

Gender and Age Influences on Interpretation of Emoji Functions

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An online survey, the *Understanding Emoji Survey*, was conducted to assess how English-speaking social media users interpret the pragmatic functions of emoji in examples adapted from public Facebook comments, based on a modified version of [15]’s taxonomy of functions. Of the responses received (N=519; 351 females, 120 males, 48 ‘other’; 354 under 30, 165 over 30, age range 18-70+), *tone modification* was the preferred interpretation overall, followed by *virtual action*, although interpretations varied significantly by emoji type. Female and male interpretations were generally similar, while ‘other’ gender respondents differed significantly in dispreferring *tone* and preferring *multiple functions*. Respondents over 30 often did not understand the functions or interpreted the emoji literally, while younger users interpreted them in more conventionalized ways. Older males were most likely, and younger females were least likely, to not understand emoji functions and to find emoji confusing or annoying, consistent with previously reported gender and age differences in attitudes toward, and frequency of, emoji use.

CCS Concepts: • **Social and professional topics** → **User characteristics** → **Gender; Age**

KEYWORDS

user demographics, pragmatic functions, survey, Facebook, attitudes

1 INTRODUCTION

A picture may be worth a thousand words, but emoji, although they collectively constitute a graphical system, are not a universal language. Research has shown that even within the same culture, users often disagree about the interpretations of emoji, regardless of whether the emoji are presented in isolation or with some context [26, 27]. The differences in interpretation have been attributed to several factors, including emoji renderings that differ across platforms, inherently ambiguous forms (such as the grimace face emoji) [26, 27], and individual differences, as well as the receiver’s familiarity with the sender [33], emoji use in a particular culture [1], and norms of emoji use on a particular social media platform [16]. Receiver demographics, however, have received little consideration as potential explanatory factors. An exception is [19], who found no overall differences in the ability of different gender and age groups to discriminate and describe the dominant emotion conveyed by emoji in a web survey. However, their study examined these interpretations in isolation and considered only emotion, whereas emoji serve many other communicative functions [15], and their interpretation is highly dependent on context [8].

This paucity of research is surprising, given that differences relating to both gender and age have been reported in attitudes toward, and usage of, emoji and their antecedents, emoticons. These graphical icons are perceived as cute, feminine, and associated with (especially, female) teenagers. In some contexts, emoji use is seen as inappropriate for males [32], and it can make adults appear incompetent [13]. Consistent with these attitudes, females use emoji and emoticons more frequently than males do [4, 37], and young adults use them more than older adults [10, 25]. Moreover, females and young people preferentially use different icons and use them for different pragmatic purposes compared to males and adults, respectively [4, 5, 32, 34, 37]. Given these well-documented differences in usage, it is natural to ask whether, and if so to what extent, different demographic categories of social media users understand emoji use differently.

2 RELATED WORKS

Most previous research on emoji interpretation has focused on their semantics, e.g., [18, 23, 26, 27]. However, emoji do not only function on the semantic level, and the reasons for their use do not derive solely from their meaning in isolation. Context shapes emoji interpretation; thus it is also important to consider their pragmatic functions in social media discourse. This level has received less attention in the literature, but there are some exceptions. Qualitative studies of pragmatic emoji functions report that emoji serve as a social tool that can be used to add personal identity expression or playfulness to a message [7, 14, 17, 20, 32], to manage the conversation [7, 20], and to maintain relationships [7, 17, 20]. More concretely, emoji, like emoticons before them, have been observed to modify the tone

of the text they accompany [7, 14, 15, 17, 28, 35]. Drawing on previous literature, [17] identified seven intentions underlying emoji use (expressing sentiment, strengthening messages, adjusting tone, expressing humor, expressing irony, expressing intimacy, and describing content) and had respondents rate how likely they were to use 20 individual emoji to express each intention. However, the emoji were presented in isolation, and the intentions were not mutually exclusive, making [17]’s results somewhat challenging to interpret. [15] identified eight mutually exclusive pragmatic functions of graphicon use (reaction, action, tone modification, mention, riff, narrative sequence, ambiguous, and other) in comments on Facebook groups, taking the discourse context into account. The results of their analysis showed that emoji were the most-used graphicon and also expressed the widest range of pragmatic functions, especially reaction and tone modification.

Even less research has been done on user interpretations of the pragmatic functions of emoji. [28] attempted to train a supervised classifier to identify possible functions of emoji in tweets, including the function “Multimodal,” which aligns with pragmatic emoji functions such as tone modification and gesture. However, the classifier struggled with this particular classification due to low agreement among coders and a small amount of training data. [8] conducted a survey on how users interpret emoji functions, based on [15]’s taxonomy, in the context of Facebook comments. They found that respondents overwhelmingly preferred tone modification, followed by action, mention, and softening, although preferred functions varied according to emoji type. [8] did not consider demographic differences in emoji function interpretation, however.

Research on the factors that influence pragmatic interpretations of emoji has thus far been lacking. Factors influencing differences in interpretation of emoji semantics include variation in emoji rendering across platforms [26, 27], intrinsically ambiguous forms [18, 26, 27], variation in cultural emoji usage norms across communities [1] and platforms [16], and the receiver’s familiarity with the sender [33]. The demographics of the receiver have received little attention in the emoji interpretation literature so far, either for semantic or pragmatic interpretations. This is despite numerous reports of gender and age differences in use of emoji and emoticons, as well as in attitudes toward their use.

As regards gender, studies have found that females produce emoji and emoticons more frequently than males do [4, 9, 30, 37] and have more positive attitudes toward emoji use [30]. In a large-scale analysis of emoticons used on Facebook between 2007 and 2012, [29] found that gender and age significantly and robustly predicted the total number of emoticons posted, and that younger users and females posted more emoticons than older users and males. In a 2015 study that interviewed social media users in the U.S. [9], 78% of females reported being frequent emoji users, as compared to 60% of males, and these females viewed emoji as more “enriching” than men did. Similarly, in a recent survey study of Portuguese social media users [30], women reported using emoji more than men, and women said that they found emoji more useful, interesting, fun, and easy to use; this latter result was especially pronounced for younger women. Emoji are perceived in Asian culture as cute and feminine [24, 32]. [32] reports that among Japanese teens, emoji are considered key to girls’ online performance of *kawaii* (“cute”) identities and are felt to be inappropriate for males to use. Furthermore, the two genders preferentially use different icons [4, 37] and use them for different pragmatic purposes [32]. For example, in a study of English language newsgroups [37], females used more varied emoticons and used them (especially smiles) to express solidarity, support, positive feelings, and thanks, whereas males used emoticons more to express sarcasm and teasing. These findings are consistent with societal stereotypes and expectations that women express more emotion, especially positive emotion, than men [31]. However, in [4]’s international corpus,¹ although females preferentially used all face-related emoji (indicating a social orientation), males preferred heart-related emoji (indicating positive emotion).

Popular wisdom in the mainstream media holds that adults over the age of 30 are less likely to use emoji and do not understand how they are used by teenagers [34]. According to [34], teenagers have devised “an intricate Hammurabi’s Code of social media precepts to govern their interactions” of which adults are ignorant. For example, teens use the blushing emoji to express polite romantic refusal [5, 6], while adults in their 20-40s indicate anecdotally that they use the blushing emoji to express being (non-romantically) flattered, smug, or satisfied, or simply as a cuter or friendlier smile [34]. [14]’s focus group participants reported that using many emoji in a message was a signal of youth or of someone trying to seem youthful and hip [36]. Consistent with this, [10] interviewed 1,320 Internet-using American adults over the age of 18 and found that frequent emoji users (those who sent emoji in messages several times a day) were more often Millennials (38%) than Baby Boomers or Gen Xer’s (31% each). [30] found that among their Portuguese survey respondents, younger users reported using both emoticons and emoji significantly more than older users, and younger users also identified more motivations for emoticon and emoji use. Finally, although emoji

¹ Principally comprised of users from Brazil, Indonesia, Mexico, and the U.S.

were not its main focus, a study by [25] included emoji as metadata to train a classifier to identify the age and gender of senders of Twitter tweets, and found that use of the ‘kissyface’ emoji positively predicted 18-24 year olds, and the smiling emoji was negatively associated with adults over 25.

Given such differences, we ask whether, and if so to what extent, gender and age impact how internet users interpret emoji. The only previous study that we are aware of that addresses this is [19], who designed an online survey study to assess the dominant prospective consumer interpretations of the emotion expressed by facial emoji presented in isolation on a website. The authors found no overall differences in the ability of different gender and age groups in Mainland China to discriminate the dominant emotion conveyed by different emoji. However, as noted earlier, emoji do not function solely to indicate emotion; they also have discourse-pragmatic functions. Therefore, in this study we investigate whether, and if so how, the gender and age of internet users influence how they understand the pragmatic functions of emoji as they were employed by other internet users in authentic contexts of use.

3 METHODS

3.1 Survey Design and Distribution

We created an exploratory online survey, the *Understanding Emoji Survey*, to investigate how internet users interpret the pragmatic functions of emoji in their immediate discourse contexts. The initial motivation for the survey was to compare lay user perceptions of how emoji function in Facebook comments with how we as researchers interpreted those functions; the results of that comparison are described in [8, 16]. In this study we focus on differences and similarities in the lay user perceptions according to gender and age. We selected the emoji from 14 graphicon-focused and media-focused public Facebook groups² that we previously sampled from because of their relatively high density of graphicon content as compared with other public Facebook groups. These groups attract diverse populations of users interested in a variety of topics. Some groups attract younger users (e.g., EmojiXpress) and others attract somewhat older users (e.g., Nihilist Memes); some groups are female predominant (e.g., Jared Padalecki) while others are male predominant (e.g., Star Wars). Emoji are by far the most frequently-used graphicon type in each group. To preserve authentic context, we collected the emoji together with the comment in which each occurred³ and the previous message(s) to which it responded.

Items were selected to represent both a range of pragmatic functions and commonly-used emoji. The pragmatic functions represented in the survey are based on [15]’s taxonomy of graphicon functions, as described further below. The 20 emoji renderings included in the survey represent 14 of the most common emoji types found in our previous Facebook research; they also include some of the most popular emoji used on social media as reported in other sources, e.g., [11, 17, 23].⁴ This sampling approach was adopted to best represent the emoji usage in the diverse Facebook groups selected.⁵

Two to five examples for each emoji type were included in the survey. These were rendered in the survey to match the emoji that appeared in the original Facebook messages. The emoji did not render consistently across examples, presumably because they were posted to Facebook from different devices. Thus to preserve the original context in the survey, we took screenshots of the emoji as they appeared in the messages. The emoji were Apple iOS 10 renderings




















² The groups that provided examples were: EmojiXpress, CatGIFs, AnimeGIFs, Nihilist Memes, Grumpy Cat Memes, Smiley, Stickers, StickersFB, Rise of the Guardians, The Chronicles of Narnia, Star Wars, Percy Jackson, Jared Padalecki, and Selena Gomez.

³ We selected comments that contained a single emoji in most cases. In a few comments, the same emoji was repeated two or three times, and two comments included two different emoji. In the latter case, the survey instructions directed the respondents to focus only on one of the emoji. Emoji reduplication is not considered further in this article.

⁴ The most popular emoji can be expected to account for a majority of emoji uses. For example, [29] found that the 15 most popular emoticons on Facebook between 2007 and 2012 accounted for 99.6% of all emoticons used.

⁵ These groups and their emoji usage might not be representative of all of Facebook or the internet, however, and thus no claims are made regarding the wider generalizability of the frequency distributions in our data.

Table 1. Emoji Types and Renderings Included in the Survey

Emoji Type	Unicode Label	Platform	Emoji Rendering ⁶
'Meh'	Confused Face	Facebook	
Big Smile	Grinning Face	Facebook	
Blush	Smiling Face with Smiling Eyes	Facebook	
	Smiling Face	Apple	
Crying⁷	Loudly Crying Face	Facebook	
	Crying Face	Facebook	
	Anguished Face	Facebook	
Frown	Frowning Face	Facebook	
	Slightly Frowning Face	Facebook	
Grimace	Grimacing Face	Facebook	
Heart	Red Heart	Facebook	
Heart Eyes	Smiling Face with Heart Eyes	Facebook	
Kiss	Face Blowing a Kiss	Apple	
Smile	Slightly Smiling Face	Facebook	
Shock	Flushed Face	Facebook	
Tears of Joy	Face with Tears of Joy	Facebook	
Tongue Out	Face with Tongue	Facebook	
		Apple	
Wink	Winking Face	Facebook	
		Apple	

⁶ Emoji are displayed larger than normal in Tables 1 and 4 to make the differentiating details easier to see.

⁷ We define 'crying' according to the dictionary definition to include both the shedding of tears and "a loud inarticulate shout ... to express fear, pain, or grief" (<https://www.lexico.com/en/definition/cry>).

and Facebook 2.0 renderings, as well as one rendering of a face with tongue from an earlier Facebook version.⁸ Individual emoji renderings were grouped into types, and each type was assigned a short descriptive label based on the physical appearance of the emoji, irrespective of their Unicode labels, which we consider to be verbose and in some cases, misleading.⁹ Table 1 shows the equivalences between the labels used in this study and the corresponding Unicode labels, as well as the platform on which each of the emoji renderings used in the survey were produced.

We anonymized and simplified the Facebook comments for the survey. The survey itself consisted of one sample item and 12 items drawn from a pool of 45 comments. Four versions of the survey were created (three items were repeated, for a total of 48 plus the sample item) using the Qualtrics survey platform. Each block of the survey contained at least one example of most of the 14 emoji types. Assignment of respondents to the blocks was random.

Respondents were asked to select the best interpretation of the use of each emoji from a list of functions adapted from those identified in [15], i.e., *tone modification*, *virtual action*, *reaction*, and *mention*. We excluded two categories from [15]’s original taxonomy, *riff* and *narrative sequence*, because riffs were expressed more by GIFs and images than emoji in [15]’s study, and because our focus is on single emoji, rather than sequences. [15] also identified the categories *ambiguous*, which we renamed *multiple functions* (asking respondents to specify the functions),¹⁰ and *other*, which we preserved. To these we added the options *softening*, *decoration*, *physical action*, and “*I don’t know*.” *Softening* is included under *tone modification* in [15], but we broke it out in our survey to make a more fine-grained distinction. We clarified the distinction between the two through the explanations of each provided in the survey.¹¹ The options *decoration* and *physical action* were added as other logical possibilities for the sake of completeness, and “*I don’t know*” was added to allow for cases where the respondents had no idea what to respond. The 10 function options used in the survey are defined and illustrated with examples in Table 2. The options from [15] were reworded, and all 10 options were explained in the sample question at the beginning of the survey, to make them accessible to laypersons. Figure 1 is an example of one of the survey items with its response options.

Table 2. Emoji Functions (modified and expanded* from [15])

Function	Definition	Example
<i>Action</i>	Emoji is used to virtually perform an action	Ha ha, you missed 😄
<i>Reaction</i>	Emoji is used to express an emotion in response to a previously posted message	[In response to a photo of an attractive celebrity]: 😍
<i>Mention</i>	Citing an emoji, e.g., to illustrate something in the immediate or a previous message	Sending kisses 😘
<i>Tone Modification</i>	Emoji directly modifies the accompanying text, indicating the intended attitude or stance of the message sender	I just realized I have a calculus exam tomorrow 😬
<i>Softening*</i>	Emoji directly modifies the accompanying text, making the message less forceful or more polite	Please help me! 😊
<i>Physical Action*</i>	Emoji mirrors an actual physical gesture or expression made by the sender	This is me right now 😬
<i>Decoration*</i>	Emoji is used primarily for its aesthetic value	That makes me happy 🌸

⁸ Some emoji appeared different (or not at all) to us as Mac and PC users; we used the images as they appeared on the first author’s Mac for the screenshots, as they were more complete.

⁹ For example, the blushing aspect of the Smiling Face with Smiling Eyes is arguably more relevant than the fact that the emoji is smiling in the uses reported in [5, 6, 34]. We also consider that the Confused Face, which we term the ‘Meh’ face, expresses ambivalence more than confusion, and that the Grinning Face looks more like an open big smile than a grin, which typically shows more teeth and is produced with a closed jaw.

¹⁰ After pilot testing the survey, we realized that distinctions among the function categories could appear subtle. To elicit more clearly differentiated results, we asked respondents to select the one best interpretation. The ‘multiple functions’ option required respondents to explain their response, providing useful information about which functions were perceived to overlap.

¹¹ *Tone modification* was defined in the survey as associating a specific tone such as positivity or surprise with the comment, while *softening* was defined as making the comment less forceful or more polite.

<i>Multiple Functions</i>	Emoji has multiple, distinct functions	[In response to a prompt asking “what makes you happy” alongside an image of a mug with a yellow smiley face]: Like this smiley mug 😊 [<i>tone</i> and <i>mention</i>]
<i>Other</i>	Emoji uses that cannot be accounted for by any of the other functions	n/a
<i>“I don’t know”*</i>	The respondent does not understand the function(s) of the emoji	n/a

[Prompt: "New Stickers! Rilakkuma by Sanrio" above an image of a series of stickers involving bears and chicks]

Song Song B: hi there,I cannot add or remove stickers for a long time.may I ask for help here or do you know where I should ask pls? 😊

The emoji shows that Song Song B is...

- (Virtually) saying “ ... may I ask for help here or do you where I should ask pls?”, and then smiling
- (Virtually) smiling in response to the prompt, not necessarily related to the text of their comment
- Illustrating the text of their comment
- Associating a positive (or some related) tone with their comment
- Softening their comment
- Literally (physically) smiling while typing their comment
- Just using the emoji as decoration
- More than one function is equally plausible (Specify/Explain your choices)
- Other (Explain)
- I have no idea

Fig. 1. Example survey item and response options

Each participant was also asked to provide information about their gender (female, male, or other), age (exact year), native language, country of residence, and social media and emoji usage. The survey concluded with an open-ended question, “Do you have any other comments about emoji use in social media?”

Between January 11 and February 20, 2018, we shared the survey with students and colleagues at Indiana University, as well as with friends, family, and strangers via social media (Facebook, Tumblr, Reddit, and Ravelry). In total, 658 surveys were collected. As not all respondents completed the survey, in order to maximize the amount of data available, we analyzed all surveys in which respondents reported their gender, age, and chose a function code for at least one emoji example.¹² In total, 519 surveys met these criteria (351 female; Mean age: 28.9, Range: 18-70+; 120 male; Mean age: 31.8, Range: 18-68; 48 ‘other,’ Mean age: 25.2, Range: 18-70+). Of these respondents, 354 were under the age of 30 (-30), and 165 were 30 years old or older (+30). Table 3 shows the gender and age breakdown of the survey respondents analyzed in this study. A majority of respondents in all age groups were female, although more of the males were over 30 and more of the ‘other’ gender were under 30.

¹² The average dropout rate after answering at least one question was 13.1% (F: 13.4%, M: 14.2%, O: 2.1%; under 30: 13.3%, over 30: 12.7%).

Table 3. Gender and Age Breakdown of Survey Respondents

	Female (n=351)	Male (n=120)	Other (n=48)	Total
-30 (n=354)	68.9%	19.8%	11.3%	100%
18-22 (n=152)	76.3%	10.5%	13.2%	100%
23-29 (n=202)	63.4%	26.7%	9.9%	100%
+30 (n=165)	64.8%	30.3%	4.8%	100%
30-39 (n=92)	62.0%	31.5%	6.5%	100%
40-49 (n=33)	72.7%	27.3%	0%	100%
+50 (n=40)	65.0%	30.0%	5.0%	100%
Total (n=519)	67.6%	23.1%	9.2%	100%

In the sample of 519 respondents, 74.0% were native English speakers (F: 74.4%, M: 74.2%, O: 70.8%; under 30: 74.3%, over 30: 73.3%), followed by German (5.6%), Chinese (2.3%), Spanish (2.3%), and French (1.9%), and 75.0% reported being based in the U.S. (F: 72.6%, M: 85.8%, O: 64.6%; under 30: 71.2%, over 30: 83.0%), followed by Canada (4.4%), Germany (4.2%), the UK (2.5%), and France (2.1%).

3.2 Quantitative Analysis

We analyzed the function codes the respondents selected for the survey items first by gender and age separately, then by gender and age together, then by emoji type, then by gender and emoji type and age by emoji type separately, and last by gender, age, and emoji type. The frequency distributions of the responses to the multiple-choice items, normalized as percentages, are presented in charts and/or described in prose. Chi-square tests of significance were conducted using Microsoft Excel 13 for Windows 8.¹³ Expected values for chi squares were calculated using the formula:

$$E_{i,j} = \frac{R_i \times C_j}{n}$$

The Adjusted Residual z-scores for the chi squares were calculated using the formula:

$$AdjRes_{i,j} = \frac{O_{i,j} - E_{i,j}}{\sqrt{E_{i,j} \times \left(1 - \frac{R_i}{n}\right) \times \left(1 - \frac{C_j}{n}\right)}}$$

Results of chi-square tests are presented as p values which were calculated using the Microsoft Excel function NORMSDIST. We conducted post hoc tests on the chi-square values using a Bonferroni correction. This is a conservative measure, especially when a large number of tests are conducted, as is the case for several of our analyses, it and can result in effects being overlooked [2]. To limit this possibility, the initial significance threshold was set at $p=.10$. Additionally, results that fall within the top 10th percentile of the z-score for each chi-square after applying the Bonferroni correction are discussed as trends. Adjusted p values and trend levels are presented separately for each set of analyses.

3.3 Qualitative Analysis

Following the quantitative analysis, a thematic content analysis of the respondents' answers to the open-ended question at the end of the survey is presented, along with examples of their responses. The findings of the qualitative analysis are discussed in relation to the quantitative results as regards gender and age differences in emoji function interpretation.

¹³ Version 15.0.5172.1000.

4 FINDINGS

4.1 Gender

Consistent with previous studies, females and males reported different amounts of emoji use: 92% of the female respondents reported using emoji, compared to 78% of the males and 79% of the ‘others.’ Although males (94%) were more likely than females (86%) and the ‘other’ gender (63%) to have a current active Facebook account, females more often said they used emoji on Facebook ‘often’ (30%) and ‘in every message’ (2%). Males reported using emoji on Facebook ‘sometimes,’ (38%) ‘rarely,’ (17%) or ‘never’ (13%) more than females (32%, 16%, 6%). More females also reported that they were ‘very confident’ that they understood the intended meaning of emoji when they saw them in social media (58%) as compared with males (47%). Males were more likely to report being ‘somewhat confident’ (43%) - and, in several cases, ‘not at all confident’ (10%) - than females (38%, 4%). Respondents who chose ‘other’ for their gender patterned similarly to females, mostly being very (56%) or somewhat (42%) confident in their understanding of emoji meaning.

Despite these expected differences between females and males in usage and attitude, we found no significant overall differences in how they interpreted emoji function. Chi-square analyses of gender and emoji function were conducted using a Bonferroni adjusted alpha level of .0033 per test ($.10/30$)¹⁴ with a 10% trend threshold of .0082. Male and female respondents both chose *tone* as their default interpretation slightly more than half the time (F: 51.5%, M: 51.9%). However, there was a trend for males to choose the “*I don’t know*” response more than expected ($p=.007^+$) and for females to choose “*I don’t know*” less than expected ($p=.0045^+$).

The ‘other’ gender category - comprising 48 people and 557 function codes¹⁵ - was the source of the only significant difference among the three gender categories. ‘Others’ were significantly more likely than expected to choose *multiple functions* ($p=.001^{**}$). The ‘others’ also had a strong tendency that approached significance to choose *tone modification* less than the other two genders ($p=.0035^+$). These preferences were evident, for example, in the interpretation of the following survey item:¹⁶

[Prompt: "There are people in our lives that help make it beautiful. Who is that for you?"]
Alistair Loveday: Nora McMaster 😊

Females and males mostly interpreted the emoji in this example as indicating *tone*, described in the survey as “associating an affectionate (or some related) tone with [Alistair’s] comment,” although some also chose *action* (described in the survey as “virtually smiling at Nora McMaster,” who was tagged in the comment). The ‘other’ genders chose *tone* less often, instead preferring *multiple functions*, which they explained in their write-in comments as some combination of *tone*, virtual *action*, and *physical action*.¹⁷

Figure 2 shows the overall proportional distribution of the selected functions (excluding *tone* to display the results for the other functions more clearly) by gender, and Figure 3 shows the gender breakdown for *tone* alone.

¹⁴ This represents a 90% confidence interval (*). Confidence intervals of 95% (**), 99% (***), and 99.9% (****) were calculated for each set of analyses by dividing the initial p values of .10, .05, .001, and .0001 by the number of tests performed to get the Bonferroni corrected values.

¹⁵ The numbers of respondents and codes differ slightly from those reported in [8]. Only respondents who indicated both their gender and their age are included in the present study.

¹⁶ Names in the survey items are pseudonyms assigned by the authors. Attempts were made to preserve indications of gender and ethnicity in the names that appeared in the original Facebook messages.

¹⁷ The ‘other’ gender respondents also differed in their self-reported social media use. In addition to being less likely to have a Facebook account, they were much more likely to have an account on Tumblr (93.6%, compared with 65.1% for females and 38.3% for males) and on ‘other platforms’ (34%, compared to 15.8% for females and 20.2% for males). The ‘other’ gender respondents were also least likely to have accounts on Instagram (38.3% vs. F: 67.5%; M: 58.5%), Snapchat (34% vs. F: 45.9%; M: 46.8%), WhatsApp (29.8% vs. 37%; M: 35.1%), Reddit (10.6% vs. F: 17.5%; M: 36.2%), and Imgur (2.1% vs. F: 5.5%; M: 8.5%).

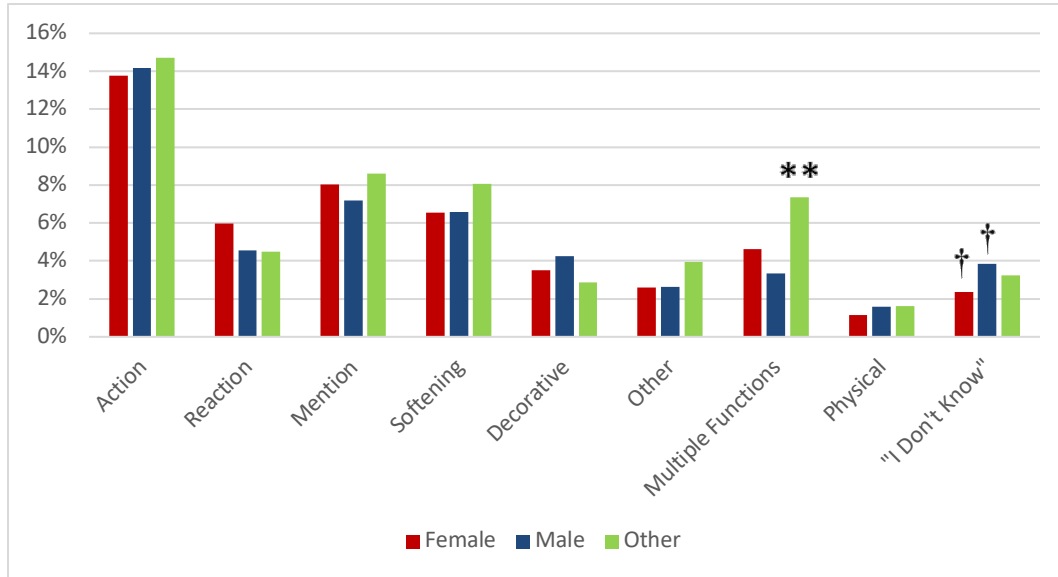


Fig. 2. Proportion of functions selected in the survey (except for *tone*) by gender.

($^{\dagger}p \leq .082$, $*p \leq .0033$, $**p \leq .0017$, $***p \leq .0003$, $****p \leq .00003$)

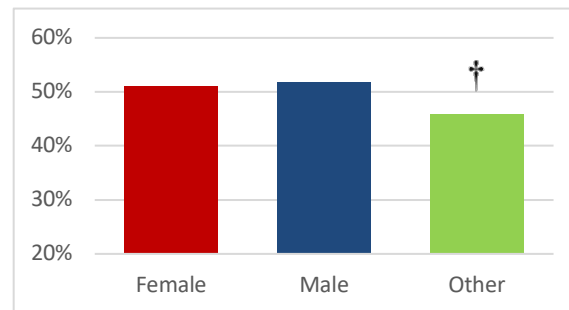


Fig. 3. Proportion of *tone* function codes selected by gender.

($^{\dagger}p \leq .082$, $*p \leq .0033$, $**p \leq .0017$, $***p \leq .0003$, $****p \leq .00003$)

4.2 Age

Both age groups reported using emoji frequently in texting (-30: 92%, +30: 88%). However, respondents under 30 more often said they used emoji on Facebook ‘sometimes’ (40%), ‘often’ (33%) and ‘in every message,’ (2%), whereas respondents over 30 reported using them ‘rarely’ (24%) or ‘never’ (11%) more than those under 30 (17%, 8%). Respondents under 30 were also less likely than respondents over 30 to have an active Facebook account (83% vs. 92%).¹⁸ More respondents in the younger group reported that they were ‘very confident’ that they understood the intended meaning of emoji when they saw them in social media (61%) as compared with older respondents (44%). Older respondents were more likely to report being ‘somewhat confident’ (44%) - and, in some cases, ‘not at all confident’ (12%) - than younger respondents (37%, 2%).

Two chi-square analyses of age were conducted, one for the five age groups in Table 3 and another comparing the -30 and +30 groups. The Bonferroni adjusted alpha level for the five-group analyses is .002 per test (.10/50), and the 10% trend threshold is .0054. For the +30 and -30 comparison, the Bonferroni adjusted alpha level is .005 per test (.10/20), and the 10% trend threshold is .0115. Age was significantly associated with several of the function

¹⁸ The younger group was also less likely to have a Twitter account (17% vs. 25%), but twice as likely as the older group to have a Tumblr account and/or a Snapchat account (23% vs. 12% for Tumblr; 17% vs. 8% for Snapchat).

interpretations in the survey. Consistent with their lower self-reported confidence levels, the “*I don’t know*” option was chosen significantly more than expected by older respondents: those over 30 ($p < .00001^{****}$)¹⁹ and in the +50 age group ($p < .00001^{****}$), in particular. Respondents over 50 also significantly favored *action* ($p = .0008^{**}$) and disfavored *tone* ($p = .00007^{***}$) and *softening* ($p = .0002^{***}$). In contrast, the 18-22 age group significantly disfavored “*I don’t know*” ($p = .0003^{**}$). *Softening* was significantly preferred by respondents under 30 ($p = .004^{*}$), and the 23-29 age group tended to disfavor *action* ($p = .0031^{+}$). Additionally, the 40-49 age group significantly disfavored the *reaction* interpretation ($p = .0006^{**}$). These findings are consistent with claims that young users understand emoji meanings differently than older users do [5, 34] and that older users are less likely to understand emoji use [34].

Age-related differences in the “*I don’t know*” response emerged clearly for the following survey item, for example:²⁰

[Prompt: Announcement of the next Chronicles of Narnia movie - The Silver Chair]
Cesar Campos: I think “The Horse and his Boy” would be a better movie than Silver Chair 😞 but I love it too

Some +30 respondents (both female and male) chose “*I don’t know*” for this item, whereas no -30s did. Instead, the -30 respondents overwhelmingly chose the *tone* option, described in the survey as “associating a disgruntled (or some related) tone with the first part of Cesar Campos’s comment.”

Figure 4 shows the overall proportional distribution of the functions (excluding *tone* to display the results for the other functions more clearly) for the five age categories in Table 3. Figure 5 shows the breakdown for the -30 group compared with the +30 group. The age breakdowns for *tone* are shown separately in Figures 6 and 7.

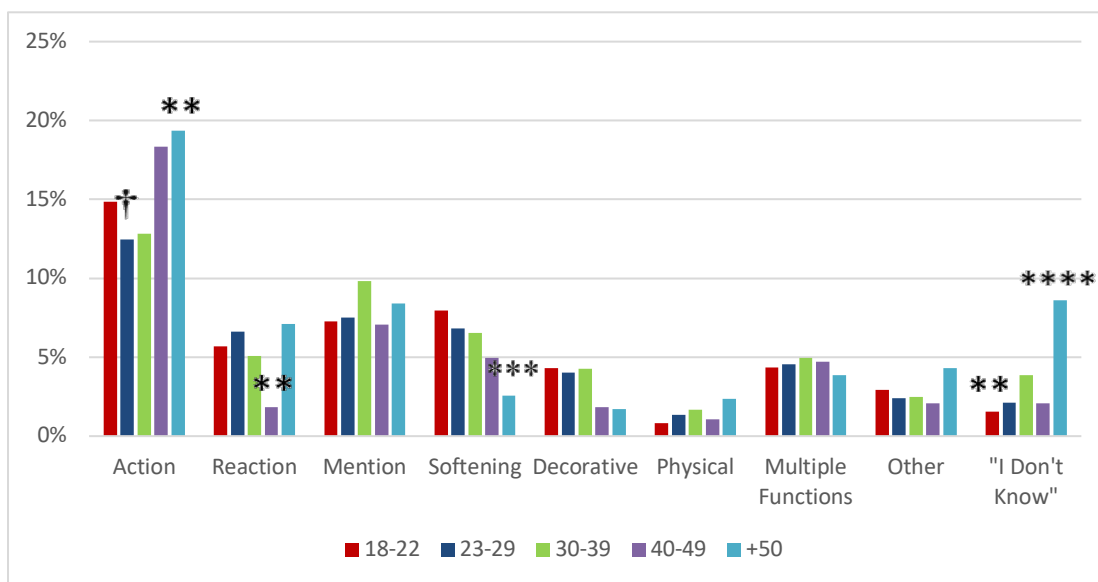


Fig. 4. Proportion of functions selected in the survey (except for *tone*) by five age groups.

([†] $p \leq .0054$, $*p \leq .002$, $**p \leq .001$, $***p \leq .0002$, $****p \leq .00002$)

¹⁹ See note 14 for an explanation of how confidence intervals were calculated.

²⁰ Before asking respondents to ascribe a pragmatic function to this emoji use, they were asked which part of the text the emoji was most closely associated with. About 90% of respondents associated the emoji with the text that preceded it. For the analysis of pragmatic functions, we combined all interpretations regardless of the respondents’ answers on this association question.

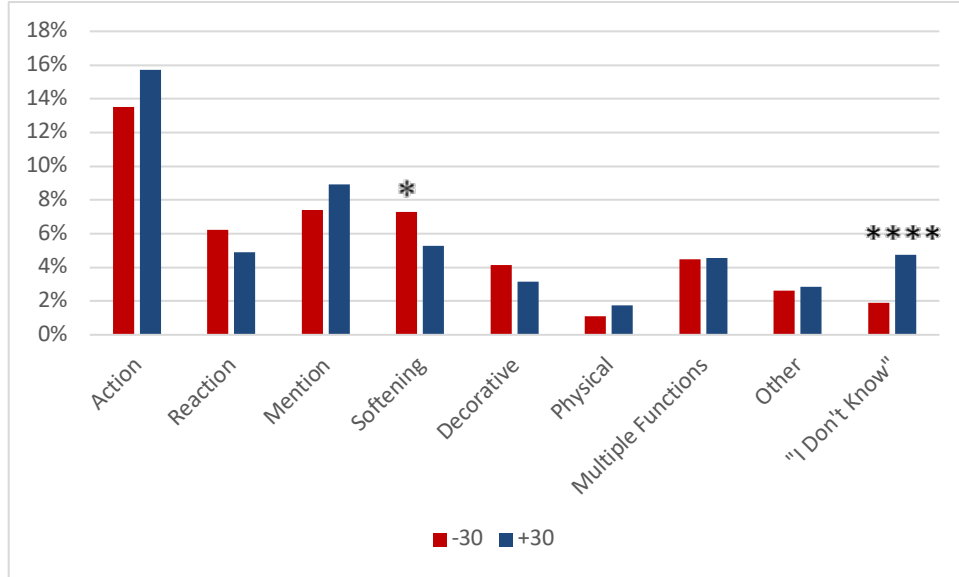


Fig. 5. Proportion of functions selected in the survey (except for *tone*) by respondents under 30 and over 30.
 († $p \leq .0115$, * $p \leq .005$, ** $p \leq .0025$, *** $p \leq .0005$, **** $p \leq .00005$)

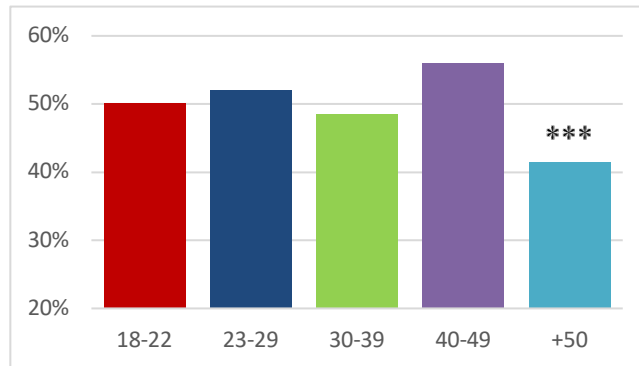


Fig. 6. Proportion of *tone* function codes selected by five age groups.
 († $p \leq .0054$, * $p \leq .002$, ** $p \leq .001$, *** $p \leq .0002$, **** $p \leq .00002$)

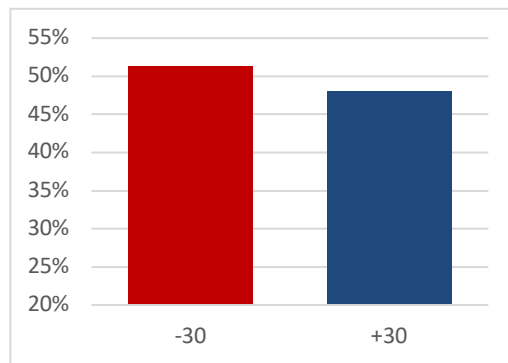


Fig. 7. Proportion of *tone* function codes selected by respondents under 30 and over 30.
 († $p \leq .0115$, * $p \leq .005$, ** $p \leq .0025$, *** $p \leq .0005$, **** $p \leq .00005$)

4.3 Gender x Age

Analyzing gender and age together in relation to emoji function reveals that the age-related difference in “*I don’t know*” responses is caused primarily by older males. Chi-square analyses of gender x age x emoji function were conducted using Bonferroni adjusted alpha levels of .0017 per test (.10/60) with a 10% trend threshold of .0047. In these and subsequent analyses, because the breakdown of the data resulted in small N’s in some subcategories, only the two combined age categories were considered, -30 and +30. The results showed that +30 males strongly favored the “*I don’t know*” response ($p < .00001^{***}$), which was paraphrased in the sample question at the beginning of the survey as “I have no idea – I totally give up.” Conversely, -30 females chose “*I don’t know*” significantly less than expected ($p = .0007^{***}$). This result is consonant with reports in the literature that young females are the most active emoji users [30, 32] and find emoji easy to understand [30].

A further finding of this analysis is that +30 females were significantly less likely than expected to choose *decorative* as an interpretation of emoji use ($p = .0003^{**}$), as for example in response to the following survey item:

[Prompt: GIF of a Siamese cat jumping up and biting a man’s butt]
Marlis Clark: Fernando still want to get a Siamese Cat 🐱






None of the +30 female respondents chose *decorative* (worded as “just using the emoji as decoration” in the survey) as the reason the Tongue Out emoji was used in Marlis’s comment, whereas that function was chosen between 8.3% and 16.7% of the time by the other gender and age categories. Instead, +30 females interpreted this example as a case of *tone modification*.

4.4 Emoji Type

Before analyzing gender and age effects further, it is necessary to first consider how emoji type affects interpretation of emoji function. Independent of user demographics, emoji type turns out to be a highly significant predictor of function interpretation. Table 4 displays the emoji that were significantly preferred or dispreferred for each function according to Bonferroni corrected chi-square tests using adjusted alpha levels of $p \leq .0007$ per test (.10/140). The 10% trend threshold for these tests is $p = .00232$.

Table 4. Emoji Types Significantly Preferred and Dispreferred for each Function

Less Likely Than Expected				Functions	More Likely Than Expected			
				Action				
				Reaction				
				Mention				
				Tone Modification				
				Softening				
				Decorative				

	Physical	
	Multiple Functions	 
	Other	
	“I Don’t Know”	

As shown in Table 4, each function is associated with different emoji types. Hearts ($p \leq .000007^{****}$), Heart Eyes ($p = .0005^*$), and Kisses ($p \leq .000007^{****}$) were interpreted as expressing virtual *actions* significantly more than expected. Conversely, Smile ($p = .000062^{***}$), Tears of Joy ($p \leq .000007^{****}$), Tongue Out ($p \leq .000007^{****}$), and Shock ($p = .00001^{***}$) were significantly less likely than expected to express virtual *actions*. Blush also tended to be used more than expected as a virtual *action*, although this was not significant using a Bonferroni Correction ($p = .0011^\dagger$). Grimaces ($p \leq .000007^{****}$), Tears of Joy ($p \leq .000007^{****}$), and Shock ($p = .0001^{**}$) were chosen significantly more than expected as *reactions* to a prompt; in contrast, Frown ($p = .000018^{***}$) and Smile ($p = .000062^{***}$) were significantly less likely than expected to be coded as *reaction*. The emoji that were interpreted significantly more than expected as expressing *mentions* (illustrating message content) were Kisses ($p \leq .000007^{****}$) and Shock ($p \leq .000007^{****}$), whereas Frown ($p = .00066^*$), Tongue Out ($p \leq .000007^{****}$), and Wink ($p = .000008^{***}$) were significantly less likely than expected to be coded as *mentions*. There was a slight trend of users preferring to see the Grimace emoji as a *mention* ($p = .0016^\dagger$). And while *tone modification* was the preferred interpretation for most of the examples in the survey, the ‘Meh’ ($p = .000062^{****}$), Crying ($p \leq .000007^{****}$), Frown ($p \leq .000007^{****}$), and Tongue Out ($p \leq .000007^{****}$) emoji were interpreted more than expected as expressing *tone*, while Big smile ($p \leq .000007^{****}$), Grimace ($p \leq .000007^{****}$), Heart ($p \leq .000007^{****}$), and Kisses ($p \leq .000007^{****}$) were significantly less likely than expected to express *tone*.

As for the additional function options that we included to supplement [15]’s taxonomy, Smiles ($p \leq .000007^{****}$), Big Smiles ($p \leq .000007^{****}$), and Winks ($p \leq .000007^{****}$) were interpreted as *softening* the force of a message significantly more than expected. In contrast, Shock ($p = .0001^*$), Crying ($p \leq .000007^{****}$), Heart Eyes ($p = .000017^{***}$), Frown ($p = .000021^{***}$), Grimace ($p = .000009^{***}$), Heart ($p \leq .000007^{****}$), Tongue Out ($p = .00005^{***}$), and Blush ($p = .000022^{***}$) were less likely than expected to express *softening*. Big Smiles were interpreted as *decorative* by some respondents significantly more than expected ($p \leq .000007^{****}$), while ‘Meh’ was significantly less likely than expected to be used *decoratively* ($p = .00011^{**}$). There were also non-significant trends of Heart being interpreted as *decorative* more than expected ($p = .0014^\dagger$) and Crying interpreted as *decorative* less than expected ($p = .0023^\dagger$). Some respondents interpreted the Heart Eyes emoji as representing a *physical action* (described in the survey as “looking adoringly” at one’s computer screen) significantly more than expected ($p = .00013^{**}$); there was also a non-significant trend of respondents choosing *physical action* for Blush ($p = .0008^\dagger$). Finally, the results for *multiple functions*, *other*, and “*I don’t know*” point to emoji examples for which the respondents were either not satisfied with the specific options provided in the survey or which were especially difficult to interpret functionally. The Tears of Joy emoji, for example, was seen to have *other* functions significantly more than expected ($p \leq .000007^{****}$) (e.g., “laughing in a mocking way,” as one respondent put it). The Blush emoji was seen as expressing *multiple functions* significantly more than expected ($p \leq .000007^{****}$), and the Grimace emoji, which is known to be ambiguous [26, 27], was positively associated with “*I don’t know*” responses ($p \leq .000007^{****}$). Although it did not reach significance, there was a tendency for items with the Frown emoji also to be coded with “*I don’t know*” ($p = .00087^\dagger$).

We now turn to examine the interactions between gender and emoji type, age and emoji type, and gender and age by emoji type as regards interpretation of emoji functions.

4.5 Gender x Emoji Type

Although each emoji type was represented roughly equally in the survey, breaking the responses down by emoji type and gender leaves some categories, especially those involving the ‘other’ respondents, too small to run chi-square analyses. Therefore, for these and subsequent analyses, we combined all function categories with total N’s less than

30²¹ into a *combined_misc* function. This was done independently for each emoji type, such that the make-up of the *combined_misc* category varies across emoji types. The Bonferroni corrected alpha level and trend threshold vary accordingly; these are reported in parentheses after the *p* value for each result.

Females were not significantly more or less likely to prefer certain functions for specific emoji when compared to males and ‘others’; however, there was one trend. Self-identified females tended to choose *combined_misc*.²² less than expected for Shock ($p=.0218^\dagger$; adjusted $p\leq.0067$ [.10/9], trend threshold $p\leq.0223$); they preferred *tone*, and to a lesser extent, *mention*, instead. Similarly, males were not significantly more or less likely to prefer certain functions for specific emoji when compared to females and ‘others,’ consistent with the overall lack of differences between male and female respondents noted earlier. However, ‘others’ chose multiple functions significantly more than expected for Blush ($p=.0067^*$; adjusted $p\leq.0067$ [.10/15], trend threshold $p\leq.0146$) and chose *tone* significantly less than expected for Smile ($p=.0046^*$; adjusted $p\leq.0067$ [.10/15], trend threshold $p\leq.0146$). For example, the ‘other’ genders chose *tone* (described in the survey as “associating a positive (or some related) tone with Cyn Cyn’s comment”) less than females and males did for the following survey item:

[Prompt: "There are people in our lives that help make it beautiful. Who is that for you?"]
Marta Jat: Would be nice to be able to say that someday
Cyn Cyn: Marta Jat Everything will happen in God’s perfect time 😊 smile 😊

The ‘others’ interpreted the use of the smile emoji in this example as more of a *mention* (described as “illustrating the text of Cyn Cyn’s comment”).

The ‘other’ gender respondents also tended to choose *tone* less than expected for Tears of Joy ($p=.0116^\dagger$; adjusted $p\leq.0067$ [.10/15], trend threshold $p\leq.0146$). These patterns are consistent with the general tendency noted earlier for the ‘other’ respondents to choose *tone marking* less and to offer more varied interpretations of the functions of the emoji in the survey than the female and male respondents.

4.6 Age x Emoji Type

Next we broke the function responses down by emoji type and age. This left some categories, especially those involving the +30 respondents, too small for the purpose of chi-square analysis. Therefore, we again combined all function categories with total N’s less than 30 into a *combined_misc* function. This was done independently for each emoji type. The Bonferroni corrected significance level is reported in parentheses after the *p* value for each result.

The -30 respondents were significantly more likely to choose *tone* than expected for Shock ($p=.0082^{**}$; adjusted $p\leq.0167$ [.10/6]). Conversely, the +30 respondents were significantly less likely than expected to choose *tone* for Shock ($p=.0082^{**}$; adjusted $p\leq.0167$ [.10/6]). These patterns are based on the following item:

[Prompt: Video of bloopers from the TV show Supernatural]
Kaylin Durand: Are my eyes vibrating?? 😳

This item was one of three items that appeared in two different blocks of the survey. For both iterations, -30 respondents chose *tone* (“associating a surprised (or some related) tone with their comment”) more than +30 respondents, who chose *tone* less than most of the other groups did. The +30 respondents tended to choose *mention* (“illustrating the text of Kaylin’s comment”) more than the -30 respondents.

Beyond these significant findings, several non-significant trends were observed. For example, -30 respondents were more likely to choose *tone modification* for Tongue Out ($p=.0356^\dagger$; adjusted $p\leq.025$ [.10/4], trend threshold $p\leq.0204$). These patterns are consistent with the -30’s overall preference for the *tone* function, as shown in Figure 5.

²¹ This was the number that we determined through trial and error allowed the expected values to be high enough to run chi-square analyses.

²² For Shock, the *combined_misc* category for this analysis contained *action*, *reaction*, *softening*, *decorative*, *other*, *multiple functions*, *physical*, and “*I don’t know*.”

The -30s also preferred *reaction* for Tears of Joy ($p=.0142^\dagger$, adjusted $p\leq.01$ [.1/10], trend threshold $p\leq.0204$). Conversely, +30 respondents tended to prefer the *combined_misc.* category for Tongue Out ($p=.0356^\dagger$), where the combined category consisted of all functions except *tone*, the Bonferroni adjusted p level for the analyses is $p\leq.025$ per test (.10/4), and the 10% trend threshold is $p\leq.0437$.

4.7 Gender x Age x Emoji Type

Last, we broke the results down by gender, age, and emoji type. As with the analyses in the previous two sections, this analysis created category with very small Ns. This was particularly true for the +30 ‘other’ gender category, which was often represented by three or fewer responses for each emoji type. To address this, we combined the +30 and -30 ‘other’ categories into a single ‘other’ category, while preserving the female and male breakdowns by age. However, this still left some categories too small to run chi-square analyses. Therefore, as in the previous analyses, we combined all function categories with total N’s less than 30 into a *combined_misc.* function independently for each emoji type. The Bonferroni corrected alpha level and trend threshold are reported in parentheses after the p value for each result.

These analyses produced two significant results and four trends. Younger females were significantly more likely than expected to choose *tone modification* ($p=.0038^*$; adjusted $p\leq.0067$ [.10/15]) and less likely than expected to choose the *combined_misc.* category for Shock²³ ($p=.0025^{**}$; adjusted $p\leq.0067$ [.10/15]). This is illustrated by the responses to the survey item involving Kaylin Durand discussed in the previous section. While -30 respondents overall favored *tone* and disfavored *combined_misc.* for that item, 53% of -30 females chose *tone* compared with 46% of -30 males, and 24% of -30 females chose *combined_misc.* compared with 43% of -30 males.

Beyond this, four trends were identified involving older males and ‘others.’ Males over 30 tended to be more likely than expected to choose *action* for Smile ($p=.0067^\dagger$; adjusted $p\leq.0040$ [.10/25], trend threshold $p\leq.0096$) and less likely than expected to choose *tone* for Grimace ($p=.0071^\dagger$; adjusted $p\leq.0040$ [.10/25], trend threshold $p\leq.0096$). When compared to the other four groups, all ‘others’ tended to choose *tone* less than expected for Smile ($p=.0046^\dagger$; adjusted $p\leq.0040$ [.10/25], trend threshold $p\leq.0096$) and to be more likely than expected to choose *multiple functions* for Blush ($p=.0067^\dagger$; adjusted $p\leq.0040$ [.1/25], trend threshold $p\leq.0096$).

4.8 Summary of Gender- and Age-Related Results

The findings from the gender and age-related analyses presented in the previous sections are summarized in Table 5. Significant results are indicated with asterisks,²⁴ and trends are indicated with the symbol \dagger . Functions for which no associations were significant or trending (i.e., *mention, physical, other*) are not included in the table.

Overall, there are more (and more robust) age-related differences than gender-related differences in the interpretations preferred by the internet users who responded to the *Understanding Emoji Survey*. For gender, the most robust findings involve the ‘other’ category. An exception is the “*I don’t know*” response, the distribution of which is highly significant according to both age and the interaction of (female and male) gender and age.

²³ The *combined_misc* category for Shock for this analysis consisted of *action, reaction, softening, decorative, multiple, other, physical*, and “*I don’t know*.”

²⁴ See note 14 for an explanation of how confidence intervals were calculated.

Table 5. Summary of Findings for Gender and Age by Function

Function		Gender	Age	Gender x Age	Gender x Emoji	Age x Emoji	Gender x Age x Emoji ²⁵
Action	preferred		+50**				+30 Males for 😊†
	dispreferred		23-29†				
Reaction	preferred					-30 for 😄†	
	dispreferred		40-49**				
Tone	preferred					-30 for 😬** -30 for 😬†	-30 Females for 😬*
	dispreferred	Others*	+50***		Others for 😊* Others for 😄†	+30 for 😬*	+30 Males for 😬† Others (all) for 😬†
Softening	preferred		-30*				
	dispreferred		+50***				
Decorative	preferred						
	dispreferred			+30 Females**			
Mult_Func	preferred	Others*			Others for 😬*		Others (all) for 😬†
	dispreferred						
“I Don’t Know”	preferred	Males†	+50**** +30****	+30 Males****			
	dispreferred	Females†	18-22**	-30 Females***			
Combined_Misc. ²⁶	preferred	—	—	—		+30 for 😬†	
	dispreferred	—	—	—	Females for 😬†		-30 Females for 😬**

4.9 Open-Ended Question Responses

At the end of the survey, respondents were asked: “Do you have any other comments about emoji use in social media?” We conducted a content analysis, employing a grounded theory approach [12] to allow recurrent themes to emerge from the data, to group the responses into 12 categories. Some responses included multiple comments that fit into more than one category; in these cases, the response was split into thematic units, and each unit was coded separately. Both authors jointly coded the responses. The frequencies for each thematic category are broken down by respondent gender and age in Table 6. (N’s represent number of coding units.)

²⁵ Because there were very small N’s for ‘others’ over 30, -30 and +30 ‘others’ were combined in these analyses.

²⁶ The category *combined_misc.* was used in the last three sets of analyses to compensate for small N’s.

Table 6. Themes Present in Open-Ended Responses by Gender and Age

Theme	Female (N=69)	Male (N=33)	'Other' (N=19)	-30 (N=84)	+30 (N=36)	Total (N=120)
Age Differences in Emoji Use	9%	0%	5%	7%	3%	6%
Comments on the Survey	7%	9%	11%	7%	11%	8%
Emoji and Language	12%	18%	16%	12%	19%	14%
Emoji are Annoying	4%	12%	0%	2%	14%	6%
Emoji are Confusing	6%	9%	0%	1%	14%	5%
Emoji Prescriptivism	4%	9%	11%	7%	6%	7%
Emoji Rendering Problems	7%	3%	11%	8%	3%	7%
Emoji Use (General)	20%	6%	11%	19%	6%	15%
Emoji Use (Personal)	10%	12%	16%	14%	6%	12%
I Like/Love Emoji	4%	6%	11%	45%	8%	6%
Other	6%	3%	0%	2%	8%	4%
Used Emoji in Response	10%	12%	11%	14%	3%	11%
Total	100%	100%	100%	100%	100%	100%

The kinds of comments made lend qualitative support to the quantitative results reported in the previous sections and in previous literature. Males and (especially) +30 respondents commented that they found emoji confusing and annoying more often than females and -30 respondents did. In contrast, of the five demographic groups, respondents under 30 most often commented that they liked or loved emoji (45% of their comments) and were more likely than older respondents to include emoji in their comments (14% vs. 3%). Both females and younger respondents were more likely than males and older respondents to comment on general emoji use, as well as on age differences in emoji use, suggesting a greater level of awareness of emoji and their usage. Females and younger respondents also showed more awareness of cross-platform emoji rendering problems.

Table 6 also indicates that males, 'other' genders, and +30 respondents were most likely to comment on Emoji and Language. Interestingly, males and 'others' were also most likely to make prescriptive comments about how emoji should or should not be used. Younger people as compared with older people commented more on their Personal Emoji Use (14% vs. 6%). The 'other' gender group also commented often (16%) on Personal Emoji Use, although it is difficult to draw conclusions about this group given that it contributed only 19 responses to the question.

At the same time, the 'other' gender group provided proportionately more responses to the open-ended question than the males and females (40% of 'other' vs. 29% of males and 23% of females). Their comments also tended to be longer and to focus on nuances of emoji interpretation, consistent with the tendency of the 'other' gender to assign multifaceted interpretations to emoji. For example, one 'other' gender respondent commented:

“Emojis are useful as shortcuts, not just in a one-to-one way (eg, a thumbs up emoji meaning that a person agrees with what the other person suggested) but also more ambiguously. a Heart emoji can be used to express support and care to a friend. it’s that i dont know the words to say to you right now, but i love you and i care about you, and all the other things i dont know how to say right now bc wow is that overwhelming.” [Emoji Use (General)]

Typical male comments, in contrast, were shorter and tended to include simple overall evaluations of emoji:

“It is a very interesting development in linguistics” [Emoji and Language]

“Many overuse it [emoji] for no reason which at times is irritating” [Emoji are Annoying]

Comments by females were more varied but resembled ‘other’ comments more than male comments.

Younger respondents (27%) answered the open-ended question somewhat more than respondents over 30 (22%). Of those who answered, seven people commented spontaneously on Age Differences in Emoji Use. For example, one -30 female wrote: “Teens and adults use emoji very differently (e.g., 😞 or 😏²⁷),” and another young female commented, “Parents use it COMPLETELY differently.” Age differences in emoji understanding were also noted. For example, a +30 female wrote:

“My grandchildren use tons of emojis in text messages. Sometimes I need to ask for a translation! :-D” [Age Differences in Emoji Use; Emoji are Confusing]

A +30 male confessed to having even more difficulties understanding emoji:

“I didn’t even really understand the question about emoji versus emoticons versus other images and video. I use things I can type, and sometimes the platform replaces them with small pictures.” [Emoji are Confusing]

This last comment is consistent with the high frequency of “*I don’t know*” responses received from older male survey respondents.

5 DISCUSSION

The analysis of the data from the *Understanding Emoji Survey* in response to actual (anonymized) Facebook group messages revealed five main findings:

1. *Tone modification* was the most favored interpretation of emoji function overall, followed by *action*. However, interpretations of emoji functions varied significantly by emoji type.
2. The ‘other’ gender respondents differed more from the females and males than the females and males differed from each other. The ‘others’ were less likely to choose *tone* and were more likely to choose *multiple functions*.
3. Respondents differed by age in their preference for several functions. Older respondents were more likely to respond “*I don’t know*” or to interpret the emoji literally as *actions* compared to younger respondents. Younger respondents were more likely to prefer *softening* or *tone*.
4. Some interaction effects were found between gender and age, and among gender, age, and emoji type in preferred interpretations of emoji functions. Older males were most likely, and younger females were least likely, to respond “*I don’t know*,” independent of emoji type.
5. In response to the open-ended question about emoji use, males and +30 respondents commented more often that emoji are annoying and confusing, whereas females and -30 respondents commented more on general emoji use. Respondents under 30 expressed the most liking for emoji.

Each of these findings is discussed in turn below.

Although *tone modification* was the most common interpretation assigned to the emoji examples overall, and all of the emoji were interpreted by at least some respondents as indicating *tone*, different emoji types specialize in expressing different pragmatic functions. The Kiss emoji, for example, was often interpreted as an *action* or *mention*, and the Grimace emoji was often interpreted as a *reaction*. The ‘Meh,’ Crying, and Tongue Out emoji were most often interpreted as modifying the *tone* of the text they accompanied, while Smiles and Winks were preferentially interpreted as *softening*. These findings offer a more nuanced understanding of emoji function than has been advanced in previous studies. The status of *tone* vis-à-vis the other functions and the specialization of emoji types for particular functions are discussed at greater length in [8].

The relative lack of gender differences in overall female and male interpretations of emoji functions might be considered surprising in light of the substantial evidence that females and males use and value emoji differently [e.g., 4, 9, 30, 37]. However, our findings are in line with the findings of [19] regarding the interpretation of emoji sentiment. Taken together, these findings suggest that females and males have similar mental representations of emoji semantics and pragmatics, and that they are able to understand emoji in similar ways even when their own usage differs. While it is outside the scope of this paper to explain why gender differences in emoji use exist, it seems evident that they are

²⁷ The appearance of this respondent’s original emoji is unknown, because the Qualtrics survey platform imposes its own renderings on the emoji inserted by respondents. Apple versions are shown here.

social in nature. Emoji play a role in identity performances, as suggested by [32, 37]. This is both acknowledged and resisted in the comment of one young female at the end of the survey:

“I don’t really like using them. I’m female and I feel that if I didn’t use enough positive emojis, it would be perceived as rude, unenthusiastic, or apathetic by my acquaintances or friends. This is sort of a pain because I want men who see me on social media to take my ideas seriously, and I’m pretty sure that the more emojis I use, the dumber I’ll be perceived by men.”

The societal expectation that (young) women should often use (positive) emoji on social media as part of their performance of gender identity - and the converse expectation, that (older) men should not - may help to explain the strongly skewed distribution of “*I don’t know*” responses to the survey items and the gender and age differences in self-reported confidence and comfort with using emoji reported in sections 4.1 and 4.2. It may be that because women are expected to understand emoji, female respondents are more likely to make an effort at understanding. The converse may be true for men, for whom “not understanding” emoji is expected of their gender; too much knowledge of emoji (and the interest in them it implies) could seem unmasculine or even effeminate. There is clearly a need for more systematic investigation of gender differences in use versus interpretation of emoji.

As for the preference of the ‘other’ gender respondents to interpret emoji as having *multiple functions*, it is tempting to conclude that they resist simple interpretations of emoji functions in the same way that they resist binary gender norms. However, we lack specific information about the make-up of the ‘other’ gender. The category could include internet users who identify as non-binary, gender-fluid, or who otherwise reject the gender binary, but it could also include people who identify as female or male but for whatever reason prefer not to provide that information in an online survey. Still, clues as to why the ‘other’ gender respondents differ in their understanding of emoji functions might possibly be inferred from their age and patterns of social media use. They are younger; 83.3% of the ‘other’ respondents were between the ages of 18 and 29, and 41.7% were between 18 and 22 years old. However, the ‘other’ gender respondents and the -30 respondents in this study pattern differently, as Table 5 shows.

Social media use offers a more promising explanation. Compared to the females and males, the ‘others’ were less likely to have a Facebook account (62.5% compared with F: 86.0%, M: 94.2%) and more likely to have an account on the microblogging site Tumblr.com (93.6% vs. F: 65.1%, M: 38.3%). Consistent with this, Tumblr users skew young, and the platform has many LGBTQ users [3]. There may be different norms of emoji interpretation associated with different social media platforms (e.g., Facebook vs. Tumblr). Interestingly, emoticons and GIFs are more common than emoji on Tumblr, suggesting that the ‘other’ genders encounter emoji elsewhere. They appear to be experienced emoji users, in any case: 81% of the ‘other’ respondents who finished the survey indicated that they use emoji, and the ‘others’ reported being more confident in their survey answers (36%) than females (30%) and males (26%); they also found the survey “very easy” or “somewhat easy” (64%) more often (F 59%; M 52%). These results are suggestive and call for further research on platform-specific emoji understandings, through surveys as well as through one-on-one interviews.

Age played a greater role than gender in determining what functional interpretations the survey respondents preferred. Older respondents were more likely than younger respondents to interpret the emoji as *virtual actions*, and they were more likely to respond “*I don’t know*.” This fits with the popular conception of older users not understanding emoji or else interpreting them literally [34]. In contrast, younger respondents favored more abstract, conventionalized functions such as *softening* and *tone modification*. These functions are conventionalized in the sense that they are secondary, later developments from the earlier uses of emoji to express emotion and perform (virtual) actions [21]. The interpretations of the younger and older respondents are thus consistent with previous claims about age differences in emoji interpretation and use, according to which younger people tend to be more sophisticated emoji users.

Two caveats should be noted here. First, the emoji that are associated with youth in the popular media tend to be specialized (e.g., the ‘See No Evil’ Monkey emoji (🙈) expressing bashfulness; the ‘Gas Tank’ emoji (🚰) used to invoke ‘gang’ solidarity [5, 6]), whereas the examples used in our survey involve common, basic emoji types such as Smile, Frown, and Crying. Second, most of the reported specialized uses involve responding to or rejecting flirtation [e.g., 6], whereas few examples in our survey could be construed as flirtatious.²⁸ The fact that we found age differences in the interpretation of basic emoji types, including in non-flirtatious contexts, suggests that there are thorough-going age differences in emoji understanding.

²⁸ Several examples involving the Heart, Kiss, and Heart Eyes emoji express love or affection, however.

Age interacts with gender, as can be seen in Table 5. Most significantly, females under 30 and males over 30 were diametrically opposed in their “*I don’t know*” responses. These two groups also emerged as significant in the gender x age x emoji type interactions more often than any other demographic category except for the ‘other’ gender. It was not possible to examine within-gender age differences for the ‘others,’ because very few +30 ‘others’ responded to the survey. Nonetheless, the interactions reported in the last three columns of Table 5 support the overall gender and age patterns reported in the previous columns, while further refining them with respect to specific emoji types. However, the interactions reported here should be tested in future studies with larger numbers of participants in the ‘other’ category.

Meanwhile, contrasts between younger females and older males can also be seen in the responses that participants wrote in to the open-ended question asking for their thoughts on emoji use. Males and +30 respondents commented more often than females and -30 respondents that emoji are confusing and annoying, consistent with their higher frequency of “*I don’t know*” responses, as well as with societal associations of emoji use with females and younger social media users. Conversely, a high number of comments from -30 respondents expressed love or liking of emoji, although females did not make such comments more than males. However, females and younger respondents both offered more helpful comments than males and older respondents about how emoji are generally used, evincing an awareness of emoji functions beyond their personal use. The open-ended comments also provide previously unreported insights that could be mined in future research, such as the tendency of males and older users to express more interest in emoji as language.

6 LIMITATIONS AND GENERALIZABILITY

The *Understanding Emoji Survey* was designed to investigate social media users’ interpretations of emoji uses in their authentic contexts of use. Initially collected to compare lay users’ interpretations with our interpretations as researchers of emoji use in Facebook groups [8, 16], the survey data reveal gender and age patterns in interpretation of emoji functions that both complement and cast new light on previously reported demographic patterns in emoji use. Thus the data should be of broader interest, particularly as this study is (to our knowledge) the first to consider demographic variables in interpreting emoji functions. We hope the results of this exploratory study might provide a baseline for future studies, which could build on the findings with follow-up surveys or by employing other methods such as one-on-one interviews, focus groups, or experimental manipulations.

Further research is needed to move beyond the limitations of the present study design. The study’s findings are limited in their generalizability due to the particular Facebook groups from which the emoji use survey items were drawn. While varied in the demographics of the users they attract, the groups were selected according to a judgment criterion (frequent graphicon use) rather than randomly or systematically sampled. The pragmatic functions of emoji may differ in other Facebook groups, as well as on other social media platforms. Moreover, the number of emoji included in the survey was necessarily limited, given the need to keep the survey instrument to a manageable length. There are more than 3,000 emoji in the Unicode standard;²⁹ thus sampling must always be selective. However, different principles could guide the selection of emoji in future studies.

Moreover, the emoji were not always rendered in the same way in the present survey, but rather were rendered according to how they appeared in the source Facebook messages (Table 1). This was done to preserve authenticity, but it also introduced an element of variability that was not controlled for in our analysis. More generally, it is likely that the respondents’ interpretations were influenced by the specific items included in the survey, although a fine-grained analysis at the level of the individual example was not feasible due to insufficient data. Finally, while the contexts of use are authentic, lending the survey items real-world validity, they were not controlled, making systematic comparison within and across contexts difficult. Future research should investigate what functions are associated with a wider range of emoji, and how the interpretations of those functions vary across users and contexts, in more focused studies.

Another limitation concerns the ‘other’ gender category. No information was available about why respondents selected that category; some people may just not have wanted to share their gender information, while others may be gender nonconforming. That uncertainty coupled with the relatively small population of ‘others’ (N=48; 557 function codes), and especially of ‘others’ over 30 (N=8; 96 function codes), makes the ‘other’ gender results less reliable and more challenging to interpret than those for self-identified females and males. Nonetheless, commonalities of age and self-reported social media platform use of the ‘other’ category suggest that it possesses some internal coherence. In

²⁹ <https://www.statista.com/chart/17275/number-of-emojis-from-1995-bis-2019/>, accessed September 15, 2019.

future research, users of different social media platforms could be interviewed to gain further insight into the platforms' norms of emoji use and interpretation.

Finally, only gender and age were considered as demographic variables. We did not analyze country of residence or native language, for example, due to insufficient data in our survey results for all but the U.S. and English. These variables could affect use and understanding of emoji functions, however, and should be considered in future research.

7 CONCLUSIONS

This study found that female and male social media users did not differ appreciably in their interpretations of emoji functions in Facebook messages. However, younger and older social media users sometimes understood emoji functions differently, and they differed in the functions they associated with particular emoji. Moreover, users over 30 tended to understand emoji functions more literally or not understand them well. These differences emerge most strongly when comparing younger females and older males.

These findings, if supported in further research, have implications for designers of emoji and of social media platforms. Depending on the context, designers need not be unduly concerned about misunderstandings of emoji due to user gender; both females and males appear to understand emoji (when they understand them) in similar ways. However, it is important that designers keep in mind their target audience and the social pressures that shape both emoji use and interpretation, as well as individuals' personal willingness to engage with emoji in the first place. To facilitate understanding for older users, platforms could include textual labels, like Facebook does with its 'feeling/activity' emoji. An option could be provided to view emoji in a larger format, so that they could be more easily visually differentiated. It might also be beneficial to provide the option of a standardized closed set of emoji that could be kept track of more easily. This approach is unlikely to appeal to younger users, however, for whom obscure emoji use may be part of an in-group code [5, 6], or to help older males, who may avoid emoji use as inappropriate for their identity performance. At the same time, the study reveals that there is a common core of emoji for which functional understanding is widely shared, e.g., the Tongue Out, Crying, Frown, and 'Meh' emoji, where *tone modification* is the preferred interpretation.

As noted earlier, research findings for Facebook do not necessarily transfer to other platforms. The self-reported social media usage of our survey respondents suggests that there are platform-related influences on emoji interpretation that are more than a proxy for gender and age. Norms of graphicon usage on different social media platforms need to be taken into account when designing emoji for those platforms, as well as in research on emoji interpretation.

Last, the findings of this study have implications for automating emoji interpretation. Identifying pragmatic usage is a challenging task in Natural Language Processing [22]. We propose that some version of the emoji function taxonomy could be used to train a classifier to recognize emoji functions in public Facebook groups. The associations found in this study between emoji types and functions, if validated by further research, could assist greatly in identifying those functions. Where available, user age and platform information could improve the performance of the classifier even further.

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