



# The emoji scale: A facial scale for the 21st century

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## ABSTRACT

Emojis have grown in popularity as a method for digital communication. Recently, there has been interest in the connection between emojis and emotional response to consumer products. Research has been conducted linking emojis and the emotional response from food stimuli in adults via avenues such as Twitter, and in children. An online study was conducted to assess the application of an emoji-based pictorial facial scale with children ages 8–11 (grades 3rd, 4th, and 5th). Two hundred and fourteen participants were asked to evaluate their liking and emotional response using the Peryam and Kroll (P&K) scale (super good/super bad) and pictorial emoji scale, respectively, for both food and non-food experiences. Scores from each grade level were not statistically different. The responses from both scales had similar mean scores and distribution patterns for all experiences with no incidence of bias toward any one emoji. These results support the suitability of the emoji scale for measuring emotional response using verbal stimuli names with children ages 8–11 in the United States and indicate it is a reasonable alternative to the P&K scale for this demographic.

## 1. Introduction

American family structures have changed over time to be more democratic, giving children greater influence in decision making (Mintel, 2016). This shift has increased the importance of children as consumers, adding value to their opinions and reactions to products. In addition to the change in family structures, the American family is becoming increasingly diverse in race and ethnicity (Mintel, 2016). These changes may affect consumer research methods in the future through new challenges such as the need for multilingual surveys and the development of more suitable methods for children of all ages.

Measuring emotional response is one method used for evaluating product acceptance with children (Laureati, Pagliarini, Toschi, & Monteleone, 2015). One method that exists is the Check-All-That-Apply (CATA) approach. A study by Pelsmaeker, Schouteten and Gellynck involving 513 primary school children in Belgium evaluated the consumption of plain and flavored milks, as well as the emotional response to six milk brands (2013). The CATA method was employed to compare the brands using a mix of positive, negative, and neutral emotion words (Pelsmaeker, Schouteten, & Gellynck, 2013). The CATA method was appropriate for discriminating between the brands, with 19 of the 20 emotion words showing significant differences across brands (Pelsmaeker et al., 2013). This method is suitable for children with developed language skills, but may be challenging with children who cannot read on their own. An alternative method for evaluating emotional response is via observation (Laureati et al., 2015). Zeinstra,

Koelen, Colindres, Kok, and de Graaf performed an observational study on seven liquids evaluated by six children, ages 5–13 (2009). The children ranked the liquids by preference and each session was recorded for facial expression analysis. The study found that the observation of facial expressions is suitable for measuring stimuli that induce a negative response, but not discriminating enough to evaluate different degrees of liking for this demographic (Zeinstra, Koelen, Colindres, Kok, & De Graaf, 2009). Due to the low number of suitable methods for assessing emotional response as a means for evaluating consumer acceptance in children, hedonic methods may also be used.

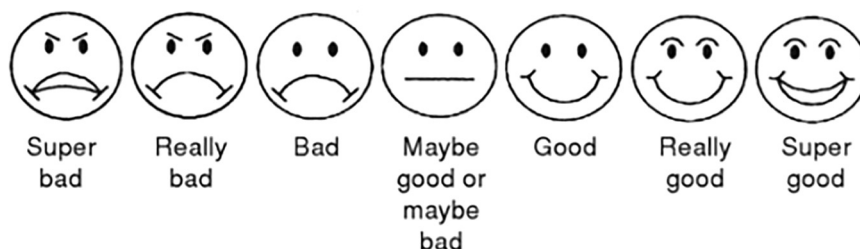
The 9-point hedonic scale is one of the most common tools in consumer research. Kroll adapted the traditional 9-point scale for children by changing the verbal anchors to more child-appropriate terms to create the P&K scale (Popper & Kroll, 2011). Kroll tested the P&K scale compared to the traditional 9-point hedonic scale and a 9-point facial scale with children ages 5–10 (Kroll, 1990). The P&K scale was the most discriminating between stimuli and was accepted as a suitable method for children over five years old (Kroll, 1990; Popper & Kroll, 2011). However, in a study on adult Argentine consumers, the translation of the traditional hedonic scale showed mixed results (Curia, Hough, Martinez, & Margalef, 2001). When participants were given the nine scale anchors in a randomized order and asked to rank them from best to worst, about 30% ordered them differently than the English scale (Curia et al., 2001). Accurate translation of verbal scales, such as the P&K scale, is a concern when performing consumer research across cultures or borders. Verbal scales are also problematic when testing

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Fig. 1. Current pictorial scales.

with young children who may find it difficult to read and comprehend anchors (Lawless & Heymann, 2010). These concerns have led to the examination of pictorial-based scales as a more versatile alternative (Moskowitz et al., 2012).

Pictorial facial scales have been used as a method for measuring acceptance in children (Moskowitz et al., 2012), but current scales have become outdated and may not function well across all demographics (Fig. 1). Other pictorial scales exist for various uses, such as pain assessment in children (Wong & Baker, 1988). Emojis have emerged as a new method for determining acceptance; they have seen a rapid growth in popularity, becoming ubiquitous worldwide (Jaeger & Ares, 2017). This broad recognition makes emojis an advantageous choice for evaluating acceptance, specifically emotional response.

Vidal, Ares, and Jaeger began researching emojis as a method for assessing emotional response to a food stimulus by analyzing tweets about food and eating occasions (2016). These studies supported that Twitter could be a source for collecting the emotional response to food products, and validated the idea that consumers use emojis to express their food-related emotions (Vidal, Ares, & Jaeger, 2016). CATA responses to food stimuli using emojis were evaluated by Jaeger, Vidal, Kam, and Ares (2017b). They found the emojis were able to discriminate between stimuli and groups of consumers, but the results are preliminary and more research is needed to develop the method (Jaeger et al., 2017b). Additionally, Jaeger and Ares studied the most common meaning associated with 33 emojis according to Chinese consumers (2017); understanding the dominant meaning is critical when assessing the validity of other test methods using emojis.

When discussing emotions, there are two dimensions to consider: valence and activation level (Spinelli, Masi, Dinnella, Zoboli, & Monteleone, 2014). The valence differentiates positive and negative emotions, where activation level corresponds with arousal (Spinelli et al., 2014). Jaeger, Lee, Kim, Chheang, Jin, and Ares looked at these two dimensions as part of their research comparing emotion word surveys to emoji surveys (2017a). They found greater discrimination existed between emojis of different valence than emojis of different arousal (Jaeger et al., 2017a). Jaeger et al. have called out the need for new methods to examine the emotional response of food and food-related stimuli (2017b). Much of the available research on emojis and emotional response has been conducted involving adults. Gallo, Swaney-Stueve, and Chambers began conducting emoji research with children ages 8–11 (2017a). They held three focus groups including both genders. The participants evaluated different food stimuli using emotional words and emojis. Only face emojis were used in the study;

the list was vetted by a researcher for relevancy to the task and study demographic. Emoji valence was analyzed and low performing emojis were flagged to be removed from future studies (Gallo, Swaney-Stueve, & Chambers, 2017a). This research greatly influenced the scale discussed in this paper.

A new pictorial scale, the emoji scale, offers a modernized option with promising recognition around the world. The purpose of this research was to compare the liking and emotional response of experiences and foods within a category using the P&K scale and emoji scale, respectively. Children in the United States, ages 8–11, assessed the suitability of the emoji scale and evaluated it as an alternative to the P&K scale for measuring acceptance.

## 2. Materials and methods

### 2.1. Online study

Two hundred and fourteen children, ages 8–11 (35% 3rd grade, 32% 4th grade, 33% 5th grade), participated in an online study in Olathe, Kansas. Participants were recruited via email to the parent or legal guardian in the Sensory and Consumer Research Center database. Equal numbers of both genders were selected with their parent or legal guardian's consent and entered into a drawing for monetary prizes upon successful completion of the survey. Children who had participated in previous food emotion studies were excluded.

A parent or legal guardian first completed the screener and initial section of the questionnaire. The child then completed the online questionnaire evaluating their liking and emotional responses to different food and non-food experiences under the supervision of the parent or guardian. The food experiences were pizza flavors and the non-food experiences were situations. Presentation order of the liking and emotional response sections was randomized across participants. Pizza flavor and situation orders within each section were consistent across participant surveys. Figs. 2 and 3 provide examples of the liking and emotional question formats. The wording of the two formats was used to differentiate between liking and emotional response. The online study was conducted using Compusense Cloud (Compusense, Inc., Guelph, Ontario, Canada).

### 2.2. Food and non-food experiences

Pizza flavor was selected as a study topic based on the high emotional response to pizza exhibited in a previous study of the same age

How would you describe going to the dentist? (Choose one)

Super bad   Really bad   Bad   Just a little bad   Maybe good or maybe bad   Just a little good   Good   Really good   Super good

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Look at the faces and click on the face that matches how the activity makes you feel.

How does going to the dentist make you feel? (Choose one face)

☐ ☐ ☐ ☐ ☐ ☐

Fig. 3. Example of emotion question format.

Table 1

Pizza flavor liking and emotional mean response.

Pizza Flavor	Liking <sup>1</sup>	Emotion <sup>2</sup>
Cheese	8.0 <sup>a</sup>	6.1 <sup>a</sup>
Pepperoni	7.5 <sup>ab</sup>	5.7 <sup>ab</sup>
Sausage	7.1 <sup>b</sup>	5.4 <sup>b</sup>
Chicken Alfredo	5.9 <sup>c</sup>	4.6 <sup>c</sup>
Taco	5.6 <sup>c</sup>	4.4 <sup>cd</sup>
Buffalo Chicken	5.2 <sup>c</sup>	4.1 <sup>d</sup>
Mushroom & Onion	3.4 <sup>d</sup>	2.7 <sup>e</sup>
R <sup>2</sup> = 0.9997		

Note: Means in the same column with the same superscript are not statistically different at  $p < 0.05$  according to pairwise comparison with Tukey's HSD.

<sup>1</sup> Liking rated on 9-point hedonic scale.

<sup>2</sup> Emotion rated on 7-point emoji scale.

Table 2

Situation liking and emotional mean response.

Situation	Liking <sup>1</sup>	Emotion <sup>2</sup>
Baking cookies	8.5 <sup>a</sup>	6.6 <sup>a</sup>
Going on a field trip	8.3 <sup>a</sup>	6.4 <sup>a</sup>
Going on a picnic	7.8 <sup>b</sup>	6.1 <sup>b</sup>
Reading a book	7.4 <sup>bc</sup>	5.7 <sup>c</sup>
Going to a museum	7.0 <sup>cd</sup>	5.4 <sup>cd</sup>
Playing with sidewalk chalk	6.6 <sup>de</sup>	5.0 <sup>de</sup>
Going to the dentist	6.4 <sup>e</sup>	4.9 <sup>e</sup>
Cleaning your room	4.2 <sup>f</sup>	3.5 <sup>f</sup>
Getting a stomach ache	1.8 <sup>g</sup>	1.6 <sup>g</sup>
R <sup>2</sup> = 0.9990		

Note: Means in the same column with the same superscript are not statistically different at  $p < 0.05$  according to pairwise comparison with Tukey's HSD.

<sup>1</sup> Liking rated on 9-point hedonic scale.

<sup>2</sup> Emotion rated on 7-point emoji scale.

group (Gallo et al., 2017a). Seven pizza flavors were evaluated in the questionnaire: cheese, pepperoni, sausage, chicken alfredo, taco, buffalo chicken, and mushroom and onion. All are recognizable American pizza toppings. The researchers felt the discrimination ability of the scale could be better tested using different flavor varieties within one food product category rather than using foods from a variety of product categories that had more overall differences. If the scale could discriminate between products in the same category, it could be inferred that the scale would also discriminate between products in different categories.

The situations were chosen for their presumed appropriateness for children in the study's demographic. The survey included nine situations: baking cookies, going on a field trip, going on a picnic, reading a

book, going to a museum, playing with sidewalk chalk, going to the dentist, cleaning your room, and getting a stomach ache. All experiences were chosen to evoke a broad range of liking and emotional response to encourage the use of the full scales; this rationale was utilized in a previous food and emotion study and was effective (Gallo, Swaney-Stueve, & Chambers, 2017b).

### 2.3. Pictorial emoji scale

Emojis in the scale were chosen based on a previous study in which Gallo, Swaney-Stueve, and Chambers held focus groups with children ages 8–11 (2017a). In one part of the study, children were tasked with sorting emojis they associated with food emotions into three categories: positive, negative, and neutral (Gallo et al., 2017a). Researchers chose the seven scale points because the faces were used frequently and consistently characterized in the same valence class in previous research, were non-redundant, and were clearly used to communicate an emotion. Additionally, several studies have presented results that support the reliability and use of 7-point scales (i.e. Cicchetti, Showalter, & Tyrer, 1985; Miller, 1956; Preston & Colman, 2000). The Apple iOS 8.3 emoji images in this study were used with permission (Apple, Inc. Cupertino, California).

### 2.4. Data analysis

An analysis of variance (ANOVA) with the Tukey's Honest Significant Difference (HSD) adjustment was performed on the liking and emotional response data to calculate and compare mean scores. Linear correlations were found between the liking and emotional response means and presented as  $R^2$ . The comparison of scales of different lengths using linear correlation is supported by a study from Colman, Norris, and Preston comparing five- and seven-point scales using four different correlation equations (1997). They found no significant difference between the linear correlation and more complicated equations, concluding the linear fit is best for most applications (Colman, Norris, & Preston, 1997). The significance level was 5%. All results were analyzed with XLSTAT 2015 (Addinsoft, Paris, France).

## 3. Results

Mean scores for the liking and emotion questions are provided in Tables 1 and 2. The liking and emotion response means were similar throughout the study based on the Tukey's HSD letter designations. The pizza flavor and situation-based liking and emotion questions had similar response distribution patterns; the distributions for each experience are provided in Figs. 4 and 5. When divided by grade (3rd–5th), scores were statistically similar across all experiences ( $p < 0.05$ ).

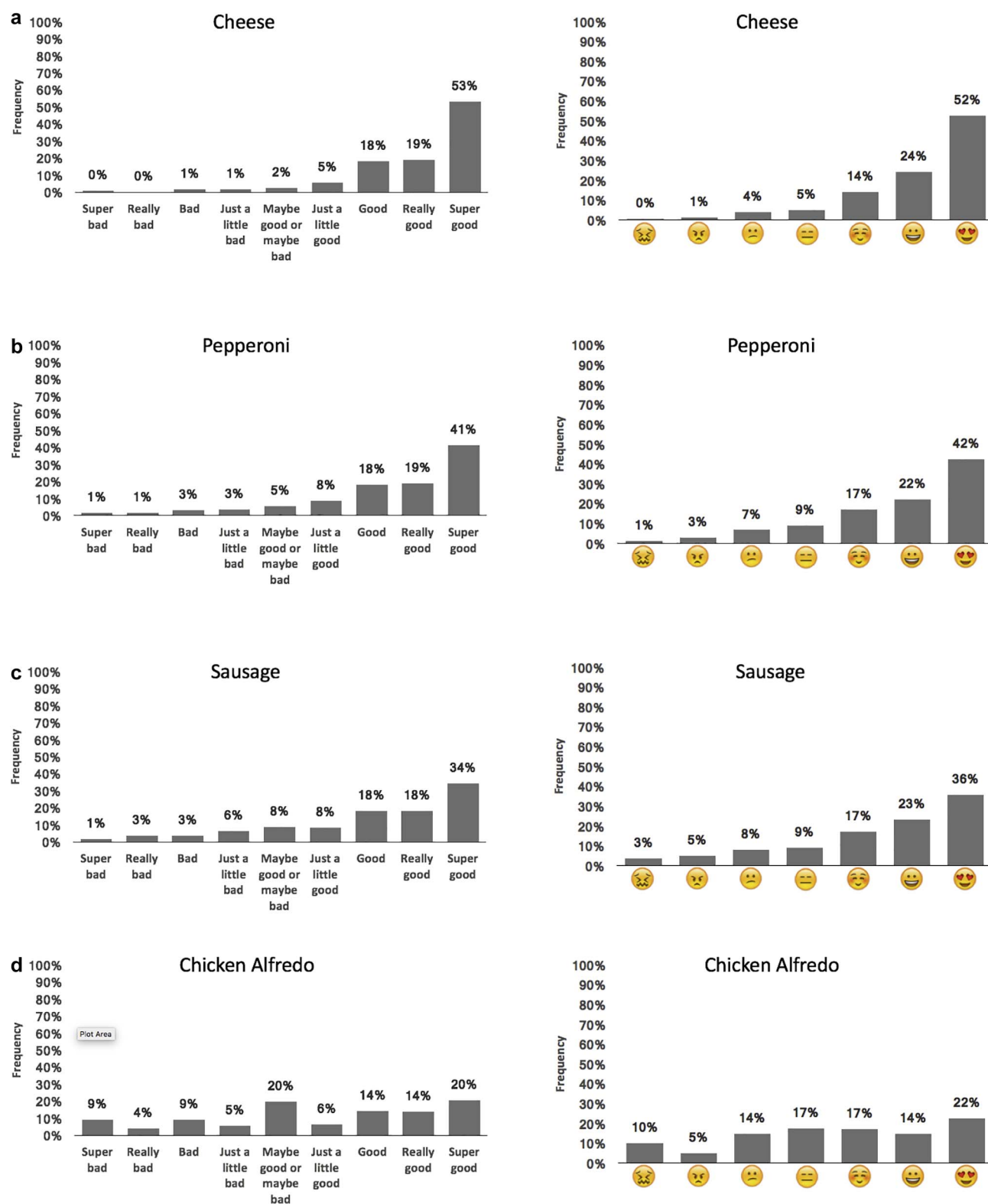


Fig. 4. Pizza flavor liking and emotion mean frequency.

Cheese and pepperoni pizza flavors had the most positive liking and emotional response, while mushroom and onion pizza flavor had the most negative liking and emotional response. Baking cookies and going on a field trip had the most positive liking and emotional response for the situations, and getting a stomach ache had the most negative liking and emotional responses. The participants used the entire super good/super bad scale (9 points) and the entire pictorial emoji scale (7 points)

for the food and situation questions. There was no indication of bias for any individual emoji within the scale as no emoji was used more frequently for all situations or pizza flavors. This is supported by the distribution of responses displayed in Figs. 4 and 5.



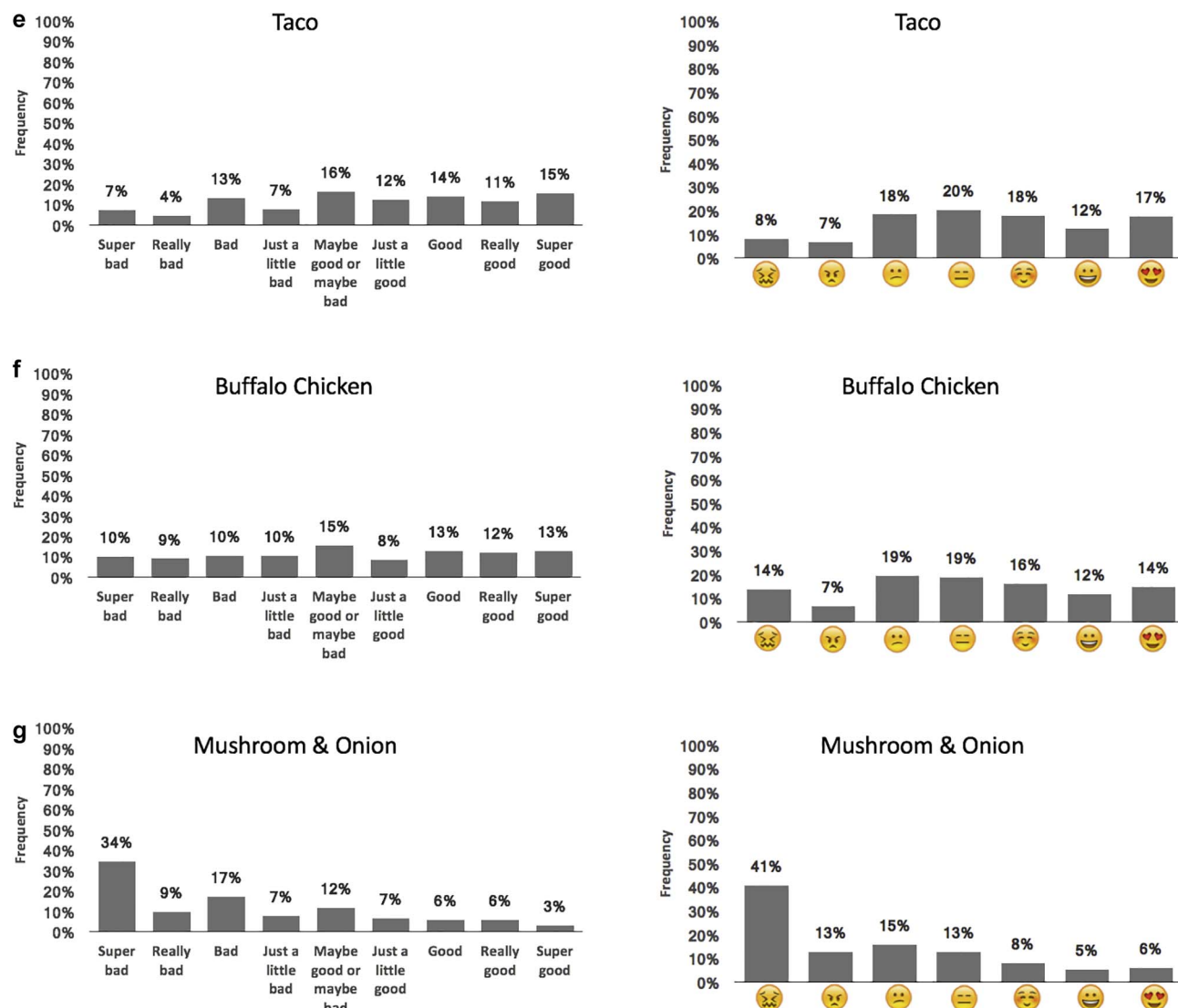


Fig. 4. (continued)

#### 4. Discussion

Overall, the emoji scale proved suitable and was able to differentiate between verbal food and non-food experiences. This aligns with the findings of Jaeger et al. (2017b), who found emojis were able to discriminate between stimuli in a CATA-based test. As discussed by Gallo, Swaney-Stueve, and Chambers in reference to their focus groups, foods with high liking typically elicit positive or happy emotions, while foods with low liking evoke emotions such as anger, sadness, or disappointment (2017a). Children tended to pick positive emojis when referencing their favorite foods (high liking), and negative emojis when referencing their least favorite foods (low liking) (Gallo et al., 2017a). Participants in this study followed that trend for both food and non-food experiences, using positive emojis when liking was high, and negative emojis when liking was low. Though the liking and emotional scales had different numbers of anchors, nine and seven, respectively, their response patterns had similar distributions. When the mean scores are used to order the pizza flavors and situations from highest to lowest, they follow the same order for both liking and emotional response. The research team chose to use seven scale points, as opposed to matching the 9-point P&K scale, due to the potential for redundancy and mixed meaning between similar (looking) emojis. The seven emojis chosen were discrete in appearance and meaning preventing confusion that may have negatively affected the results.

A strong, positive, linear correlation ( $R^2 > 0.99$  for both pizza flavors and situations) between liking and emotion question responses was found. This may indicate that liking and emotional response are interchangeable for children ages 8–11. This aligns with findings from a study on breakfast drinks where valence emotions linearly correlated to liking, while the activation level did not (Gutjar et al., 2015). If more differentiation between liking and emotional response is desired, the emojis would need to be chosen for their activation level instead of valence, as discussed by Spinelli et al. (2014). Differentiation of stimuli with emojis of different activation levels have been used with the CATA method (Jaeger et al., 2017a); further research would be needed to evaluate an emoji scale that tests emotional arousal.

Despite the range in age of the participants, all experiences received statistically similar scores between the three grade levels. This is supported by Jean Piaget's developmental stages. Children ages 8–12 fall under the “concrete operational” stage in which they develop the ability to understand and respond to more complex ideas (Guinard, 2000); because of their developmental similarities, the decision to combine this age range was appropriate.

One limitation of this research was the use of verbal stimuli as opposed to real situations and tasted foods. Piaget's work can again support this; since the 8 to 11-year-old age group has complete understanding and reasoning skills, they are able to appropriately score foods and situations based on the verbal names alone (Guinard, 2000). A

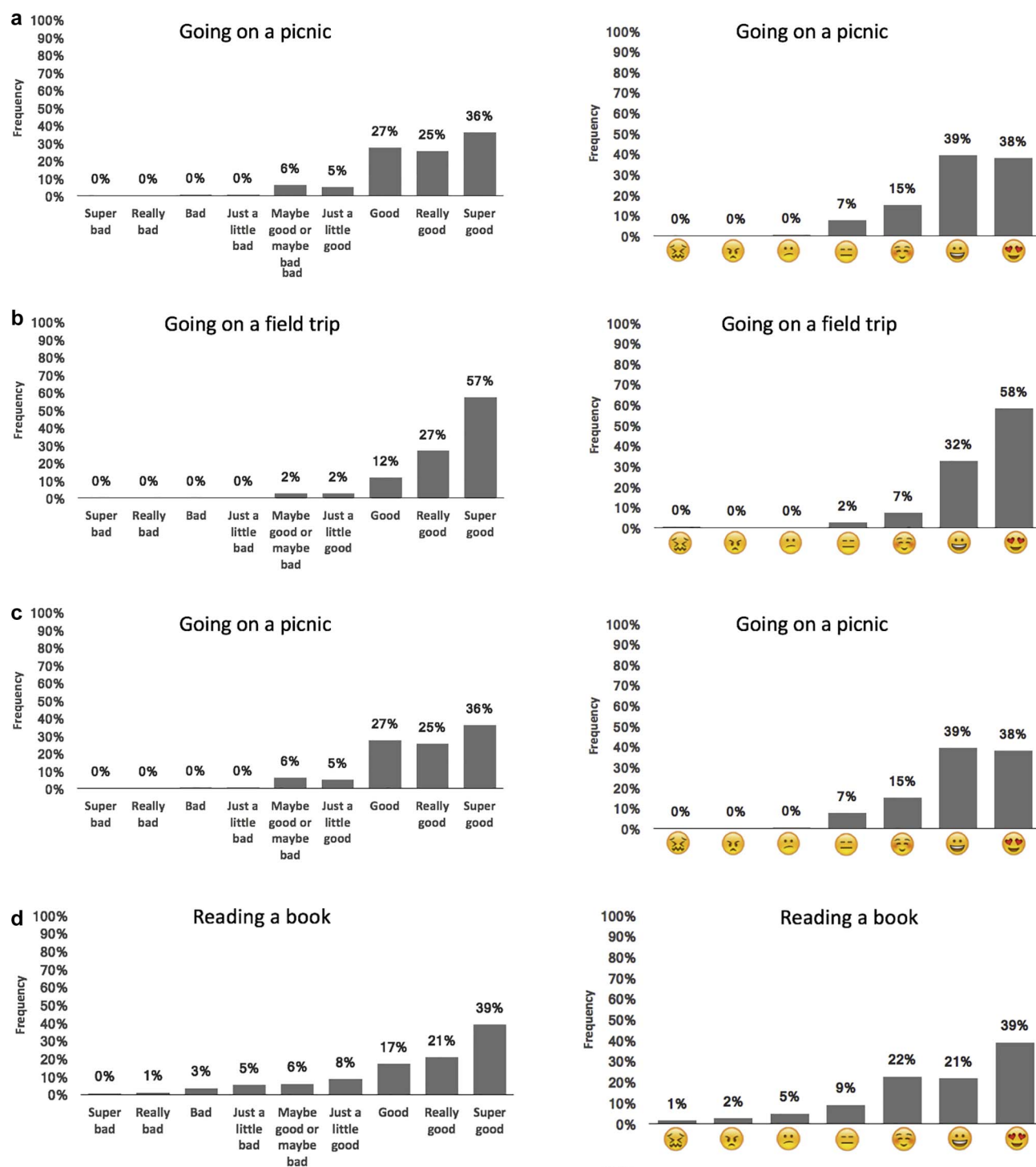


Fig. 5. Situation liking and emotion mean frequency.

study involving adults compared the emotional response to both food names and tasted products (Cardello et al., 2012). The results showed the food names and tasted products were similar in their response patterns but still showed some differences indicating verbal and tasted stimuli are not interchangeable (Cardello et al., 2012). Future research is needed to determine if differences between verbal food name and tasted product emotional responses are different for children using the emoji facial scale.

The emoji scale proved applicable for measuring emotional response to verbal food and non-food stimuli in children ages 8–11. Due to the high positive correlation between emotional response and liking, the

emoji facial scale could also function as an alternative to the P&K scale for this demographic. The emojis used in this study are trademarked by Apple and were approved for this research project.

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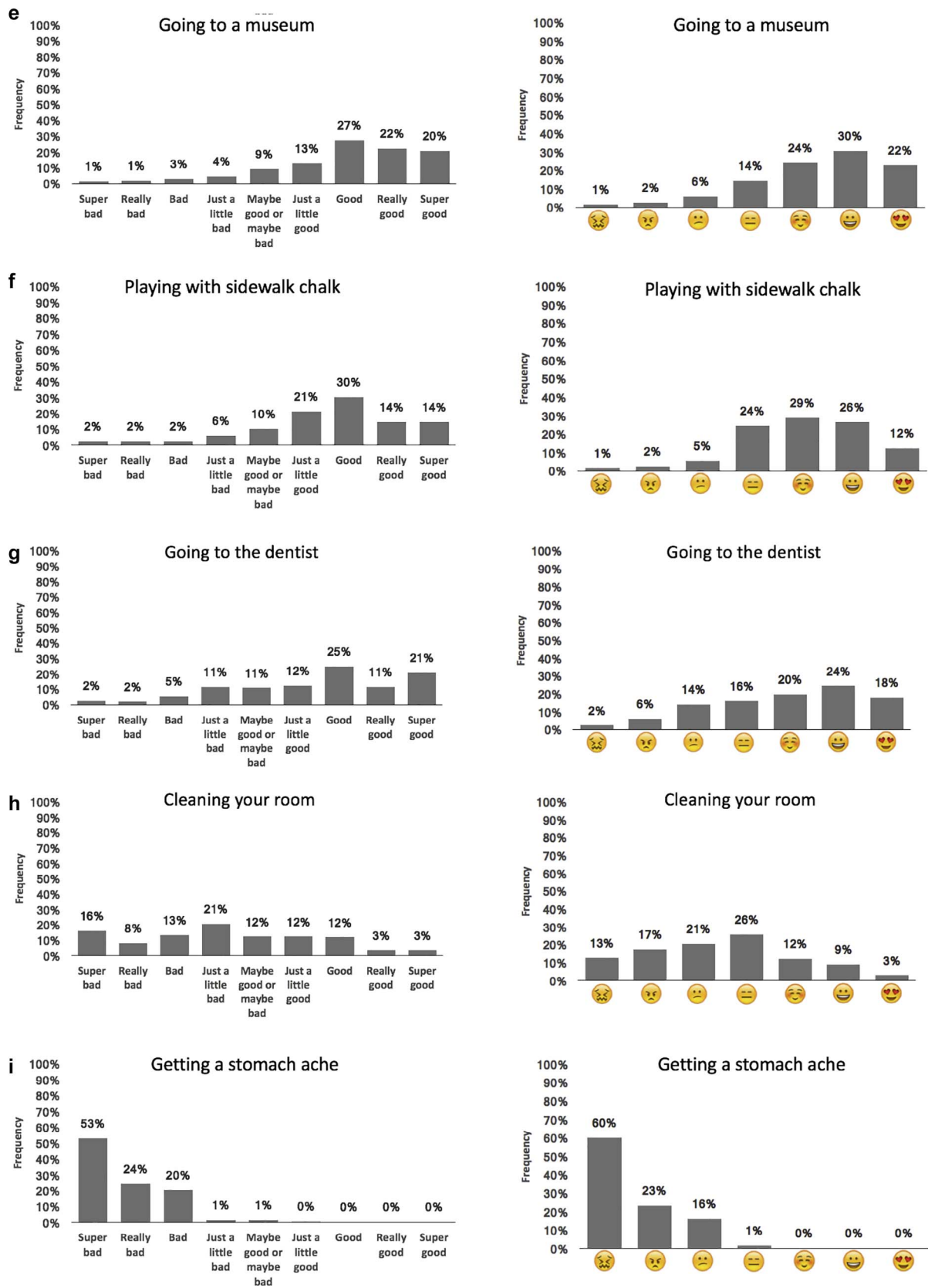


Fig. 5. (continued)

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