# Do emoji use a grammar?

## Emergent structure in non-verbal digital communication

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Abstract

Sequences of emoji characters are often used in online communication to convey meaning in conjunction with words, but also in their place. This thesis explores the use of emoji-only utterances in instant messaging, looking at them from a grammatical point of view, building on Jackendoff and Wittenberg's (2014) hierarchy of grammatical complexity for the structure of sentence-level utterances. In this context, emoji, if used in isolation might posit word-like properties and show grammatical patterns and orders, similar to words. The present study investigates whether emoji showcase grammar on their own and identifies the grammatical patterns appearing in utterances where they substitute for words. According to its results, emoji-only communication shows grammatical patterns on the lower levels of Jackendoff and Wittenberg's hierarchy.

*Keywords*: emoji, emoji grammar, non-verbal, visual language, linguistics

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# Do emoji use a grammar?

## Emergent structure in non-verbal digital communication

### 1. Introduction and theoretical framework

In the present day, we rely heavily on social media applications to stay in touch with friends, relatives, colleagues, and business associates (Correa, Hinsley, & De Zuniga, 2010). During the last few years, emoji have become a ubiquitous part of our mobile communication habits. Along with their use, emoji characters have seemingly developed a substantial cultural significance as evidenced by the Oxford Dictionary "Word of the year" award for 2015, won by the emoji character face with tears of joy 😂 (Skiba, 2016), also being the first-ever instance where that prize has been awarded to a non-alphanumeric word object. Owing to their widespread use, emoji have become such a cultural phenomenon, that it led many to wonder whether they show similarity to language and possess grammar of their own (Thompson, 2016). The present thesis investigates this subject matter.

#### 1.1. History of Emoji

The accepted emoji creation date is sometime in the late 1990's and Japan has been the most often cited emoji birthplace (Miller, Thebault-Spieker, Chang, Johnson, Terveen, & Hecht, 2016; Magnus, 2016). Pictorial characters, very similar to present-day emoji, called *smileys* among other names, were already in use in web chartrooms, websites and Instant Messaging programs like ICQ going back to the late 1990's and the early 2000's (Voiskounsky, 1999; Weverka, & Taylor, 2000; Oakley & O'Modhrain, 2002; Olivine, 2006). This shows some disagreement with respect to the true origin of emoji characters. However, the term '*emoji*' itself did originate in Japan, where it was introduced when local mobile cellular networks started

incorporating faces and other pictorial symbols for use in text messages (Lebduska, 2014). In their nature, emoji are pictorial emoticons that have their own Unicode characters and can be transmitted and read on any mobile or desktop platform, via chat programs or SMS. Compared to the earlier, textual (ASCII) emoticons like ":-)", emoji characters possess more richness in that they are pictorial and represent more possibilities for displaying a larger set of emotional states. Therefore, they enhance the valence in transmitting meaning and emotions. Emoji characters have largely replaced emoticons in mobile and web communication where they are used to transmit feelings or emotions, to illustrate objects or concepts, or to encourage relational playfulness (Pavalanathan & Eisenstein, 2016). Unlike emoticons, emoji are not only capable of transmitting moods and feelings, but they can also be used as substitutes for nouns and actions, as many emoji embody objects, events or activities (Pavalanathan & Eisenstein, 2015; Davis & Edberg, 2016; Dresner & Herring, 2010).

Why do we even use emoticons or emoji? Generally, it has long been acknowledged that transmitting feelings and emotions via the (still predominantly) text-based computer-mediated communication has been a challenge due to the absence of the verbal and nonverbal cues present in real-life face-to-face communication (hereinafter FtF) which possesses the advantage of using body language, visual cues, gestures and intonation (Dresner & Herring, 2010; Preece & Ghozati, 2001). Computer-mediated communication (hereinafter CMC) refers to communication, which takes place via computers (Herring, 1996), such as instant messaging, video conferencing, texting and email. With the advent of the internet, CMC has become a preferred method of distant communication; of which the most commonly used forms today are emails and texting (Thorne, 2008). However, due to CMC limitations, it has been thought that expressing feelings and emotions via CMC is more difficult than in face-to-face communication (Walther, 1996;

Walther & D'Addario, 2001; Derks, Fischer, & Bos, 2008). While video CMC can be compared to FtF communication, as it provides numerous benefits over the less rich text-based CMC (Lee & Wu, 2006), it has so far met with limited adoption rates, with text-based CMC like text messaging and email still being the most widely used modes (Xu, Zhang, & Li, 2011; Hogg, Lomicky, & Weiner, 2008).

The desire to circumvent the inherent limitations of textual CMC in transmitting emotional valence and content led to the creation of the earlier, ASCII emoticons. They were first suggested by a group of Carnegie Mellon University researchers in 1982 where the symbolic textual combination of ":)" was proposed to stand in for a smiling face (Lebduska, 2014). By their definition, emoticons are graphics composed of text that portray an emotional state (Lebduska, 2014). In the late 1990's and into the 2000's with the growing popularity of mobile phones and texting emoticons rapidly entered the mainstream. However, compared to pictorial emoticons (smileys) used by computer instant messenger (IM) apps like ICQ, AIM or MSN, or emoji, traditional text-based emoticons seem to be very limited in their use as they can portray emotions only, while emoji can also transmit objects, weather, activities, animals, etc. (Pavalanathan & Eisenstein, 2015). While pictorial emoticons (also called "smileys") in the messaging programs in the 2000's were better at representing emotions than the textual ones, they were not cross-platform, as each IM client had its own set and order of emoticons and used a different network protocol (Olivine, 2006). On the other hand, they were pictorial, not having their own Unicode codes and positions, so they were incompatible across applications and systems. For this reason, no cross-platform sharing of messages and hence, of smiles was possible (Eisenstadt, Komzak, & Dzbor, 2003). Meanwhile, mobile phones did not support pictorial smileys, so they had to rely only on the textual emoticons. The ubiquity of emoji and

their ability to be rendered on the three most popular mobile systems – iOS, Android and Windows Phone/Mobile is what makes their latest iteration different and might be the main reason for their rapid rise in popularity.

More recently, emoji have attracted the attention of language scientists and researchers. Lines containing only emoji or utterances where emoji characters are used instead of words (as seen in rebus writing) have become increasingly common in CMC as noted by Danesi (2016). Unfortunately, very few studies have been performed on the specific grammatical roles emoji play in communication, despite emoji characters being regarded by many researchers as an emerging "visual language" (Danesi, 2016; Lu, Ai, Liu, Li, Wang, Huang and Mei, 2016; Lebduska, 2014). The majority of studies on emoji and grammar analyse how emoji relate to language and if they show similar grammatical structures like words and sentences when used alongside words (Barbieri, Ronzano, & Saggion, 2016). Barbieri et al. analysed emoji in the context of Twitter messages. Their findings suggest that emoji characters are complex enough to carry meaning when used alone, without relying on words. However, they only analysed short, twitter status messages, sent by their author to a big, usually silent audience. Barbieri et al. did not look at long, two-way interactions. The question here, which they did not look into, is whether emoji would also show grammatical patterns in isolation if they were used the same way as words and sentences, i.e. in a prolonged discussion between chat partners?

### 1.2. Emoji in Communication and Culture

As mentioned previously, emoji have been increasingly regarded as a new form of a visual language by researchers and journalists alike (Evans, 2015; Lebduska, 2014). Considering the widespread use of the emoji characters, it is particularly interesting whether they show

grammatical patterns. So far, the majority of studies on emoji have focused on what information they communicate and the roles they play within a mixed mode of communication (using both words and emoji). For example, Kelly and Watts (2015) proposed that emoji play roles beyond conveying emotions. According to their findings, people would use emoji not only to pictorially represent their facial expressions, thoughts and feelings, but also to control a conversation and to encourage humorous behaviour. Other researchers suggested that emoticons are used as cues for controlling the emotional valence of textual communication (Walther & D'Addario, 2001). Since emoji characters have superseded emoticons and are used in similar ways, these findings might also be valid with respect to emoji. Nevertheless, Walther and D'Addario's results prompted them to posit that the importance of emoticons is overstated, and they rely on the words they appear with: "In most cases, emoticons were overwhelmed by the valence of verbal statements that they accompanied" (Walther & D'Addario, 2001, p. 341). They posited that in most instances, e-mail messages that contained emoticons did not generate different interpretations than those without emoticons. Apparently, in the context of CMC, emoticons serve a complementary function to verbal messages, without contradicting or enhancing them (Walther & D'Addario, 2001, p. 342). Few similar studies focus on the present-day emoji. As some researchers note, emoji are far more complex and possess inherently more richness than the text-based emoticons, which provides people with the ability to transmit more complex information compared to emoticons, and their standardisation makes them much easier to be analysed by researchers (Lu, Ai, Liu, Li, Wang, Huang, & Mei, 2016). As emoji play roles similar to pictures, graphics or gestures, studies on communication through visual narratives and sign languages might hold some interesting ideas that can help demystify the grammatical roles of emoji.

In a prior study, focusing on how pictures are used when combined with words, participants were found to be able to accurately understand the concepts and get the correct meanings in mixed (rebus) sentences, consisting both of pictures and words (Potter, Kroll, Yachzel, Carpenter, & Sherman, 1986). Potter et al. used sentences where a specific noun was replaced by a picture. According to the results obtained by Potter et al, the arrangement of pictures did not have any effect on understanding; that is even where pictures were put in a reversed order; subjects could understand the correct meaning of the sentence. Later studies have shown that cultural differences and cognitive ability influence understanding pictures or visual stimuli (Hong, Morris, Chiu, & Benet-Martinez, 2000), or emoji (Miller, Thebault-Spieker, Chang, Johnson, Terveen, & Hecht, 2016) much more than linguistic differences. While more research is needed on interpretation and misinterpretation of emoji across individuals and cultures, research on emoji in the context of linguistics and grammar has been even less extensive. At the moment of writing very few studies focus on grammar in emoji when used in isolation. Therefore, the present study builds on past studies on gestures and sign language which suggest that people might possess a natural, cognitive tendency to create consistent ordering of semantic elements, not dependent on the presence of a prior language model (Gershkoff-Stowe & Goldin-Meadow, 2002; Goldin-Meadow & Mylander, 1983).

### 1.3. Grammar and emoji

The main aim of this study is to give more insight on the grammatical roles emoji play when used in isolation. In order to analyse emoji grammar from a linguistic point of view, a tool of identifying grammatical structures needs to be employed. In their 2014 work, Jackendoff and Wittenberg proposed a universally-applicable grammatical hierarchy. They challenged the

popular assumption that complex syntactic knowledge appears in every language, and instead posited several levels of grammatical complexity. Jackendoff and Wittenberg noted that a noun-verb distinction appears in every language, even in the most syntactically simple ones that lack inflection, definite/indefinite articles and markers of plurality. Moreover, though not all languages use a complex syntax, Jackendoff and Wittenberg substantiated that most languages seem to have picked up full syntax as they developed.

The hierarchy of grammars as identified by Jackendoff and Wittenberg (2014) characterized the range of linguistic structures and utterances from words to phrases:

**1. One-word grammar**

[Utterance Word], for example: *doggie*! [Look, a doggie; I saw a doggie, etc.]

**2. Two-word grammar**

[Utterance Word (Word)], e.g. *union member* [a member of a union]

**3. Linear grammar**

[Utterance Word*]

**4. Simple phrase grammar**

[Utterance Word/Phrase*], [Phrase Word Word] or [Phrase Word*]

**5. Recursive grammar**

[Utterance Word/Phrase*], [Phrase Word/Phrase*]

Two additional elaborations focus on combinatorial structure within words, thereby allowing for morphology:

**6. Compounding:**

[Word Word Word]

**7. Affixal morphology:**

[Word {Word/Stem, Affix}] (either order)

If emoji do not use a system of sequencing reminiscent of full syntax, one might expect people communicating in only emoji to use more basic strategies of combination, as outlined here. As Jackendoff and Wittenberg noted (2012), the receiver would have a harder time extracting the correct meaning from a low grammatically complex "language" (i.e. picture- or emoji-only communication), compared to a more complex language. They provided the example "chicken eat", which might be interpreted at least in two different ways, carrying distinctly different information, such as "I/You/Someone ate the chicken" or "The chicken eats something" (Jackendoff & Wittenberg, 2012, p. 3). In the present experiment, we do not extensively look at misinterpretation of meaning, as we are specifically interested in emoji grammar. For this reason, this study only reports a few instances of misunderstanding in the discussion section below, while focusing our analysis more on the grammatical structures, word orders and patterns observed in emoji utterances.

Since emoji characters exist outside a full linguistic system, on the preliminary level, we assumed they might use a linear grammar and/or combinatorial structure limited to the morphological level and employing the lower levels per Jackendoff & Wittenberg's aforementioned hierarchy of grammar. One characteristic of linear grammar and morphologically limited combinatorial structures is placing the *agent* (or *doer*) before the *patient* or *object* of that action (Chan, Lieven, & Tomasello, 2009). This is a very common pattern, used by most modern languages (at least in simple sentences) and recurs in other instances of communication, such as gesture-based communication.

For example, Gershkoff-Stowe and Goldin-Meadow (2002) found that participants used an agent-patient-act gesture order regardless of their native language when required to communicate only through gestures without speaking. This order also appears for deaf children who invent their own gesture system, and have no prior access to conventional language models (Gershkoff-Stowe & Goldin-Meadow, 2002; Goldin-Meadow & Mylander, 1983). Moreover, when native English-speaking adults were asked to create gestures from scratch, they did not necessarily follow the natural word orders found in English (Gershkoff-Stowe & Goldin-Meadow, 2002). Goldin-Meadow further suggested that when gesture communication substitutes for speech, it assumes a "language-like form, with structure at word and sentence levels" (Goldin-Meadow, 1999, p. 419). She posited that both gesture communication and spoken and written language possess similar organizational principles. While she pointed that speech is linear and non-spatial while gestures used in sign languages rely on spatial contrasting, research suggests that sign is processed as linguistic rather than spatial information. Like spoken and written language, sign languages were found to possess the same linguistic structures such as syntax, phonology and morphology (Liddell, 1980; Lillo-Martin, 1991; Supalla, 1986; Supalla & Newport, 1978; Corina and Sandler, 1993; Perlmutter, 1992).

It is particularly intriguing whether emoji characters display the same linguistic structures as spoken, written and sign languages. If people do not copy the same word order of their native language when communicating in gestures, it is interesting whether this is also applicable in an emoji-only mode of communication. Unfortunately, the majority of past studies on grammatical properties of emoji looked at them when used alongside written text. This is comparable to having more studies investigating speech-accompanying gestures rather than looking at sign language. For this reason, our current study uses similar methods as Gershkoff-Stowe and

Goldin-Meadow (2002) asking participants to communicate often with emoji alone, in order to shed light on emoji substituting for words and sentences.

Danesi (2016) has been one of the few researchers investigating emoji-only utterances in the context of grammar. He claimed that when emoji are used alongside text, they use a *placement grammar*; that is they are used as substitutes for words in the places where written words are expected to occur. However, Danesi posited that in texts where emoji appear alone, their use would rely on *conceptual* and not strict rules of grammar. Hence, in Danesi's view, emoji grammar couldn't be regarded as simply a "replica of linguistic grammar with visual symbols" (Danesi, 2016, p. 78). In his view, emoji grammar possesses its own organization system (syntactic) for creating meaningful structures. However, he does not identify whether it is universal, or culture-specific. Most notably, the majority of not all examples of emoji use in his book are from native English speakers. It is not clear whether cultural background affects emoji syntactic. Danesi posits that utterances composed entirely of emoji characters showcase similar grammatical patterns as those found in visual narratives and sequences of images (Kress & Van Leeuwen, 1996). While visual narratives such as those found in comic books often possess rich information and context (Chute & DeKoven, 2006; Wilson & Wilson, 1987), emoji characters are much more simplistic and lack the details found in photos and pictures used in those narratives.

Danesi further identified a process of converting or transliterating words into emoji (picture-words) as *calquing* (Danesi, 2016). Thus in order for the receiver to understand calquing, they must possess an advanced knowledge of a specific natural language. Some of the examples Danesi gave in his book for calquing could be easily misinterpreted by the recipient. For example,

the utterance "*bombshell bikini*", created using 3 emoji characters (a *bomb*, a *sea shell* and *bikini*) might be interpreted only by a person that has heard and knows the meaning of the English language expression "*bombshell*". It is also unclear whether calquing is widely used or not when people communicate in emoji characters. It might be argued that Danesi overestimates the similarity of emoji-only communication to visual narratives, as emoji characters are much more simplistic in their nature. In the context of emoji grammar, Danesi pointed that emoji-only utterances indeed showcase grammar-like arrangements, and differentiation between agents, patients, objects and actions/verbs.

Gershkoff-Stowe and Goldin-Meadow (2002) did an experiment with adults who were asked to observe various scenes and to reconstruct them by using gestures. They found that the order of semantic elements appeared consistently in an agent-patient-act order. Their most interesting observation was that this preference of non-English orders appeared, even though participants were fluent in English. This suggests that when people have to communicate in a different language system (i.e. through gestures or pictures) they form orders that don't have to be consistent with the main word order found in their native language. As participants generated these orders spontaneously, Gershkoff-Stowe and Goldin-Meadow suggested that word order might signify a potential general property of human cognition to create specific orders, suggesting that grammatical ordering is not determined exclusively by the need to exchange information. We might expect communication with emoji to be similar, making simplistic grammatical orders of emoji characters on the go, not necessarily affected by the most common word order of their native language. For example, prior studies on the development of new grammars in pidgin language posited that people have some form of innate ability to create

grammatical or linguistic structures on the go, without being necessarily exposed to prior pidgins (Bickerton, 1991).

In order to investigate emoji grammar, we took the studies of Gershkoff-Stowe and Goldin-Meadow as models and decided to ask people to have conversations using only emoji. The main objective of our research is to establish whether emoji use grammar and show structural linguistic patterns like those found in sentences composed of words. For example, we were interested whether Subject-Verb-Object (SVO) and other word orders would appear in emoji-only mode. We built this experiment on the assumption that when people communicate in emoji, they do not necessarily follow the high-level grammatical orders on the Jackendoff hierarchy of grammar, but rather make use of the more simplistic, lower level orders. In the context of prior studies on gestures and sign language, we would believe that people would use word orders like agent-patient-act orders (e.g. SOV) when communicating in emoji. Prior to performing our experiment, we expected to find similar, linear progressions of time or order of actions as seen in studies on visual narratives where photographs or pictures were used (Kress & Van Leeuwen, 1996). However, as emoji characters carry inherently less graphical and contextual information than photographs or pictures, we supposed their graphic morphology would be much more simplistic. Moreover, we foresaw even more ambiguity and discrepancies between the intended and perceived meaning in emoji-only communication, especially when exchanging more complex information.

### 1.4. Relevance of this research

We wondered if emoji showcase a grammatical patterning, and for the purpose of this study it was decided to examine them in isolation (in utterances without words), in order to filter out any effects and influences by the use of written words. The aim of the current paper is to

investigate the patterns and ordering in emoji use. The importance of this research lies in its focus on a yet-to-be extensively studied area of computer-mediated communication from a linguistic point of view. It would potentially lead to a wider exploration of *emoji grammar*, a concept which has yet to attract attention from scholars. What makes this research different than most past research is that it decided to look at emoji characters and their grammar in the absence of words. At the moment of this writing, the bulk of studies done on emoji grammar have analysed emoji used alongside written language, where emoji usually play a symbolic or complimentary function to text. The present piece is perhaps one of the very first studies, where both chat partners in the experiment were asked to communicate solely in emoji.

## 2. Research question

The present study aims to shed new light on the language of emoji from a linguistic point of view, looking for answers to these research questions:

- Does emoji sequencing take on properties similar to language?
- Can we observe a linguistic-like grammatical order in emoji-only communication?

As studies on the grammar of emoji-only communication are limited, in order to address the questions, we build on the methods used in some prior studies and literature on word orders and grammar in the context of gesture- and sign languages (Gershkoff-Stowe & Goldin-Meadow, 2002; Corina and Sandler, 1993; Perlmutter, 1992; Lillo-Martin, 1991; Supalla, 1986; Liddell, 1980; Supalla & Newport, 1978). This study investigates the patterns that emerged during our experiment where emoji characters were used instead of words. Our experiment strives to shed light on the emerging phenomena of extensive emoji use and how it relates to linguistics and communication.

**Hypothesis:** We predict that people use methods of emoji patterning that resemble patterns found in other communication systems when people are asked to communicate without words. We expect to find utterances that are similar to those found in other linear grammars and other contexts where people communicate without speech (Mihalcea & Leong, 2008; Potter et al., 1986). Our main expectation is that people use the lowest levels according to Jackendoff and Wittenberg's hierarchy of grammar (2014) when communicating in an emoji-only mode, because as stated by Evans (2015), emoji have an iconic function. That is, emoji are used based on the concepts (emotional states, objects, actions or natural phenomena) they represent. Since emoji characters lack many properties of written language and speech, this thesis assumes that when people are asked to use emoji instead of words, they show a preference for forming simplistic utterances instead of complex narratives or translating full sentences into emoji, word by word.

Despite the simplistic grammar expected in emoji, some properties of natural language are expected to appear, namely emoji characters playing semantic roles as the agent, the patient or object, or the action in an utterance. One prior expectation of this study is the appearance of low-level grammar-like patterns when using emoji. We also expect some lines (or utterances) to be purely temporal visual narratives (e.g. *e1 -> e2 -> e3…* where each "*e"* stands for a specific emoji character, showcasing an action, or a feeling that takes place after the preceding one).

## 3. Methods

### 3.1. Participants

Sixteen students from Tilburg University participated in the experiment in pairs, with an average age of 25.4 (age range 21 to 31). All participants were recruited via the Tilburg University research participation pool, and all of them read and signed informed written consent

forms prior to the experiment. We did not discriminate on the basis of age, gender, cultural or ethnic background, field of studies, marriage or residence status, or any other personal characteristic. The sample was culturally diverse, with participants from Brazil, China, Great Britain, Greece, Indonesia, Italy, the Netherlands, Norway, South Korea, and the USA.

31.25% of the participants reported to have used the chat application used in the experiment before (Google Hangouts), while 68.75% of them reported no prior experience. On a five-point scale (1 = I use emoji rarely; 5 = I use emoji very often), the average frequency of emoji use by our participants was 3.75, suggesting that the majority of participants use emoji occasionally. The lowest score was 3 and this was the most commonly occurring frequency of use with 9 out of 16 people stating they use emoji occasionally. This is in line with the general view that emoji have been adopted by the majority of young people.

### 3.2. Materials and Procedure

Two dummy Google Hangouts accounts were set for use by the participants in the experiment. Two people of each group used them at a time. Since the sample size of our study is 16 people, 8 chat sessions were recorded.

In each session, pairs of participants were asked to participate in four brief digital conversations using tablets with the Google Hangouts software application to facilitate communication in words and in emoji. The chats were held in four different rounds, each round being based on a different topic. The duration of each round was about 7-9 minutes. As some participants had to take more time to get used to the software, they were given extra minutes. In the first round, one participant was asked to only use emoji and punctuation, while their partner was asked to use written words. In the second round, they switched roles, with the person that

used emoji-only in round 1 had to use words and vice-versa. In round 3, both chat partners were asked to only communicate in emoji, without any written words or letters, but punctuation, numbers and arrows (e.g. ->) were also allowed if needed. In the fourth round both parties used a mixed words and emoji mode. This last round asked participants to substitute emoji for words in sentences, but will not be reported here. A screen capture of round 1 from a randomly selected pair can be seen in Appendix D.

A total of 4 topics for discussion were provided to participants in all groups and they were rotated between sessions. The topics were “The perfect date”, “Travelling”, “Future plans”, and “Zoo visit”. To encourage our participants to communicate, we used leading questions for each topic such as “Ask the other person to help you plan the perfect date”, “Get the other person to tell you about their future plans over the next ten years”, etc. We also used guiding questions to help them further, such as “What would be a perfect date for you?” and “How would you describe your perfect partner?” The order of topics of discussion was rotated between pairs.

The duration of experiment sessions was approximately 30 to 60 minutes. After each session, participants were requested to fill out a post-test questionnaire, inquiring about their attitude towards different modes of communication, their use of emoji, their enjoyment of the chat sessions, the comprehensibility of conversations, and their knowledge of languages. After the questionnaires, each participant was given printouts of their chat and was asked to annotate their conversations. Participants were asked to describe what they meant with their chat messages and how they perceived the messages sent by the other participant (what meaning they were able to extract).

### 3.3. Data analysis

Participants' chats were annotated for patterns like the Agent-Patient-Act order, semantic associative fields, word-like orders of emoji, based on three- (*SVO, SOV*, etc.) or two-word (SV, SO, OS, OV, VS, VO) orders, temporally ordered events (*Linear time*), *Unrelated lists*, *Semantic lists*, or repetition (*Reduplication*). Participant utterances were categorized into these categories and the mean for each type of utterances were calculated. The data was then analysed using one sample t-tests, ANOVA, paired-sample t-tests and correlation analysis. ANOVA tests were run to compare different groupings of categories. ANOVA tests with Bonferroni correction post-hoc were run. Additionally, a correlation analysis was performed where pairs of variables were examined based on their category, to see whether there is a relationship between the two variable. One-sample t-tests against the frequency rate of .026 were also performed in instances where we wanted to know whether emoji from a certain category appear to a certain degree compared to the total. The .026 value was obtained by dividing the total number of different pattern categories, used in the analysis (38) to 1.

### 3.4. Annotation

The collected utterances were analysed based on multiple categories, based on their placement, order, or grammatical role. However, it is important to note, that as no prior research has been carried on categorizing emoji into such categories, therefore fitting emoji into clean-cut categories intended for words or sequences of words was challenging and future researchers might consider a different way of categorization. Nevertheless, we felt that sticking as much as possible to categories already used for words and sentences would make identifying their grammatical roles easier. A complete list of the categories that were used in this research is provided in Appendix A. For example, *Formulaic expressions* (Plunkett, 1993) stood for emoji

patterns, related to expressing emotions such as “yes”, “no”, “huh”, “hmm”, “sure”. They were compared to *Responsive emotions* (emoji used for feelings and emotions towards subject) in the analysis. *Linear Lists* stood for linear sequences of emoji characters. Based on their nature, these were further divided in *Reduplication* (repetition of emoji), *Linear time* (a linear sequencing referring to one event happening after another), *Unrelated lists* (lists of random, non-related emoji characters, e.g. “animal, tree, car, sun”) and *Semantic lists* (a list of emoji that represent a common concept, e.g. emoji representing office furniture; list of different animals, etc.)

Emoji order categories were those where we looked for word-like orders of emoji, based on three- (*SVO, etc.*) or two-word (*SV, etc.*) orders. We also looked for a correlation between SVO and SOV fluency, to see whether the order of the native language of participants has an effect on the emoji orders they prefer to use. Other emoji order semantic categories included Agent–Instrument, Instrument–Agent, and the Source–Goal and Source–Via–Goal orders, where “source” represents the start of a path, “via” is the midpoint of the path and “goal” refers to the end point of the path. Those structures were often used to refer to goals and objectives. The number of emoji *Embeddings* were also counted as well as the levels of embeddings. A category on *Metonymy* was included as well. Metonymy has been defined as “a figure in which one word is substituted for another on the basis of some material, causal, or conceptual relation” (Preminger & Brogan, 1993). In the context of the present study it stood for emoji characters (usually material objects) used to represent a more abstract concept or word. For example, in some chat sessions, our participants used the briefcase  or the necktie  emoji characters as substitutes for the words “work” and “job”.

Some categories like *Rebus* and *Compositional* were omitted from the statistical analysis as they occurred only in isolated instances, so data was insufficient. *Rebus* or *Rebus writing* is in

line with the definition of calquing Danesi provided (2016), where the sound quality of an emoji is used to represent a word, e.g. the books emoji 📚 being used instead of the verb "to book" [a flight], the only example of rebus within our results. *Compositional* emoji within this study means a combination of several emoji characters, used in such a way as to form a specific pictorial narrative, e.g. the combination of the running person 🏃 and dashing away 💨 emoji, to enhance the feeling of speed: 🏃💨.

## 4. Results

A total of 285 utterances were obtained in the experiment across all participants. The average number of utterances per person was 17.80, while the average number of emoji characters per utterance was 2.79. The number of misunderstandings of meaning was 50 out of 285, or 17.54%. On average, the number of misunderstood utterances was 3.12 per person. As this study looks more into the grammatical roles and patterns of emoji-only communication, instances where the receiver misinterpreted some emoji characters, but generally was able to understand the main idea of the utterance were not counted as misunderstandings.

### 4.1. Participants' expertise

Participants rated their overall understanding of the task on a scale of 1 to 5 (where 1 signified "Very difficult to understand" and 5 stood for "Very easy to understand"), and their average was 3.00 ($N$=16, $SD$ = 1.10). The task of creating emoji utterances was rated with an average 2.37 on a 5-point scale, suggesting that while most participants understood the task relatively easily, they had more difficulties in the creation of emoji utterances. 37.5% of participants reported to have used strategies when performing the tasks, while the rest (62.5%)

reported no strategy use. A moderate positive correlation between the number of emoji used in the experiment and the reported number of emoji when texting was observed $r(15) = 0.521$, $p < .05$.

The most commonly used categories of emoji were *Responsive emotions* and *Formulaic expressions* with 32% and 17% out of the total utterances in the experiment respectively. The frequent use of Responsive emotions confirms prior studies concluding that emoji are predominantly used for representing feelings, opinions, facial expressions or/and highlight the meaning of the sentences in CMC (Danesi, 2016). *Reduplication* of emoji was also very common, with 20% of utterances having at least one emoji repeated. On average, the number a single emoji character was repeated (reduplicated) in an utterance was 4 times per utterance. *Unrelated lists* were used in 6% of all utterances, while *Arrows* and *Temporal orders* were each used in 5% of instances.

### 4.2. Statistics of emoji use per categories

Formulaic expressions and Responsive emotions

A paired-samples t-test compared the two most-commonly used categories of emoji - *Formulaic expressions* (used in 17% utterances) and *Responsive emotions* (32% of the whole). There was a significant difference in the scores for *Formulaic expressions* ($M = 0.18$, $SD = 0.07$) and *Responsive emotions* ($M = 0.33$, $SD = 0.11$) conditions; $t(15) = -7.42$, $p < .001$. The mean scores of both *Formulaic expressions* and *Responsive emotions* were significantly higher than the mean population score of 0.026.

Linear lists

One sample t test was performed on *Reduplication* ($M = 0.20$, $SD = 0.19$), *Linear Time* ($M = 0.03$, $SD = 0.06$), *Unrelated lists* ($M = 0.06$, $SD = 0.06$) and *Semantic lists* ($M = 0.13$, $SD = 0.08$).

There was a slightly significant difference in occurrence only between the scores for *Unrelated lists* and *Semantic lists*, $t(15) = -3.50$, $p = .003$.

An ANOVA test was performed to compare the frequencies of occurrence between patterns that involved *Linear lists*. The difference between the frequency of these categories was statistically significant at $F(3, 45) = 8.62$, $p < .05$. The difference between the frequency of use of *Reduplication* and *Semantic lists* was insignificant, $p = .17$. The difference between *Linear time* ($M = 0.03$, $SD = 0.06$) and *Unrelated list* ($M = 0.06$, $SD = 0.06$) was also not statistically significant, $p = .556$. A statistically significant correlation was observed, however, between the *Reported use of emoji when texting* and *Reduplication*, $r(15) = 0.63$, $p = .008$.

Emoji orders

Triple orders like Agent-Patient-Act for example, or the more general SVO, etc. orders occurred in very isolated instances; therefore, no analysis on them was performed as data was insufficient. The use of triple orders was well below 5% in total. We did however investigate which of the 6 double emoji orders (*SV, SO,* etc.) appeared the most frequently. Here are the double orders, ordered by their means from the highest to lowest:

| **Emoji order** | **Statistics** |
|---|---|
| OV | $M = 0.03$, $SD = 0.06$, $p = .635$ |
| SO | $M = 0.03$, $SD = 0.04$, $p = .723$ |
| SV | $M = 0.03$, $SD = 0.06$, $p = .843$ |
| VS | $M = 0.01$, $SD = 0.03$, $p = .406$ |
| OS | $M = 0.00$, $SD = 0.01$, $p = .001$ |

**Population mean = 0.026*


*Figure 1. An Excel graph representing the means of the six double orders against the test value*

An ANOVA test performed on the 6 double emoji orders (*SV, SO, OS, OV, VS, VO*), showed no statistical significance between their means: $F(5, 75) = 1.48$, $p = .20$. A correlation analysis found no significant correlations between any of the orders, except between *VS* and *VO*, $r(15) = 0.67$, $p = .004$. A statistically significant correlation between *SVO language fluency* with the *VO* order was also observed, $r = .66$, $p = .005$. The only emoji order where a statistically significant correlation with *SOV fluency* was observed was the *SO* order ($p = .001$).

Agent – Instrument vs. Instrument – Agent

The results showed that the *Agent – Instrument* order ($M = 0.05$, $SD = 0.04$) was used more frequently than the *Instrument – Agent* one ($M = 0.00$, $SD = 0.02$), $t(15) = 3.81$, $p = .002$.

Source – Goal and Source – Via – Goal

A paired sample t-test compared the use of emoji in representing actions in the Source – Goal and Source – Via – Goal orders, where often pointers such as arrows or the pointing hand emoji were used. Source – Goal ($M = 0.05$, $SD = 0.08$) appeared to have been used more frequently than Source – Via – Goal ($M = 0.02$, $SD = 0.06$). However, the results were not statistically significant, $t = 1.37$, $p = .20$. The correlation between Source-Goal and Source-Via-Goal was found to be marginally close to significance at $r(15) = 0.49$, $p = .053$.

Entities before action versus Action before entities & Embedding

Entities usually preceded actions ($M$ = 0.08, $SD$ = 0.10), rather than actions before entities ($M$ = 0.07, $SD$ = 0.07). However, the results were not statistically significant, $t$ = 0.54, $p$ = .59. No correlation between *Embedding* and the *Number of embeddings* was found: $t$ = 0.46, $p > .05$.

Use of arrows as pointers

Arrows were used in emoji-only communication to represent various concepts like causation ($M$ = 0.02, $SD$ = 0.03), pointing to a person or an object ($M$ = 0.07, $SD$ = 0.09), or for temporal order of events, direction and motion ($M$ = 0.06, $SD$ = 0.05). A statistical significance was observed with the three categories referring to usage of arrows in emoji-only communication context, $F(2, 30) = 4.93$, Sig. $p = .014$, $p < .05$. However, no statistical significance arose between the instances where arrows were used to indicate direction or movement and those that pointed to a concept, object, a person or emotion ($p > .05$).

Places of Emotions

Finally, an ANOVA with Bonferroni post-hoc test was conducted to compare the means of the three categories of emotion placement. The test showed statistically significance for *Emotions first*: $F(11, 4) = 12.36$, p = .013, but no significance for *Emotions last* ($F(11, 4) = 1.90$, $p = .280$) or *Emotion surround* ($F(11, 4) = 2.19$, $p = .234$). According to these results, the *Emotion first* category was the one most used, followed by *Emotion last* and the least used *Emotion surround*. A prior ANOVA test showed a significant difference for the frequencies of use of emotions as a whole against the test statistic, $F(2, 30) = 7.24$, $p < .05$.

## 5. Discussion

The most commonly used categories of emoji were *Responsive emotions* and *Formulaic expressions* with 32% and 17% out of the total utterances in the experiment respectively. The

frequent use of Responsive emotions confirms prior studies concluding that emoji are predominantly used for representing feelings, opinions, facial expressions or/and highlight the meaning of the sentences in CMC (Danesi, 2016). *Reduplication* of emoji was also very common, with 20% of utterances having at least one emoji repeated. On average, the number a single emoji character was repeated (reduplicated) in an utterance was 4 times per utterance. *Unrelated lists* were used in 6% of all utterances, while *Arrows* and *Temporal orders* were each used in 5% of instances.

As can be seen in the Results section, the use of triple-part orders (e.g. Agent-Patient-Act or the more general SVO, etc.) was well below 5%, implying that emoji-only communication makes use of lower grammatical patterns as identified in the Jackendoff and Wittenberg's hierarchy of grammars. The VO order was the one most commonly occurring, followed by the OV order. The SO and SV orders were used in an insignificant number of utterances. This preference of using two-part (double-word) orders if at all indicates that when people are made to communicate in an emoji-only mode, they tend to revert to a very simplistic "language". The second placing of the OV order by frequency of use is interesting as the SVO order was the natural order of the native languages of all but one of our participants. These results are in line with the results of Gershkoff-Stowe and Goldin-Meadow's 2002 experiment on gestures, where participants used gesture structures that departed from the word order found in their spoken language (English: SVO). Reverse orders, where the Patient/Object came before the Verb/Action appeared where questions were asked in emoji, for example: 🤷‍♂️📱👀?

<u>Formulaic expressions and Responsive emotions</u>

A paired-samples t-test compared the two most-commonly used categories of emoji - *Responsive emotions* (used in 32% of all utterances) and *Formulaic expressions* (used in 17%). We found a significant difference in the scores for *Formulaic expressions* and *Responsive emotions* conditions, which implies that *Responsive emotions* occurred more frequently than *Formulaic expressions*. The mean scores of both *Formulaic expressions* and *Responsive emotions* were significantly higher than the mean population score of 0.026, making them the two ways emoji are predominantly used in CMC when people are required to communicate only in emoji. As noted above, *Responsive emotions* showed the highest frequency of use, confirming prior research which found that emoji are mainly used for transmitting emotional content, feelings and opinions (Brisson, 2015). We found that their secondary function seems to be to highlight text with pictorial representation of objects, concepts and places. However, this often leads to misinterpretations, as discussed in the Discussion section further below.

Linear lists

The difference between the frequencies of appearance of the list categories was statistically significant according to our test results. *Reduplication* was the most frequently observed linear list of emoji characters used by participants, followed by *Semantic lists*. This implies that people are likely to use emoji to either list semantically related items or reduplicate (repeat) one or more emoji characters in a message, perhaps to enhance or underline the meaning or emotion portrayed. Initial analysis suggested a vast difference between the frequency of use of *Reduplication* and *Semantic lists*, further analysis found no significant difference. Moreover, the difference in frequency of occurrence between *Linear time* and *Unrelated list* was not statistically significant. On average, both were used very infrequently by our participants. The significant correlation between the *Reported use of emoji when texting* and *Reduplication*

suggests that the participants in our study who use more emoji while texting are also the ones more likely to repeat emoji in their messages.

Emoji orders

*OV* was the order with the highest mean score, indicating the most use. It was closely followed in frequency of use by the *SO* and *SV* orders. The differences between the mean values of *SO* and *SV* were minor. The frequency of appearance of the *VS* and *OS* orders were lower than the population mean of 0.026, implying a very low use for them. However, statistical significance was obtained only for the *OS* order, which implies that only the mean frequency use of *OS* was statistically significantly different from the sample-estimated mean. For the *SV, SO, OV* and *VS* orders all *p* values suggest statistical significance, hence the difference between their means and the 0.026 mean used as the test value cannot be considered statistically different.

An ANOVA was performed on the 6 double emoji orders (*SV*, *SO*, *OS*, *OV*, *VS*, *VO*), as some of them occurred much more often than triple orders, but no statistical significance was observed. These results suggest that the mean scores for the 6 word orders were not statistically significantly different from each other.

We looked for a correlation between the default word order of participants' native language and emoji orders (15 of our participants' native languages are predominantly SVO-based, and only one participant had native fluency in a SOV order language). The statistically significant correlation between *SVO language fluency* and the *VO* order, implies that *SVO fluency* influenced only the use of *VO* order of emoji in our experiment. A statistically significant correlation between *SOV fluency* and the *SO* order was observed. Apparently, the sole SOV native speaker would drop the verb when communicating in emoji, while the majority of SVO

speakers showed a preference for not using an emoji indicating the subject(s) performing the action. The lack of significant correlations between the six orders apart from *VS* and *VO* suggest that participants who placed emoji representing the action/verb in front of the subject also tend to put the verb/action emoji before the object.

Agent – Instrument vs. Instrument – Agent

The *Agent – Instrument* order was used more frequently than the *Instrument – Agent* one. This signifies that emoji characters, representing agents/actors were put before the emoji signifying an instrument, a tool, or a place for performing that action. For example, utterances like 👫🚗, standing for a couple travelling with a car would appear more often than 🚗👫.

Source – Goal and Source – Via – Goal

The Source – Goal sequence was preferred over the longer Source – Via – Goal, implying that in most instances of emoji-only use, people would prefer to rely on utterances as simple and non-complex as possible. However, the results were not statistically significant, implying that there was not a marked difference between the uses of these sequences. The correlation between Source-Goal and Source-Via-Goal was marginally close to significance, and the correlation was positive, which implies that the majority of participants who used the Source-Goal structure were also the ones who would employ the longer Source-Via-Goal one.

Entities before action versus Action before entities & Embedding

Our results suggest that emoji characters portraying entities are usually placed before those standing for actions more often than vice-versa. However, the results were not statistically significant, suggesting that the preference of putting entities before actions is not marked. We also found no correlation between the use of *Embedding* by a person and the *Number of Embeddings*. This suggests that using embedding more often does not imply that a larger number

per utterance or more complex levels of embedding were used. Indeed, embeddings appeared rather infrequently and where they did we observed only the simplest, one-level embedding type.

Use of arrows as pointers

During coding, we noticed that many participants have used emoji arrows for representing various concepts like causation, pointing (to an emoji standing for a person, or object), and for temporal order of events, direction and motion. Our results suggest that arrows are most commonly used for pointing, followed closely by their use as direction/motion markers. Arrows signifying causation are only sporadically used. Further analysis showed no marked correlations between the different uses of arrows. Due to software limitations much of the arrow data proved difficult to analyse. Nonetheless, we discovered that arrows play an important role, as they are used for pointing to oneself, one's chat partner, or a third party. Pointing was often used to refer to the topic of discussion, e.g. pointing towards an island emoji, in order to give a hint to the other person about the theme of the next topic of discussion. Perhaps as a more abstract concept, causation was used sparsely.

Places of Emotions

Finally, a paired-samples t-test was conducted to compare the three categories of emotion placement. The test showed statistically significant difference in the scores of between *Emotion first* and *Emotion surround*, and between *Emotion last* and *Emotion surround*. These results suggest that *Emotion first* was the most used category, followed by *Emotion last* and the least used were *Emotion surround*. A follow-up ANOVA test showed a significant difference for the frequencies of use against the test statistic, confirming prior research that emoji are used to signify emotions, feelings and opinions (Pavalanathan & Eisenstein, 2016). The following paired sample t-test showed significant differences between the means of *Emotion first* and *Emotion*

*surround* pair on one hand and the *Emotion last* and *Emotion surround* pair on the other. This confirms the implication that emoji used to express emotion, surrounding a non-emotive emoji (an emoji, representing a person, concept, or an object) are used significantly less frequently than placing emotions before or after the object emoji. Like in the paired sample test, there was no statistically significant difference in the mean scores of *Emotion first* and *Emotion last*, implying that both are used fairly frequently. What is an interesting observation here is that people seem more likely to use reduplication of the emotion or feeling-signifying emoji before or after the emoji(s), representing people, animals, objects and concepts. This implies that emoji surrounding is the least preferred method to enhance or underline the feelings or emotions. The only statistically significant correlation between the three placement types of emoji between *Emotion surround* and *Emotion last* was on the borderline level of statistical significance, implying that the participants that used the most emotion emoji surrounding object emoji were also more likely to put the emotion emoji last, following the objects or entities towards those emotions apply.

### 5.1. Summary of the findings of this study

This experiment examined the sequencing patterns of emoji when people were asked to communicate without words. We found that people do use emoji patterning that resembles patterns found in other communication systems. Moreover, we observed utterances similar to those found in other linear grammars and other contexts where people communicate without speech (Mihalcea and Leong, 2008; Potter et al. 1986). However, very simplistic patterns occurred, confirming our hypothesis that individuals who communicate in an emoji-only mode show a preference for, and make use of, the lowest levels in the hierarchy of grammar as proposed by Jackendoff and Wittenberg (2014). Our results imply that in emoji-only mode, the

majority of people would form simplistic utterances instead of complex narratives or translate full sentences into emoji word by word.

Our results confirm the expectation that emoji-only communication shows higher ambiguity than mixed emoji and word communication. In the context of prior studies on gestures and sign language, we indeed observed a tendency in our participants to use emoji orders not consistent with the main word orders found in their native language. Moreover, the results collected suggest that the linguistic structures used in emoji-only communication are indeed less complex than those found in studies on sign language and visual narratives (Mihalcea and Leong, 2008; Potter et al. 1986; Kress & Van Leeuwen, 1996).

Our hypothesis that emoji showcase grammatical roles and they appear to follow similar structural linguistic patterns as words is confirmed by the results yielded. Triple-part emoji orders like SOV, SVO, etc. would appear very infrequently and some of them did not occur at all. Our results suggest that double orders like Verb-Object (the most-common) were preferred instead. Our results are in line with the findings of Gershkoff-Stowe and Goldin-Meadow from their 2002 study on gestures as the participants in our study readily used grammatical orders that were not bound to their native language word order when communicating in emoji. This is in contrast with most studies on gesture-based languages, where people did not show a heavy reliance on conventional language models and word orders (Goldin-Meadow & Mylander, 1983).

Nonetheless, we found emoji utterances that do fit into the higher levels of Jackendoff and Wittenberg's hierarchy of grammars (2014), but only on the lowest levels, such as One-word grammar [Utterance Word], Two-word grammar [Utterance Word (Word)] and Linear grammar. According to our findings, in most cases, emoji-only utterances tend to be linear in nature, not

unlike the very basic and simple sentences used within natural language in speech and writing (Sinclair & Mauranen, 2006). The findings of this paper suggest that most people use very simple patterns when required to use an emoji-only communication mode and the more complex structures like Agent-Patient-Act order rarely occur. Moreover, based on the discrepancies in meaning listed above (and many other examples not hereby listed), we posit that emoji indeed enhance text and sentences. If used in isolation, they seem able to only transmit the simplest meanings, emotions and concepts.

The preference for simplistic word orders and simple grammatical units in emoji-only communication implies that in real, mixed communication mode, words and emoji are used to enhance one another. This confirms Danesi's view (2016) that words are used to supply the main meaning and context of the discussion, while emoji characters represent pictorial representations or highlights of feelings, moods and facial expressions. For this reason, emoji might not be suitable for transmitting more complex or abstract information. When creating emoji-only utterances, most people show a tendency to use simplistic emoji units of a limited number of characters. Instead of creating complex utterances of emoji, most participants would divide complex information in series of several two-emoji order utterances. This is similar to Jackendoff & Wittenberg's "concatenation grammar", prior to a "phrase structure grammar" (i.e., sticking small groupings together, rather than embedding them). According to our results, longer and more complex utterances often led to increased ambiguity and misinterpretation on the part of the receiver.

### 5.2. Specific examples

Perhaps due to the limitation of using emoji characters in place of words, most participants in the present study would do omission of emoji, standing for some parts of language. For example, in many instances, emoji representing the agent or the action/verb (or both) were omitted. For example, the majority of our participants would use an emoji, signifying the object used to perform a certain action, such as a car 🚙 and/or train 🚅emoji standing for utterances meaning "*I want to/plan to travel*". In those cases, a face or a person emoji was omitted and the agent/subject were not signified at all. In such cases it can be assumed that the omission occurred because it was evident that each person is talking about themselves, similarly to how some natural languages like Italian show a tendency of dropping pronouns in speech (MacWhinney, Bates & Kliegl, 1984). However, while such languages allow the drop of many pronouns, in our results usually the first singular pronoun was dropped, followed by the first plural. When our participants wanted to mention a third party like their partner, family or friends they often indicated them with the appropriate emoji like 👧, 👦, 👩‍❤️‍👨, 👫, etc. However, as they were required not to use words, receivers relied on the context of the discussion to attribute the correct meaning.

In some cases, the division between Agent and Action appeared diluted. One example is where the sender professed their love for the cities of Paris and New York only in emoji, using 😍 ("smiling face with heart-shaped eyes"), followed by the tower 🗼 emoji representing Paris due to that city's association with the Eiffel tower, while 🗽 stood for New York. It seems as though here and in several other, similar utterances, the 😍 emoji stood for both the agent "I"

and the verb “love”. Therefore, the sentence “I love Paris and New York” translated in emoji looked like 😍🗼🗽 in this case.

Calquing, as defined by Danesi (2016) almost never occurred. We can interpret this as a sign that people consider calquing too complex to create, especially since it requires looking for specific emoji characters. While participants in this experiment had time to choose what emoji characters to use, they refrained from using calquing. Since mobile communication is usually fast-paced, one can safely assume that calquing rarely occurs in real-world mobile communication. However, that is subject to further analysis. As misinterpretation of meaning was not the main subject of this thesis, this intriguing example on how translating more complex information in emoji might lead to misunderstanding is discussed in Appendix B at the end of this paper: ➡️SOON💯✔️😤🤤💯✔️⬅️END, 🐎🦊?

The examples above illustrate our results that confirmed our initial stance that in emoji-only mode people would use the lowest levels of grammatical structure within the Jackendoff and Wittenberg’s hierarchy of grammars. However, building on previous studies about word order and gesture studies we seem to have initially overstated the occurrence of full, three-part word order structures like SVO. As per our results, emoji characters seem less complex than gesture communication patterns when they are used in isolation. This is only true for emoji-only communication or only for those real-life utterances that lack words. As emoji and words usually appear together in real-world CMC, words and emoji characters play complementary roles to each other. Therefore, despite emoji being used in place of some words, they by themselves seem to carry too little information to be a viable alternative to written language. Indeed, the annotations we collected revealed quite a few misunderstandings and wrong interpretation of

intended meanings. The average number of misinterpretation is reported in the "Results" section above. Since this study is interested in grammatical patterns and not misinterpretation of meaning, no further statistical analysis was performed on this subject. Future research might look more into that aspect of emoji-only communication. Moreover, it is important to note, that our participants were helped and prompted to communicate in emoji with specific topics and leading questions. Therefore, we might expect that in setting where participants are asked to just communicate using only emoji without any specific topic or guiding questions, they would have even more trouble in interpreting the meaning of emoji-only utterances. It would be interesting for prospective research to look whether our results are applicable in a no or free topic mode.

Our results confirm the notion introduced by Potter and colleagues that "pictures are ill suited to depict verbs and adjectives that are separate from nouns" (Potter et al., 1986, p. 293). This notion is directly transferrable to emoji, as nouns were the most often used emoji in emoji-only CMC, followed by faces, showcasing a range of emotions, feelings and opinions about those nouns. Adjectives were particularly hard for our participants to "translate into emoji", while verbs were formed by using emoji, representing nouns like objects (car, beach, etc.) both with and without pointers or direction markers like ->, 🔜, ➡️, or 👉. Alternatively, the walking person emoji 🚶 was used as a replacement for the verb *to go*, followed by a place- or activity-marking emoji, but this was used in a negligible percent of cases. For the verbs *to see* or *to check (out)* either 👀 or 🔍 were used, whereas the thinking face emoji (🤔) stood for the verb *to think*. Based on our findings, we can assume that in emoji-only communication, people tend to adhere to using simple verbs like *"go" / "walk"; "see" / "check (out)"; "think"* and more complex verbs and actions are not easy to "translate" into emoji. For some of them like

various sport activities (e.g.  ,  used to signify the actions of *surfing* and *snowboarding*), an emoji character already exists, but their availability is still limited.

### 5.3. Limitations and suggestion for future research

This research had several limitations. The main one is that all participants were relatively experienced with emoji. It is thus not evident whether a novice to emoji would use them in the same ways and showcase the same patterns. Another limitation was rooted in the age range of our participants. Since the participants in the experiment had an age range 21 to 31, it is not clear whether the results would be directly transferrable to the general population. Nonetheless, people within this age range are among the most frequent users of emoji, only behind adolescents (Lu et al., 2016).

An important aspect of this experiment was the provision of a set of topics for discussion. Moreover, we used guiding questions. We found that the topic of each round lowered uncertainty and helped our participants to logically connect the meaning of what they were discussing with their chat partners. Many of them commented that if they were not given any specific topics and guidance, they would not have anything to base their guesses on. Therefore, it is highly likely that an experiment looking for grammatical patterns within emoji-only communication where people can discuss any topic they wish might yield completely different results.

Our results suggest that emoji substituting for facial expressions and emotions were the least likely to be misinterpreted. On the other hand, emoji characters, referring to more abstract concepts, actions or objects would often lead to misunderstanding on the part of the receiver. For this reason, it might be appropriate for potential emoji grammar researchers to separate emoji into different categories, based on their type. For example, they might find it easier to analyse

facial expression and emotion emoji independently than those that stand for objects. This might potentially make interpreting of the grammatical roles of emoji more efficient. One aspect that appears to be currently absent in emoji research is the influence of individual differences and personality types on using, perceiving and understanding of emoji. Indeed, prior research has suggested that personality differences influence differences in perception (Witkin, Lewis, Hertzman, Machover, Meissner, & Wapner, 1954), language learning (Carrell, Prince, & Astika, 1996), and attitude towards CMC (Beauvois & Eledge, 1995). A larger, more systematic study taking these issues into consideration might be needed.

## 6. Conclusion

The results of this study support the dominating opinion by scholars that emoji make communication easier and enhance it when used in addition to words and sentences in CMC by substituting for the missing elements of FtF such as facial expressions, gestures, emotions, feelings, etc. (Pavalanathan & Eisenstein, 2015/2016; Davis & Edberg, 2016; Dresner & Herring, 2010). However, if used in isolation, emoji appear to be suitable to transmit only the very basic information and people show a tendency to use the most simplistic, low-level grammatical structures. They confirm our supposition that emoji possess grammar, but a very simplistic one. Emoji were found to commit to the low levels of the Jackendoff and Wittenberg's hierarchy. Despite the simplicity of emoji characters and the topics we provided to our participants, emoji-only utterances lead to many instances of misinterpretation. Therefore, while their complimentary function to text is indeed very important, a visual language based solely on emoji characters results in very basic communication, making the exchange of anything but the least complex content difficult.

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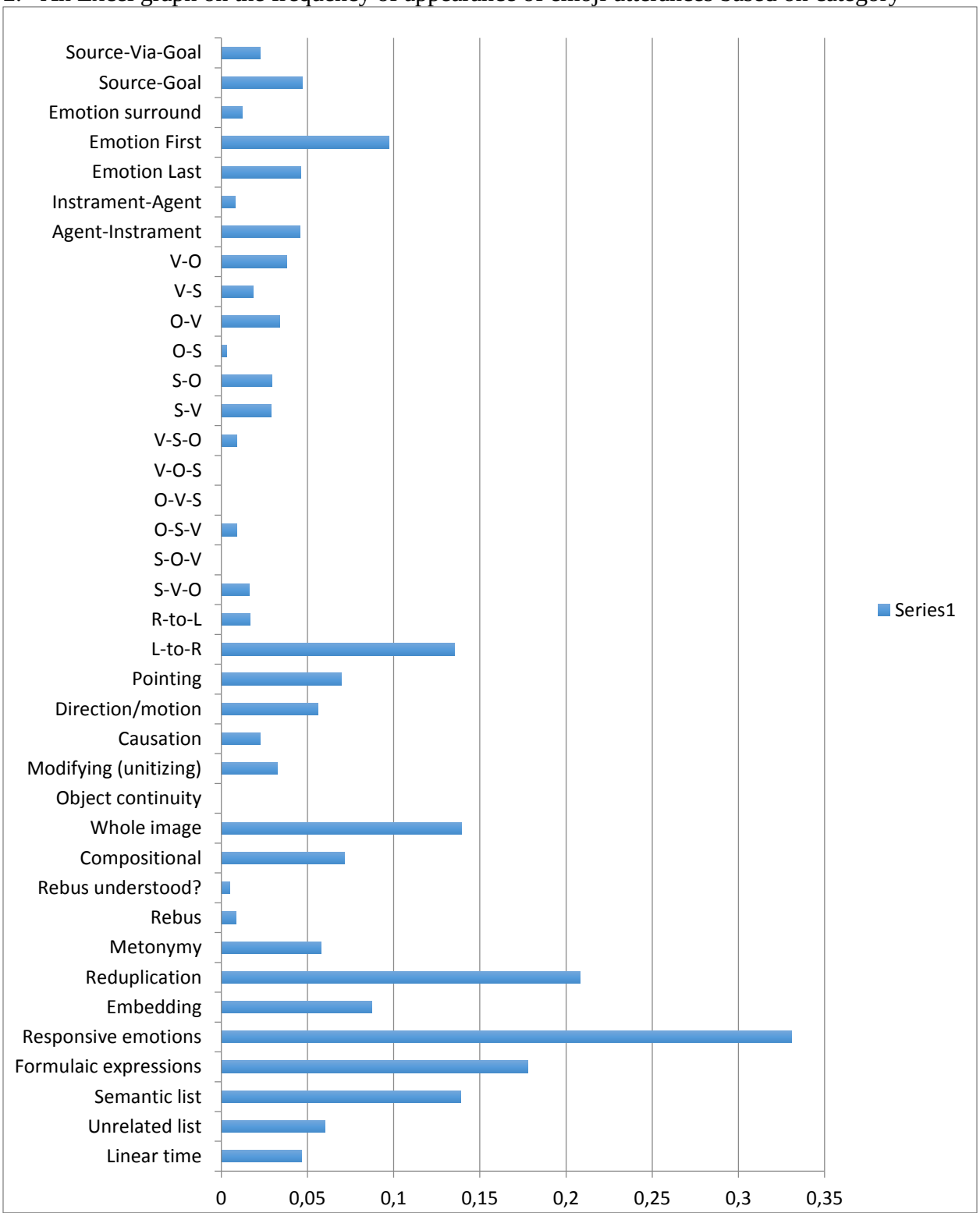
# Appendix A

## 1. All categories used in emoji utterance analysis

Linear time
Unrelated list
Semantic list
Formulaic expressions
Responsive emotions
Embedding
Reduplication
Metonymy
Rebus
Rebus understood?
Compositional
Whole image
Object continuity (redundant/no observations detected)
Modifying (unitizing)
Causation
Direction/motion
Pointing
L-to-R
R-to-L
S-V-O
S-O-V
O-S-V
O-V-S
V-O-S
V-S-O
S-V
S-O
O-S
O-V
V-S
V-O
Agent-Instrument
Instrument-Agent
Emotion Last
Emotion First
Emotion surround
Source-Goal
Source-Via-Goal

2. An Excel graph on the frequency of appearance of emoji utterances based on category



# Appendix B

## Complex information and the misinterpretation of meaning

In a discussion on the "Going to the zoo" topic, a participant used the utterance[1]

➡SOON💯✔😣😩💯✔⬅END, 🐴🐱?

It was supposed to mean "*Soon we will have exams, which is not a good timing. After the exams [are over] we can go to the zoo maybe?*" The responder did not understand the meaning and she answered with a question: 😩👉👧😤? According to her annotation it stood for "*Are you afraid of petting animals?*" Here the sender of the first utterance thought that the recipient received the intended meaning. Therefore, this question was understood as "*Sure, what if you fail the exams?*" This implies that when more complex information has to be sent in emoji, misunderstanding might occur, supporting the predominant view that emoji serve complementary, highlighting and enhancing roles to words.

[1] According to our categories, this emoji utterance provides examples of what we called *Linear time*, *Reduplication*, *Metonymy* and has one level of *Embedding*.

# Appendix C

## Rotation of conversation topics throughout the sessions

| | Session 1: Participants 1 - 2 | Session 2: Participants 3 - 4 | Session 3: Participants 5 - 6 | Session 4: Participants 7 - 8 |
|---|---|---|---|---|
| Round 1 | Perfect date | Zoo visit | Future plans | Travelling |
| Round 2 | Travelling | Perfect date | Zoo visit | Future plans |
| Round 3 | Future plans | Travelling | Perfect date | Zoo visit |
| Round 4 | Zoo visit | Future plans | Travelling | Perfect date |

| | Session 5: Participants 9 - 10 | Session 6: Participants 11 - 12 | Session 7: Participants 13 -14 | Session 8: Participants 15 -16 |
|---|---|---|---|---|
| Round 1 | Perfect date | Zoo visit | Future plans | Travelling |
| Round 2 | Travelling | Perfect date | Zoo visit | Future plans |
| Round 3 | Future plans | Travelling | Perfect date | Zoo visit |
| Round 4 | Zoo visit | Future plans | Travelling | Perfect date |

# Appendix D

## A screen capture of one of a random discussion in Round 1