RiCL Research in Corpus Linguistics

Emoji use by children and adults: An exploratory corpus study

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Abstract – Emoji (e.g., 🤪✈️🧁) are increasingly used on social media by people of all ages, but little is known about the concept 'emoji literacy'. To investigate different age groups' emoji preferences, an exploratory corpus analysis was conducted using an innovative corpus-gathering method: children and adults were instructed to add emoji magnets to pre-constructed printed social media messages. The corpus (with 1,012 emoji) was coded for the number of emoji used per message, the type of emoji, their position and function in the message, and the sentiment they conveyed. Intuitions about emoji use turned out to be similar for children and adults, with greater use of facial emoji, emoji at the end of messages, emoji to express emotions, and emotional emoji to convey positive sentiment. Children's emoji preferences were studied in more detail. Results revealed that their age, gender, smartphone ownership, and social media use related to differences in the number, position, and function of the emoji used. The data showed that older children, girls, children with their own smartphone, and children using social media exhibited a more advanced and sophisticated use of emoji than younger children, boys, and children without smartphones or social media experience. This study constitutes an important first step in exploring children's emoji literacy and use.

Keywords – emoji; social media; computer-mediated communication; children; digital natives; emoji literacy

1. Introduction

Digital messages are becoming increasingly visual (Thurlow *et al.* 2020). Text-based computer-mediated communication (henceforth CMC) can nowadays be augmented with visual elements such as emoji, stickers, GIFs, memes, photos, and videos (Wang *et al.* 2019). Emoji in particular abound in personal CMC (Coosto 2020) and professional CMC (Dijkmans *et al.* 2020). These colourful small images cannot just present facial expressions (😛, 😢, 😉, 😆), similar to the more old-fashioned emoticons consisting of typographic characters (*:p*, *:'(*, *;)*, *XD*), but also all kinds of activities (⛹️), animals (🦚), objects (🧢), and symbols (☢️). The range of emoji available in the Unicode Standard (Unicode 2023) continues to expand, with currently over 3,700 emoji, including different genders, skin tones, and countless flags. In 2015, Oxford Dictionaries even pronounced the 'face with tears of joy' (😂) emoji as 'word' of the year, which testifies to the ubiquity

and salience of emoji in digital writing (Steinmetz 2015). Emoji are a striking aspect of contemporary online language, making them a highly interesting research topic. The body of academic literature on emoji is expanding, but research on children's (i.e., digital natives') use of emoji is generally lacking. The present paper will fill this research gap by reporting on a corpus analysis exploring how children use emoji. The aim of the study is thus to explore children's inclinations for using emoji (e.g., 😀🍕🙏🌸). The following two research questions are addressed:

RQ1: Do children use emoji differently than adults?

RQ2: Which demographic factors affect children's use of emoji?

2. Theoretical framework

2.1. Emoji as a multifunctional resource

Emoji are one of the visual elements that can make social media messages multimodal. They are small graphical images, also called 'graphicons' (Herring and Dainas 2017; Dainas and Herring 2021), which contain considerable visual detail. Previous studies have examined the utility of emoji as a digital resource, showing that they can fulfil numerous communicative functions in online writing by combining the roles of images, words, ideograms, nonverbal signals, and punctuation marks (Dürscheid and Siever 2017; Siebenhaar 2018; Tang and Hew 2018; Cohn *et al.* 2018, 2019; Beißwenger and Pappert 2019; Dürscheid and Meletis 2019). Prior work has revealed that emoji representing faces (😊😍😜), gestures (👍🙌✌), or people (👩‍👨‍👦) can compensate for the lack of non-verbal communication and paralinguistic cues in writing, can change the meaning or tone of a message, can express emotions, and can convey humour (Verheijen 2016; Evans 2017; Gawne and McCulloch 2019; Seargeant 2019). Other emoji (🎁🧁🐶) can simply visualise, 'decorate', or disambiguate text, thereby reducing chances of misinterpretation (Riordan 2017b). Emoji can make messages more playful or informal, indicating a sense of intimacy or social familiarity (Stark and Crawford 2015; Riordan 2017a). They can be used to structure messages, complementing or replacing punctuation marks (Dürscheid and Siever 2017; Pappert 2017; Busch 2021). In terms of speech acts, emoji can change the locution —the literal meaning of a message— and illocution —how the sender intends a message to be interpreted—, thereby affecting the perlocution —how a message affects

the recipient— (Austin 1962; Searle 1969). Drawing on Spina's (2018) work on emoticons, emoji can, in short, be designated as having semiotic, emotional, social, structural, and pragmatic functions.

Not everyone interprets emoji in the same way. Dainas and Herring (2021) point out that many emoji are semantically ambiguous. As previous research indicates, variability in emoji interpretations occurs both within and between digital platforms, in semantics (meaning) and sentiment (valence/tone/positivity), when presented in isolation or in the context of messages (Tigwell and Flatla 2016; Miller *et al.* 2016, 2017; Weissman 2019; Franco and Fugate 2020). Such a variation in emoji meanings also exists because besides a denotation (the literal/surface meaning), emoji can have multiple connotations (i.e., non-literal/figurative meanings), which may be metaphoric or euphemistic (e.g., 🐍🍆, Weissman 2019). Differences in emoji interpretations can be dependent on users' age, where younger people tend to be more familiar with novel connotations (e.g., 💀 to express dying from extreme laughter) and older people are more prone to 'incorrectly' interpret emoji (e.g., using 😂 in a sad context) (EditieNL 2016; Abril 2022).

Today's children are growing up with practically unlimited access to digital resources, whereas adults have only learned the ways of CMC at a later age. Younger generations, the 'digital natives', are more familiar with CMC —including emoji— than older generations, the 'digital immigrants' (Prensky 2001; Frey and Glaznieks 2018). Tailored to emoji, natives were born after emoji were invented in 1997. The present paper will study emoji usage by digital natives and digital immigrants from a multitude of approaches, including a) their semiotic use (by examining different types of emoji), b) their structural use (by examining different positions of emoji), c) their pragmatic use (by examining different functions of emoji), and d) their emotional use (by examining different sentiments of emoji).

2.2. Emoji literacy

In this digital day and age, the literacy landscape has been transformed up to the point where traditional literacy no longer suffices. Rather, a mastery of multiple literacies is required to succeed in society. Such new literacies include —but are not limited to— what have been named 'computer literacy', 'digital literacy', 'new media literacy', and 'visual

literacy' (see Verheijen 2018, for an extensive overview and discussion of new literacies). Emoji are a striking visual element of digital writing. Hence, emoji literacy (coined by Danesi 2016) can be considered a subtype of visual literacy. Wang *et al.* (2019) emphasise that digital visual literacy includes more than just emoji, since emoji are part of a wider inventory of graphicons which includes other visual means of expression such as emoticons, stickers, GIFs, and memes. Still, the present paper zooms in on emoji, because these have become so highly integrated into digital writing that they have been incorporated into the Unicode Standard, which encodes most of the world's writing systems (Unicode 2023).

According to Danesi (2016: 88), being emoji literate means that "semantic, syntactic, reinforcement, and conceptual aspects of the grammar interrelate with each other to produce the meaning behind (or underneath)" emoji. Freedman (2018) argues that emoji literacy has a cultural dimension, because they originated in Japan. Scheffler *et al.* (2022) observe that emoji literacy bears similarities to traditional (or 'linguistic') literacy. However, Freedman (2018) and Scheffler *et al.* (2022) focus on the comprehension of emoji, even though literacy crucially depends not just on reading but also writing skills, receptive and productive skills. As such, emoji literacy is determined by people's competence to read and write emoji, that is to say, to comprehend them and to use them. In this paper, we therefore define emoji literacy as the ability to understand and use emoji in appropriate ways in written CMC. Appropriate emoji use and understanding requires an awareness of different emoji meanings and a sensibility for differences in (online) registers.

Emoji literacy is key to effective digital writing. As Hurlburt (2018: 18, 15) rightly notes, "visual literacy, including the use of emoji, becomes an increasingly important skill" and emoji literacy needs to be acquired "to become a truly effective emoji communicator." Digital natives, who have grown up with digital communication tools and social media, can be expected to be more 'emoji literate' than digital immigrants, who have learnt to use such tools and media at a later age. Accordingly, digital natives have more positive attitudes towards emoji in general (Prada *et al.* 2018), are more familiar with (meanings of) emoji (Herring and Dainas 2020), and may be more proficient at attributing emotions to emoji. The current paper will explore if any differences in emoji use can be identified between digital natives and digital immigrants, and among digital natives (here, children) themselves.

2.3. Emoji and children

In recent years, emoji have come under increasing scrutiny of scientific research (see reviews by Bai *et al.* 2019; Tang and Hew 2019; Manganari 2021), but only little research has examined emoji perceptions or production by children. Research with a psychological approach has revealed that children can attribute emotions to facial emoji (Oleszkiewicz *et al.* 2017; Liu and Li 2021; da Quinta *et al.* 2023). Oleszkiewicz *et al.* (2017) found that children without social media or smartphone experience (between the ages of four and eight) can accurately interpret which emotions, especially happiness and sadness, are expressed by certain widely used facial emoji. This accuracy in emotion recognition from emoji was higher in girls and older children than in boys and younger children. Da Quinta *et al.* (2023) confirm that children (aged six to 12) can understand facial emoji. However, they add that such an understanding depends on the context of evaluation. Liu and Li (2021) sampled an even younger age group and showed that 30-month-old toddlers can already associate commonly used facial emoji with emotion words, thereby showing the first signs of emoji literacy.

In the field of education, previous research observed that emoji can also help children to understand emotions and other abstract concepts and to improve their self-expression (Fane 2017; Fane *et al.* 2018), that children can use emoji as storytelling devices (de la Rosa-Carrillo 2018), and that emoji can be used to measure children's attitudes to school subjects like mathematics (Massey 2022).

Most previous studies that have focused on children and emoji were in the domain of marketing and consumer research. Emoji on food packaging have been shown to affect children's dietary choices (Siegel *et al.* 2015; Luangrath *et al.* 2017). A substantial body of research has studied how emoji can be effectively utilised to measure children's emotional responses to food and other products (Gallo *et al.* 2017; Swaney-Stueve *et al.* 2018; Schouteten *et al.* 2018, 2019; Lima *et al.* 2019; Deubler *et al.* 2020; Sick *et al.* 2020a, 2020b; da Cruz *et al.* 2021; da Quinta *et al.* 2023).

Reviewing the relevant research that has been conducted on emoji thus far, it becomes apparent that children are a hitherto underexplored demographic in emoji research from a linguistic perspective. To our knowledge, this paper is the first pragmalinguistic study into children's emoji use, rather than into their perceptions or interpretations of emoji. The purpose of this study is twofold: a) to investigate if children (digital natives) use emoji differently than adults (digital immigrants) and b) to examine

which demographic factors affect children's emoji use. These questions will be addressed by analysing a corpus collected under semi-experimental conditions. The analysis will provide additional knowledge on emoji use by children as compared to adults and will thereby also contribute to existing theory on emoji literacy.

3. METHODOLOGY

3.1. Materials: Data collection

The research questions were addressed with a corpus collected at the *Kletskoppen Kindertaalfestival* in 2020, a language festival in Nijmegen (the Netherlands) aimed at children. The data were collected at this festival by means of "The Great Emoji Experiment" (*Het Grote Emoji Experiment*). 30 children (mean age = 8.5; age range = 5–16; 11 boys, 18 girls, 1 other) and their parents or caregivers (no metadata available) voluntarily participated in the study. Both the children and the adults were requested to add emoji magnets of their choosing to the same seven pre-constructed *WhatsApp* messages. This methodology was chosen because the data had to be collected in a task that was fun, uncomplicated, and suitable for the young children who would attend the language festival.

Fifty emoji magnets, with 49 different emoji, were available to the participants. These represented the following emoji: 😃😂😭😉😘😍😛😐😎😇😴🤓😺😹😻🙈🙉🐵👍👌🙏👊✌🙌💃👯🍔🍕🌮🎂🍆🍌🍻☕☕💕💔💩💀👻🌴🌸☀🔥🚗✈🚀💣👀💯. This was a standard emoji set, i.e., a convenience sample, that had been purchased by the researchers for the purposes of the data collection. One magnet set was available to the children and one magnet set to the adults. Therefore, participants could use each magnet/emoji only once and could not repeat emoji (except for the coffee emoji, which happened to occur twice in the magnet set).

The following seven messages in Dutch had been devised by the principal researcher for the addition of emoji (English translation provided below):

(1) *Yesss Morgen naar de Efteling voor mn verjaardag!!*
'Yesss Tomorrow to the Efteling for my birthday!!'

(2) *RIP! Kat Poekie van oma is overleden*
'RIP! Grandma's cat Poekie has passed away'

(3) *Lekker chillen op het strand #vakantie #genieten*
'Chilling on the beach #holiday #enjoy'

(4) *Whaha wat n blunder… In de poep gestapt, oeps!*
'Whaha what a blunder... Stepped in poo, oops!'

(5) *Zaterdag mogen we kiezen wat we eten. Jippieee*
'Saturday we can choose what we eat. Yaaay'

(6) *Grapje! Ik speel toch NOOOIT vals*
'Just kidding! I NEEEVER cheat anyway'

(7) *Hey sorry dat ik boos was … love you*
'Hey sorry that I was angry ... love you'

The messages were devised so as to match the range of emoji available in the magnet sets and aimed to resemble actual Dutch youths' *WhatsApp* messages. They were written to be suitable for primary school-aged children and were checked by two teachers for their appropriateness in terms of both language and content. As for language, the messages were intentionally informal and included features of textese, such as reduplications (*yesss*, *jippieee*, *NOOOIT*), hashtags (*#vakantie*, *#genieten*), interjections (*yesss*, *whaha*, *oeps*, *jippieee*, *hey*), non-standard abbreviations and orthography (*RIP*, *mn*, *n*, *hey*), and English borrowings (*yesss*, *RIP*, *chillen*, *love you*). In terms of content, they covered the topics of a birthday trip to a well-known Dutch amusement park, the passing away of a pet, a vacation, an unfortunate incident with poo, choosing dinner, cheating at games, and an apology for being angry. Three messages were happy in sentiment (1, 3, 5), three expressed more complex emotions (4, 6, 7), and one was clearly sad (2). The messages were visualised as *WhatsApp* chats and printed on large posters. As for the lay-out, extra spacing was provided at the beginning, in the middle, and at the end of each message, so as to leave room for positioning emoji anywhere. Participants were also allowed to add emoji right next to or below words, indicating that they should be inserted right after a word.

The poster with the *WhatsApp* messages was attached to a magnetic board. Each child and adult were positioned back to back, so the simultaneous data collection occurred independently (they could not see each other's emoji choices). Participants were instructed to decide for themselves how many emoji to use, which emoji to use, and where to add them. Afterwards, metadata on the child participants' gender, age, smartphone

ownership, and social media use[1] were gathered. Moreover, informed consent was collected of all participants.

Because the data collection involved underage children, we sought ethical approval beforehand. The data collection procedure was approved by *Radboud University's Ethics Assessment Committee*.

The Appendix presents a picture of what the collected data looked like. After a child and adult had added the emoji magnets to the *WhatsApp* messages, a picture of the poster with the messages and emoji was taken. In the end, this provided us with 60 pictures: 30 of emoji use by children and 30 of emoji use by adults. The next step was to digitise all the data: for each participant, the messages and emoji were copied in digital format into *Microsoft Excel*, including their exact use of emoji (as had been captured in the pictures). The corpus for investigating children's and adults' emoji preferences contained 420 messages (60 participants × 7 messages), with a total of 1012 emoji.

3.2. Procedure: Data coding

The corpus was coded in *Excel* for: a) the number of emoji per message, b) the type of each emoji that was used, c) the position of each emoji in the messages, d) the function of each emoji, and e) the sentiment conveyed by emoji that expressed sentiment.

Based on the emoji included in the magnet set used for collecting the data, a distinction was made between six types of emoji:

1) Faces (12): 😃😂😭😉😘😍😛😐😎😇😴🤓
2) Animal faces (6): 🐱😹🙀🙈🐵🐵
3) Gestures and movements (8): 👍👌🙏👊✌️👐💃👫
4) Food and drinks (8): 🍔🍕🌮🎂🍆🍌🍻☕
5) Hearts (2): 💕💔
6) Other (including objects and symbols) (13): 💩💀👻🌴🌸☀️🔥🚗✈️🚀💣👀💯

[1] Note that smartphone ownership and social media use did not correspond one to one, since children who did not own a smartphone could use their parents' phone for social media apps. In fact, all children reported having at least some experience with using a smartphone.

For the position of emoji, the coding scheme distinguished between four options of where to add the emoji to the pre-constructed messages: a) at the beginning of a message (before the text); b) after a keyword within the message; c) between sentences, clauses, or intonation units (in the middle of a message); or d) at the end of a message (after the text). These four positions are visualised in example (8):

(8) 😘 *Hey sorry dat ik boos* 🔥 *was ...* 🐵 *... love you* 💕
'😘 Hey sorry that I was angry 🔥 ... 🐵 ... love you 💕'

From an initial exploration of our corpus, four functions of emoji emerged: a) visualising a keyword in the message, b) visualising the content of a message, c) expressing an emotion, and d) unconventional use. The main distinction between the visualisation functions is that the emoji either literally matched a specific (key)word in a message (e.g., a palm tree emoji 🌴 accompanying the word *beach*; food emoji 🍕🌮🍔 accompanying the word *food*) or was associated by participants with the general content of a message but did not match any specific word (e.g., a plane ✈️ or a beer emoji 🍻 in a message about a holiday that made no mention of the travel mode or drinking of any kind). In example (8) above, the fire emoji visualises a keyword (*boos* 'angry') and the two hearts emoji expresses emotion. In example (9) below, the birthday cake emoji also visualises a keyword (*verjaardag* 'birthday'), while the car emoji visualises the general message, but not a specific word within the message. Emoji use was coded as 'unconventional' when it did not correspond to any of the conventional meanings of the emoji as codified by Emojipedia and when it otherwise made no sense to the annotator: for instance, when an adult participant used the 'face with tears of joy' in a message that expressed a sad occasion, such as the death of a pet in example (10). Emoji could also be coded for multiple functions (but this was the case for only 3,5% of all emoji in the corpus).

(9) *Yesss Morgen naar de Efteling voor mn verjaardag!!* 🚗😉🎂
'Yesss Tomorrow to the Efteling for my birthday!! 🚗😉🎂'

(10) *RIP!* 😿 *Kat Poekie van oma is overleden* 💀😂
'RIP! 😿 Grandma's cat Poekie has passed away 💀😂'

For the emoji whose function was to convey a sentiment, the sentiment of emoji was specified in coding the data. Our coding scheme made a distinction between positive sentiment (expressing happiness, amusement, joy, or love, e.g., 😃🌸😂👍🏻😍), negative sentiment (expressing sadness, anger, or fear, e.g., 😭💔💣😕😿), and ambiguous

sentiment (open to multiple interpretations (subjective), e.g., 🙈👀🤓). Note that since emoji can express subtle emotions and a broad spectrum of sentiments (Novak *et al.* 2015; Upadhyay *et al.* 2023), this classification is an oversimplification, but the positive-negative dichotomy is at the core of much research on emotions (Solomon and Stone 2002) and has been used in recent emoji research (e.g. Neel *et al.* 2023). Emoji were classified by the annotator on a case-by-case basis in the context of the message in which they were used.

The codebook was established by scrutinizing a subset of the data. After practising with the codebook, the entire corpus was coded independently by the second author. When in doubt, specific cases were discussed with the first author, until a consensus was reached.

3.3. Statistical treatment: Data analysis

The statistical analysis of the coded data consisted of two parts. The first research question set out to compare and contrast children's and adults' use of emoji. A t-test was performed to examine if there was an effect of age group (children vs. adults) on the number of emoji that were used per message. Chi-square tests were conducted to examine if there were relationships between age group and the type, function, or sentiment of the emoji used. A Fisher's exact test was run for testing if there was a relationship between age group and the position of emoji, since not all requirements for a chi-square test (i.e., at least five observations per condition) were met.

The second research question aimed to identify factors that affect children's use of emoji. To answer this question, children's emoji use was analysed together with their Age (5 to 7 years old, 8 to 9 years old, 10 to 16 years old),[2] Gender (girls vs. boys), smartphone ownership (yes vs. no), and social media use (yes vs. no). First, Pearson correlations were calculated between these four variables. There turned out to be significant correlations between age and social media use ($r(28) = .451$, $p = .014$) and between gender and smartphone ownership ($r(28) = .391$, $p = .033$). A closer inspection showed that older

[2] Age was divided into three groups with a similar number of child participants, for performing chi-square tests.

children more frequently used social media than younger children and that girls more often possessed their own smartphone than boys.

Then, a multiple linear regression was conducted to explore if any of these variables (children's age, gender, owning a smartphone, and using social media) predicted the number of emoji per message. Since age and social media use correlated significantly, as well as gender and smartphone ownership, only age and smartphone ownership were added as predictor variables in the regression model. These two were selected because another (exploratory) regression suggested that they would contribute more to the model than their correlating counterparts.

Finally, more chi-square tests were performed to investigate relationships between, on the one hand, the children's demographic variables (age, gender, smartphone ownership, and social media use) and, on the other hand, the type, position, function, and sentiment of emoji. When there were not enough observations in a condition to meet the requirements for chi-square testing, a Fisher's exact test was performed instead.

4. Results

4.1. Children's vs. adults' emoji use

4.1.1. Number of emoji

To explore if there was any effect of age group on the number of emoji used per message, a simple t-test was performed. No significant difference was found ($t(58) = -.06$, $p = .953$) between the number of emoji that children used ($M = 2.40$, $SD = .065$) and the number of emoji that adults used ($M = 2.41$, $SD = .585$) in our corpus. In fact, the number of emoji used in total by all of the child participants and the number of emoji used by all of the adult participants was nearly identical, 505 and 507 respectively.

4.1.2. Type, position, function, and sentiment of emoji

An overview of the raw frequencies of emoji use by participants of both age groups can be found in Tables 1–4 below. Because the total number of emoji used by the children and adults were so similar, it was deemed unnecessary to compute relative frequencies.

Age group	Faces	Animal faces	Gestures and movements	Food and drinks	Hearts	Other
Children	170	44	43	96	39	113
Adults	170	48	58	88	25	118

Table 1: Frequencies of type of emoji by age group

Age group	At beginning of message	After keyword (within message)	Between sentences (in the middle of message)	At end of message
Children	3	7	144	351
Adults	11	3	144	349

Table 2: Frequencies of position of emoji by age group

Age group	Visualisation of keyword	Visualisation of message	Expression of emotion	Unconventional use
Children	168	35	305	12
Adults	179	42	288	5

Table 3: Frequencies of function of emoji by age group

Age group	Positive sentiment	Negative sentiment	Ambiguous sentiment
Children	205	70	30
Adults	199	56	33

Table 4: Frequencies of sentiment of emoji expressing emotion by age group

Chi-square tests and a Fisher's exact test were carried out to investigate if there were any relationships between age group and the type, sentiment, or function of the emoji used. As seen in Table 5, no significant differences were found between the children and adults.

Type	Purpose	Sentiment	Position
$\chi^2 = 5.92$	$\chi^2 = 4.32$	$\chi^2 = 1.30$	
$p = .314$	$p = .229$	$p = .522$	$p = .102$ (F)

Table 5: Results of χ^2 tests and Fisher's exact tests[3]

[3] *Note*: (F) = Fisher's exact test was performed instead of χ^2 test

4.2. Children's emoji use

4.2.1. Number of emoji

A multiple linear regression was performed to investigate which variables predicted the number of emoji per message. Because of correlations between children's age and social media use and between gender and owning a smartphone, social media use and gender were excluded and only age and smartphone ownership were included in the regression.

The regression showed that there was a collective significant effect of age and smartphone ownership on the number of emoji used ($F(2,26) = 5.07$, $p = .014$, $R^2 = .281$). The individual predictors were examined further and indicated that only age was a significant predictor in the model ($\beta = .521$, $p = .007$). Closer inspection of the data showed that the older the children were, the more emoji they used per message. Means and standard deviations for the three age groups that we distinguished among the children are shown in Table 6.

5 to 7 years old	**8 to 9 years old**	**10 to 16 years old**
$M = 1.91$	$M = 2.60$	$M = 2.77$
$SD = 0.54$	$SD = 0.71$	$SD = 0.32$

Table 6: Means and standard deviations per age group

4.2.2. Type, position, function, and sentiment of emoji

Chi-square tests were performed to investigate the relationships between the independent variables (age, gender, smartphone ownership, social media use) and the dependent variables (type, position, function, and sentiment of emoji). In Table 7 below we can see that no significant relationships were found between the independent variables and the type of emoji or sentiment of emoji that were used. Significant relationships between the independent variables and the function of emoji and the position of emoji are reported in more detail below.

Independent variable		Type	Function	Sentiment	Position
Age	(5–7 vs. 8–9 years)	$\chi^2 = 5.30$	$\chi^2 = 6.39$	$\chi^2 = 0.12$	
		$p = .381$	$p = .094$	$p = .943$	$p < .001$*** (F)
	(8–9 vs. 10–16 years)	$\chi^2 = 1.39$		$\chi^2 = 2.40$	
		$p = .926$	$p = .051$ (F)	$p = .302$	$p = .096$ (F)
	(5–7 vs. 10–16 years)	$\chi^2 = 3.34$		$\chi^2 = 1.36$	
		$p = .647$	$p = .009$** (F)	$p = .507$	$p < .001$*** (F)
Gender (girl/boy)		$\chi^2 = 2.62$		$\chi^2 = 1.64$	
		$p = .758$	$p = .011$* (F)	$p = .440$	$p = .010$** (F)
Owns a smartphone (yes/no)		$\chi^2 = 3.80$	$\chi^2 = 7.19$	$\chi^2 = 1.59$	
		$p = .579$	$p = .066$	$p = .452$	$p < .001$*** (F)
Uses social media (yes/no)		$\chi^2 = 5.30$		$\chi^2 = 0.33$	
		$p = .381$	$p = .009$** (F)	$p = .846$	$p < .001$*** (F)

Table 7: Results of χ^2 tests and Fisher's exact tests

4.2.2.1 Position of emoji and age

There was a significant relationship between children's age and the position in a message where they inserted the emoji. This difference was visible between the group of 5-to-7-year-old participants compared to the group of 8-to-9-year-old participants ($p < .001$) and between the group of 5-to-7-year-old participants compared to the group of 10-to-16-year-old participants ($p < .001$). Standardised residuals, provided in Table 8, show that 5-to-7-year-olds more often put their emoji at the end of a message than 8-to-9-year-olds and 10-to-16-year-olds. Furthermore, 5-to-7-year-olds less often placed their emoji after a sentence in the middle of a message than 8-to-9-year-olds and 10-to-16-year-olds.

Group	At beginning of message	After keyword (within message)	Between sentences (in the middle of message)	At end of message
5–7 years	NaN	-1.647	-3.152	3.515
8–9 years	NaN	1.647	3.152	-3.515
5–7 years	-1.619	-1.619	-4.245	4.874
10–16 years	1.619	1.619	4.245	-4.874

Table 8: Standardised residuals of children's age and the position of emoji

4.2.2.2 Position of emoji and gender

There was a significant relationship between gender and where in a message emoji were most often positioned ($p < .01$). Standardised residuals are presented in Table 9. They show that girls less often put emoji at the end of a message and more often placed them after a sentence in the middle of a message than boys did.

Group	At beginning of message	After keyword (within message)	Between sentences (in the middle of message)	At end of message
Girls	1.298	1.840	2.177	-2.800
Boys	-1.298	-1.840	-2.177	2.800

Table 9: Standardised residuals of children's gender and the position of emoji

4.2.2.3 Position of emoji and smartphone ownership

There was a significant relationship between owning a smartphone and the most frequent positioning of emoji in a message ($p < .001$). Standardised residuals, as shown in Table 10, show that children who owned a smartphone placed emoji at the end of a message less often. They rather placed them after a sentence in the middle of a message. This was not the case for children who did not have their own smartphone.

Group	At beginning of message	After keyword (within message)	Between sentences (in the middle of message)	At end of message
Does not own a smartphone	-0.922	-1.414	-3.487	3.931
Owns a smartphone	0.922	1.414	3.487	-3.931

Table 10. Standardised residuals of children's smartphone ownership and the position of emoji

4.2.2.4 Position of emoji and social media use

There was a significant relationship between using social media and the most frequent positioning of emoji in a message ($p < .001$). Table 11 presents the standardised residuals. The data show that children who used social media less often placed emoji at the end of a message, and that they also placed emoji more in the middle of a message than children who were not used to social media.

Group	At beginning of message	After keyword (within message)	Between sentences (in the middle of message)	At end of message
No social media	-0.243	-0.632	-4.399	4.515
Social media use	0.243	0.632	4.399	-4.515

Table 11: Standardised residuals of children's social media use and the position of emoji

4.2.2.5 Function of emoji and age

There was a significant relationship between age and the functions of the emoji used. This relationship was visible in the difference between the group of 5-to-8-year-old participants compared to the group of 10-to-16-year-old participants ($p < .01$). Standardised residuals (see Table 12), show that the emoji used by 5-to-7-year-olds were less often meant to visualise a keyword than those used by 10-to-16-year-olds. Furthermore, the emoji use of 5-to-7-year-olds was more often unconventional than the emoji use of 10-to-16-year-olds, who did not use emoji in an unconventional manner.

Group	Visualisation of keyword	Visualisation of message	Expression of emotion	Unconventional use
5–7 years	-2.193	0.562	1.053	2.666
10–16 years	2.193	-0.562	-1.053	-2.666

Table 12: Standardised residuals of children's age and the function of emoji

4.2.2.6 Function of emoji and gender

There was a significant relationship between gender and the functions of the emoji used ($p < .05$). Table 13 provides the standardised residuals, which show that girls more often used emoji to visualise a keyword than boys. In addition, boys' emoji use was more unconventional than that of girls.

Group	Visualisation of keyword	Visualisation of message	Expression of emotion	Unconventional use
Girls	2.670	-0.438	-1.610	-2.253
Boys	-2.670	0.438	1.610	2.253

Table 13: Standardised residuals of children's gender and the function of emoji

4.2.2.7 Function of emoji and social media use

Finally, there was a significant relationship between using social media and the functions of the emoji used *($p < .01$)*. Standardised residuals (Table 14) show that children who did not use social media used emoji more often in an unconventional way than children who reported using social media.

Group	Visualisation of keyword	Visualisation of message	Expression of emotion	Unconventional use
No social media	-1.761	0	0.727	3.100
Social media use	1.761	0	-0.727	-3.100

Table 14: Standardised residuals of children's social media use and the function of emoji

5. DISCUSSION

This paper reports on a corpus study that set out to explore children's emoji use, which has remained understudied in previous research. Prior studies into emoji and children focused mostly on the potential of emoji to express emotions, including children's perceptions of facial emoji (Oleszkiewicz *et al.* 2017; Liu and Li 2021), how emoji can help children to understand emotions and concepts (Fane 2017; Fane *et al.* 2018) and how emoji can measure children's emotions and preferences (Gallo *et al.* 2017; Schouteten *et al.* 2018; Swaney-Stueve *et al.* 2018; Lima *et al.* 2019), and the effects of emoji on children from a marketing perspective (Siegel *et al.* 2015; Luangrath *et al.* 2017). For the present study, a corpus was collected in an innovative manner for the sole purpose of eliciting emoji use from children and their parents or caregivers. A pragmalinguistic approach was taken to analyse the corpus.

5.1. A comparison of children's and adults' use of emoji

Our corpus analysis started with a comparison between children's and adults' emoji use. The first part of our results showed no significant differences between children and adults in their use of emoji. Both age groups preferred facial emoji (in favour of other types, such as objects), placed emoji mostly at the end of messages (rather than at the beginning, after a keyword, or between sentences, clauses, or intonation units), used emoji to express emotions mostly (instead of visualising keywords or the content of a message), and

mostly used emotional emoji to convey a positive sentiment, rather than a negative or ambiguous one.[4] Realtime monitoring of emoji use on *Twitter* with emojitracker[5] shows that the top ten of most popular emoji by adults on *Twitter* include many faces (😂😭😍😊😔😘) and hearts (❤️❤️💕), which also express emotions. Likewise, the top ten of the most frequently used emoji in a large Swiss *WhatsApp* corpus only consisted of (emotional) faces (😂😄😊😉😘😁☺️), animal faces (🙈😻), and a heart (❤️). In fact, 65 per cent of all emoji in the corpus were facial emoji (Dürscheid and Siever 2017). Prior research based on large-scale *Twitter* corpora showed that the most popular emoji have a positive sentiment and that adults tend to use emoji at the end of tweets (Novak *et al.* 2015). Similarly, the most popular emoticon :-) is positive in sentiment and the majority of emoticons (64%) appear at the end of tweets (Spina 2018). The current study, albeit with a small-scale corpus analysis, confirms all these findings on emoji use and tentatively extends them to children as well.

Our results suggest that adults and children generally have very similar intuitions about how many emoji to add to a message, which emoji to use (of which types), and where to place them. Furthermore, the emoji that were used by adults and children often served similar pragmatic functions in the message and overall held similar sentiments. The latter finding concurs with results from previous studies on children and emotions: like adults, children can attribute emotions to commonly used emoji (Oleszkiewicz *et al.* 2017; Liu and Li 2021; da Quinta *et al.* 2023) and can therefore select emoji that match the sentiment of a message.

The findings mentioned above answer our first research question: the study has not provided evidence that children (digital natives) use emoji differently than adults (digital immigrants). If all conditions are equal —i.e., when presented with the same 'digital' messages and the same set of emoji to choose from— digital natives and digital immigrants do not seem to use emoji in significantly different ways. This appears not to be in line with Frey and Glaznieks's (2018) finding that digital natives use more CMC style markers, which include emoji, than digital immigrants. This discrepancy may be due to their methodological choice of not separating emoji from other markers such as

[4] The sentiment that was visually expressed by the emoji being used matched the sentiment that was verbally expressed in the pre-constructed messages, since there were more messages with positive than negative content.
[5] http://emojitracker.com

emoticons, acronyms, and hashtags. It may also be because of an age difference between the digital natives who contributed to their corpus (operationalised quite broadly as people born from 1980 onwards) and the digital natives who contributed to our corpus (children born between 2004 and 2015 who are quite young in comparison). Still, our study shows that both digital immigrants and children who are digital natives reveal a basic and similar emoji literacy (Danesi 2016; Scheffler *et al.* 2022).

5.2. A closer inspection of children's use of emoji

The study's second research question aimed to identify which demographic factors affect children's use of emoji. Our results showed that the older the children, the more emoji they tended to use per message. The connection between emoji literacy and traditional literacy (Scheffler *et al.* 2022) could be at play here. The older children may have had a better understanding of the pre-constructed social media messages than the younger children, and therefore a better understanding of the added value of emoji to the text. This effect might also be attributed to the significant positive correlation between age and social media use. In other words, the greater exposure to social media of older children as compared to younger children is another possible explanation for their greater use of emoji. Emoji use keeps increasing and about one in five tweets now contains at least one emoji (Emojipedia)[6] and, for *WhatsApp*, this number is even higher, as Dürscheid and Siever (2017) report that a staggering 91 percent of all *WhatsApp* chats in their corpus contained emoji. Accordingly, more exposure to social media will be inextricably linked to more exposure to emoji.

Several significant relationships were found for the function and the position of emoji but not for the type or for the sentiment of emoji. It is conceivable that this lack of differences for the variables of type and sentiment is due to our method of corpus collection. All participants added emoji to the same messages, the content of which guided the children in the types of emoji they selected. For instance, the message about what to choose for dinner caused the selection of food emoji. Likewise, the content of the messages as well as the emoji that were available in the magnet set invited children to use emoji with a certain sentiment. The message about a birthday, for example, elicited emoji with a positive sentiment, whereas the message about the death of a pet could be expected

[6] https://emojipedia.org

to elicit emoji with a negative sentiment. Regarding the position and function of the emoji, the participants were not guided in any way, making these significant relationships between children's demographic variables and emoji use variables especially interesting.

Children's age, gender, social media use, and smartphone ownership were in significant relationship with the position of emoji. Being older, being a girl, owning a smartphone, and using social media were all related to positioning fewer emoji at the end of messages and more emoji in the middle of messages, between sentences. A possible explanation for this may lie in the established use of emoji instead of final punctuation marks to end sentences in written CMC (Danesi 2016; Sampietro 2016). The end of a message can be considered the default position for emoji: both adults and teenagers tend to conclude their messages with one or more emoji systematically (Novak *et al.* 2015; Hilte *et al.* 2022). While the use of a period has become pragmatic rather than syntactic in informal digital writing (Androutsopoulos and Busch 2021), emoji, in contrast, have assumed a structural or syntactic role, similar to emoticons (Provine *et al.* 2007; Dresner and Herring 2010; Spina 2018), replacing traditional punctuation marks (Dürscheid and Siever 2017; Pappert 2017; Beißwenger and Pappert 2019; Busch 2021). Placing emoji between sentences, clauses, or intonation units within a message as structural boundaries can thus be seen a more sophisticated use of emoji. Both owning a smartphone and using social media expose children to this use of emoji as sentence boundaries, and older children will have received more such exposure, making smartphone owners, social media users, and older children more emoji literate and thus more aware of the possibility to use emoji in a punctuation-like manner. The gender difference here may partly depend on the correlation between gender and smartphone ownership, where girls possessed their own smartphone more often than boys.

Age, gender, and social media use were also significantly related to the functions of the emoji used in the message. Firstly, participants who were older, female, or were social media users used emoji in an unconventional manner less frequently. Assuming that using social media increases exposure to emoji and hence emoji literacy, this last relationship makes sense. The finding that girls and older children used emoji less in unconventional ways may be explained by their traditional (linguistic) literacy skills, which are attested to be higher in these demographic groups than among boys and younger children (Below *et al.* 2010; McTigue *et al.* 2021). These findings also concur with those of Oleszkiewicz *et al.* (2017), who found that older children and girls are more

adept at recognizing the emotions that are expressed with emoji. Secondly, the girls and older children more often used emoji to visualise a keyword. Perhaps there is, again, a connection with traditional literacy. Better literacy skills could cause participants to pay more attention to the individual words in a text, using emoji to visualise them and thus disambiguate the content of a message (Riordan 2017b; Beißwenger and Pappert 2019).

5.3. Limitations and future research

The exploratory nature of the present corpus study has some drawbacks. Because our corpus was collected in a semi-experimental setting, this analysis should be replicated with a corpus of natural social media messages to examine if similar patterns occur. The manner in which the data were obtained also entailed that the interlocutor (to whom the social media messages were hypothetically sent) was unclear, which means that we could not explore children's social use of emoji. In a non-experimental CMC setting, people with high emoji literacy may be more mindful of their conversation partner and the conversational setting in their emoji usage, showing more situational awareness. Following Hilte *et al.* (2021), further research could discover if people of different age groups accommodate to their interlocutor to a greater or lesser extent in their emoji use. Wang *et al.*'s (2019) distinction between communicative and performative use of emoji (and other graphicons) also deserves more attention in future research: when do people use emoji for instrumental purposes, to support communication, and when do they merely want to show off their emoji literacy to their audience?

The ecological validity of our study was subject to limitations. The 50 emoji magnets that participants could use during data collection represent a very small subset of the current range of over 3,700 existing emoji (Emojipedia)[7] and were not a representative sample in terms of types: for example, no activities (🚵, 🏄) were included. Although participants had popular emoji at their disposal, future studies would preferably not limit participants in their emoji selection. Since it is unfeasible to select from thousands of emoji magnets, a recommendation for future studies is to collect data in a digital fashion, which would enable participants to a) select from all existing emoji, b) use the same emoji more than once, and c) find emoji using keywords.

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[7] https://emojipedia.org/stats

In our analyses, the adult participants were treated as a homogeneous group, because the present study's main interest lies with children's use of emoji. Metadata about the adults, such as demographic information and social media use, were unfortunately not collected. Among the child participants, differences could be identified regarding their age and use of social media. A closer inspection indicated that these variables impacted children's emoji use in multiple ways. This raises intriguing questions regarding the nature of emoji literacy. Can differences in emoji use or understanding between children and adults be found if children are somewhat older (i.e., pre-teens or teenagers) and more experienced social media users? Future research could delve into the question if digital immigrants use emoji much in the same way as young children who are not yet experienced social media users. It is plausible that more advanced emoji literacy — including extensive knowledge of connotations of emoji (Weissman 2019), of how emoji can have different literal and figurative meanings depending on the context— only emerges in (pre)adolescence, when children have gained more experience with emoji and have had more exposure to other users' emoji. In other words, emoji literacy is likely to go hand in hand with familiarity with emoji.

Since the participating children's literacy skills were not tested, we can only speculate how age effects can be explained. They may even be due to differences in reading skills or in properly understanding the task at hand. The youngest participant was only five years old: her limited reading proficiency may have hindered her understanding of the messages and, consequently, her execution of the task. Further research should be undertaken to determine the interplay between traditional literacy and emoji literacy.

Finally, the corpus was rather small: 60 participants contributed to it. Its scale was limited by the analogue data collection at a language festival. Children's emoji use could be investigated with a larger corpus, to allow for more external validity. However, our corpus did contain over a thousand emoji, which justifies our quantitative statistical analyses. Because all participants were Dutch, results may not be generalisable cross-linguistically or cross-culturally, since emoji use has been shown to differ across cultures (Barbieri *et al.* 2016; Freedman 2018; Guntuku *et al.* 2019). This invites future research to take a contrastive cross-cultural perspective to children's emoji use.

5.4. Implications and conclusion

Although there is abundant room for further progress in exploring children's use of graphicons in written CMC, the findings of this study, while preliminary, constitute an important first step to the study of emoji use by (Dutch) children. Moreover, it has brought us a little closer to developing a full picture of the concept of emoji literacy. Besides such scientific relevance, our results may also have potential societal relevance for education, health communication, and marketing. First, wider knowledge about children's emoji use may be beneficial for educators as they teach children to read and write, as well as for the purposes of second language acquisition. Second, it may be valuable for child psychologists and paediatricians in doctor-patient conversations when trying to connect with this young age group. Lastly, it may help marketeers to further tailor their messages to a young target audience.

Our corpus study suggests that under identical circumstances, children and adults do not significantly differ in their use of emoji. What is more, we have shown that children's emoji use can be explained in terms of age, gender, smartphone ownership, and social media use. Being an older child, a girl, owning a smartphone, and using social media apps are all features related to more sophisticated emoji use and more emoji literacy.

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APPENDIX: EXAMPLE OF DATA COLLECTED