchor (1) is associated with arousal and high anchor (9) is associated with non-arousal. Classical confidence interval is used for error bars

et al., 2018). In line with gender, little effect of age group was found on the PAD meanings of individual emoji. While this is in line with research examining the emoji meanings of 33 emoji using a CATA task with words (Jaeger et al., 2018), a study by Brants et al. (2019) found that the meanings of two out of nine emoji differed by age groups. Another study by Weiß et al. (2020) reported age-related differences of emoji to represent emotions with participants asked to evaluate the ability of each emoji to represent 18 emotions (e.g., amused, angry, and ashamed) using a visual analogue scale (0 indicated not at all and 100 very strong). Therefore, it could be that differences in meanings according to age might be the result of the method chosen to establish those meanings, but also that the classification of age groups plays a role. The present research was limited to considering two age groups (18–45 and 46–69 years old), where greater refinement is seen by other authors, for example Brants et al. (2019) who used five age bands (18–23, 24–29, 30–35, 36–42 and > 42 years old).

4 | CONCLUSIONS

The present research has contributed needed methodological research to underpin uptake of emoji in consumer research by those interested in doing so. Using a set of 12 emoji selected to span the valence × arousal emotion space, meanings were quantified using the PAD model. Responses were obtained from consumers in Germany, Singapore, and Malaysia, and this was a key contribution since emoji meanings in these countries have not previously, to our knowledge, been studied. Despite many "small" differences, between-country similarity rather than differences in meanings dominated the

main study results, and this was further extended to the five-country comparison for a set of four emoji. Overall, the present research shows that emoji might be suitable for multicountry research because of largely similar (albeit not identical) meanings across different countries. This was extended to a large extent to interpersonal differences (e.g., age, gender, and frequency of emoji usage), although there may be reason to be cautious about participants who infrequently use emoji in emoji-based research methodology.

AUTHOR CONTRIBUTIONS

Joachim J. Schouteten: conceptualization; methodology; writing – original draft; writing – review & editing. **Fabien Llobell**: formal analysis; writing – review & editing. **Sok L. Chheang**: data curation; investigation. **David Jin**: data curation; investigation. **Sara R. Jaeger**: conceptualization; methodology; writing – original draft; writing – review & editing.

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CONFLICT OF INTEREST

There are no conflicts of interest to declare.

ORCID

Joachim J. Schouteten https://orcid.org/0000-0002-2030-5608

Sara R. Jaeger https://orcid.org/0000-0002-4960-5233

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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