INTERPRETATION OF EMOJI® IN MALAY LANGUAGE AMONG CHILDREN IN MALAYSIA

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Abstract

The existing dental anxiety scales for paediatric patients tend to categorize and label children according to their level of cooperation. However, human emotions are more complex, and each child is unique. Hence, a more dynamic and interactive method should be introduced for a better understanding of the patient's current state of emotion. The aim of this study was to investigate the interpretation and understanding of children towards frequently used emoji® for the development of an emoji® dental emotional spectrum. Both online and physical surveys were conducted among 147 Malay language-speaking children aged between 4-to-16 years in Malaysia. The children were asked to interpret 30 pre-selected emoji® images in their own words using the Malay Language. The pre-selected emoji® represent happiness, neutral, fear, sadness, and anger. The interpretations were subsequently based on their similar meaning, a process that was validated by two experts in the field of linguistics. The study involved participants with an average age of 9.2 years, with the majority of them being female (61.2%). Of the 30 pre-selected emoji® images used in this study, 13 had respondent agreement exceeding 60% which was the threshold set for suitability for use in evaluating dental emotion. The remaining 17 emoji® images have a remarkable variability in the interpretation which indicates potential misinterpretation by the respondents. The 13 emoji® images range from happiness, neutral, fear, dislike, unhappy, sad, anxious, and angry with the emoji® images which represent "excited" (94.0%), "loudly crying" (97.3%) and "angry" (91.8%) had the highest agreement. Meanwhile, the emoji® images represented "confounded" and "downcast" had the least agreement among respondents (1.3%). Despite the universal meaning imposed by emoji®, the interpretations may vary in different populations and age groups. Emoji® images hold the potential to serve as a valuable tool for identifying and managing children's behaviour.

Keywords: Emoji, Interpretation, "Bahasa Melayu", Children, Communication

Introduction

Establishing, nurturing, and enhancing a strong rapport with paediatric patients is paramount for dental practitioners in ensuring effective clinical management during dental visits. This necessitates the establishment of effective communication between the dental professionals and young patients. However, it's important to recognise that communicating with children can be challenging, as their thought processes and responses to situations often differ significantly from those of adults (1, 2). Conducting a face-to-face formal interview with a child may lead to potential misinterpretation of their feelings regarding the dental visit, potentially complicating the process of clinical management. Several measures are available for assessing dental anxiety in children, including the Modified Children Dental Anxiety Scales (MCDAS) and the Facial Image

Scale (FIS). The MCDAS and FIS employ graphic pictorials of smiling and frowning faces to gauge child anxiety (2, 3). The MCDAS comprises eight questions that inquire about children's anxiety levels concerning various dental procedures, such as general dental visits, examinations, scaling and polishing procedures involving local anaesthesia, restorations, extractions, general anaesthesia, and inhalation sedation (4). Children are asked to rate their anxiety for each scenario on a five-point scale, ranging from relaxed to very worried. While the MCDAS has demonstrated reasonable reliability, previous studies have shown that it tends to yield a high number of incomplete questionnaires (4, 5). This may be attributed to some included situations not being fully understood by the children (5).

On the other hand, the FIS utilises a row of five faces, ranging from very happy to very unhappy and children are asked to indicate the face that best represents their current feelings (5). This scale assigns scores from 1 (the most positive face) to 5 (the most negative face), with lower scores indicating more positive emotions. The FIS is praised for its speed, ease of administration, and suitability for younger age groups (5). However, it has its limitations, including being a single-item measure, which makes it challenging to precisely identify the construct of anxiety being assessed (4). Additionally, some children may find the images used in this scale intimidating, potentially leading to avoidance of answering the questions.

Considering the limitations mentioned earlier, there's a call for the introduction of a novel dental anxiety scale that incorporate more pleasant and familiar mode of communication. Nonverbal communication cues have the potential to provide clearer expression of a patient's feelings and enhance interactions between paediatric patients and dental practitioners, thereby facilitating effective communication (6). One notable example of such nonverbal cues is the use of emoji®. Emoji® are "picture characters" or pictographs that have become widely recognised in text-based communication and are commonly used in smartphone messaging and on various social media platforms. Emoji® have gained extensive integration into people's everyday language and communication (7). Currently, research on the utilisation of emoji® expressions in dental settings with children is relatively novel in Malaysia. Furthermore, due to the diverse usage of the Malay language and the influence of various cultural backgrounds, the interpretation of the emoji® might differ even among individuals sharing similar racial backgrounds (8). Emoji® prove to be highly beneficial for conveying nonverbal cues during dental assessments, allowing paediatric patients to articulate their emotions and feelings for each specific dental procedure more effectively (8, 9).

This in turn, aids children in expressing their emotions clearly during dental visits. Nonetheless, it is essential to acknowledge that emoji® usage can sometimes be prone to misunderstanding and may introduce ambiguities in interpretation and communication. These ambiguities can potentially lead to inefficiencies during dental visits. Consequently, this study aims to identify how Malay-speaking children commonly interpret emoji® that represent various levels of dental anxiety. To the best of our knowledge, this is the first study focused on examining how children in the Malay-speaking population interpret emoji®, providing valuable insights into this unique linguistic and cultural context.

Methodology

Participants
Sample size was calculated using Epi Info with α = 0.05, expected frequency was 79.8%, non-response rate was 20%; yielding a final value of 140 participants. A total of 147 participants were selected via simple random sampling method with the age group of four to sixteen years old, with parental consent and sought assent from children who are capable of understanding emoji®. The location of this study is at Faculty of Dentistry, University Teknologi MARA and also conducted via online survey. The inclusion criteria encompassed Malay-speaking children aged four to sixteen years who could effectively communicate verbally and had obtained consent from their parents or guardians. Conversely, the exclusion criteria encompassed children outside the age range of four to sixteen years, unable to effectively communicate verbally in 'Bahasa Melayu' and children for whom parental or guardian consent was not obtained.

Pilot study
The initial pilot study included fifteen participants, constituting approximately 10% of the total sample size. These participants were presented with a set of forty (40) emoji®. The pilot study aims to finalized

selection of thirty emoji® based on the ones most frequently used by the participants.

Data collection

A set of frequently used emoji® sourced from The emoji® - The Iconic Brand in various social media platforms was initially selected by a participants in the pilot study panel of assessors. Subsequently, thirty emoji® were chosen based on the pilot study and were interpreted by the participants (n=147) in the actual study. These selected emoji® were considered appropriate for representing the following emotions: very happy to very sad; painless to very painful; and very comfortable to very anxious.

Both online and physical surveys were administered, commencing with the collection of demographic information about the participants, including their gender, date of birth, ethnicity, and current place of residence. In cases where participants were unable to read and write, the surveys were administered with the assistance of their parents. On the other hand, most adolescents were able to independently complete the survey. During the survey, the participants were instructed to provide their own description of each emoji® using the Malay language, based on their personal understanding and not influence by their parents. In the final phase, the gathered interpretations were categorised according to their shared meanings, a process validated by two experts in the field of linguistics. The calibration was done by an expert in linguistic field. Inter-rater and intra-rater reliability was determined by using Kappa scores and we observed a percentage agreement of 88-95%.

Results

In terms of demographic data, the respondents were predominantly female, accounting for 61.2% of the sample, with a mean age of 9.2 years. Regarding race, the majority were Malays, comprising 95.9%, while 2% were of Indian descent, and 2.1% belonged to other racial groups (Figure 1). Geographically, a significant portion of the respondents were from Selangor (43.5%), followed by Sarawak and Kuala Lumpur (8.8%), Negeri Sembilan (8.2%), and Kedah (6.8%) (Figure 2). Out of the 30 emoji® images examined in this study, 13 achieved respondent agreements exceeding 60%, meeting the predetermined threshold for suitability in evaluating dental emotions. These findings are illustrated below:
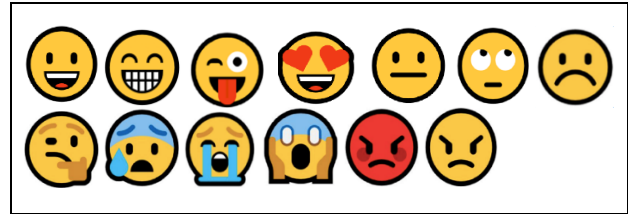
Seventeen of the emoji® images were excluded from the analysis due to significant variations in the interpretation, indicating notable potential for misinterpretation among respondents. Table 1 describes the selected thirty Emoji®, the genuine meanings based on The Iconic Brand website, and the interpretations provided by the respondents. The highest levels of agreement were observed for emoji® images categorised as "loudly crying" (97.3%) and "angry" (91.8%), while the lowest agreement was observed for emoji® images depicting a "downcast face" (1.3%). In Table 2, it is evident that fourteen of the emoji® images were interpreted to match precisely with the meanings intended by The Iconic Brand website.
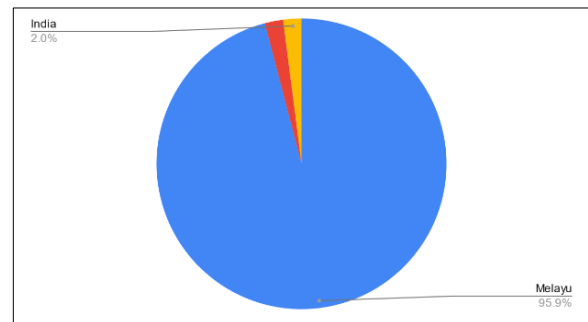

Figure 1: The pie chart shows the race of the respondents (n = 147)
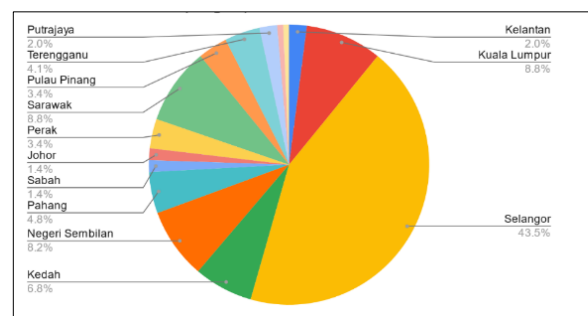

Figure 2: The pie chart displays the percentage of the respondent's state (n = 147)

Table 1: The selected 30 Emoji®, the real meaning of Emoji® based on The Iconic Brand website and its interpretations by the respondents

No.	Emoji®/ real meaning of emoji® based on The Iconic Brand website	Interpretations & Results (Percentage)	Interpretation follows the real meaning of emoji®	Explanation
1.	Grinning face with big eyes	**Happy ('Gembira') (87.76%)** Other interpretations: 1) Smile ('Senyum') 2) Frustrated ('Hampa') 3) Excited ('Teruja') 4) Laughing ('Ketawa')	No	The interpretation of emoji® revealed a high understanding of emoji® which is happy with a percentage of 87.76%. Some of the interpretations of the others may include a cynical smile, disappointment, the realization of smiling and it is okay, false hope, like but shy, ready to hear our talk and get to know. This showed that some respondents have similar interpretations although there is a wrong meaning.
2.	Grimacing face	**Too happy (Sangat gembira) (75.48%)** Other interpretations: 1) Senyum ('Smile') 2) Gembira ('Happy') 3) Gelak ('Laughing') 4) Gigi ('Teeth') 5) Lawak ('Funny') 6) Teruja ('Excited') 7) Bangga ('Proud')	No	The emoji® revealed a high understanding of happiness among respondents with a percentage of 75.48%. The other's interpretations were proud, making fun of something, expressing wanting to take a photo and evil smiles.
3.	Grinning face with sweat	**Relief (Lega) (47.5%)** Other interpretations: 1) Sorry ('Minta maaf') (39.72%) 2) I Don't know ('Tak tahu') 3) Tired ('Penat') 4) Worry ('Risau') 5) Shy ('Malu')	No	The emoji® revealed a low understanding of happiness among respondents with a percentage of 75.48%. The other's interpretations were proud, making fun of something, expressing wanting to take a photo and evil smiles.Most of the respondents agreed that these emoji® reflect sorry. The others may include shy, and I don't know.

4.	Winking face	**Winking eyes ('Kenyit mata') (55.78%)** Other interpretations: 1) Smile ('Senyum') (32.2%) 2) Frustrated ('Hampa') (9.67%) 3) Excited ('Teruja') 4) Laughing ('Ketawa')	Yes	The emoji® revealed a high understanding interpretation of winking eyes with a percentage of 55.78%. The other interpretations include kidding/mischievous, fairly well, suspicious of something, able to achieve something or I don't care.
5.	Smiling face with smiling eyes	**Smile ('Senyum') (55.77%)** Other interpretations: 1) Happy ('Gembira') 2) Hampa (Frustrated) 3) Excited ('Teruja') 4) Laughing ('Ketawa')	Yes	The emoji® revealed a high understanding interpretation of winking eyes with a percentage of 75.48%. The majority of the respondents revealed the emoji® reflects a smile with a percentage of 55.77%. Others were thank you and excited.
6.	Winking face with tongue	**Kidding ('Bergurau') (69.38%)** Other interpretations: 1) Smile ('Senyum') 2) Hampa ('Frustrated') 3) Teruja ('Excited') (21.9%) 4) Ketawa ('Laughing')	No	The emoji® revealed a high understanding interpretation of kidding with a percentage of 69.38%. Most of them agreed that this emoji® showed an 'I'm just kidding' expression, protruding tongue, posing when taking a picture for photography and some of them stated it is the face showing thirst.
7.	Hugging face	**Thank you ('Terima kasih') (30.1%)** Other interpretations: 1) Smile ('Senyum') (24.5%) 2) Hugging ('Peluk') (18.3%) 3) Excited ('Teruja') 4) Hello ('Hello') 5) Good bye ('Selamat tinggal') 6) Clapping hand ('Tepuk tangan')	No	The emoji® revealed a low understanding interpretation of kidding with a percentage of 30.1%. The other interpretations were smile, clapping hands, welcoming someone, its ok and good job! Most of the respondents agreed that the meaning was hugging.

8.	 Face with hand over mouth	**Shy ('Segan') (46.94%)** Other interpretations: 1) Smile ('Senyum') 2) Frustrated ('Hampa') 3) Excited ('Teruja') 4) Laughing ('Ketawa')	No	The majority of the respondents revealed the emoji® reflects the shy feeling. The other interpretation was to close the mouth due to smelly things.
9.	 Smiling face with heart eyes	**Excited ('Teruja') (94.06%)** Other interpretations: 1) Like ('Suka') 2) Love ('Sayang') 3) Really? ('Ohh') 4) Sad ('Sedih)	No	The interpretation of emoji® revealed a high understanding of emoji® which is excited with a percentage of 94.06%. The other interpretation was I love you, sad and wow.
10.	 Slightly smiling face	**Smile a bit ('Senyum sedikit') (55.09%)** Other interpretations: 1) Smile ('Senyum') 2) Frustrated ('Hampa') 3) Excited ('Teruja') 4) Laughing ('Ketawa')	Yes	Half of the respondents agreed this emoji® represents a little bit smile with a percentage of 55.09%. The neutral face, happy and face of acceptance were also interpreted.
11.	 Neutral face	**Neutral ('Tiada perasaan') (77.2%)** Other interpretations: 1) Tutup Mulut (Keep quiet) 2) Sedih (Sad) 3) Tidak Suka (Dislike) 4) Bosan (Bored) 5) Marah (Angry) 6) Gementar (Nervous)	Yes	The majority of the respondents revealed the emoji® reflects the neural face/no feeling with a percentage of 77.2%. The other interpretation was confused and keep quiet.

12.	Unamused face	**Annoyed ('Menyampah') (32.64%)** Other interpretations: 1) Smile ('Senyum') 2) Frustrated ('Hampa') (54.34%) 3) Sad ('Sedih') 4) Astonished ('Teruja')	No	More of the respondents agreed that the meaning of emoji® was annoyed with a percentage of 32.64%. There are great variations of interpretation for this emoji® which include a feeling of jealousy, sad, astonished, and proud face.
13.	Face with raised eyebrow	**Suspicious ('Curiga') (42.14%)** Other interpretations: 1) I Don't know ('Tak tahu') (36.47%) 2) Angry ('Marah') 3) Dislike ('Tak suka') 4) Proud ('Bangga')	No	The interpretation of emoji® revealed a high understanding of emoji® which is suspicious with a percentage of 42.14% and then followed by I don't know (36.47%). Others were annoyed and felt ashamed of something.
14.	Face with rolling eyes	**Annoyed ('Menyampah') (78.32%)** Other interpretations: 1) I don't know ('Tak tahu') 2) Thinking ('Berfikir') 3) Sarcastic face ('Muka sarkastik') 4) Bored ('Bosan')	No	The interpretation of emoji® revealed a high understanding of emoji® which is annoyed with a percentage of 78.32%. Some of the respondents interpret this as ignorance or a sarcastic face and feeling dizzy.
15.	Pensive face	**Accept ('Redha') (44.85%)** Other interpretations: 1) Sleep ('Tidur') 2) Disappointment ('Kecewa') 3) Shy ('Malu') 4) Smile ('Senyum') 5) Happy ('Gembira') 6) Felt sorry for ('Menyesal') (38.3%)	No	The highest interpretation of this emoji® shows acceptance of things with a percentage of 44.85%. However, some of the respondents interpreted it as feeling sorry for, relief and nodding.

16.	Worry face	**Worry ('Risau') (20.3%)** Other interpretations: 1) Sad ('Sedih') 2) Afraid ('Takut') 3) Frustrated ('Kecewa') 4) Shock ('Terkejut')	Yes	The emoji® expresses a worried face which most of the respondents are unable to interpret correctly with a percentage 20.3%. The emoji® was perceived as sad, afraid, frustrated, and shocked by the rest of the respondents.
17.	Frowning face	**Sad ('Sedih') (82.3%)** Other interpretations: 1) Dislike ('Tak suka') 2) Angry ('Marah') 3) Bored ('Bosan')	No	The exact interpretation of the emoji® is a frowning face. However, most of the respondents interpret the emoji® as a sad face with the percentage of 82.3%. Other interpretation includes dislike, anger, and boredom.
18.	Pleading face	**Pleading ('Merayu') (13.1%)** Other interpretations: 1) Sad ('Sedih') 2) Need attention ('Minta perhatian') 3) Afraid ('Takut')	Yes	Only a small number of respondents agreed that this is a pleading face emoji® with a percentage of 13.1%. Other respondents interpret it as a sad face, a need for attention face, and an afraid face.
19.	Thinking face	**Thinking ('Berfikir') (83.0%)** Other interpretations: 1) Don't know ('Tak tahu') 2) Cool ('Bergaya') 3) Confuse ('Keliru')	Yes	The majority of the respondents were able to interpret the exact meaning of this emoji® which is a thinking face with a percentage of 83.0%. This emoji® is highly understandable. Other interpretation includes don't know face, cool face, and confused face.

20.	Fearful face	**Fearful ('Takut') (12.5%)** Other interpretations: 1) Shock ('Terkejut') (24%) 2) Fever ('Demam')(19.74%) 3) Face turning blue ('muka tukar biru') (26.54%) 4) Ohh no! ('Oh tidak')	Yes	Most of the respondents interpret this emoji® as a shocked face with a percentage of 12.5% which is different from the exact meaning of the emoji® which is a fearful face. There are various interpretations such as shock, fever, oh no and face turning blue.
21.	Anxious face with sweat	**Worry ('Risau') (62.6%)** Other interpretations: 1) Exhausted ('Penat') 2) Sad ('Sedih') 3) Shock ('Terkejut') 4) Don't know ('Tak tahu') 5) Sweating ('Berpeluh') 6) Forgot ('Terlupa') 7) Weird ('Pelik') 8) Unwell ('Sakit')	No	Most of the respondents interpret revealed a high understanding of this emoji® as a worry face with a percentage of 62.6%. Instead of interpreting the emoji® as an anxious face with sweat, most of the respondents interpret it as a worried face.
22.	Sad but relieved face	**Sad but relieved ('Sedih tapi lega') (27.1%)** Other interpretations: 1) Worry ('Risau') (50.64%) 2) Sweating ('Berpeluh') 3) Did not expect ('Tidak sangka')	Yes	Some of the respondents able to interpret the exact meaning of this sad but relieved face emoji® with a percentage of 27.1%. Meanwhile, most respondents interpret the emoji as a worried face. Others were a sweating face, and a "did not expect" face.
23.	Loudly crying face	**Loudly crying ('Menangis sekuat hati') (97.3%)** Other interpretations: Funny ('Kelakar')	Yes	This emoji® revealed a high understanding as most of the respondents interpret it as a loudly crying face with the percentage 97.3%.

24.	Confounded face	**Confounded ('Keliru') (1.3%)** Other interpretations: 1) Dislike ('Tidak suka') 2) Afraid ('Takut') (64.32%) 3) Sour ('Masam') 4) In pain ('Sakit') 5) Angry ('Geram') 6) Frustrated ('Kecewa')	Yes	Only a small number of respondents were able to interpret this confounded face emoji® correctly with a percentage of 1.3%. Other interpretation includes dislike, afraid, sourness, pain, angry, and frustration. However, the majority of the respondents agreed that the emoji represents afraid with a percentage of 64.32%.
25.	Face screaming in fear	**Surprised ('Terkejut') (85.0%)** Other interpretations: 1) Afraid ('Takut') 2) Shy ('Malu')	No	Most of the respondents revealed a high understanding of this emoji® as a surprised face instead of a face screaming in fear with a percentage of 85.0%. Other respondents also interpret it as an afraid face and a shy face.
26.	Downcast face with sweat	**Downcast ('Muram') (1.3%)** Other interpretations: 1) Sorry ('Bersalah') 2) Sad ('Sedih') 3) Tired ('Penat') 4) Worry ('Risau') 5) Shy ('Malu')	No	No respondent able to interpret the exact meaning of this emoji®. They understand and interpret it as a downcast face with a percentage of 1.3%, a sorry face, a sad face, a tired face, a worry face, and a shy face.
27.	Weary face	**Weary ('Penat') (28.3%)** Other interpretations: 1) Sad ('Sedih') 2) Angry ('Marah') 3) Tired ('Penat') 4) Mengeluh ('Sigh')	Yes	Majority of the respondents interpret this emoji® as a sad face and an angry face with a percentage 28.3%. However, the exact meaning of the emoji® is a weary face which can be identified by a small number of respondents.

28.	Face with steam from nose	**Frustrated and angry ('Kecewa dan marah') (59.9%)** Other interpretations: 1) Unsatisfied ('Tidak puas hati') 2) Trying to be patient ('Cuba bersabar')	No	No respondents were able to interpret the exact meaning of this emoji®. Most of the respondents interpret it as a frustrated and angry face with a percentage 59.9%.
29.	Very angry face	**Very angry ('Sangat marah') (71.9%)** Other interpretations: 1) Angry ('Marah') 2) Fierce ('Garang')	Yes	This emoji® is highly understandable as most of the respondents can understand it correctly with a percentage 71.9%. Other interpretations include angry and fierce face.
30.	Angry face	**Angry ('Marah') (91.8%)** Other interpretations: 1) Dislike ('Tak suka') 2) Jealous ('Cemburu')	Yes	Most of the respondents revealed a high understanding that this emoji® exhibits an angry face with a percentage of 91.8%. Other interpretations include a disliked face and a jealous face.

Table 2: Fourteen of the emoji® were interpreted with the exact meaning of emoji® based on The Iconic Brand website

No	Description	Emoji®
1	Winking face	
2	Smiling face with smiling eyes	
3	Slightly smiling face	
4	Neutral face	
5	Worry face	
6	Pleading face	
7	Thinking face	
8	Fearful face	
9	Sad but relieved face	
10	Loudly crying face	
11	Confounded face	
12	Weary face	
13	Very angry face	
14	Angry face	

Discussion

The utilisation of emoji® can enhance interactions, including oral health provider-patient relationships, and aid in aligning with patients at their preferred level of comprehension or cognition. Hence, this study was conducted to identify how Malay-speaking children commonly interpret emoji® that represent various levels of dental anxiety. In this study, a set of thirty of the most frequently used emoji® was included in the survey to gauge how each respondent interpreted these emoji® and to discern variations in perception and interpretation. The study's findings revealed a multitude of meanings and interpretations for each emoji®, which aligns with the observations made by Jaeger et al. (10). Their research highlighted how the utilisation of emoji® can lead to compromised communication experiences, social awkwardness, and cultural offenses due to the inherent ambiguity, potential for misinterpretation, and the influence of cultural differences (10, 11). It is important to note that emoji® can be subject to diverse interpretations, often diverging from their intended meanings (10). One potential explanation for this variance is that individuals tend to have their own subjective understandings of how specific emotional states should be conveyed through facial expressions.

This study has several limitations that must be acknowledged when interpreting the results. First, all participants in this study have a wide age range from four to sixteen years old, and individuals with other demographic characteristics, such as gender and culture, were not included. Second, only emoticons from The Iconic Brand website were used in this study. As a result, minor differences in emoji® designs may have an impact on the results. Even though the same code is used, the design of emojis displayed on Android and iPhone devices differs slightly. These design changes have been proven to influence emoji® interpretation, particularly for emoji® that communicate ambiguous emotions (12). As a result, the findings of this study may alter when various emoji® designs are employed, but the particular differences are unknown. Finally, the participants in the current study were mostly Malay, as such, our data does not accurately represent the diverse population of Malaysia. The most significant influence on emoji® interpretation variations was attributed to emoji® familiarity; however, additional research is required to account for the effects of these other variables. The interpretation of emoji® is indeed influenced by several factors, including diverse cultural backgrounds, technical differences, and the visual characteristics of the emoji® images themselves (8). Furthermore, the variations in perceived meaning and emotional content of emoji® can be attributed to the diversity of languages and ethnical backgrounds (11). Thus, the greater the variation of interpretation an emoji® has, the higher the likelihood of misinterpretation when it is used in communication.

Some emoji® were not fully understood by the respondents in terms of their intended meaning, leading them to interpret the emoji® based on their perception and understanding. The emoji® images with incorrect interpretations included; 😃 (grinning face with big eyes), 😬 (grimacing face), 😊 (smiling face with smiling eyes), 😜 (winking face with tongue), 🤭 (face with hand over mouth), 😍 (smiling face with heart eyes), 🙁 (unamused face) and 😥 (pensive face). Emoji® are misinterpreted for two reasons: 1) differing viewpoints regarding appropriate usage and meanings of emoji®; and 2) platform-specific variations in emoji® design (10, 12). The comments make it quite evident that a misunderstanding would arise if someone was unable to "calculate" or decipher the intended meaning of an emoji®. Because of this, misinterpreting messages based on divergent interpretations of emoji® can cause breakdowns in communication and, in certain situations, even harm to relationships (12).

Many responses were brief, consisting of single or double words, often acting as nouns or adjectives, such as 'happy', 'smile', 'laugh' or 'close eye'. In the case of certain emoji® images, multiple words were used to describe them, like 'lazy to serve', 'hide something weird', and 'happy but in pain'. It is important to note that emoji® can convey a range of emotions and can have positive, negative, or neutral connotations, signifying the corresponding emotions and nuances in a conversation. For instance, 😃 (grinning face) and 😊 (smiling face) convey positive emotions, while 😐 (neutral face) represents a neutral expression, and 😒 (unamused face) conveys a negative expression. The emoji® 😠 (angry) is undeniably a popular one; however, the study's findings indicate that its popularity is not solely due to its denotation but also because of the psycho-emotional characteristics attributed to it by respondents. This symbol is overwhelmingly

associated with negative connotations, with 91.8% of respondents perceiving it as representing wrath, rage, and anger based on its visual depiction and this echoed with the study by Annamalai & Salam (11).

It is noteworthy that the emoji® 🙄 is primarily interpreted as conveying annoyance along with a perceptual error when compared to the intended meaning which carries a sarcastic connotation and conveys feelings of despondency, melancholy, and fatigue. While a majority of respondents interpreted the (face screaming in fear) 😱 emoji® as indicating surprise, some respondents perceived it as ironic or exaggerated. Malay speakers tend to use emoji® more literally compared to speakers of other languages. For instance, the sweating face emoji® 😅 is often employed by Malay speakers to express laughter, whereas in other languages, it is more commonly used to convey nervousness or anxiety. Additionally, Malay speakers sometimes utilise combinations of emoji® to create new meanings. For instance, the combination of the emoji® 😍 + 🤗 (heart eyes + hug) is frequently used to convey love in Malay, while in other languages, the same combination is more commonly employed to express excitement or enthusiasm.

However, it is important to note that not all emoji® images exhibit the same level of variability in interpretation. In the present study, thirteen emoji® achieved respondent agreement exceeding 60%. Interestingly, this research revealed that the emotions with a high degree of agreement included happiness, neutrality, fear, dislike, unhappiness, sadness, anxiety, and anger (happy, neutral, fear, dislike, unhappy, sad, anxious, and angry). Out of these, only thirteen emoji® were interpreted in line with the exact meanings assigned by The Iconic Brand website. Notably, the emoji® (loudly crying face) 😭 obtained the highest level of agreement among respondents. Conversely, the emoji® (fearful face) 😨 exhibited the most variation in interpretation, with responses ranging from shock (24%) and fever (19.74%) to face turning blue (26.54%) and expressions like 'Oh no!'. It is worth mentioning that while Schouteten et al. (12), suggested that the emoji® (winking face with tongue) 😜 displayed ambiguity, the results of this study indicate the

opposite. In this study, most of the children demonstrated very similar interpretations, often conveying the meaning of "just kidding". Furthermore, the study highlights that the perception of certain emoji® images such as 🙄 (annoyed), 🙁 (worry face), and 😖 (confounded face) as ambiguous would suggest that children use them in various contexts with different pragmatic meanings.

An interesting observation was made with the 😍 emoji®, which children used to convey contradictory messages, signifying both joyful and sad pragmatic meanings. It is crucial to emphasise that the meaning of an emoji® can significantly vary depending on the context in which it is used. For instance, the 😌 emoji® (smiling face with smiling eyes) can serve to express genuine laughter, but it can also be employed sarcastically. This contextual variability can lead to misinterpretation of sentiment, as multiple interpretations can arise from the same visual image. Consequently, relying solely on emoji® to gauge a person's emotional state may yield incorrect conclusions if the individual perceives the emoji® differently from the intended meaning.

These findings further underscore that the comprehension of emoticons not only varies across different cultures but also within the same culture, such as Malay culture. The interpretation of emoji® across diverse cultures, age groups, and demographic segments continues to present challenges. As a result, it is advisable to conduct additional extensive research to ensure the reliability and validity of clinical assessments and interpretation outcomes. It is important to highlight that a notable degree of variability in interpretation exists, especially when individuals analyse the same emoji® (13). One potential explanation for these observed outcomes lies is the inherent trade-off in emoji® design, particularly concerning the level of detail or intricacy, such as variations in colour intensity on a cheek or the angle of an eyebrow (12, 13). While the use of emoji® offers a means for conveying subtle and intricate forms of expression, this very complexity can lead to a broader range of interpretations (9, 13). Investigating the relationship between specificity in emoji® design and the likelihood of misinterpretation represents a significant avenue for future research.

This study is expected to make a valuable contribution to comprehending the interpretations and meaning of emoji® images, particularly among

Malaysian children. Additionally, it holds the potential to serve as a useful tool for assessing dental anxiety. To achieve this, it is crucial to place emphasis on the recipient's characteristics to determine the framework of the respondent's speech and verbal skills. Furthermore, gaining insights into the understanding of emoji® and their associated meaning has implications for usage behaviour and underscores the existence of differences among individuals from various continents and cultural backgrounds. In conclusion, this study is anticipated to significantly enhance our understanding of emoji® interpretations, particularly among Malaysian children, and may be instrumental as an assessment tool for dental anxiety.

Conclusion

Despite the universal meaning assigned to emoji®, our study revealed substantial variations in their interpretation among Malaysian children. As part of our future research, we are keen on exploring how emoji® can be effectively utilised as a tool for behaviour evaluation and incorporated into the treatment planning process for paediatric dental patients.

Acknowledgement

Competing interests

The authors declare that they have no competing interests.

Ethical Clearance

The approval to conduct the study was granted by The Research Ethics Committee (REC) of Universiti Teknologi MARA (UiTM) code REC/02/2021 (MR/55). Also, approval for the use of emoji® in this study has been obtained from The Emoji® company, and this project falls under their Corporate Social Responsibility (CSR) program (EMJ-137).

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