



**EMOJI USAGE ON TWITTER DATA: ANALYZING THE USER'S
INTERPRETATIONS OF EMOJI IDEOGRAMS**

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**EMOJI USAGE ON TWITTER DATA: ANALYZING THE USER'S
INTERPRETATIONS OF EMOJI IDEOGRAMS**

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ABSTRACT

EMOJI USAGE IN TWITTER DATA: ANALYZING USERS' INTERPRETATIONS OF EMOJI IDEOGRAMS

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In conjunction with the significant growth in the use of social media, emojis have become a trending topic in informational technology related studies. New writing and communication styles using emojis are being used by people as a new language in different social media channels. This study adopts a quantitative research approach regarding emoji interpretations of users in order to evaluate the research problem using collected data from *Twitter* which is combined using the R program. These collected data are used in a survey questionnaire administered to 201 participants (students, staff and employees) from Çankaya University using Google Forms and shared by visiting the classes of students and by sending the survey using social media channels. This study aims to evaluate the interpretation of emojis by users. The methodology of the study depends on two parts, the first of which is the collection of data and the second using these data in a survey. The survey included questions related to the demographics of the respondents and questions about using social media and emojis. Then the remaining questions about the interpretation of the 201 participants for each of the top 100 emojis were collected from the R program as 'negative,' 'neutral' and 'positive.' Later, the study analyzed the results, which revealed that some of the emojis have different interpretations for different users.

Keywords: Emoji, Twitter, Hashtags.

ÖZ

TWITTER VERİLERİNDE EMOJİ KULLANIMI: KULLANICILARIN EMOJİ İDEOGRAMLARININ YORUMLAMALARI ANALİZİ

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Emojiler, sosyal medya kullanımındaki önemli derecede büyüme ile birlikte bilişim teknolojisiyle ilgili çalışmaların en çok konuşulan konularından biri haline gelmiştir. Emojiler kullanarak yeni yazım ve iletişim türleri, insanlar tarafından sosyal medya kanallarında yeni bir dil olarak kullanılmaktadır. Bu çalışmada, R programı kullanılarak Twitter'daki toplanan verileri kullanarak araştırma sorularının değerlendirilmesi amacıyla kullanıcıların emoji yorumlamalarıyla ilgili olarak nicel bir araştırma yapılmıştır. Toplanan veriler, Çankaya Üniversitesi'nden 201 katılımcıya (öğrenciler, personel ve çalışanlar) Google Formları kullanılarak verilen anket formunda kullanıldı ve aynı zamanda öğrencilerin sınıfları ziyaret edilerek ve sosyal medya kanalları aracılığıyla paylaşıldı. Bu çalışma, kullanıcıların emoji yorumlamalarını değerlendirmeyi amaçlamaktadır. Çalışmanın metodolojisi iki kısma bağlıdır; Bunlardan ilki verilerin toplanması, ikincisi ise toplanan verilerin ankette kullanılmasıdır. Anket; katılımcıların demografik özellikleri, sosyal medyayı ve emojileri kullanmalarıyla ilgili soruları kapsamaktadır. En çok kullanılan ilk 100 emojinin her biri için 'olumsuz', 'nötr' ve 'olumlu' olarak 201 katılımcının yorumlamaları toplandı. Bu çalışmanın sonuçları, bazı emojilerin farklı kişiler için farklı algılar ortaya çıkardığını göstermektedir.

Anahtar Kelimeler: Emoji, Twitter, Etkiketler.

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LIST OF ABBREVIATIONS

UTF Unicode Transformation Format

CSV Comma separated values



CHAPTER 1

INTRODUCTION

1.1 Introduction

People have started using a new style of communication or a new language by using emojis on different social media channels and smart phones as well as on different platforms in conjunction with the significant growth in the use of various social media. This chapter endeavors to give an introduction to emojis, their invention, growth and their usage. This study takes Twitter as a sample of emoji usage. The first part of the chapter takes social media and Twitter to provide an idea about Twitter. Then the same part takes the emoji form from different perspectives, meaning emoji encoding, the official names of emojis, expressing gestures and emotions with emojis, the technical implications of emojis, their effects on slang words, and an example of a chatting conversation with emojis. The second part presents the problem statement of the study. The third part presents the aims of the study. The fourth part discusses the significance of the study. Finally, this chapter ends with the thesis outline.

1.1.1 Social media and *Twitter*

In the last fifteen years, looking for information and sharing it is one of the important issues in people's lives. In the past, people acquired the information they were seeking in the classical manner, for example, by phoning each other or texting relatives, having direct conversations or by using a web search engine. Recently, by using social media through different channels, most of us have changed how we acquire information [1]. The number of social media users is growing daily through the use of various applications such as *Facebook*, *YouTube*, *Twitter*, etc., which gain a large amount of publicity which cannot be disregarded. They have become some of the most significant applications on the Web. They allow people to structure connections and

networks with other people in a simple and timely manner. Moreover, they allow people to participate in different types of information and use a collection of utilities such as video sharing, picture sharing, etc. [2].

One of these applications is *Twitter*; a micro-blogging social media service that enables people to post their opinions as well as to share or communicate with no more than 140 characters, in a post termed a *tweet*. *Twitter* is available to anybody by means of an account set up and registration to allow them to post what they want. However, others cannot post without their own account. In 2016, the total monthly number of active *Twitter* accounts was more than 319 million. On the day of the 2016 U.S. presidential election, *Twitter* proved to be the largest source of breaking news, with 40 million election-related tweets sent in one day [3]. In 2017, the number of monthly active users exceeded 328 million with a 5-percent yearly growth [4]. Now, *Twitter* is not only used in a personal manner, it has become a powerful marketing apparatus for advertising, businesses, and brand imaging because the large number of tweets can together, by analyzing them, be meaningful [5].

Twitter, after all this, has become a huge source of different types of information due to the nature of the *Twitter* design which allows people to post small messages (tweets) at real-time on various topics. It also allows people to grumble and debate with each other and to express positive or negative opinions on what they think about in life [6].

1.1.2 Emojis

While different social media applications have appeared, the use of emoticons and emojis has increased. Emoticons such as ;-) are reductions of facial expressions. They allow the user express feelings, sense or mood, and boost a written message with no verbal elements. They contribute to the reader noticing and promoting the meaning of a message [7].

Later emojis, the new generation of emoticons, have become widely used in mobile communications and social media such as *Twitter*. They are Unicode graphic

symbols used to express ideas and concepts which not only elucidate facial expressions, they also elucidate occasions, weather conditions, buildings, vehicles, eating and drinking, fauna and flora, actions and feelings. Emojis in email applications and in chat on smartphones have become more prevalent around the world. For example, *Instagram* offers online image and video participation, and this particular social-networking platform, in March 2015, recorded almost half of the text on *Instagram* containing emojis [7].

The word ‘emoji’ implies “picture character” in Japanese. Emojis were found in Japan at the end of the twentieth century to ease digital communication by a number of Japanese companies including DoCoMo, KDDI, and Softbank, which provided their special enforcements with dissonant encoding schemes. Emojis became unified for the first time in Unicode 6.0, which was the first group of emoji types containing 722 different types of emoji. Emojis gained a great amount of publicity after The Apple Company supported them in 2010 by starting to use them. In August 2015, Unicode 8.0 was formed with 1281 double or single emoji symbols [7].

1.1.2.1 Emoji Encoding

The invisible coding structure for expressive samples (emojis) is the Unicode standard, which is the basis of text in all new writing systems. Inside Unicode, different numbers, or code samples, mutate characters into emojis. To analyze these numbers or points and to make them machine comprehensible, the Unicode Transformation Format (UTF) is required, which is a private coding system. We can find three main types of UTF used to encode emojis in various software and systems. These include:





UTF-8: This is a Unicode which represents code points as 8-bit variable-length which increase compatibility with ASCII. For that, the representation of a character with low code-point ranges may take 1 byte (e.g., English text), but the high one may take 4 bytes or more [8].

UTF-16: This is the Unicode which represents code points as 16-bit variable-length. The representation of a character with low code-point ranges may take 1 byte while the high one may take 4 bytes or more. This encoding is used for many programming languages, such as Java and Python [8].

UTF-32: This Unicode represents code points as 32-bit variable-length, with the representation of a character taking 4 bytes consistently [8].

The study in 2016 [9] stated that there are 1282 emojis in the Unicode standard, every one of which having a name and code, such as U+1F601 for ‘beaming face with smiling eyes’; however, they lack images (visual form). This algorithm is closer to the Unicode text character, such as U+0041 index of the Latin capital letter ‘A’ whilst it does not show how ‘A’ appears. Thus, there is a technique called rendering which renders the Unicode characters into something visible such as an emoji or as letters. Furthermore, this technique has been used by several platform vendors, such as Google, Microsoft and Apple, who used this mechanism to create their own emojis by using their own rendering of the Unicode characters [9]. We can see the same emoji on an Apple mobile device or on a Samsung mobile device (for example), which is saved in the same Unicode character with different rendering (see Table 1). In 2017, there were more than 2,623 official Unicode emojis that have 1507 emoji numbers for people and/or smiley shapes, 113 emojis of a number of animals and nature ideograms, 102 emoji shapes of food and numbers, 207 kinds of travel and places, 60 activity emojis, 162 object emojis, 205 ideograms of symbols, 267 flags as well as the official date of World Emoji Day on 17 July every year [10].

Table 1: Corresponding platforms with their respective emoji (Source: emojiopedia.org)

Platform Render	Emoji	Name of Emoji
Apple		Grinning face with smile eyes
Google		Grinning face with smile eyes
Microsoft		Grinning face with smile eyes
Samsung		Grinning face with smile eyes

1.1.2.2 Official Emoji Names

The Unicode Consortium is a group of non-profit organizations which are interested in, and follow up, affairs of the Unicode Standard. Apple and Samsung together suggested the initial unified names for emojis and offered them to the Unicode Consortium. These names became official after Unicode Consortium acceptance and after suggestions submitted in Unicode version 6.0 were released [11]. Users generally have no idea about the official meaning of any emoji they use. Thus, a website called *Emojiopedia* has been developed to help users to know the official meanings of any emoji standardized by the Unicode Consortium.

1.1.2.3 Expressing Gestures and Emotions with Emojis

In our daily communication, users may experience an inability to express physical gestures, facial expression or intonation which we can easily do in face-to-face communication. This problem could be solved with emojis. Emoji are reached in many pictures having different or several meanings and which could help to express an opinion, personality, and feelings in an influential manner. For example, an application designer can use emojis in their designs or applications (e.g., video streaming) to translate certain linguistic features for deaf individuals. This can be useful when the

content of the media contains sarcastic metaphors spoken which need facial expressions or tone changes and cannot be easily expressed in written text because of the content of irony [12].

1.1.2.4 Emoji Technical Implications

We can notice easily the steps taken by different social media platforms to improve performance or to attract more users and one of these steps or features is the emoji. For example, the technical team at *Instagram* added a supporting feature to its system to enable the use of emojis in hashtags [13]. This feature allowed users to make it easier to search for content using their preferred emoji. Later, in its comments, the use of emojis on *Instagram* increased to approximately half. In a similar issue, *Google* inserted emojis into its search engine to enable users to do searches using emojis without using words or using words and emojis together. Moreover, *Facebook* has created ‘like’ and ‘dislike’ buttons consisting of a group of seven emojis known as ‘Reaction Buttons’: ‘beating heart,’ ‘crying face with an animated tear’ and ‘red/angry/pouting face,’ ‘smiling face,’ ‘surprised face,’ ‘thumbs up,’ and ‘laughing face,’ all of which enable users to interact differently with or share each post (see Figure 1), which is an astute step from *Facebook* to allow users to select more than one emoji.

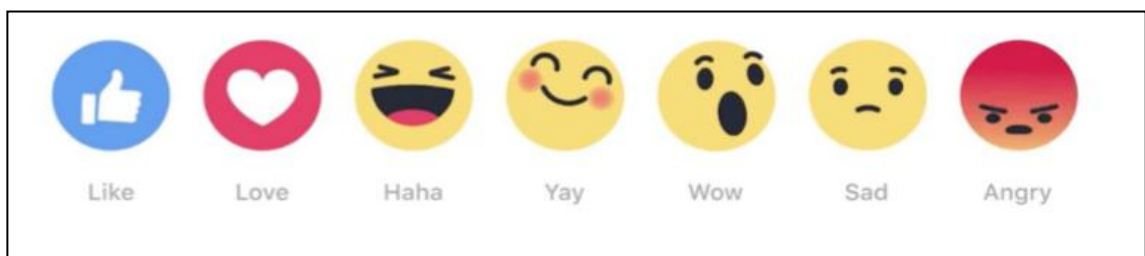


Figure 1: Facebook Reaction Buttons (Facebook)



1.1.2.5 Emojis and their effect on slang words



Sentiment analysis is a very important aspect of our current technological age. It depends on the analysis of what a user writes or comments on different platforms such as *Twitter* or *Facebook*. Most users add a number of special words to express their feelings, such as ‘rofl’ or ‘bae,’ which do not have any meaning in machine language; however, the use of informal or slang words by users will affect the result of an analysis operation as these words are not understandable by the machine language regarding their meaning or purpose in specific contexts. Emoji usage can contribute to solving this problem. We can note this issue in *Instagram* where emoji usage has increased as an alternative to the use of colloquial words which has led to reduced use of slang and informal words [13].

1.1.2.5 Examples of a chatting conversation with emojis

In his study, Brisson [14] presents an analysis of a text message conversation example containing emojis which can, by default, be shared between two individuals. This conversation record can be defined as an informal exchange between two English-speaking Americans who share a personal friendship (see Figure 2). User A selects messages to the left of the screen; User B selects messages to the right of the screen. User A in the first line attempts to initiate a conversation using the emoji 🙄. User B responds to User A with the emoji 😲 to show him his interest and his attempt to learn what is happening. Then the conversation continues with User A using another emoji 😞 as an enhancement of the first expressive message. User A writes more than the emoji 😞 and 😞 with the same feelings to show that something bad has occurred as well as to show sadness. Increasing the interpreter’s function in decoding an emoji makes the interpretation of meaning very fruitful. As User B indicates, the first two responses were questions related to the semiotic message of User A. User B responded productively to questions related to the emoji with “What’s wrong?” and “Oh no, did

something happen today at work?” Two ideas were implicit through the self-reasoning and logical deductive reasoning of User B. It is important to note that User B is not simply producing in terms of texts; instead, User B responds with visual emotion, as he would in a real or face-to-face conversation. Bilateral relations between sadness, frustration, surprise, and anxiety converge between lines 1 and 4. Visual responses through expressive symbols express a clear concern regarding User A’s cryptic messages.

The fifth line of dialogue is the essence of the conversation because it brings the narrative to life through text and images. User A describes a situation with a set of words and images that aim to recreate and provide visual signals about the incident that caused the first exchange of emojis. A combination of the emojis  and  restores the story in the images and at the same time allows User B to visualize User A in the mode. Although the purpose of the emoji in line 5 is to give visual signals to the situation within the message, User B may also have had an easier time replacing the car expressive symbol with User A’s actual car and possibly visualize User A making a similar expression while expressing his frustration with his car crashes, and thus his delay from work.

In the sixth line, User B uses another emoji, the surprised emoji , followed by  in an attempt to reassure User A. Lines 7 and 8 thus change the tone completely. The result is more positive with User B using repetition to recognize the support and make visual references together.

Emojis have enabled both User A and User B to re-create several layers of signals that would be present in a face-to-face conversation through the ability to express facial expressions, incorporate things into their conversation and use gestures. Additionally, using emojis has allowed users to make the conversation a more normal progression of conversation between User A and User B. The writer stated that if we assume the removal of emoticons from the text of the conversation, there will be a lack of transfer

of emotions between User A and B. Instead, User A has had to reinvent the way to add “thrill” to a text message, which has not been easily and efficiently transferred as can occur through the use of emojis.

It is equally important to note that the preferred reading of expressive symbols exists in the exchange between Users A and B, and then an almost seamless exchange of emotions and thoughts in the conversation ensues as if they could have been communicating face to face. The emoji acts as a palimpsest, where an intersection between cultural conventions and a modern form of communication collide. Since both users were writing in the English language registry in the United States, manual feedback and gestures are easily interpreted from user to user. However, if a user is replaced by a native German speaker speaking through an acquired English record, some facial expressions, cultural references, and hand gestures may be misinterpreted.



Figure 2: An example *Twitter* conversation between users who speak English in the United States [14]

1.2 Problem Statement

With the huge expansion of social web services and mobile devices, individuals and organizations are using information at an increasing rate from social media resources such as users' emotions or opinions for several purposes, including data mining, opinion mining, decision-making, as well as solving issues in the commercial domain, and health, political, and security problems. *Twitter* is one of the social media channels that allow users to post or send text (maximum 140 characters in each tweet), images, videos or sound clips through it and using information from the *Twitter* data source would decrease the need for creating a survey, public opinion polls or focus groups as big data or information already exists on social media such as *Twitter* [15].

“Sentiment analysis” is a comprehensive term and covers many aspects related to data mining. It points to the identification and collection of situations, emotions, and opinions for any product, case, happening, service, etc., and the development of these over time is known as sentiment analysis. *Twitter* is one of the most popular social media applications on the web and it allows people to discuss what they are thinking about by posting on it. It has enticed the notice and attention of researchers, especially with regard to the widespread use of hashtags and for a limited length of tweets [16].

While social media channels are maturing, the use of emojis in messages, emails and social media is growing rapidly at an increasing rate. On the other hand, sentiment analysis depends on the text in *Twitter* or special words on it or any other social media channel to obtain a decision or expectation. However, what if the post were an emoji instead of alphabetic characters or a part of it is an emoji?

In this study, we try to answer the following questions:

1. How often does the user use emojis in social media, specifically on *Twitter*?
2. What are the top 100 most used emojis on *Twitter* in Turkey?
3. What are the interpretations of users about the top 100 most used emojis which we extracted from the tweets as being ‘positive,’ ‘negative’ or ‘neutral’?

We have taken *Twitter* as a sample of social media as it is widely popular in the world of social media.

1.3 Aims of the study

Daily use of emojis in social media communications is growing. This fact becomes clear when checking the latest statistics regarding emojis. In 2017, more than half of *Instagram* users used emojis. The average number of emojis used on *Facebook* numbered more than 60 million per day and the average number of emojis sent on Facebook Messenger was more than 5 billion per day used [10]. This study aims to check how often emojis are used in social media, specifically on *Twitter* by acquiring answers from 201 Turkish participants in a survey. We took students and employees from Çankaya University in Turkey as a sample of Turkish people. Moreover, this study endeavors to determine how often emojis are used on each post on *Twitter*. Is it every time, almost every time, sometimes, almost never or never? This study also aims to determine the top 100 emojis being used in Turkey by using R program code on the data which we collected from *Twitter* using special Turkish hashtags. Finally, this study aims to determine users' interpretations of the top 100 emojis that we extracted from our *Twitter* data as to whether they are positive, negative or neutral by considering the idea that each emoji may have different interpretations for different users.

1.4. Significance of the study

Many studies mention the use of emojis and users' interpretations emojis. The study in [9] mentioned that there is a different interpretation between users because emojis have special shapes for each emoji that depend on the rendering platform (see Table 1). For example, the participants in [9] described the same meaning of the Google rendering emoji of “grinning face with smiling eyes” 😄 according to the Unicode standard, which is written as ‘blissfully happy,’ while they described the Apple emoji 😊 is described as “ready to fight.” Another study in [12] mentioned the importance of emojis' use as a new language in social media. The latest statistics showed that the use of emojis in social media has increased. For example, in 2017 more than 5 billion

emojis on average are sent each day through *Facebook Messenger*, with the average number of emojis being used on *Facebook* daily numbering 60 million. Moreover, more than 50% on Instagram used emojis. However, there is no similar study in Turkey examining emoji usage on *Twitter*. Therefore, this study was chosen to focus on the use of emojis on social media, as well as to focus on the interpretation of users of those emojis as it is rich in data which comes from users and their opinions and what they post can be used as a new source of data analysis or data mining. *Twitter* will be our sample from social media to check also the use of emojis.

Thesis Outline

This research includes five chapters, as shown below:

Chapter 1: Introduction, problem statement, aims of the study, and
significance of the study

Chapter 2: Literature review

Chapter 3: Method, acquisition of *Twitter* data and analysis and obtaining
users' interpretations of emojis and analysis

Chapter 4: Results and analysis

Chapter 5: Conclusion and future work

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Twitter, known for its weblog role and social networking role, is one of the largest micro blogging services in the world. Although Kwak et al. mention the social network merits of *Twitter* [17]; *Twitter* so far is one the most energetic sites that have compact social links. By following the user, tweets established or retweeted will display automatically in the follower's home timeline. This follows that the network is an oriented network and makes *Twitter* unlike other social networks such as *LinkedIn* and *Facebook*. Kwak et al. realized that nearly all relationships between users are asymmetrical and that general media companies or famous people can use *Twitter* as a suitable channel for publishing news for those who follow them [17]. A tweet is possible to own hashtags such as #HelloWorld to signalize user-defined topics. The user can also point to other accounts by using a mentioned sign such as @DheyauldeenM.

Opinion mining or sentiment analysis is the arithmetically studying of people's opinions, or their stances, emotions and sentiments. The expansion values of sentiment analysis synchronize with the prosperity of social media used like *Twitter*, *Facebook*, etc.

Emojis or emoticons have shown great importance in automated sentiment classification of unofficial texts [18] and a basic distinction between negative and positive emoticons were used to produce positive and negative paradigms of texts. These paradigms were then used to experience sentiment-classification models using machine learning techniques and test them. In subsequent work, these samples were applied to building groups of positive and negative tweets [15, 16 and 18]

automatically, and collections of tweets with ersatz sentiment parts, like sad and angry emotional situations [18]. Emoticons can take advantage of this to expand tools used in text mining, such as sentiment carrying words. A few groups of emoticons have already been used for extra merits polarity classification [15, 19].

Furthermore, there is a study that recognizes diagrammatic emoticons and their sentiment and harnesses them in a sentiment classification function. The researcher in [20] manually mapped the emoticons from Unicode 8.0 to nine emotional denominations and performed a sentiment categorization of tweets, using both a bag of words and emoticons. Ganesan et al [21] proposed a system for appending graphical emoticons to text as an example of linear feelings.

In this literature review, we will present the related research studies of emojis by taking related research studies from different sides first of which includes emoji usage and perceptions, second, emoji linguistic issues, third, business and marketing issues, fourth, health issues, fifth, sociological issues, and finally, psychosomatic issues.

2.2 Related Research Studies on Emojis

2.2.1 Emoji Usage and Perceptions

With the increasing popularity of emojis, studies and research are also increasing. According to what Andral and Larroque referenced in [22] and the SwiftKey Emoji Report [23], people in the U.S. regularly used emojis at a rate of 74% in their online communications. Furthermore, they sent an average of 96 emojis per day. It is also emphasized by the emoji research team that 92% of people in the U.S. use emojis daily. This ratio gives us the perception that emojis can be understood by anyone. This is the same thinking as Xu Bing when writing *Book from the Ground*, which was written using only emojis. This publication was supposed to be readable by anyone. However, occasionally, people may not wish to make an effort simply to understand a group of images and translate them into words.

Emojis have become more than merely images. A survey was developed by Andral and Larroque in [22] to consider the perception of emojis when used specifically by companies that use emojis in their advertising. Their results showed that 52.4% of people thought of emojis as ludicrous and 39.8% deemed them trendy. The researchers also found that 27.7% of participants in the survey held negative feelings toward emojis and deemed them to be non-professional, and 10.7% of them believed they reflected a low-end brand. Another part of Andral and Larroque's survey research was to send two kinds of emails to several people, one containing emojis and words and the other containing only words. The result showed that 60.7% of the respondents saw the emails with emojis as being more attractive. In general, it seems that people have a positive impression of emojis.

Another study from Walther and D'Addario in [24] focused on emoji usage and its effects by creating and administering a survey to analyze how emojis affect emails. The researchers found that emoji use in emails may complete the message and added that the interpretation also did not change with or without emojis. They stated that in general, the written content was more valuable than the emoji content, as the verbal components contributed more to the meaning of the message. The assumption was to explain why the words carried more weight than the emojis was viewed as requiring little effort while the written text is more engaging and laborious.

Additionally, a part of this survey contained the respondents, which included matching emojis of emotion. They found that disagreement on which appropriate emoji expressed a certain state of emotion was very small on most issues. For nine of the 12 sentiments, over 80% of respondents agreed on emojis that should be used to express feelings, indicating a clear consensus. This result supports the universality of emojis and the ability of everyone to understand them.

In another study, Derks, Bos and von Grumbkow in [25] conducted a study whose results contradict the results of the above research. Their study included classroom students who were given e-mails to read and a questionnaire to complete. While again

finding that verbal messages online have a greater influence than emojis, the effects of emojis vary. Based on respondents' responses, emojis can be used to supplement and reinforce a verbal message, which differs from the results found by Walther and D'Addario in [24]. For assistance, the positive message will have a strong positive feel if it has an emoji with it rather than one without an emoji. Consistent with Walther and D'Addario, emojis are not strong enough to contradict the written word. For example, even when adding a smiley face emoji to a negative message, the emoji will not be able to overcome negative emotions even though it may be somewhat less negative without the emoji.

It can be seen in another study conducted by Thompson, Mackenzie, Leuthold, and Filik in [26] that emoticons or emojis not only affect messages but also provide emotional motivation. They conducted an experiment that captured electrical activity in the brain to measure the excitement and reaction from facial electromyography to detect muscle movements while some looking at emojis. The study found that there was increased excitement, reduced smiling, and an enhanced smile in the presence of an emoji. She explained that the emoji had contributed to clarifying intentions in a difficult situation.

Another study explored a positive response to emojis without measuring any physical responses in the body. Huang, Yen, and Zhang in [27] used a survey to analyze the wealth of information, the perceived utility, enjoyment, and personal interaction of emojis with instant messaging. The study found that the largest number of respondents used emojis with great enjoyment. Furthermore, emojis directly influenced their enjoyment, which in turn influenced the personal interaction. There was a positive and indirect correlation between the emojis and information richness, meaning that emojis can affect co-workers' contacts through instant messaging.

In addition to studies conducted in the workplace, a series of surveys were conducted by Luor, Wu, Lu, and Tao in [28]. The results showed that negative emojis can negatively affect complex or simple task-oriented communication; positive emojis

only in complex communications generally created a positive effect, and in simple communication. For women, however, there were no huge differences between task oriented messages with or without neutral emojis. The negative emoji listed above may give an unintended bad impression, prompting researchers to suggest avoiding them in instant messaging at work. The study showed that close attention must be paid to the use of emojis as they can be misinterpreted, especially in the workplace.

According to the Tauch and Kanjo study in [29], an experiment was conducted to see how emojis impacted the appeal of mobile notifications from social networking applications. It was found by using sentiment analysis that emojis were used on *Twitter* at high polarity even though they were at lower polarity on *Facebook*. To find the polarity, an emotional degree was given to an emoji. These grades were then grouped to find the total polarization of each platform. Furthermore, *Facebook* and *WhatsApp* (for example) use both positive and negative emojis, while *Twitter* used mostly positive emojis in notifications. This has led to a more positive sense in *Twitter* notifications.

Gender is also of interest when considering the effects of emojis. The author in [30] started in real posts from various news groups: three groups and the Soccer Group. Then he analyzed groups of the same gender in addition to a mixed group. This was performed by classifying usernames as female, male or unknown gender. The result was 11 various meanings (emotion) which were used for emoji classification. Seven of the categories were used by females, while three were used by males. Men used emoticons to express teasing and ridicule more, and then the emoji fell into the signature file category, while women often used emojis to express humor, then teasing and ridicule. The conclusion of this study mentioned that there is no statistically significant difference between the sexes in the frequency of emoji use.

The researcher in [31] studied emojis as an old or new visual language. Because of the nonverbal nature of emojis, he mentioned that many emojis with facial expressions are universal. On the same issue, emojis can be seen as a code that complements and increases the tone and vocabulary of a text message. It was expected

that the functionality of emojis from being a code system would be uninterrupted and unrestricted in the future. Al-Shanqeeti [31] also points out that emojis are beginning to replace colloquial words such as ‘lol.’

In another study on the acceptability of using emojis according to Speier in [32], with Emoji usage growth, many issues have appeared, such as given the diversity of emoji users in terms of age, culture and social customs, meaning and emoji usage will also vary. Furthermore, there are many people who do not use emojis because of the problems of appearing to lack experience in using them. Chevrolet, the American car brand, claimed that the younger generation only understood expressive symbols and used them widely. Thus, the car company industrialized an explanatory video series on the use of emojis known as ‘Emoji Academy.’ This series helped less experienced users to use expressive symbols for and justify the meaning and purpose of emojis. This attempt was an astute approach to bridge the gap between the broader Chevrolet audiences and add some privacy to the brand using emojis.

In the above studies, we find that the most important factor is the user’s interpretation of emojis and whether users enjoy the use of emojis. Therefore, we will address in this study the user interpretation of emojis as well as the symbols being used. Staff and students from Çankaya University as a sample of Turkish society will be the core participants of our research.

2.2.2 Emoji Linguistic Issues

Emojis are changing the way we speak. Recently, text emoticons have been thoroughly investigated and they have been deemed to be a way to relocate ideas and feelings through the simulation of nonverbal marks in speech (Rezabek & Cochenour, 1998; Wolf, 2000) [30, 33]. Yuasa, Saito, & Mukawa state that nonverbal data are the specimens of information that the user’s brain distinguishes and processes as being sentimentally interactive when seeing or perceiving an emoji or emoticons [34]. The authors in [35] explained that people read these images and shapes (such as emojis or emoticons) as passionate information and not words; thus, texting with these shapes is

as important as text messaging with words to illustrate the meanings of messages via digital communication. In general, emojis in a digital connection help represent human gesticulations, voice tones and expressiveness when communicating out loud, whether talking in real life or over the telephone. Dresner and Herring in [36] explain in their study that emoticons refer to the intention of the speaker, and they concluded three posts for emoticons. Firstly, they consider emoticons as emotional indicators directly related to facial expressions; e.g., sad or angry. Secondly, they consider emoticons to be non-emotional indicators also associated with facial expressions; e.g., joking. Lastly, they regard emoticons as indicators of inhuman power that is not related to facial expressions but related to deep intention. Pavalanathan and Eisenstein in [37] conducted a similar inquiry on emoticons and reached a similar conclusion. The results showed that expressive symbols appear to play similar functions in human language.

Through the above, we can observe the effects of symbols on the emotions of humans, which are based on the understanding or interpretation of a user expressive emoji. In this study, we take a sample of the top 100 emojis being used in Turkey using the R program with *Twitter* and we show them to users to learn their explanations about these symbols using the survey.

2.2.3 Business and Marketing Issues

Speier in [32] stated that marketers recently noticed the importance and popularity of emoticons and have digitized them in their marketing strategies for mobile applications, social media platforms, and emails. Yakın and Eru in [38] claimed that the most important reason to harness social media as a publicity channel is to cover a broad audience at a low financial plane. Furthermore, social media helps to target appropriate audiences for a particular campaign. Based on this idea, a study was conducted using an empirical design method and applying a survey to a particular sample. The outcome explained that emojis were convenient tools for proclamation campaigns. Moreover, the participants in this study stated that the messages sent during those campaigns were helpful and efficient.

For example, the famous food brand McDonald's established an advertising board near London to boost their sales by using emojis according to Speier in [32]. This painting contains emojis such as cars; construction and a crying emoji face (see Figure 3).



Figure 3: McDonald's advertising board in London (Source: twitter.com/SocialSecretUK/)

The study above mentioned the importance of the use of emojis in social media, so one aspect of this study will be to know the use of emojis in different social media platforms using the survey; Turkish society will be the sample of this survey.

2.2.4 Health Issues

It is possible that emojis may affect several medical or health aspects. For example, Vidal, Ares, and Jaeger in [39] conducted a study on emotional experiences related to food through the analysis of the use of emojis on *Twitter*. Köster and Mojet in [40] conducted a previous study aimed at understanding the effect of emoji use on emotional reactions related to food during different eating situations. However, Vidal, Ares, and Jaeger in [39] clarified the profound knowledge about the way that food consumers transfer emotional feedback to drinking and eating status side to side with

the product they consume. This study searched tweets that described buying food, consumption or elaboration. The results explained that the frequency of using expression symbols depended on whether the user was with other people or alone. Users who escorted others used emojis relevant to positive emotional reactions, including ‘face with tears of joy’ 😂, or the ‘OK hand sign’ 🙌, or ‘face savoring food’ 😋. On the other hand, negative emotional reactions were reported when people were alone, such as ‘crying face’ 😭, or ‘disappointed face’ 😞. This study also debated tweets that included eating in several places, such as at work, in schools, and restaurants. It was noted that the restaurant tweets contained emojis with positive reactions, unlike the school or work tweets, which contained emojis with negative reactions. Another investigation was performed in the same study but associated with food consumption. For example, users purposely used negative emojis such as an unamused face or a weary face when they felt hungry, and they used positive emojis when they felt gorged or full. The paper proposed that emojis could be a powerful tool and an intuitive path to show emotions for situations related to food.

As mentioned above, the use of emojis and their psychological effects on users can be found. Users in restaurants prefer to use positive emojis. In schools or in the workplace, they may use negative emojis, all of which depend on the user’s interpretation and understanding of emojis and the times they are being used. One of the objectives of the research is to know in which places the user prefers to use social media, and thus, the use of emojis through the use of a survey.

2.2.5 Sociological Issues

Studies in recent years have shown that emojis are not only representations of emotional attitudes. They have been shown to play different roles relating to sociology. Through emoticons and their similarities to emojis as explained previously, people can elucidate their intentions in different identities and social cultures [25, 41]. Kelly and Watts in [42] have further explored the function of digital emoji usage in different communities and cultures. They conducted a study on emoji usage by interviewing 20

participants from different cultures about the several uses of emojis in digital textual communication. The researchers stated that depending on the results, in addition to emojis' and emoticons' conveying emotions, they are used for another purpose, such as creating conversations, allowing playful interactions and providing secrecy within relationships. In other words, emojis provide versatility in diversity using more than one way to express or communicate, such as in terms of gender, ethnic origin, and belief, etc. Apple, as a sample, has invented a number of new emojis for its operating systems (OS X 10.10.3 and iOS 8.3), which benefit from the new emoji skin tones. Then the new skin color emojis were recommended to the Unicode Consortium in November 2014 and became standard for users to select from their devices (see Figure 4).



Figure 4: Skin color emoji options on Apple Keyboards (Source: *Emojipedia.org*)

In addition, the updates also supplied a family relationship emoji, such as father and mother, or father and mother and one or two children (see Figure 5). These kinds of emoji support relationships within families.

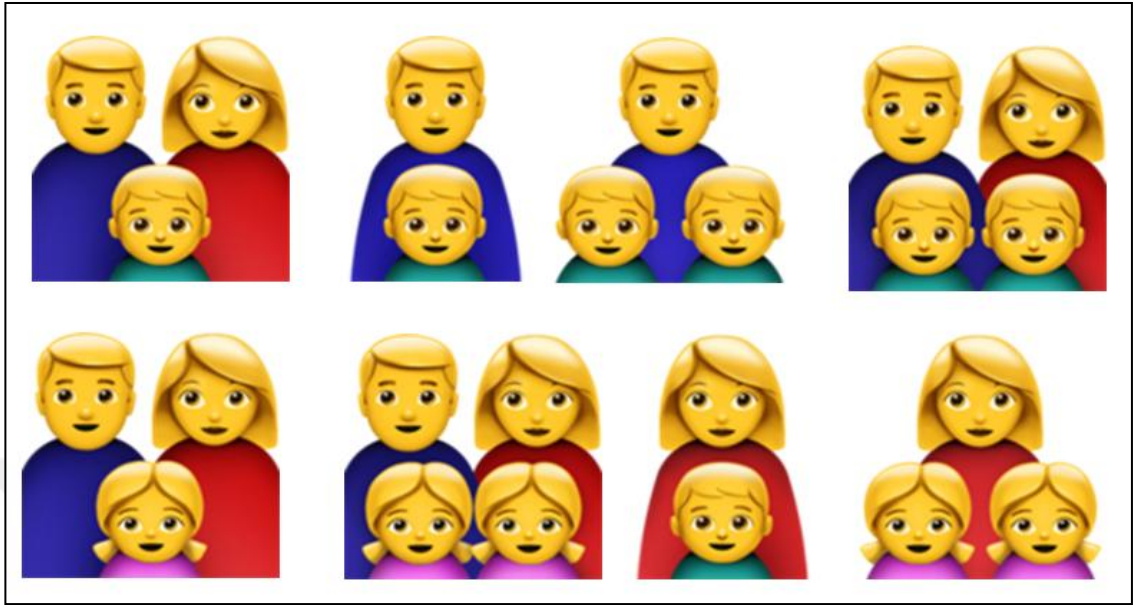


Figure 5: Family emoji options on Apple Keyboards (Source: *Emojipedia.org*)

The previous studies cited above have shown the importance of using emojis as a new method of communication reinforced by diversity and the increase of expressive symbols to add more emoji shapes that include skin color or family to their symbols. One of the questions addressed to participants in this research survey was whether symbols were used.

2.2.6 Psychosomatic Issues

According to the Walther & D’Addario study in [24], in the absence of nonverbal signals, emojis or emoticons can interpret emotions to express face shapes in different situations, such as a smile. In a communicable manner, people can imitate their emotions or expressions when they talk face to face. According to Hatfield in [43], a phenomenon known as Emotional Contagion can occur, in which similar sentiments and behaviors occur directly from person to person. This phenomenon can happen automatically through synchronization and copying. There is an evolving similarity between different living organisms [44], of attitudes or expressions, activities and voices. This is how people participate in empathy and how they establish relationships. We can say that an online system had been lacking in these types of empathy prior to

the invention of the emoji. Some researchers, such as Churches, Nicholls, Thiessen, Kohler and Keage in [45], have found similarities between identical sections of human brain activities either when somebody sees a real human smiling or when he sees an online smiley face. The study added that this similarity is not inborn but has incrementally developed with the advent of electronic or online systems and their unique language. Another study found that emojis may have crucial psychological and emotional influences on users depending on several factors, not only on the brain reaction. According to Churches et al. in [46], ambient environments or culture may cause people to adopt and acquire new skills not present at birth. Through the above, we can say that when people recognize a textual smiley face (i.e., an emoji), they will react emotionally towards it as if they reacted to a real facial expression.

The above studies show that the use of emojis may have helped the users to understand quickly as if they were face-to-face if they wanted to chat with each other in any case, as text-only conversation could be as poor as emotions in contrast to real conversation, and expressive emojis could help to solve this problem. However, people's understanding or interpretations of emojis from one to other may make this difficult, so in this study, we have taken a sample of emojis, namely the top 100 emojis used in Turkey that we extracted with the R program. We asked 201 participants from Turkish society about this emoji interpretation.

At the end, we can notice the importance of using emojis in different social media, and we can notice from the SwiftKey Emoji report the use of emojis in the United States and the large proportion of people using emojis. Another study from Derks, Bos, and von Grumbkow in [47] states that using messages which do not include emojis has greater influence than messages which included emojis, and this result differed from the results found by Walther and D'Addario in [24], who stated that a positive message will have a stronger positive feel if it has emojis in it than a message without emojis. Thompson, Mackenzie, Leuthold, and Filik in [26] stated that emoticons or emojis not only affect messages, they also gave emotional motivation. Their study found that there was increased excitement and elevated positive emotions when there were

emoticons or emojis. Another study on emojis relating to health issues from Vidal, Ares, and Jaeger in [39] found that users purposely used positive emojis if they ate in a restaurant and they would use negative emojis if they ate at home or at school. Moreover, users purposely used negative emojis such as an unamused face or a weary face when they felt starving, and they used positive emojis if they felt gorged or full. Kelly and Watts in [42] mentioned that in addition to emojis' and emoticons' conveying emotions, they are being used for another purpose, such as to create conversations, allowing playful interactions and providing secrecy within relationships. From the above, we can observe that most studies depend on user interpretations of emojis. Therefore, we are conducting this research by endeavoring to determine user explanations for emojis by taking a sample of emojis from the top 100 emojis used in Turkey and we will take 201 Çankaya University academic personnel and other employees and students as a sample of Turkish society for the study.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, we will explain our methodology in two steps, the first of which explains how we obtain our data from *Twitter* by obtaining authorization to access the *Twitter* API and acquire *Twitter* passwords from the *Twitter* API, after which we authorize *Twitter* by using the R program, then using the R program depending on special hashtag groups such as politics, television programs, city names, and football clubs with a specific language, namely the Turkish language, followed by saving the data in a CSV Excel file and then extracting emojis from them using the R language after removing repeated tweets. After that, we save the results and extract the emojis from our data using the R program again and then extracting the top 100 emojis from the total number of extracted emojis. In the second step of our methodology, we take the top 100 emojis from our data and take the opinions of 201 participants from Çankaya University about these emojis by administering survey questionnaires using Google Forms; the participants include students, staff and employees. Finally, we discuss and analyze the results. Figure 6 shows the methodology of this study. In this study, we have chosen a purposeful sampling strategy because it can be used to decrease the range of the differences related to the views of the various participants with a view to focus on the similarities [48]. This strategy implemented quantitative criteria such as calculating the average of every item in the survey. In addition, since this research has been conducted at Çankaya University, the members of this institution were more readily accessible than outside participants.

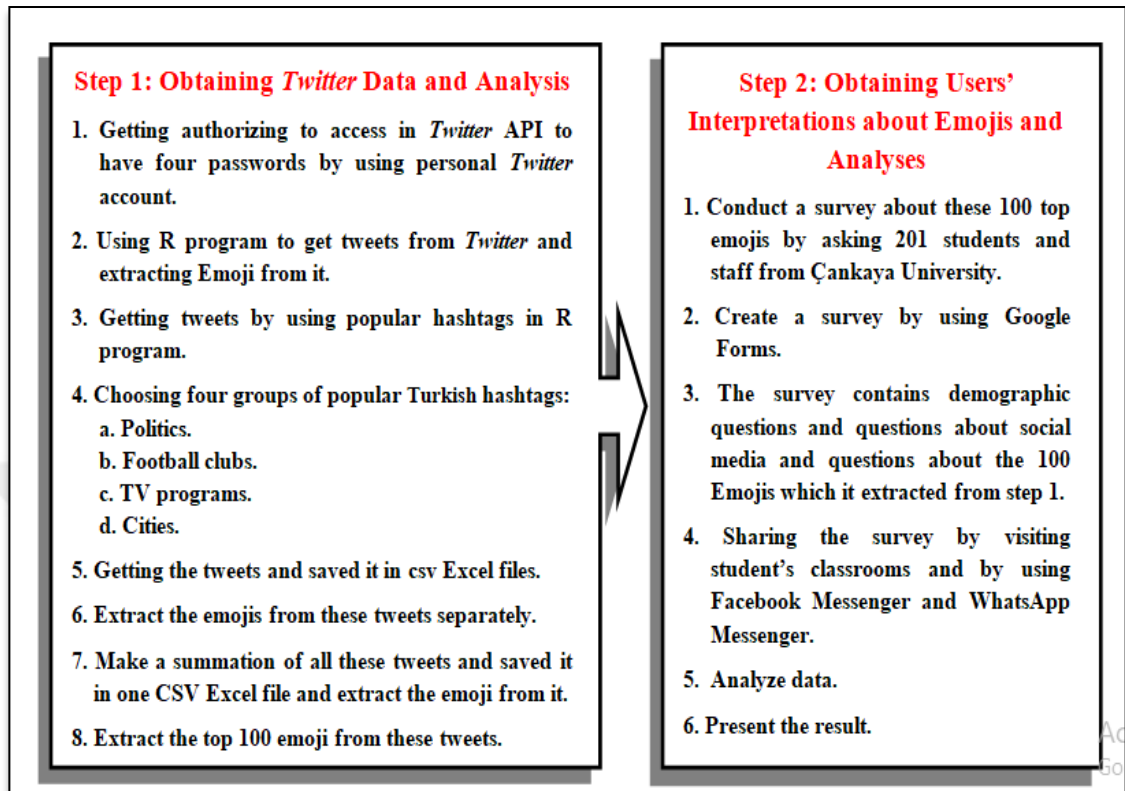


Figure 6: Methodology of the study

3.2 Step 1: Obtaining *Twitter* Data and Analysis

3.2.1 Data collection

Twitter API authorization

To acquire from *Twitter*, we had to access the *Twitter* API, which is a *Twitter* platform in order to read or write, or both, and because *Twitter* has different regulations and interest limits imposed, *Twitter* requires that all users must register a real account with an email address and phone number when they query the API [49]. For this reason, we accessed the website of *Twitter* REST API, after which we chose (My App), followed by (create a new account). We acquired the four passwords which we needed later after completing the required fields. This is available at <https://apps.twitter.com/>.

3.2.2 Using the R program

R is an open source programming language and software environment for statistical computing which is used for data mining and data analysis and surveying data miners. Recent studies have shown the widespread use of the R language and its benefits [50]. We used the R program in this study to collect data and to extract emojis from these data. We used the passwords obtained from the *Twitter* API using a piece of code in R with special hashtags and language to acquire the tweets.

Below is the first R code to obtain *Twitter* authorization to access *Twitter*:

```
library(twitteR)
library(reshape)
api_key <- "xxxxxxxxxxxxxxxxxxxxxxxxxxxx"
api_secret <- "xxxxxxxxxxxxxxxxxxxxxxxxxxxx"
token <- "xxxxxxxxxxxxxxxxxxxxxxxxxxxx"
token_secret <- "xxxxxxxxxxxxxxxxxxxxxxxxxxxx"
setup_twitter_oauth(api_key, api_secret, token, token_secret)
```

(obtaining this password from Twitter API).

3.2.3 Using Hashtags

A hashtag is a word tag which is used in microblogging services and different social media or networks such as *Twitter*. A hashtag makes it possible for users to find messages with a particular topic or with particular content. Any user can create and use one by writing the pound or number sign (#) and directly after it (without any space) a word or understandable phrase anywhere in a post. This makes searching for the same or related subjects much easier. The hashtag has become widely used on *Twitter* [51].

However, in our research, we assumed that a method to collect data depended on hashtags. In order to acquire more tweets, we first looked for the popular topics in the *Twitter* environment in Turkey. In our pre-analysis phase, we collected data from the top ten hashtags which took users' attention, and our analyses revealed that politics, football clubs, cities, and television programs were more popular than other categories, such as food, travel, etc. Later, we searched for the first five trending topics for each category. We determined the topics as follows:

1. Politics hashtags: we chose this type of hashtag to see the trends of users regarding politics and whether they used emojis in their posts.
 - a. **Erdoğan** (president of Turkey).
 - b. **evet** (which mean ‘yes’ in Turkish; we chose this hashtag during April 2017 as there was a referendum on the new Turkish constitution)
 - c. **hayır** (which mean ‘no’ in Turkish; we chose this hashtag during April 2017 as there was a referendum on the new Turkish constitution)
 - d. **Kılıçdaroğlu** (a well-known politician in Turkey)
 - e. **Bahçeli** (a well-known politician in Turkey)
2. Football clubs hashtags: We chose this kind of hashtag to see the trends of users regarding sport in general and football specifically and whether emojis were used in their posts.
 - a. **Fenerbahçe** (name of a Turkish football club)
 - b. **Trabzonspor** (name of a Turkish football club)
 - c. **Galatasaray** (name of a Turkish football club)
 - d. **Bursaspor** (name of a Turkish football club)
 - e. **Beşiktaş** (name of a Turkish football club)
3. City hashtags: We chose this kind of hashtag to see the trends of users regarding city names and whether emojis are used in their posts.
 - a. **Ankara** (name of the capital of Turkey)
 - b. **Antalya** (name of a city in Turkey)
 - c. **Bursa** (name of a city in Turkey)
 - d. **Istanbul** (name a of city in Turkey)
 - e. **Izmir** (name of a city in Turkey)

4. Television Programs hashtags: We chose this kind of hashtag to see the trends regarding television programs and whether emojis are being used in their posts.

- a. **EDHO** (a television series in Turkey)
- b. **Kiralık Aşk** ('Love for Rent') (a television series in Turkey)
- c. **Savaşçı** ('The Fighter') (a television series in Turkey)
- d. **Söz** ('Promise') (a television series in Turkey)
- e. **Survivor** (one of the most famous television programs in Turkey)

We will use the R program again with these hashtag names to collect tweets related to these hashtag names. By using this operation, we collected 70,777 tweets dating from 1 April 2017 to 15 April 2017 as *Twitter* has provided only tweets in real time, and in the last 7 days, we performed this operation two times. The R code of the retrieved tweets from *Twitter* is presented in Appendix A1, and the R codes for the extraction of emojis from the data are presented in Appendices A2 and A3.

3.2.4 Extracting Emojis Using the R program

After using all these hashtags in R one by one or individually, we saved the data in Excel as a CSV file. An emoji is saved as a Unicode and as seen in Chapter 1, for example, 'face with tears of joy' is saved as this form (U+1F602). On the other hand, we have an emoji dictionary saved on it with emoji names and their Unicodes. Based on this using the R program with a code, R started to compare the emoji dictionary (which we have) with what exists in each CSV file, when it finds an emoji, R saved the name of this type of emoji with a counter. This operation continues to finish each file separately. Afterwards, we extracted the 100 emojis from the extracted emojis from the data.

3.3 Step 2: Obtaining Users' Interpretations about Emojis and Analyses

In the second step, we conducted a survey to obtain users' interpretations of the emojis. After finishing the extraction of the emojis, we chose the top 100 emojis used in the tweets. Then we designed a survey questionnaire (see Appendix A4, A13) including these emojis and applied the questionnaire to a sample consisting of 201 students, professors and employees at Çankaya University in Turkey. The design was an online questionnaire using Google Forms with English and Turkish languages to make it easier for participants to answer. The questions had different form types (such as check boxes, multiple choice and drop-down lists). We announced it via the *WhatsApp messenger* and *Facebook Messenger* and by visiting the students' classes. The survey contained two parts: (1) Demographic information and social media usage; and (2) users' opinions about the emoji ideograms. The first part contained five questions, as presented below:

1. Age?
2. Gender?
3. When do you use social media? (more than one option can be chosen) (See Figure 7).

<input type="checkbox"/>	while eating - yemek yerken
<input type="checkbox"/>	while watching TV - televizyon seyredirken
<input type="checkbox"/>	while driving - araç sürerken
<input type="checkbox"/>	while shopping - alışveriş yaparken
<input type="checkbox"/>	while work or school - çalışırken veya okulda
<input type="checkbox"/>	while exercising - spor yaparken
<input type="checkbox"/>	while travelling - seyahat ederken
<input type="checkbox"/>	while on toilet - tuvalette
<input type="checkbox"/>	Never - Hiç kullanmıyorum

Figure 7: Multiple choices about the social media question

4. How often do you normally use the following social media? (See Figure 8)

How often do you normally use the following social media? - Sosyal medyayı hangi sıklıkta kullanıyorsunuz? *							
	Many times a day - Günde birçok kez	Once a day - Günde bir kez	Once every two, three days - Her iki, üç günde bir	Once a week - Haftada bir	Once a month - Ayda bir	Less often - Daha az sıklıkta	Never - Hiç kullanmıyorum
Facebook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instagram	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Twitter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Linkedin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pinterest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Snapchat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BiP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 8: Question of using social media channels in the survey

5. How often do you use emojis in your posts in social media? (See Figure 9).

<input type="radio"/> Every time - Her zaman
<input type="radio"/> Almost every time - Neredeyse her zaman
<input type="radio"/> Sometimes - Bazen
<input type="radio"/> Almost never - Neredeyse hiç
<input type="radio"/> Never - Hiç kullanmıyorum

Figure 9: Options for the emoji usage question in the survey

The second part of the survey contained the 100 opinion questions about the top 100 emojis extracted from the tweets and answered with responses as being positive, negative or neutral, as in Figure 10.

face with tears of joy - sevinç gözyaşı ile yüz *



negative - negatif

neutral - nötr

positive - pozitif

smiling face with heart-shaped eyes - kalp şeklinde gözlerle gülen yüz *



negative - negatif

neutral - nötr

positive - pozitif

Figure 10: Sample opinion questions about emojis

The survey starts with a question about age of the participant and followed by their gender. The purpose is to know the sex and age group involved in the survey. The following question is about the time of using social media so as to know the diversity of circumstances surrounding the user during the use of social media and thus diversifying the use of available means, such as emojis. The next question concerns the number of times social channels such as *Twitter* are used. The next question is to determine how many times the participants used emojis. The aim is to find the percentage of emoji use of participants to know and determine the percentage of use of emojis by the participants. The 100 subsequent questions are about the participant's opinions about the 100 emojis extracted from the data. The survey was created using Google Forms and it was shared with 201 participants over *WhatsApp messenger* and *Facebook messenger* and by visiting the students while attending their lectures.

CHAPTER 4

RESULTS AND ANALYSIS

4.1 Introduction

In this chapter, we present and analyze the results we obtained in the study. The first part of the results is what was obtained from the R program on the number of tweets from *Twitter* based on the total number of hashtags (in the Turkish language), which numbered 70,777 tweets stored in an Excel file in csv form, through which we extracted the number and percentage of emojis used in these data. The total number of emojis found in these tweets was 19,937. After this, we will present the top 100 emojis used in these data. The second part of the results will review and analyze the results of the survey conducted on 201 participants. The research was conducted with the staff and students of Çankaya University (professors, instructors, employees, students), where we will review and analyze the results of the survey questions to be mentioned later, including the 100 types of emoji that were the results of the first part of our research.

4.2 Results and Analyses

This section presents the results in two parts. First, it presents and analyzes the tweets on *Twitter* which were collected from the R program and it shows and analyzes the 100 emojis which were extracted from these tweets. Second, it presents and analyzes the survey results.

4.2.1 R Program Code Results and Analyses

4.2.1.1 Obtaining tweets and emojis from *Twitter* using the R program

In Table 2 (see table 2), which presents the results obtained from *Twitter* using the R language based on the Turkish hashtags, is divided into four sections (political, names of Turkish cities, names of Turkish football teams and Turkish television programs)

with five hashtags in each section, The Table shows us the number of tweets we collected from each hashtag and the number of emojis which were extracted from these tweets and the number of emoji types in each of the hashtag tweets and the ratio of emojis in each of the hashtag tweets. We collected 70,777 tweets in these operations from *Twitter* between 1 April 2017 and 15 April 2017.

Table 2: Number of tweets and emojis collected from *Twitter* using the R program

Turkish Hashtag groups	Name of the Hashtag	Collected Tweets	Emoji number founded in tweets	Number of Emoji types	Emoji Ratio in Tweets
Hashtags related to Politics	Evet	4962	414	55	8.3%
	Hayır	8915	983	96	11%
	Erdoğan	1443	70	23	4.8%
	Kılıçdaroğlu	481	26	4	5.4%
	Bahçeli	84	0	0	0%
Hashtags related to major cities	İstanbul	3969	1070	143	27%
	Ankara	3755	617	94	16%
	Antalya	1757	317	69	18%
	Bursa	2268	267	58	11.7%
	İzmir	510	119	32	23%
Hashtags related to famous football clubs	Beşiktaş	4955	1568	87	31%
	Fenerbahçe	3782	1031	67	27%
	Galatasaray	3703	517	55	14%
	Trabzonspor	840	243	30	28%
	Bursaspor	713	75	11	10.5%
Hashtags related to famous TV programs	Survivor	9639	3314	128	34.3%
	Savaşçı	7153	1441	90	20%
	Söz	7032	3659	134	50%
	Kiralık Aşk	3040	2502	121	80%
	EDHO	1776	821	68	46%
Total		70777	19937	398	29.4%

In Table 2, we find that the highest number of tweets in the hashtag of the TV programs section was the ‘Survivor’ (Turkish TV program name) hashtag with 9,639 tweets, and the highest number of emojis are in the hashtag ‘Söz’ (Turkish TV series name), which is also in the TV programs hashtags group with 3,659 emojis used in these tweets, which also has the highest number of emojis used in all hashtag groups. The hashtag name with the highest number of emoji types was the ‘Istanbul’ hashtag (name of a Turkish city) in the name of Turkish hashtags sections with 143 types of emoji. The highest ratio of emoji use in the tweets was in the TV programs section group, specifically in the ‘Kiralık Aşk’ (name of a Turkish TV series) hashtag name with 80% of emojis used in their tweets. The total number of tweets collected from every hashtag section from *Twitter* was 70,777 tweets and the total number of emojis found or used in these tweets numbered 19,937 emojis, which contained 398 types of emoji. This means 29.4% of the tweets contained emojis, which is a good ratio of emoji usage, opening new resources of data such as emojis. Moreover, we found that the section of hashtags containing the most emojis was the TV programs section hashtags, followed by the football clubs hashtags, then the city names hashtags, and finally, the political hashtags. This means that emojis have increased in tweets when the hashtags take the attention of users who in turn expressed their interactions using emojis as a second method in addition to written texts. Therefore, we find that one of the factors driving the use of emojis in posts on *Twitter* depends on the interaction of the user with the hashtag, which expresses the emotion or condition or encouragement of a team or club or expression of political opinion. This could be a temporary hashtag as we found in the hashtag ‘Evet’ (‘yes’ in Turkish). We chose this hashtag in April 2017 during the referendum on the new Turkish constitution. We can see the interaction of users at that time with a large number of tweets as well as emojis to state their opinions.

4.2.1.2 Extracting the top 100 emojis from the total data using the R program

After we stored all the data in an Excel file in CSV form, we obtained 398 different types of emoji in our total dataset using the R program code again. Then we selected the top 100 emojis from these emojis and presented them to 201 participants

from the Turkish community (students, staff, and professors at Çankaya University) to be appointed for research in a survey, the results of which will be seen later in this chapter. Table 3 below shows the top 100 emojis.

Table 3: The top 100 emojis extracted from the data using the R program















No.	Emoji picture	Emoji Name	Number of times appears in total tweets
1		face with tears of joy	2035
2		smiling face with heart	1153
3		black heart	998
4		clapping hands	976
5		person with folded hands	684
6		thumbs up	677
7		fisted hand	591
8		blue heart	526
9		smiling face with sunglasses	476
10		smiling face with smiling eyes	466
11		flexed biceps	452
12		yellow heart	343
13		winking face	339
14		smirking face	268
15		grinning face	261
16		two hearts	251
17		Ok hand sign	220
18		victory hand	217
19		crying face	215
20		chequered flag	205

Table 3: The top 100 emojis extracted from the data using the R program

Continuation of Table 3























No.	Emoji picture	Emoji Name	Number of times appears in total tweets
21		grinning face with smiling eyes	205
22		smiling face with open mouth and smiling eyes	203
23		loudly crying face	159
24		fire	157
25		slightly smiling face	152
26		soccer ball	151
27		face blowing a kiss	131
28		person raising both hands in celebration	126
29		trophy	117
30		unamused face	111
31		rose	108
32		pensive face	108
33		heart suit	106
34		medium white circle	105
35		medium star	104
36		relieved face	103
37		sparkling heart	102
38		smiling face with open mouth and cold sweat	101
39		medium black circle	96
40		raised hand	88
41		glowing star	86
42		see-no-evil monkey	86

Table 3: The top 100 emojis extracted from the data using the R program
Continuation of Table 3
























No.	Emoji picture	Emoji Name	Number of times appears in total tweets
43		leaf fluttering in wind	86
44		dizzy symbol	85
45		smiling face with open mouth	85
46		happy person raising one hand	84
47		hot beverage	83
48		collision symbol	82
49		pouting face	82
50		pistol	79
51		white down pointing backhand index	76
52		white right pointing backhand index	75
53		smiling face with open mouth and tightly-closed	75
54		television	74
55		heavy exclamation mark symbol	72
56		large red circle	70
57		basketball and hoop	70
58		broken heart	69
59		revolving hearts	68
60		face savoring delicious food	67
61		purple heart	67
62		smiling face with a halo	61
63		dancer	61
64		bomb	60
65		smiling cat face with heart-shaped eyes	58

Table 3: The top 100 emojis extracted from the data using the R program

Continuation of Table 3




































No.	Emoji picture	Emoji Name	Number of times appears in total tweets
66		balloon	57
67		face screaming in fear	57
68		sparkles	56
69		four leaf clover	55
70		sun with face	54
71		disappointed face	54
72		thumbs down sign	53
73		face with stuck-out tongue and winking eye	53
74		grimacing face	52
75		multiple musical notes	51
76		flushed face	51
77		cherry blossom	48
78		eyes	48
79		expressionless face	46
80		crown	46
81		blue circle	44
82		sleepy face	44
83		heavy check mark	44
84		kiss mark	41
85		angry face	41
86		hibiscus	40
87		heart with arrow	40
88		confused face	39

Table 3: The top 100 emojis extracted from the data using the R program

Continuation of Table 3

No.	Emoji picture	Emoji Name	Number of times appears in total tweets
89		sun rays	39
90		clapper board	38
91		index pointing up	37
92		herb	37
93		waving hand sign	37
94		alarm clock	36
95		green heart	35
96		right arrow	34
97		double exclamation mark	33
98		round pushpin	33
99		orange diamond	33
100		anticlockwise arrows button	33

In Table 2 above, we can see different types of emoji used by users to explain their feelings or opinions about sports, politics, drama or TV programs, and nationality, which we found in the hashtags groups because all of our collected data related to these four items directly or indirectly. These emojis were extracted from Turkish users on *Twitter* and the survey results, which we will see later, were also obtained from Turkish participants. We took their opinions about these emojis.

4.2.2 Survey Results and Analysis

4.2.2.1 Demographic Analysis

Demographic analysis is a method whereby we explore different variables related to research participants, including factors such as their age gender, ethnicity and so on.

In our study, we asked the participants involved in the study about their gender and age. Table 4 shows the percentage distribution of age groups.

Table 4: Participant age groups

		Frequency	%
Valid	Under 18	2	0.99
	18-25	106	52.75
	26-45	87	43.28
	Over 45	6	2.98
	Total	201	100.0

According to the table above, the majority of the respondents falling within the age range 18-25 was 53% and 43.55% for those falling within the range 26-45. This means that the vast majority of participants were adults of different age, including young and middle aged participants. 3% of the participants were aged 45 and over.

Figure 11 shows gender distribution with 121 males participating at 59.7% and 80 females participating at 39.8%. Thus, the majority of respondents participating in the study were male.

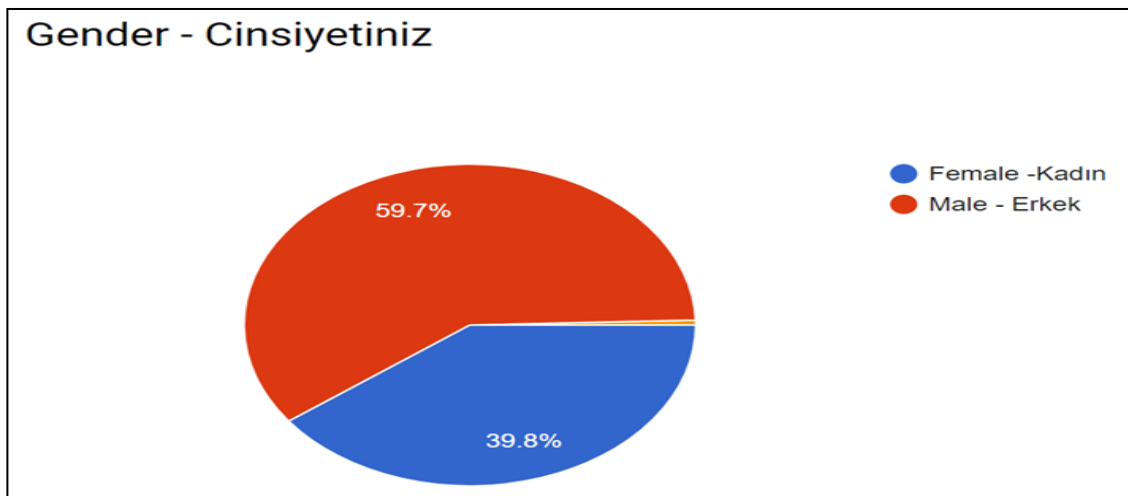


Figure 11: Gender Distribution

4.2.2.2 Survey Questions Results and Analysis

The first question in the survey was ‘When do you use social media?’ and the answers were multiple choice. As Figure 12 below shows, the participant can choose more than one option. These different environments at the time of use of social media may lead to the user being encouraged to interact with them, whether receiving or transmitting. One of these options is the possibility of increased use of emojis (for example).

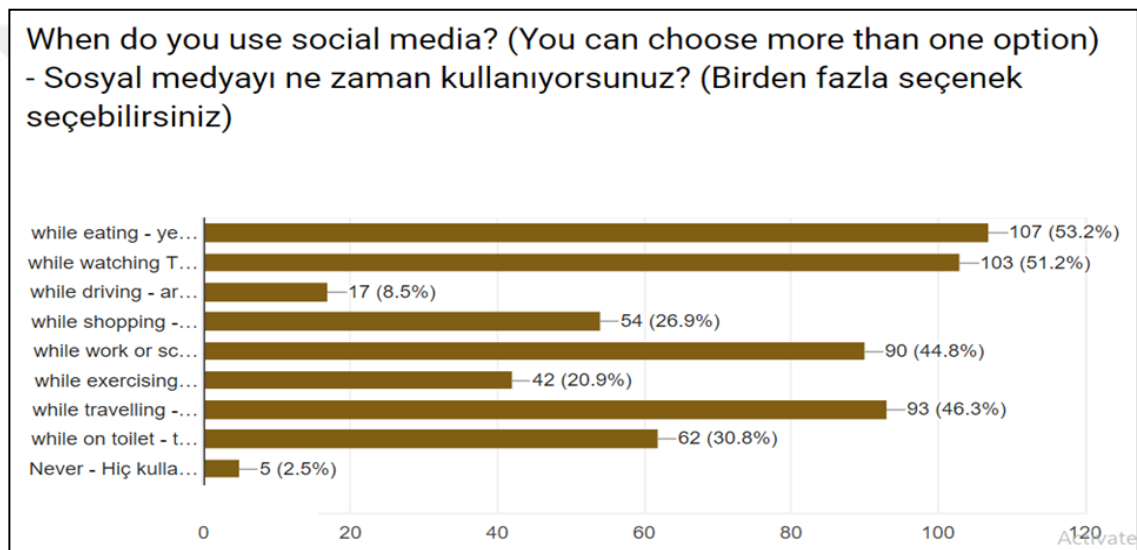


Figure 12: Participants’ answers about the first question in the survey

The largest proportion of these answers was for the option ‘while eating,’ with 107 participants (53.2%). This percentage may increase the likelihood of using emojis for food or happy emojis because the environment that accompanies eating is often a comfortable environment. Another ratio was 46.3% with 93 participants for the choice ‘while traveling.’ For the aspect of travel, there is also the possibility of increasing the use of emojis to express the different conditions of a trip, whether fun or tiring or interesting. Moreover, in travel, especially with regard to the means of transport, the traveler often has much time. For the option of ‘while watching TV’), 103 participants (51.2%) responded. This different ratio for the various choices may increase the likelihood of using emojis.

The second question was ‘How often do you normally use the following social media? The answers to this question are presented in Table 5. Figure 13 shows the participants’ choices distribution using the various social media channels in question.

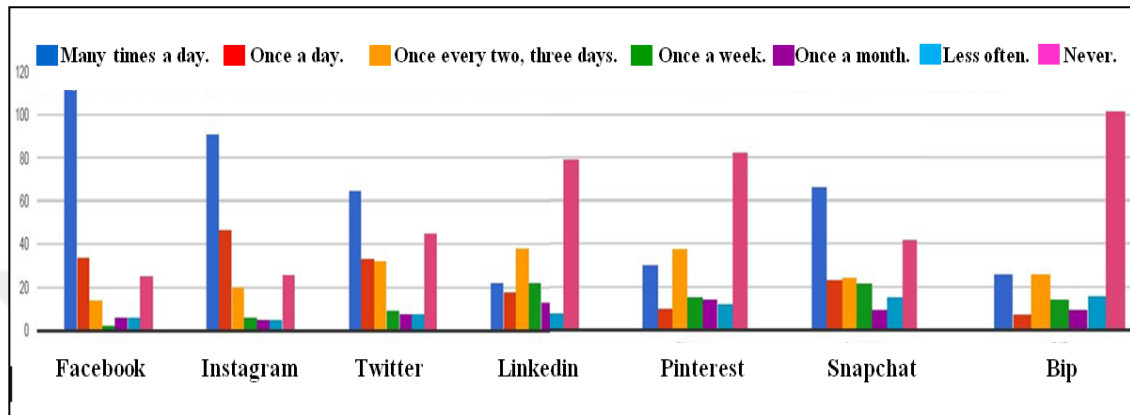


Figure 13: Participants’ choices distribution

The highest result on *Facebook* is 114 for ‘many times a day’; on *Instagram*, it is 92 for ‘many times a day’; on *Twitter*, it is 66 for ‘many times a day’; on *LinkedIn*, it is 80 for ‘never’; on *Pinterest*, it is 83 for ‘never’; on *Snapchat*, it is 67 for ‘many times a day’; on *Bip*, it is 103 for ‘never.’ Table 5 shows the result of Question 2. The results for the study sample (*Twitter*) show that the majority of the participants used *Twitter* in different proportions: 66 of them used *Twitter* many times a day, 33 used *Twitter* once a day, 32 used *Twitter* every two or three days, 9 used *Twitter* once a week, 8 used it once a month and 45 never used *Twitter*. Only 22.5% of the participants never used *Twitter*. Overall, these ratios are good, as participants use *Facebook*, *Twitter*, and *Instagram* at very close intervals and this leads to more interaction with these channels.

Table 5: Results of participants' choices for Question 2

	Facebook	Instagram	Twitter	LinkedIn	Pinterest	Snapchat	Bip
Many times a day	114	92	66	22	30	67	26
Once a day	34	47	33	18	10	23	7
Once every two, three days	14	20	32	38	37	24	26
Once a week	2	6	9	22	15	21	14
Once a month	6	5	8	13	14	9	9
Less often	6	5	8	8	12	15	16
Never	25	26	45	80	83	42	103
Total	201						

Question 3 was 'How often do you use emojis in your posts on social media?' Figure 14 below shows the proportion of the participants' answers. 82 of them chose 'every time' (40.5%), 41 chose 'almost every time' (20.5%), 60 chose 'sometimes' (29.5%), 12 chose 'almost never' (5.8%), and 6 chose 'never' (3.2%).

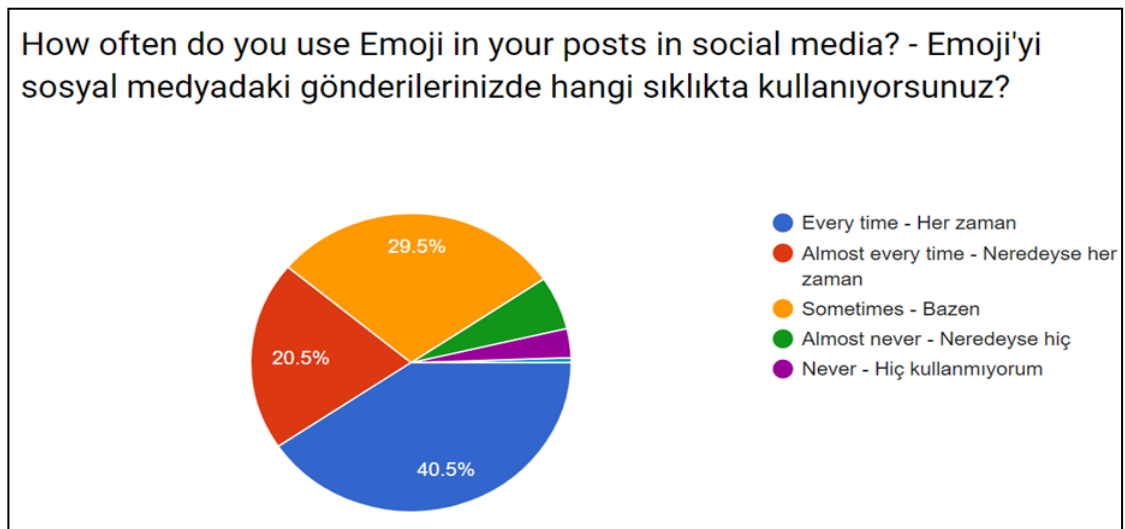


Figure 14: Participants' distribution of answers to Question 3 in the survey

4.2.2.3 Survey Results and Analysis of the 100 extracted

This section presents the participants' interpretations of the top 100 emojis extracted from the data using the R program. Figure 15 shows the first top emoji in the *Twitter* data, which was “face with tears of joy” where the result was 153 participants being positive within 76.1%, 35 participants being neutral within 17.4%, and 13 participants being negative within 6%. This means that the majority of the participants had the same interpretation of this emoji.



Figure 15: The first emoji interpretation results extracted from the data

The second emoji is shown in Figure 16 from the top 100 extracted from the *Twitter* data. 178 of the participants (88.1%) chose positive, and 19 chose neutral (9.5%) and 4 participants (2%) chose negative. In addition, the majority of the participants had the same interpretation of the second emoji.

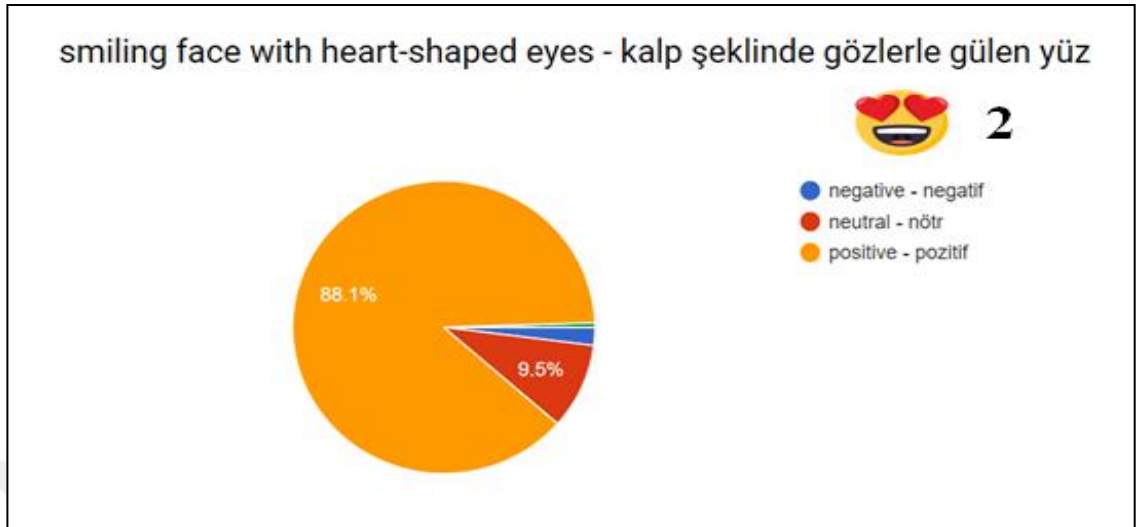


Figure 16: The second emoji interpretation results extracted from the data

The third emoji from the top 100 emojis was ‘black heart’ and Figure 17 below shows the results of the participants’ interpretations. 127 of the participants (62.7%) responded negatively and 38 (18.9%) responded positively and 36 (17.9%) responded negatively. In this interpretation, more than 50% were the same about the third emoji.

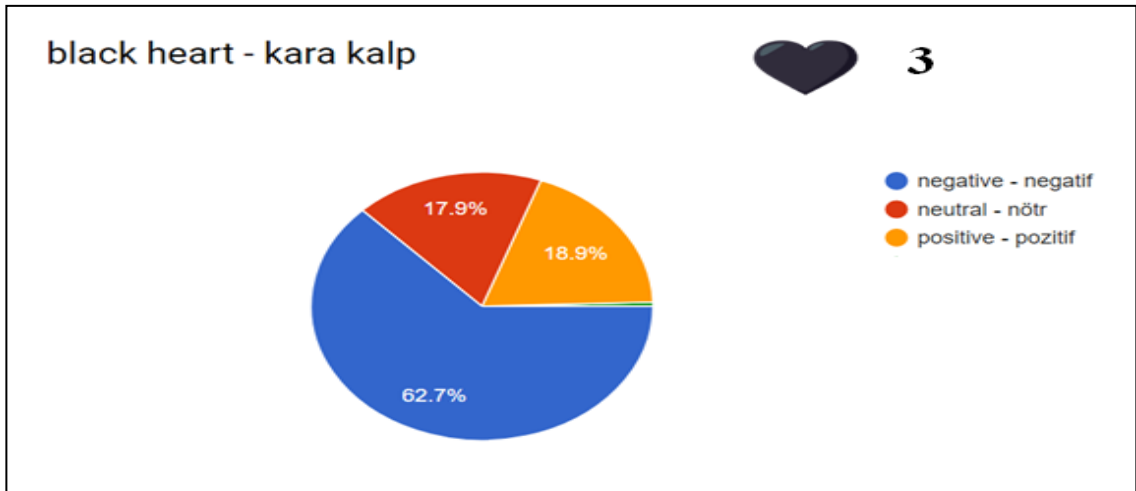


Figure 17: Third emoji interpretation results extracted from the data

The fourth emoji was “clapping hands”. Figure 18 below shows the results of the participants’ interpretations as being 119 of them having chosen positive within 58.7%, 60 persons within 29.9% having chosen neutral and 22 of them within 10.9% having chosen negative. Moreover, in this result, the majority of the participants were the same.



Figure 18: Fourth emoji interpretation results extracted from the data

The fifth emoji was “person with folded hands,” shown in Figure 19 below. For this result, we find a difference in the interpretation of the participants of this emoji as being 81 of them from within 40.3% having chosen negative, 90 of the participants having chosen neutral from within 44.3% and only 30 of them from within 14.9% having chosen positive.

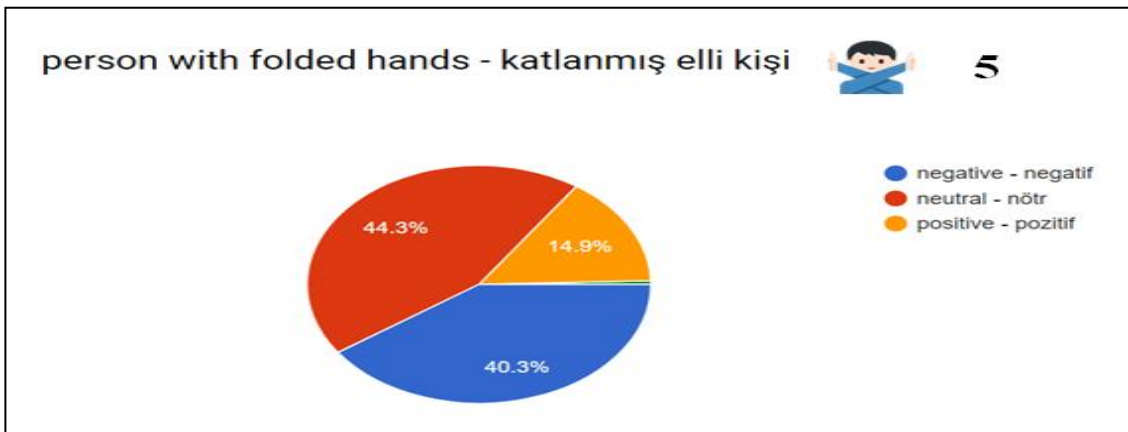


Figure 19: The fifth emoji interpretation results extracted from the data

All the results of the top 100 emojis are presented in Table 6, which shows the participants' interpretations.

Table 6: Interpretations of participants of the 100 emojis























No.	Emoji picture	Emoji Name	Negative	Negative ratio	Neutral	Neutral ratio	Positive	Positive ratio
1		face with tears of joy	13	6%	35	17.4%	153	76.1%
2		smiling face with heart	4	2%	19	9.5%	178	88.1%
3		black heart	127	62.7%	36	17.9%	38	18.9%
4		clapping hands	22	10.9%	60	29.9%	119	58.7%
5		person with folded hands	81	40.3%	90	44.3%	30	14.9%
6		thumbs up	10	4.5%	35	17.4%	156	77.6%
7		fisted hand	39	19.4%	104	51.2%	58	28.9%
8		blue heart	28	13.9%	89	43.8%	84	41.8%
9		smiling face with sunglasses	12	6%	59	29.4%	130	64.2%
10		smiling face with smiling eyes	11	5.5%	26	12.9%	164	81.1%
11		flexed biceps	23	11.4%	54	26.9%	124	61.2%
12		yellow heart	37	18.4%	78	38.8%	86	42.3%
13		winking face	7	3.5%	61	30.5%	133	66%
14		smirking face	59	29.4%	92	45.3%	50	25.3%
15		grinning face	14	7%	40	20%	147	73%
16		two hearts	9	4.5%	15	7.5%	177	88%
17		Ok hand sign	27	13.5%	51	25.5%	123	61%
18		victory hand	10	5%	43	21.5%	148	73.5%
19		crying face	150	74.5%	29	14.9%	22	11%
20		chequered flag	33	16.5%	105	52%	63	31.5%
21		grinning face with smiling eyes	12	6%	39	19.5%	150	74.5%
22		smiling face with open mouth and smiling eyes	11	5.5%	32	16%	158	78.5%

Table 6: Interpretations of participants of the 100 emojis (Continuation of Table 6)

























No.	Emoji picture	Emoji Name	Negative	Negative ratio	Neutral	Neutral ratio	Positive	Positive ratio
23		loudly crying face	163	81%	18	9%	20	10%
24		fire	115	57%	54	27%	32	16%
25		slightly smiling face	16	8%	53	26.5%	132	65.5%
26		soccer ball	14	6.8%	86	43%	101	50.2%
27		face blowing a kiss	8	4%	16	8%	177	88%
28		person raising both hands in celebration	34	17%	71	35.5%	96	47.5%
29		trophy	19	9.5%	36	18%	146	72.5%
30		Un amused face	118	58.5%	56	28%	27	13.5%
31		rose	10	5%	26	13%	165	82%
32		pensive face	150	74.5%	21	10.5%	30	15%
33		heart suit	4	2%	16	8%	181	90%
34		medium white circle	47	23.5%	129	64%	25	12.5%
35		medium star	21	10.5%	65	32.5%	115	57%
36		relieved face	10	5%	73	36.5%	118	58.5%
37		sparkling heart	13	6.5%	21	10.5%	167	83%
38		smiling face with open mouth and cold sweat	14	7%	51	25.5%	136	67.5%
39		medium black circle	131	65%	54	27%	16	8%
40		raised hand	54	27%	86	42.5%	61	30.5%
41		glowing star	20	10%	52	26%	129	64%
42		see-no-evil monkey	23	11.5%	52	26%	126	62.5%
43		leaf fluttering in wind	25	12.5%	103	51%	73	36.5%
44		dizzy symbol	21	10.5%	64	32%	116	57.5%
45		smiling face with open mouth	13	6.5%	33	16.5%	155	77%
46		happy person raising one hand	19	9.5%	58	29%	124	61.5%

Table 6: Interpretations of participants of the 100 emojis (Continuation of Table 6)
























No.	Emoji picture	Emoji Name	Negative	Negative ratio	Neutral	Neutral ratio	Positive	Positive ratio
47		hot beverage	15	7.5%	66	33%	120	59.5%
48		collision symbol	95	47.5%	59	29%	47	23.5%
49		pouting face	163	81%	15	7.5%	23	11.5%
50		pistol	152	75.5%	29	14.5%	20	10%
51		white down pointing backhand index	96	47.5%	86	43%	19	9.5%
52		white right pointing backhand index	51	25.5%	117	58%	33	16.5%
53		smiling face with open mouth and tightly-closed	15	7.5%	53	26.5%	133	66%
54		television	29	14.3%	101	50.2%	71	35.5%
55		heavy exclamation mark symbol	82	41%	94	46.5%	25	12.5%
56		large red circle	70	35%	95	47%	36	18%
57		basketball and hoop	25	12.5%	96	47.5%	80	40%
58		broken heart	152	75.5%	25	12.5%	24	12%
59		revolving hearts	13	6.5%	26	13%	162	80.5%
60		face savoring delicious food	6	3%	29	14.5%	166	82.5%
61		purple heart	31	15.5%	74	37%	96	47.5%
62		smiling face with halo	6	3%	48	24%	147	73%
63		dancer	12	6%	44	22%	145	72%
64		bomb	144	71.5%	31	15.5%	26	13%
65		smiling cat face with heart-shaped eyes	13	6.5%	31	15.5%	157	78%
66		balloon	24	12%	65	32.5%	112	55.5%
67		face screaming in fear	133	66%	41	20.5%	27	13.5%
68		sparkles	28	14%	107	53%	66	33%
69		four leaf clover	18	9%	68	34%	115	57%

Table 6: Interpretations of participants of the 100 emojis (Continuation of Table 6)
































No.	Emoji picture	Emoji Name	Negative	Negative ratio	Neutral	Neutral ratio	Positive	Positive ratio
70		sun with face	24	12%	49	24.5%	128	63.5%
71		disappointed face	158	78.5%	18	9%	25	12.5%
72		thumbs down sign	136	67.5%	42	21%	23	11.5%
73		face with stuck-out tongue and winking eye	13	6.5%	55	27.5%	133	66%
74		grimacing face	44	22%	72	35.5%	85	42.5%
75		multiple musical notes	20	10%	71	35.5%	110	54.5%
76		flushed face	68	33.5%	76	38%	57	28.5%
77		cherry blossom	18	9%	53	26.5%	130	64.5%
78		eyes	36	18%	118	58.5%	47	23.5%
79		expressionless face	101	50.2%	70	35%	30	14.8%
80		crown	22	11%	42	21%	137	68%
81		blue circle	43	21.5%	114	56.5%	44	22%
82		sleepy face	123	61%	62	31%	16	8%
83		heavy check mark	21	10.5%	35	17.5%	145	72%
84		kiss mark	12	6%	31	15.5%	158	78.5%
85		angry face	150	74%	34	17%	18	9%
86		hibiscus	18	9%	48	24%	135	67%
87		heart with arrow	36	18%	38	19%	127	63%
88		confused face	85	42.5%	83	41%	33	16.5%
89		sun rays	24	12%	55	27.5%	122	60.5%
90		clapper board	31	15.5%	96	47.5%	74	37%
91		index pointing up	25	12.5%	92	45.5%	84	42%
92		herb	22	11%	74	37%	105	52%
93		waving hand sign	21	10.5%	71	35.5%	109	54%

Table 6: Interpretations of participants of the 100 emojis (Continuation of Table 6)

No.	Emoji picture	Emoji Name	Negative	Negative ratio	Neutral	Neutral ratio	Positive	Positive ratio
94		alarm clock	29	14.5%	111	55%	61	30.5%
95		green heart	17	8.3%	83	41.5%	101	50.2%
96		right arrow	18	9%	131	65%	52	26%
97		double exclamation mark	82	40.5%	92	46%	27	13.5%
98		round pushpin	49	24.5%	107	53%	45	22.5%
99		orange diamond	28	14%	135	67%	38	19%
100		anticlockwise arrows button	25	12.5%	142	70.5%	34	17%

The results in Table 6 above show that more than 50% of the participants selected 14 emoji types from the top 100 emojis as negative, more than 50% of them selected 13 kinds of emojis as neutral and more than 50% of the participants selected 52 kinds of emoji as positive. This means that 79 types from the top 100 emojis had the same interpretations from the participants with more than 50% of answers from them about each emoji and 21 emoji types obtained results from the participants with less than 50% of every choice, which means they have different interpretations about these 21 types of emoji.

CHAPTER 5

CONCLUSION AND FUTURE WORK

5.1 Conclusion

Emojis are one of the most important topics or tools in the world of technology. This is what we found in the research results of the study, where the percentage of emoji use in the data of the research sample was 29.4%, thus providing evidence that emojis are used. However, the study in [7] mentioned that only 4% of the data which was collected from *Twitter* in 2015 contained emojis. Additionally, the study in [52] shows that the use of emojis in Turkey is less than 20% from the tweets on *Twitter*, while the results we obtained show that emoji usage in the collected data was 29.4%. Furthermore, the usage rate of emojis increases when there is an interesting hashtag on *Twitter*, or when events capture users' attention. For example, we found that emoji use by users increased while watching TV shows, where the results of using emojis reached 80% with the Turkish series the #KiralıkAşk hashtag (see Table 2) when 2502 emojis were used in 3040 tweets. In general, there is an increase in emoji use during famous Turkish TV shows (see Table 2). Otherwise, the results which comes from the data show 29.4% of users use emojis in their posts, while Question 3 in the survey shows that 61% of the participants used emojis every time and almost every time. This means that there are differences using emojis between real data, which it collected from *Twitter* using the R program, and the answers to Question 3 in the survey in Turkish society. The study in [6] suggested that it is better to use hashtags to filter data in *Twitter*, which what it is done as a part of this study. We used four groups of hashtags (five hashtags for each group) to filter the data collected from *Twitter*. This study found this algorithm to be useful for filtering data because it collects related data depending on the hashtag name.

Depending on these results, this study focused on the interpretation of emojis by users. We took the top 100 emojis which were used in Turkey between 1 April 2017 and 15 April 2017 from the survey's participants (see Table 3). The results show that 79% of the participants have the same interpretations about 79 emoji types from the top 100 with more than 50% of participants for each emoji, and 29% of them have different interpretations, numbering 29 from the top 100 emojis with less than 50% of participants for each emoji. The study in [9] mentioned that there is miscommunication between users depending on the survey study because emojis have different rendering on different platforms. In our study, we depended on the standard renderer from Standard Unicode and the results were as mentioned previously. It can be concluded that the interpretation from users, in general, are the same regarding emoji interpretation, which take clear meanings (sad, happy, angry, thinking, etc.). For example, the first emoji from the 100 emojis is (face with tears of joy) taken by 76.1% of participants as being positive, which means that this emoji has the same interpretation from the participants (see Figure 14). The emoji which appears in number 32 (pensive face) is taken by 74.5% as being negative from the participants' interpretations (see Table 6). The emoji in number 52 (white right pointing backhand index) is taken by 58% as neutral by the participants. Table 6 shows all the percentages of the participants for the top 100 emojis. The fifth emoji (person with folded hands) receives a different interpretation from the users with less than 50% for each negative, neutral and positive interpretation (see Figure 18). The practical benefit from this study was to check the interpretations of emojis from the users' perspectives. The results of this study revealed that some emojis have different interpretations for different users. This is valuable information, especially for commercial firms that use emojis in their advertisements and product announcements. They might take this difference into consideration while sending social media messages that include emojis. The results of this study may also be used as a cultural representation of Turkish Twitter users' emoji interpretations, and can be compared with other cultures.

5.2 Future work

The emoji is one of the important technological issues in the world. The results of this study show the importance of emoji usage because it provides ratios about emoji usage in posting tweets in *Twitter*. In the future, it will be possible to obtain more frequency results if numbers of participants increase (for example, 500 participants). The interpretations from users about emojis are very important. Emoji may become a huge source on which data mining depends on social media channels. Moreover, emojis could be that source as well as text in different social media.



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APPENDICES

R code for retrieving tweets from *Twitter*

```
set.seed(20170330) ht <- '# name of the hashtag you looking for'
tweets.raw <- searchTwitter(ht, n = number of tweets you want, lang = 'language',
since = 'starting search time', until = 'ending search time')
df <- twListToDF(strip_retweets(tweets.raw, strip_manual = TRUE, strip_mt =
TRUE))
df$hashtag <- ht
df$created <- as.POSIXlt(df$created)
df$text <- iconv(df$text, 'latin1', 'ASCII', 'byte')
df$url <- paste0('https://twitter.com/', df$screenName, '/status/', df$id)
df <- rename(df, c(retweetCount = 'retweets'))
df.a <- subset(df, select = c(text, created, url, latitude, longitude, retweets, hashtag))
nrow(df.a)
head(df.a)
setwd('saving tweets place in your computer')
write.csv(df.a, paste0('tweets.cleaned_', format(min(df.a$created), '%m%d'), '-',
format(max(df.a$created), '%m%d'), '_', ht, '_', Sys.Date(), '_', format(Sys.time(),
'%H-%M-%S'), '_n', nrow(df.a), '.csv'), row.names = FALSE)
tweets <- df
tweets$z <- 1
tweets$created <- as.POSIXlt(tweets$created)
nrow(tweets)
min(tweets$created)
max(tweets$created)
median(tweets$created)
```

Extracting Emoji from collected data

```
library(plyr)
library(ggplot2)
library(splitstackshape)
library(stringr)
##### READ IN SAVED TWITTER DATA
setwd('saved file path(for example, c:/tweets folder)');
fnames <- c('file name');
fnames <- paste0(fnames, '.csv'); df <- do.call(rbind.fill, lapply(fnames, read.csv));
df$username <- substr(substr(df$url, 21, nchar(as.character(df$url))), 1,
nchar(substr(df$url, 21, nchar(as.character(df$url))))-26);
tweets.full <- df; tweets.full$X <- NULL; tweets.full$z <- 1;
#### sanity checking
tweets.full$created <- as.POSIXlt(tweets.full$created); min(tweets.full$created);
max(tweets.full$created); median(tweets.full$created); nrow(tweets.full);
length(unique(tweets.full$username))
## dedupe dataset by url
tweets.dupes <- tweets.full[duplicated(tweets.full$url), ]; nrow(tweets.full);
nrow(tweets.dupes); # test <- subset(tweets.full, url%in% tweets.dupes$url); test <-
test[with(test, order(url)), ];
tweets <- tweets.full[!duplicated(tweets.full$url), ]; tweets <- arrange(tweets, url);
row.names(tweets) <- NULL; tweets$tweetid <- as.numeric(row.names(tweets));
nrow(tweets);
tweets.final <- tweets;
## dedupe dataset by username
# tweets.dupes <- tweets.full[duplicated(tweets.full$username), ]; nrow(tweets.full);
nrow(tweets.dupes); # test <- subset(tweets, url%in% tweets.dupes$url); test <-
test[with(test, order(url)), ];
# tweets <- tweets.full[!duplicated(tweets.full$username), ]; tweets <-
arrange(tweets, url); row.names(tweets) <- NULL; tweets$tweetid <-
as.numeric(row.names(tweets)); nrow(tweets);

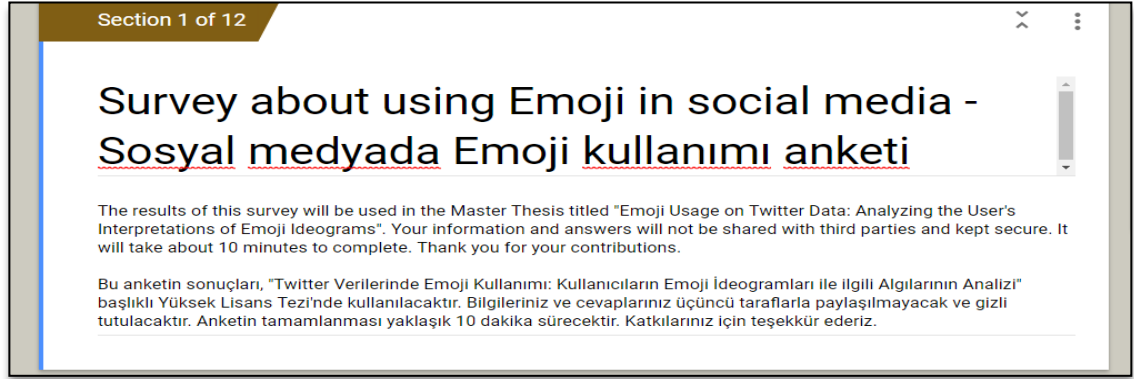
#### READ IN EMOJI DICTIONARIES
setwd('name of your emoji dictionary file');
emdct.la <- read.csv('emoticon_conversion_noGraphic.csv', header = F); #Lauren
Ancona; https://github.com/laurenancona/twimoji/tree/master/twitterEmojiProject
emdct.la <- emdct.la[-1, ]; row.names(emdct.la) <- NULL; names(emdct.la) <-
c('unicode', 'bytes', 'name'); emdct.la$emojid <- row.names(emdct.la);
emdct.jpb <- read.csv('emDict.csv', header = F) #Jessica Peterka-Bonetta;
http://opiateforthemass.es/articles/emoticons-in-R/
emdct.jpb <- emdct.jpb[-1, ]; row.names(emdct.jpb) <- NULL; names(emdct.jpb)
<- c('name', 'bytes', 'rencoding'); emdct.jpb$name <- tolower(emdct.jpb$name);
emdct.jpb$bytes <- NULL;
```

Extracting Emoji from collected data

```
##### merge dictionaries
emojis <- merge(emdict.la, emdict.jpb, by = 'name'); emojis$emojiid <-
as.numeric(emojis$emojiid); emojis <- arrange(emojis, emojiid);

##### FIND EMOJIS FROM COLLECTED DATA
tweets <- tweets.final;
# tweets <- subset(tweets.final, hashtag%in% c('#file tweet saved name'));
## create full tweets by emojis matrix
df.s <- matrix(NA, nrow = nrow(tweets), ncol = ncol(emojis));
system.time(df.s <- sapply(emojis$rencoding, regexpr, tweets$text, ignore.case = T,
useBytes = T));
rownames(df.s) <- 1:nrow(df.s); colnames(df.s) <- 1:ncol(df.s); df.t <-
data.frame(df.s); df.t$tweetid <- tweets$tweetid;
# merge in hashtag data from original tweets dataset
df.a <- subset(tweets, select = c(tweetid, hashtag));
df.u <- merge(df.t, df.a, by = 'tweetid'); df.u$z <- 1; df.u <- arrange(df.u, tweetid);
tweets.emojis.matrix <- df.u;
##### create emoji count dataset
df <- subset(tweets.emojis.matrix[, c(2:843)]); count <- colSums(df > -1);
emojis.m <- cbind(count, emojis); emojis.m <- arrange(emojis.m, desc(count));
emojis.count <- subset(emojis.m, count > 1); emojis.count$dens <- round(1000 *
(emojis.count$count / nrow(tweets)), 1); emojis.count$dens.sm <-
(emojis.count$count + 1) / (nrow(tweets) + 1);
emojis.count$rank <- as.numeric(row.names(emojis.count));
emojis.count.p <- subset(emojis.count, select = c(name, dens, count, rank));
##### summary stats print
subset(emojis.count.p, rank <= 400);
num.tweets <- nrow(tweets); df.t <- rowSums(tweets.emojis.matrix[, c(2:843)] > -
1); num.tweets.with.emojis <- length(df.t[df.t > 0]); num.emojis <-
sum(emojis.count$count);
min(tweets$created); max(tweets$created); median(tweets$created);
num.tweets; num.tweets.with.emojis; round(100 * (num.tweets.with.emojis /
num.tweets), 1); num.emojis; nrow(emojis.count);
```

Survey contents



Section 1 of 12

Survey about using Emoji in social media - Sosyal medyada Emoji kullanımı anketi

The results of this survey will be used in the Master Thesis titled "Emoji Usage on Twitter Data: Analyzing the User's Interpretations of Emoji Ideograms". Your information and answers will not be shared with third parties and kept secure. It will take about 10 minutes to complete. Thank you for your contributions.

Bu anketin sonuçları, "Twitter Verilerinde Emoji Kullanımı: Kullanıcıların Emoji İdeogramları ile ilgili Algılarının Analizi" başlıklı Yüksek Lisans Tezi'nde kullanılacaktır. Bilgileriniz ve cevaplarınız üçüncü taraflarla paylaşılmayacak ve gizli tutulacaktır. Anketin tamamlanması yaklaşık 10 dakika sürecektir. Katkılarınız için teşekkür ederiz.

Figure 1: Survey Introduction

Part1: survey demographic information



Section 2 of 12

Demographic information - Demografik bilgiler

Please provide the following information - Lütfen aşağıdaki bilgileri giriniz

Age - Yaşınız *

Short-answer text

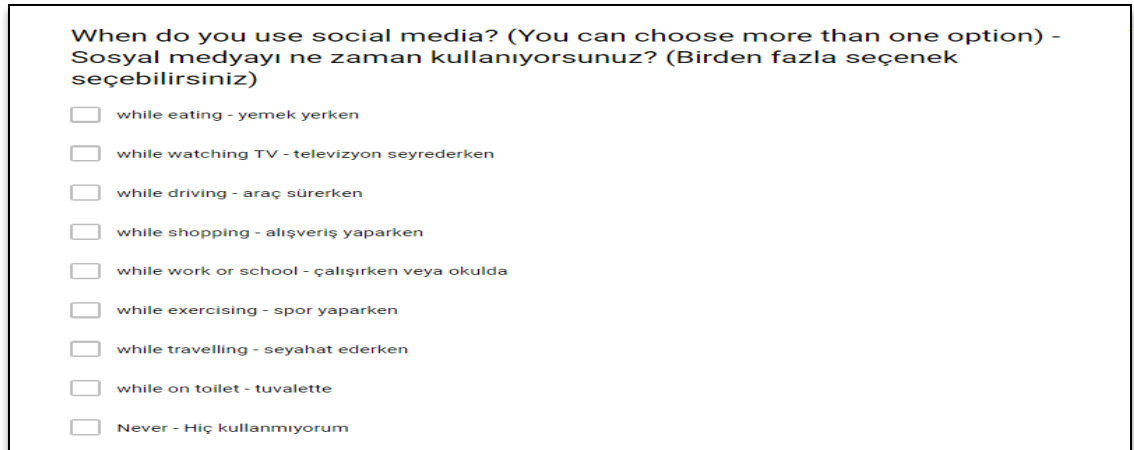
Gender - Cinsiyetiniz *

Female -Kadın

Male - Erkek

Activate V
Go to Setting

Figure 2: demographic information 1



When do you use social media? (You can choose more than one option) - Sosyal medyayı ne zaman kullanıyorsunuz? (Birden fazla seçenek seçebilirsiniz)

while eating - yemek yerken

while watching TV - televizyon seyrederken

while driving - araç sürerken

while shopping - alışveriş yaparken

while work or school - çalışırken veya okulda

while exercising - spor yaparken

while travelling - seyahat ederken

while on toilet - tuvalette

Never - Hiç kullanmıyorum

Figure 3: demographic information 2

How often do you normally use the following social media? - Sosyal medyayı hangi sıklıkta kullanıyorsunuz?

	Many times a day - Günde birçok kez	Once a day - Günde bir kez	Once every two, three days - Her iki, üç günde bir	Once a week - Haftada bir	Once a month - Ayda bir	Less often - Daha az sıklıkta	Never - Hiç kullanmıyorum
Facebook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instagram	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Twitter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LinkedIn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pinterest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Snapchat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BIP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 4: demographic information 3

Part2: Getting opinion about the top 100 Emoji

Section 3 of 12

Getting your opinion about emoji ideograms - Emoji ideogramları hakkındaki duygusal algılarınız

There are top 100 emojis which are extracted from 70,000 tweets in Twitter database. Please select one of the "negative" "neutral" or "positive" options that the emojis listed in the list mean emotionally for you.

Bu ankette Twitter veritabanında yer alan 70.000 tweet'ten elde edilen en çok kullanılan 100 emoji vardır. Lütfen listede listelenen emojiğin "sizde oluşturduğu duyguyu" ifade eden "negatif", "nötr" veya "pozitif" seçeneklerden birini seçin.


Figure 5: getting the participants opinions about the top 100 Emoji

QUESTIONS RESPONSES 201

There are top 100 emojis which are extracted from 70,000 tweets in Twitter database. Please select one of the "negative", "neutral" or "positive" options that the emojis listed in the list mean emotionally for you.

Bu ankette Twitter veritabanında yer alan 70.000 tweet'ten elde edilen en çok kullanılan 100 emoji vardır. Lütfen listede listelenen emojiğin "sizde oluşturduğu duyguyu" ifade eden "negatif", "nötr" veya "pozitif" seçeneklerden birini seçin.

face with tears of joy - sevinç gözyaşı ile yüz *




negative - negatif

neutral - nötr

positive - pozitif

smiling face with heart-shaped eyes - kalp şeklinde gözlerle gülen yüz *



negative - negatif


neutral - nötr

positive - pozitif

Figure 6

QUESTIONS RESPONSES 201

black heart - kara kalp *




negative - negatif

neutral - nötr

positive - pozitif

clapping hands - alkışlar *



negative - negatif


neutral - nötr

positive - pozitif

Figure 7


QUESTIONS RESPONSES 201

person with folded hands - katlanmış elleri kişi *



negative - negatif
 neutral - nötr
 positive - pozitif

thumbs up - başparmak havaya *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 8


QUESTIONS RESPONSES 201

fisted hand - yumruklulu el *



negative - negatif
 neutral - nötr
 positive - pozitif

blue heart - mavî kalp *



negative - negatif
 neutral - nötr
 positive - pozitif

Figure 9

QUESTIONS RESPONSES 201

smiling face with sunglasses - güneş gözlüğü ile gülümseyen yüz *



negative - negatif
 neutral - nötr
 positive - pozitif

smiling face with smiling eyes - gülümseyen gözlerle gülen yüz *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 10

QUESTIONS RESPONSES 201

flexed biceps - sıkılmış pazı *




negative - negatif
 neutral - nötr
 positive - pozitif

Section 4 of 12

survey continue - anket devamı

Description (optional)

yellow heart - sarî kalp *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 11


QUESTIONS RESPONSES 201

winking face - göz kırpan yüz *



negative - negatif
 neutral - nötr
 positive - pozitif

smirking face - pis pis sırttan yüz *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 12


QUESTIONS RESPONSES 201

grinning face - sırttan yüz *



negative - negatif
 neutral - nötr
 positive - pozitif

two hearts - iki kalp *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 13

QUESTIONS RESPONSES 201

Ok hand sign - tamam el işareti *




negative - negatif

neutral - nötr

positive - pozitif

victory hand - zafer işareti *



negative - negatif


neutral - nötr

positive - pozitif

Figure 14

QUESTIONS RESPONSES 201

crying face - ağlayan yüz *




negative - negatif

neutral - nötr

positive - pozitif

chequered flag - damalı bayrak *



negative - negatif


neutral - nötr

positive - pozitif

Figure 15

QUESTIONS RESPONSES 201

grinning face with smiling eyes - gülümseyen gözlerle sırıtan yüz *



negative - negatif

neutral - nötr

positive - pozitif

Section 5 of 12

survey continue - anketin devamı

Description (optional)

smiling face with open mouth and smiling eyes - açık ağızla ve gülümseyen gözlerle gülümseyen yüz



negative - negatif

neutral - nötr

positive - pozitif

Figure 16

QUESTIONS RESPONSES 201

loudly crying face - yüksek sesle ağlayan yüz *



negative - negatif

neutral - nötr

positive - pozitif

fire - ateş *



negative - negatif

neutral - nötr

positive - pozitif

Figure 17

QUESTIONS RESPONSES 201

slightly smiling face - az gülümseyen yüz *



negative - negatif

neutral - nötr

positive - pozitif

soccer ball - futbol topu *



negative - negatif


neutral - nötr

positive - pozitif

Figure 18

QUESTIONS RESPONSES 201

face blowing a kiss - öpücük üfleyen yüz *




negative - negatif

neutral - nötr

positive - pozitif

person raising both hands in celebration - kutlama sırasında iki elini kaldıran kişi



negative - negatif


neutral - nötr

positive - pozitif

Figure 19

QUESTIONS RESPONSES 201

trophy - ganimet *




negative - negatif

neutral - nötr

positive - pozitif

unamused face - beceriksiz yüz *



negative - negatif

neutral - nötr

positive - pozitif

Figure 20

QUESTIONS RESPONSES 201



negative - negatif

neutral - nötr

positive - pozitif

Plan section 5 Continue to next section

Section 6 of 12

survey continue - anketin devamı

Description (optional)

pensive face - solgun yüz *



negative - negatif

neutral - nötr

positive - pozitif

Figure 21

QUESTIONS RESPONSES 201

heart suit - kalp *



negative - negatif

neutral - nötr

positive - pozitif

medium white circle - orta boy beyaz daire *



negative - negatif

neutral - nötr


positive - pozitif

Figure 22

QUESTIONS RESPONSES 201

positive - pozitif

medium star - orta boy yıldız *




negative - negatif

neutral - nötr

positive - pozitif

relieved face - rahatlamış yüz *



negative - negatif


neutral - nötr

positive - pozitif

Figure 23

QUESTIONS RESPONSES 201

sparkling heart - köpüklü kalp *




negative - negatif

neutral - nötr

positive - pozitif

smiling face with open mouth and cold sweat - soğuk ter ile ağzi açık gülümseyen yüz



negative - negatif


neutral - nötr

positive - pozitif

Figure 24

QUESTIONS RESPONSES 201

medium black circle - orta boy siyah daire *




negative - negatif

neutral - nötr

positive - pozitif

raised hand - kalkan el *



negative - negatif

neutral - nötr

positive - pozitif

Figure 25

QUESTIONS RESPONSES 201



negative - negatif
 neutral - nötr
 positive - pozitif

After section 6 Continue to next section

Section 7 of 12

survey continue - anketin devamı

Description (optional)

see-no-evil monkey - kötü niyetli maymun *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 26


QUESTIONS RESPONSES 201

leaf fluttering in wind - rüzgarda uçan yaprak *



negative - negatif
 neutral - nötr
 positive - pozitif

dizzy symbol - baş dönmesi sembolü *



negative - negatif
 neutral - nötr
 positive - pozitif

Figure 27

QUESTIONS RESPONSES 201

smiling face with open mouth - açık ağızla gülen yüz *



negative - negatif
 neutral - nötr
 positive - pozitif

happy person raising one hand - tek elini kaldıran mutlu bir kişi *



negative - negatif
 neutral - nötr
 positive - pozitif

Figure 28


QUESTIONS RESPONSES 201

hot beverage - sıcak içecek *



negative - negatif
 neutral - nötr
 positive - pozitif

collision symbol - çarpışma simgesi *



negative - negatif
 neutral - nötr
 positive - pozitif

Figure 29

QUESTIONS RESPONSES 201

pouting face - somurtan yüz *



negative - negatif
 neutral - nötr
 positive - pozitif

pistol - tabanca *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 30

QUESTIONS RESPONSES 201

white down pointing backhand index - aşağı doğru işaret eden parmak *



negative - negatif
 neutral - nötr
 positive - pozitif


After section 7 Continue to next section

Section 8 of 12

survey continue - anketin devamı

Description (optional)

white right pointing backhand index - sağa işaret eden parmak *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 31


QUESTIONS RESPONSES 201

smiling face with open mouth and tightly-closed eyes - ağızı açık ve sıkıca kapalı gözlerle gülümseyen yüz



negative - negatif
 neutral - nötr
 positive - pozitif

television - televizyon *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 32


QUESTIONS RESPONSES 201

heavy exclamation mark symbol - ağır ünlem işareti sembolü



negative - negatif
 neutral - nötr
 positive - pozitif

large red circle - büyük kırmızı daire *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 33


QUESTIONS RESPONSES 201

basketball and hoop - basket topu *



negative - negatif
 neutral - nötr
 positive - pozitif

broken heart - kırık kalp *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 34


QUESTIONS RESPONSES 201

revolving hearts - dönen kalpler *



negative - negatif
 neutral - nötr
 positive - pozitif

face savouring delicious food - lezzetli yemeklerin tadını çıkaran yüz *



negative - negatif
 neutral - nötr
 positive - pozitif

Figure 35

QUESTIONS RESPONSES 201

purple heart - mor kalp *



negative - negatif
 neutral - nötr
 positive - pozitif

Continue to next section

Section 9 of 12

survey continue - anketin devamı

Description (optional)

smiling face with halo - halo ile gülümseyen yüz *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 36


QUESTIONS RESPONSES 201

dancer - dansçı *



negative - negatif
 neutral - nötr
 positive - pozitif

bomb - bomba *




negative - negatif
 neutral - nötr
 positive - pozitif

Figure 37

QUESTIONS RESPONSES 201

smiling cat face with heart-shaped eyes - kalp şeklinde gözlerle gülümseyen kedi yüzü




negative - negatif

neutral - nötr

positive - pozitif

balloon - balon *



negative - negatif


neutral - nötr

positive - pozitif

Figure 38

QUESTIONS RESPONSES 201

face screaming in fear - korkuyla çılgın atan yüz *




negative - negatif

neutral - nötr

positive - pozitif

sparkles - parıltı *



negative - negatif


neutral - nötr

positive - pozitif

Figure 39

QUESTIONS RESPONSES 201

four leaf clover - dört yapraklı yonca *




negative - negatif

neutral - nötr

positive - pozitif

sun with face - güneş yüz *



negative - negatif

neutral - nötr

positive - pozitif

Figure 40

QUESTIONS RESPONSES 201

disappointed face - hayal kırıklığına uğramış yüz *



negative - negatif

neutral - nötr

positive - pozitif

Next section > Continue to next section

Section 10 of 12

survey continue - anketin devamı

Description (optional)

thumbs down sign - aşağıyı işaret eden baş parmak *



negative - negatif


neutral - nötr

positive - pozitif

Figure 41

QUESTIONS RESPONSES 201

face with stuck-out tongue and winking eye - göz kırpmaya ile dil uzatan yüz *




negative - negatif

neutral - nötr

positive - pozitif

grimacing face - ekşimiş suratlı yüz *



negative - negatif


neutral - nötr

positive - pozitif

Figure 42

QUESTIONS RESPONSES 201

multiple musical notes - birden fazla nota *




negative - negatif

neutral - nötr

positive - pozitif

flushed face - kızamık surat *



negative - negatif

neutral - nötr

positive - pozitif

Figure 43

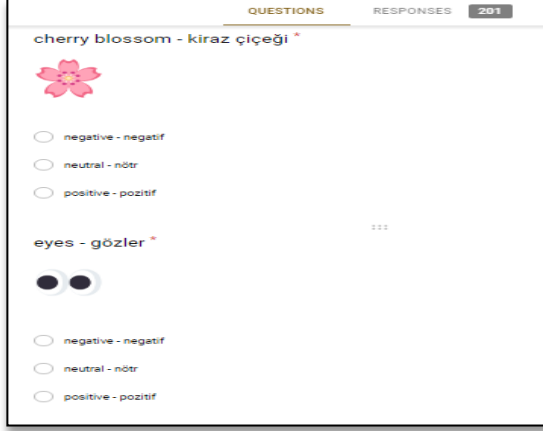


Figure 44

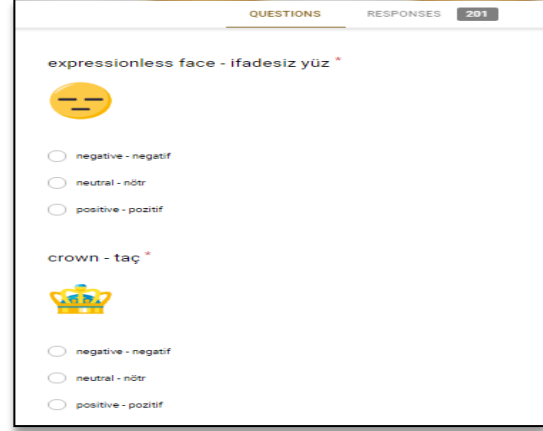


Figure 45



Figure 46

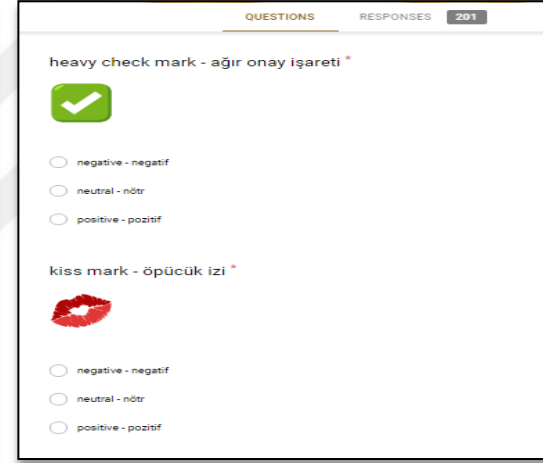


Figure 47

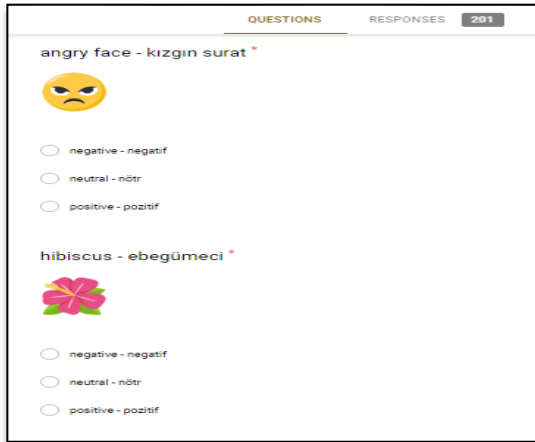


Figure 48

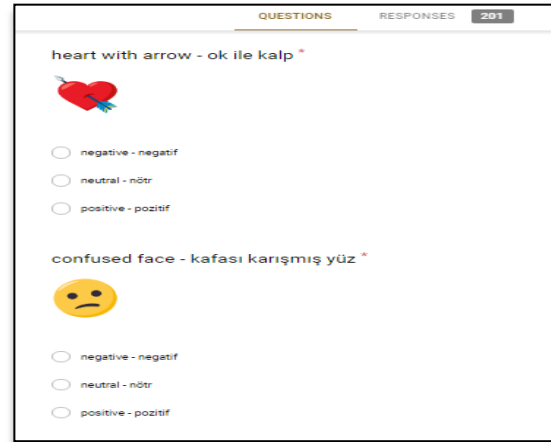


Figure 49

QUESTIONS RESPONSES 201

sun rays - güneş ışınları *



negative - negatif

neutral - nötr

positive - pozitif

clapper board - sinema çekim tahtası *



negative - negatif

neutral - nötr

positive - pozitif

Figure 50

QUESTIONS RESPONSES 201

index pointing up - yukarıya doğru işaret eden parmak *



negative - negatif

neutral - nötr

positive - pozitif

Previous section 11 Continue to next section

Section 12 of 12

survey continue - anketin devamı

Description (optional)

herb - ot *



negative - negatif

neutral - nötr

positive - pozitif

Figure 51

QUESTIONS RESPONSES 201

waving hand sign - el sallama işareti *



negative - negatif

neutral - nötr

positive - pozitif

alarm clock - alarm saati *



negative - negatif

neutral - nötr

positive - pozitif

Figure 52

QUESTIONS RESPONSES 201

green heart - yeşil kalp *



negative - negatif

neutral - nötr

positive - pozitif

right arrow - sağ ok *



negative - negatif

neutral - nötr

positive - pozitif

Figure 53

QUESTIONS RESPONSES 201

double exclamation mark - çift ünlem işareti *




negative - negatif

neutral - nötr

positive - pozitif

round pushpin - yuvarlak işaret pini *



negative - negatif


neutral - nötr

positive - pozitif

Figure 54

QUESTIONS RESPONSES 201

orange diamond - turuncu elmas *




negative - negatif

neutral - nötr

positive - pozitif

anticlockwise arrows button - saatin tersi yönünde ok düğmesi



negative - negatif

neutral - nötr

positive - pozitif

Figure 55

CURRICULUM VITAE

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High School	Al-Mahmodyia School	2000

LANGUAGES

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English