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A study on the relationship between college students' creativity and their ability to interpret emojis emotionally

Seung Min Lee[1*]
[1]Multimedia, Namseoul University, Korea, mini0920@nsu.ac.kr (S.M.L.).

Abstract: This study was conducted to evaluate how accurately emoji users can identify the emotions conveyed by emojis in non-face-to-face communication and to inform future directions in emoji design. Specifically, the study aims to explore the relationship between individuals' creative personality traits—defined as the cognitive ability to generate new and appropriate ideas or outcomes—and their capacity to interpret the emotions expressed by emojis. The focus of this research is on university students in their 20s, examining how accurately they recognize the emotions conveyed by emojis and empirically analyzing the relationship between this ability and their creativity. For the study, an online survey was conducted on students from a university in Chungnam, Korea. The results indicate that among the six emotions represented by the emojis used in the study, the emoji depicting happiness had the highest correct response rate, while the emoji representing fear had the lowest. Furthermore, there was no significant difference in the ability to interpret emoji emotions between male and female participants. However, individual creativity was found to influence the capacity to interpret these emotions. The research findings have significant implications for the use of emojis in online conversations with partners from diverse backgrounds.

Keywords: *Communication, Creative, Emoji, Emoticon, Emotion.*

1. Introduction

Emojis, which allow users to express emotions in a simple and enjoyable manner rather than through words, have become an essential component of online communication. In face-to-face interactions, emotions can be conveyed both verbally and non-verbally through facial expressions, tone of voice, gestures, and eye contact. These non-verbal cues facilitate a clear and immediate understanding of the speaker's feelings [1].

However, online communication lacks these non-verbal elements, which heightens the potential for miscommunication or misunderstandings when conveying emotions or messages. To mitigate this, emojis and emoticons are frequently used alongside text in social networking services (SNS) to convey emotions in online communication [2].

The proliferation of mobile messaging applications has significantly transformed traditional modes of interpersonal communication. Among the younger generation, the proportion of voice calls within overall communication processes is gradually declining, while messaging apps are emerging as the primary channel for interpersonal interactions [3]. Furthermore, mobile messengers facilitate a new, asynchronous communication environment that supports multiparty conversations [4]. As the use of these applications has expanded, there has been a growing academic interest in emojis, which have become a fundamental feature of messaging platforms and serve as a cultural code.

According to Adobe's <Future of Creativity: 2022 Global Emoji Trends Report>, more than half of the Korean respondents (56%) found that emojis were more effective than words in expressing their

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* Correspondence: mini0920@nsu.ac.kr

thoughts and feelings. Additionally, 82% of respondents believed that emojis positively influenced likability, while 78% believed that emojis enhanced trust between communicators.

Over 3,600 emojis and emoticons are available across most devices and platforms. In an online communication environment, emojis are processed similarly to words. However, incorporating emojis into a sentence can change the interpretation of a message, potentially leading to confusion or misunderstandings. This raises the possibility of conveying unintended messages [5].

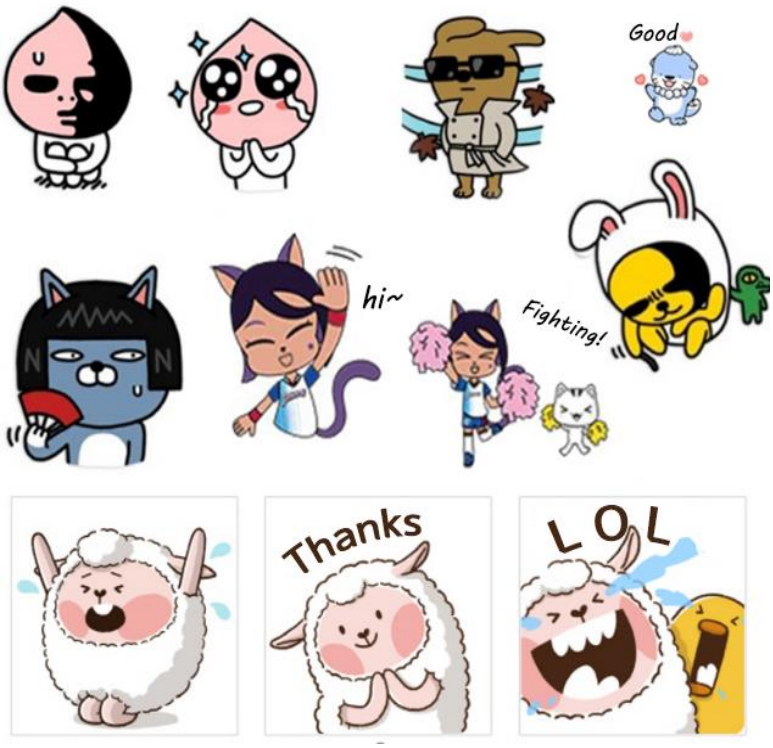

Figure 1.
Various forms of mobile emoji.

While emojis and emoticons can enhance emotional expression, their interpretation varies based on the recipient's gender, age, cultural background, and personal perspective. Therefore, the ability to accurately understand and interpret emojis is essential for effective communication.

In summary, while emojis can enhance communication, they must be used judiciously. Misinterpretation of emojis can lead to confusion, and neglecting to consider the context or situation may undermine the credibility of the communication. Additionally, excessive use of emojis can diminish the professionalism of a message or lead to fatigue for the recipient. Therefore, it is essential to use emojis strategically and in moderation to add value to the message or to express empathy toward the other person.

Previous studies on emoticons have primarily concentrated on their design or the communication process from the sender's perspective. However, to accurately assess the effectiveness of emoticon usage, it is essential to analyze how well messages are interpreted from the receiver's viewpoint, rather than solely from the sender's. This approach will help clarify the emoticons' effectiveness. Furthermore, many of these studies are limited to simplistic comparisons between text messages and emoticon-enhanced messages or focus on one or two types of emoticons that were prevalent at the time of the research. Consequently, there is a pressing need to evaluate the relative effectiveness of the various types of emoticons that have been recently developed and are currently in use [2].

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Meanwhile, although there are various perspectives on creativity, it is generally understood as an individual's cognitive ability to produce something new and appropriate. This ability manifests through the interplay of complex factors between the individual and their environment. In other words, creativity can be defined as the capacity to solve problems by presenting original and potentially viable solutions to intricate issues. Consequently, it relies on cognitive abilities, encompassing various thinking skills such as fluency, originality, and flexibility, all of which are rooted in divergent thinking [6].

The relationship between cognitive abilities and creativity has been extensively studied, with various hypotheses proposed regarding their correlation Kang and Bak [7] and Sternberg and O'Hara [8]. Sternberg and O'Hara [8] noted that there are multiple perspectives on the relationship between cognitive abilities and creativity: creativity may be considered a subsystem of cognitive ability, cognitive ability may be viewed as a subsystem of creativity, or both intelligence (as a form of cognitive ability) and creativity may be regarded as identical concepts. Additionally, there is a viewpoint that intelligence and creativity are entirely distinct, while others suggest that they are closely related, with significant areas of overlap [8].

This study aims to empirically analyze how the creativity factor of individuals with creative personality traits—specifically those who are open to considering the ideas of others, experience strong emotions, and have a desire to excel—affects emoji users in their twenties. Specifically, the study evaluates how accurately university students identify the emotions represented by emojis and examines the relationship between cognitive abilities related to these images and individual creativity.

2. Theoretical Background

2.1. The Concept of Emojis and Emoticons

In Korea, emoticons and emojis are often used interchangeably; however, as illustrated in [Figure 2], there is a distinct difference between the two. An emoticon, a combination of the words "emotion" and "icon," refers to facial expressions created using letters, symbols, numbers, and other characters. Examples include ":-)" and "^^" to represent a smiling face, as well as Korean-specific characters like "ㅜㅜ", "ㅇㅅㅇ." and ":D" .

Since emoticons are constructed from letters, their representations have evolved differently across various cultures. For instance, in Western countries, emotions are typically expressed using mouth shapes (e.g., ":-)", ":D"), while in Korea, they are represented using eye shapes (e.g., "^^", "ㅜㅜ")

Figure 2.
Emoticons (Left) and emojis(Right).

As technology has advanced, the demand for emoticons has increased. In contrast, "emoji" refers to symbols that originated in Japanese mobile text messages. Unlike emoticons, which convey meaning by combining characters from existing writing systems, emojis use a single image to represent a concept or feeling. Each emoji, with its unique visual style, functions as a standalone character, communicating emotions and expressions more directly.

Both emojis and emoticons serve the common purpose of visually expressing emotions and intentions, facilitating the communication of feelings that may be challenging to articulate through

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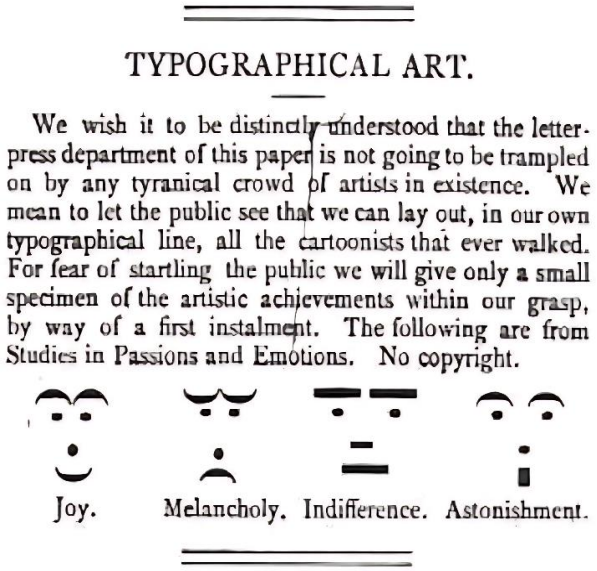
words alone. They help bridge communication gaps where language may be inadequate and function as a natural means of dismantling generational barriers. In contemporary communication, it is commonplace to encounter emojis in online interactions, and they have evolved into an essential, universally recognized form of communication that transcends grammatical conventions [9].

Emojis made their first appearance in April 1857 in the 'National Telegraphic Review and Operator's Guide'. They were introduced to symbolize the meaning of 73 as "love and kiss." Also, on March 30, 1881, an American magazine, Puck, released an emoticon using a Morse code that resembles a person's facial expression, as shown in the following [Figure 3]. The four emoticons in the magazine are made in a monotonous form, representing depression, indifference, surprise, and joy.

The world's first online emoticon appeared at 11:44 a.m. on September 19, 1982, on a university bulletin board as ':-)', a combination of the punctuation marks colon (:), hyphen (-), and parenthesis ()). Scott Palman, a computer science professor at Carnegie Mellon University in the U.S., posted a smiley expression on the school's online bulletin board, which could only use text. Guinness World Records named it the "first digital emoticon."

Early emojis were created by a combination of text and character symbols. Emoticons have gradually evolved as modern technology advances and people's usage rates increase. Nowadays, emoticons are much more convenient to use than early emojis and come in the form of various images [10].


TYPOGRAPHICAL ART.

We wish it to be distinctly understood that the letter-press department of this paper is not going to be trampled on by any tyranical crowd of artists in existence. We mean to let the public see that we can lay out, in our own typographical line, all the cartoonists that ever walked. For fear of startling the public we will give only a small specimen of the artistic achievements within our grasp, by way of a first instalment. The following are from Studies in Passions and Emotions. No copyright.

Joy. Melancholy. Indifference. Astonishment.

Figure 3.
Four emoticon released by the American magazine Puck in 1881.

In Korea, the distinction between emoticons and emojis is often blurred, with the terms being used interchangeably. However, this study focuses on KakaoTalk emoticons, which align more closely with the concept of emojis, as they are used as individual images within text. To maintain clarity, the term "emoji" will be employed throughout the study to refer to these emoticons.

2.2. Communication and Emotions of Emojis

In digital media communication, the ability to accurately interpret emojis is essential for their effective use. Only by understanding which expressions, gestures, or background elements are suitable for conveying specific emotions or situations can emojis be utilized appropriately.

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In the realm of computer-mediated communication (CMC), conveying subtle emotions through text messages alone can be challenging, making it difficult to accurately interpret contextual information. As a result, the use of emojis has become increasingly prevalent.

Emojis not only express emotions and clarify the emotional content of text messages but also summarize [11] emphasize, and enhance the meaning of the text, aiding in the interpretation of messages [12]. Consequently, individuals tend to prefer expressing emotions through emojis rather than relying solely on text, and this inclination is particularly pronounced when conveying positive emotions [13].

However, the interpretation of emoji content can vary based on the recipient's background, which suggests the potential for misunderstandings that diverge from the sender's intent. A study by Yihua, et al. [14] the accuracy of interpreting emojis depicting surprise, fear, sadness, and anger diminishes with age. Furthermore, women are more likely than men to accurately interpret emojis representing happiness, fear, sadness, and anger [15].

Moreover, Huang, et al. [16] asserted that the use of emojis enhances the enjoyment of communication, thereby improving both the usefulness and interaction within relationships. This, in turn, leads to more accurate information transmission, maximizing the efficiency and effectiveness of communication. In other words, emojis act as a means of directly expressing emotions and facilitating rapid communication [16] while also serving as visual information that can be easily understood. Consequently, the emotions conveyed by emojis are vital not only for the sender's emotional expression but also for the recipient's interpretation of the message [17].

In face-to-face communication, both the sender and recipient acknowledge each other's presence and actively engage in dialogue. Non-verbal vocal elements, such as pitch, speed, and changes in intonation, significantly influence the emotional tone of the message [18]. Similarly, in computer-mediated communication (CMC), the meaning of a message can vary based on the non-verbal elements that accompany the verbal content [3].

Therefore, non-verbal actions in communication play a significant role in conveying meaning throughout the communication process. Misinterpretation of emojis can result in communication errors, making it essential to understand their appropriate use.

2.3. Creativity

Creativity is the capacity of individuals, organizations, or societies to generate original and valuable ideas or results through close interaction with their environment Kim [19]. Urban [20] defined creativity as the ability to produce new, novel, and original outcomes by mobilizing insights from specific or perceived problems Urban [20]. Amabile [21] a prominent theorist on creativity, asserted that the primary focus of creativity is the individual, emphasizing the ability to combine ideas in unique ways or connect them to related areas in distinctive manners [21]. In addition, he presented the primary topics and areas of creativity research, as well as the level of research, as illustrated in [Figure 4]. The field of creativity research encompasses various dimensions, including neurological, affect/cognition and training, individual and personality, group dynamics, social environment, culture and society, and systems approaches. It also involves inter-level research, which examines individual characteristics and environmental factors at specific levels, such as the individual level. There is a cross-level research framework. In this seemingly simple circuit diagram, concentric circles increasingly represent key levels, with creativity playing a central role. This study focuses on personal creativity among the research-level items in T. Amabile's framework (see Figure 4).

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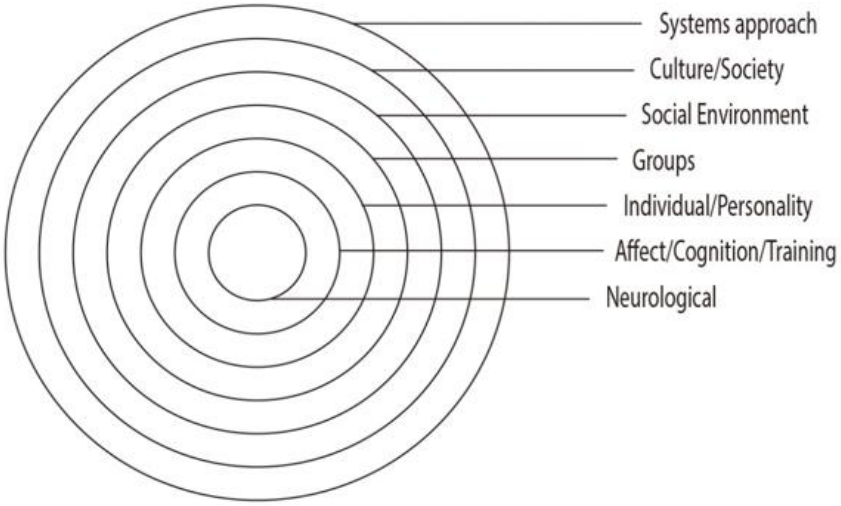

Figure 4.
Concentric circles at the level of creativity research.

Creativity is a universal trait that all humans possess. It encompasses the ability to approach and resolve various situations or problems encountered in daily life in innovative and unique ways Hennessey [22]. Guilford [23] identified divergent thinking as a fundamental component of creativity, which includes six sub-elements: sensitivity to problems, elaboration, redefinition, fluency, flexibility, and originality, all of which contribute to divergent thinking ability [23].

The cognitive approach defines creativity as a cognitive ability or a series of problem-solving processes, emphasizing the creative thinking capabilities and methodologies employed by individuals. Torrance [24] characterized creativity as the process of identifying challenging problems, generating ideas, formulating hypotheses, testing them, and communicating the outcomes. Similarly [24] and Cropley [25] described creativity as the capacity to produce novel and effective thoughts or solutions related to specific problems. This cognitive perspective, which underscores the importance of creative thinking and problem-solving processes, aligns closely with the widely accepted definition of creativity as "the ability to generate new and appropriate ideas or results" [26].

Choi and Kim [27] identified several key factors that influence creativity, including knowledge, intelligence, cognitive thinking ability, motivation levels, problem-solving styles, and the process of interpreting situations. Consequently, personal creativity can be defined as the generation of new and useful ideas by individuals, as well as the ability to combine or relate concepts in unique ways based on personal characteristics [27].

Creativity is linked to originality and novelty, as well as the ability to identify and solve problems [21]. It encompasses complex cognitive processes involved in problem-solving and includes sub-elements such as fluency, flexibility, originality, and elaboration [23].

Khatena and Torrance [28] distinguished between creative and non-creative personality traits. Creative personality traits encompass a willingness to consider others' ideas, a productive mindset, talent in various fields, the experience of strong emotions, a desire to outperform others, a thirst for knowledge, a non-conformist attitude toward societal norms, and an appreciation for beauty Khatena and Torrance [28]. Jung [29] in a study of university students, defined everyday creativity as the process of approaching various situations or problems in innovative and unique ways. This form of creativity enhances self-actualization and adaptability while producing valuable and relevant personal outcomes in daily life [29].

In the digital environment, digital creativity is defined as the ability to creatively produce programs, scripts, and other content using available information and information and communication technology (ICT). Research has demonstrated that this ability can positively influence adaptation to new digital

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environments, facilitate the acquisition of new skills, and address challenges related to preferences for task difficulty [30, 31].

People who possess creativity often have a more profound understanding of image patterns and symbolism when processing visual information [32]. They are more likely to interpret images in a deeper and more meaningful way. Additionally, they tend to uncover hidden meanings or narratives that extend beyond surface elements during image interpretation, demonstrating more flexible and integrated thinking when engaging with visual stimuli.

In conclusion, creativity is the capacity to envision multiple possibilities and make informed decisions among them. It encompasses the problem-solving process, and the presence of creative traits and attitudes is essential. Accordingly, the current study defines creativity in university students as the ability to think in novel and unique ways to address various learning, life, and ideological challenges, coupled with the behavioral capacity to generate creative outputs.

3. Research Methods

3.1. Research Subjects

This study was conducted through an online survey of students from a university in the Chungnam region of South Korea, between April 22 and May 8, 2024, spanning 17 days. A total of 161 students participated; however, after excluding 10 responses deemed insincere, the responses of 151 students were analyzed. The sample comprised 69 male and 82 female students.

3.2. Survey Structure

As illustrated in [Figure 5], the study initially prepared six emojis for each of the six emotions: fear, surprise, anger, sadness, happiness, and disgust, resulting in a total of 36 emojis that are commonly used in KakaoTalk. One emoji representing each emotion was randomly selected and presented to the university students participating in the study. The students were then asked to choose one emotion that the emoji represented from the six options provided.

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Figure 5.
Emotional emoji of Kakao Talk.

Next, a survey was conducted to measure the individual creativity of university students. The survey items were based on validated measurement tools from previous studies, including those by Amabile [21] and were designed to align with the study's objectives. The survey included traditional research that views creativity as a personal trait, as well as environmental factors such as job characteristics and occupational identity, which are increasingly recognized as influential in creativity. The items were crafted to be easily understood by university students, and responses were rated using a 5-point Likert scale.

The questionnaire consisted of a total of 21 questions. As shown in [Table 1], the reliability was verified using Cronbach's alpha, and all creativity measurement items demonstrated a value of .90, confirming that there were no issues with overall internal consistency.

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Table 1.
The results of the reliability analysis of creativity.

Variable	Question	Cronbach`s Alpha
Creativity	1. When I work, I devise new ways to achieve my goals or tasks.	0.892
	2. I have a new and realistic idea to improve my work performance.	0.884
	3. I am good at finding new technology courses, methods, and ideas.	0.882
	4. I propose a new way to improve the quality of my work.	0.886
	5. I have good resources for the production of creative ideas at work.	0.884
	6. I don't have the fear of work or task.	0.906
	7. I promote or support other people's ideas.	0.901
	8. I represent creativity in work when given the opportunity.	0.885
	9. I make appropriate plans and schedules for the implementation of new ideas.	0.894
	10. I have a new and innovative idea for work.	0.883
	11. I think of creative solutions to problems.	0.887
	12. I have a fresh approach to the problem.	0.884
	13. I come up with a new way to do my job.	0.884

3.3. Analytical Tool

SPSS statistical software was utilized to analyze the survey data. An independent samples t-test was conducted to compare gender differences, while regression analysis was employed to examine the relationship between creativity and emoji type, as well as their impact on emotional recognition. The analytical tools used for each research question are summarized in [Table 2].

Table 2.
Method of analysis by research questions.

Sortation	Content of the study	Analysis method
Research Question 1	Emojis and Their Corresponding Emotions by Gender	Frequency Analysis Independent Sample t-Test
Research Question 2	Differences in Creativity Among College Students by Gender	Independent Sample t-Test
Research Question 3	The relationship between creativity, content, and emotional perception is influenced by emoji type	Regression Analysis

4. Research Results

4.1. Analysis Of Emoji Content and Emotional Recognition by Emotion and Gender

To investigate the differences in university students' emoji-reading abilities across six types of emotions, a frequency analysis was conducted. As shown in [Table 3], the frequency of correct answers for emojis expressing happiness was the highest at 87%, while the frequency of correct answers for fear-related emojis was the lowest at 19%.

Table 3.
Emotional differences in emoji-reading abilities.

Type of emotion	Frequency (person)	Percentage (%)
happiness	144	87
anger	124	75
surprise	52	31
disgust	52	31
fear	31	19
sadness	114	69

To investigate the differences in emoji emotional recognition abilities between male and female students, an independent two-sample t-test was performed, as shown in [Table 4].

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Table 4.
Gender differences in emoji emotional recognition abilities.

Gender	Male	Female
mean	3.04	3.20
standard deviation	1.10	0.97
number of cases	69	82
t statistics	-0.90	
probability of significance	0.371	

The average emoji emotional reading ability of male students was 3.04, with a standard deviation of 1.10, whereas the average for female students was 3.20, with a standard deviation of 0.97. The t-statistic value for the difference in emoji emotional reading abilities between male and female students was -0.90, with a p-value of .371. At a significance level of .05, while female students scored slightly higher, no significant difference was found in emoji emotional reading abilities between the genders.

4.2. Analysis of Creativity by Gender

To examine the differences in creativity between male and female university students, an independent two-sample t-test was conducted, as shown in [Table 5].

The average creativity score for male students was 3.45, with a standard deviation of 0.63, while the average creativity score for female students was 3.39, with a standard deviation of 0.50. The t-statistic value for the difference in creativity between male and female students was 0.572, with a p-value of .568. At a significance level of .05, while male students scored slightly higher, there was no statistically significant difference in creativity between the genders.

Table 5.
Comparison of gender creativity.

Gender	Male	Female
Mean	3.45	3.39
Standard Deviation	0.63	0.50
Number of Cases	69	82
T Statistics	0.572	
Probability Of Significance	0.568	

4.3. Analysis of the Relationship Between Creativity and Emoji Content and Emotional Recognition

The results of the regression analysis on emotional recognition of emojis are shown in [Table 6].

Table 6.
The relationship between creativity and emoji emotion recognition.

Independent Variable	Non-Standardization Coefficient		Standardization Coefficient	*T statistics*	Probability of Significance
	B	standard error			
creativity	0.562	0.143	0.306	3.93	0.000
	R^2(adj. R^2)=.094(.088), F=15.44				

The statistical significance of the model predicting emoji emotional reading scores based on creativity scores was tested. The F-statistic value was 15.44, with a p-value of .000, indicating that creativity significantly explains emoji emotional reading scores at the .05 significance level (t=3.93, p=.000). According to the adjusted R-squared, 9% of the total variance in emoji emotional reading scores is explained by creativity.

5. Conclusion

5.1. Research Conclusions and Implications

This study aimed to examine the emotional perception responses to emojis among students at a university in Chungnam, South Korea. Six types of emotion-expressing emojis from KakaoTalk were

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randomly selected and presented to the students to assess their level of emotional recognition and to analyze gender-based differences. In addition, the study investigated how the level of creativity among the students influenced their ability to interpret emotion-expressing emojis. The findings and their implications for each research question are as follows:

First, the analysis of the students' ability to recognize the emotions conveyed by emojis, categorized by emotional type, revealed that they were most proficient at identifying happiness, followed by anger, sadness, surprise, disgust, and fear. These findings suggest that recognition is higher for familiar and frequently encountered emojis; this is supported by previous research highlighting the prevalence of positive emojis. In contrast, the recognition of less commonly used and negative emoji emotions, such as disgust and fear, was significantly lower. This observation aligns with Ahn, et al. [33] finding that negative emojis generally exert a diminished impact on messaging. Consequently, the effectiveness of messages that incorporate negative emojis often needs to be enhanced using text or exaggerated images.

Second, the analysis of gender differences in the emotional recognition of emojis revealed that, although women scored slightly higher, no statistically significant differences existed between genders regarding their ability to interpret emoji emotions. This finding contrasts with previous studies suggesting that women express emotions more richly and utilize emojis more frequently than men. The lack of significant gender differences in emoji usage frequency among the students might indicate comparable abilities to read emoji emotions. Nevertheless, further research is warranted in this area.

Third, the analysis of the relationship between the students' creativity and their ability to recognize emoji emotions revealed no statistically significant gender differences in creativity. However, creativity was found to influence the ability to perceive emoji emotions in general. Essentially, higher levels of creativity were associated with a greater capacity to interpret the emotions expressed through emojis. Creativity is linked to the ability to approach problems from fresh perspectives and think beyond established frameworks. As a result, creative individuals are more likely to interpret the meanings and emotions conveyed by emojis in a diverse and profound manner. Furthermore, these findings align with previous studies suggesting that creative individuals tend to perceive emojis not as simple symbols but as expressions imbued with underlying emotional and social contexts.

Therefore, in emoji research and development, it is essential to consider various contexts, such as the communication context and message complexity, as opposed to relying solely on simplistic demographic factors such as gender.

These findings have significant implications for the use of emojis in online conversations with individuals from diverse backgrounds. This research could serve as a foundational study on visual messaging, particularly emojis, as a tool for effective emotional communication.

Currently, the emotional expressiveness of emojis in computer-mediated communication is significantly inferior to that of face-to-face interactions. The findings of this study may contribute to enhancing the emotional expressiveness of emojis in the future.

5.2. Limitations of Research

If existing research on emojis has primarily concentrated on the motivations and reasons behind the sender's choice of emojis, this study distinguishes itself by focusing on the user's interpretation and evaluating the effectiveness of the communication process through visual messages.

Nevertheless, there is a possibility that this study did not adequately verify whether the six emotional emojis used in the experiment accurately represent their intended emotions. This oversight may have led to variations in participants' recognition of each emotion-specific emoji. Furthermore, certain emotional emojis, such as those representing hate and fear, have inherent limitations that could confuse when expressing similar emotions. Additionally, the study's participant age group was restricted to individuals in their 20s. If the scope of the survey were expanded to include a broader range of age groups, it is likely that new findings, not identified in this study, would emerge.

Finally, in this study, the degree of emotional interpretation was assessed by focusing exclusively on a single mobile messaging platform's emojis, specifically those from KakaoTalk. Given that KakaoTalk

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emojis are the most frequently used in South Korea, users exhibit a high level of familiarity and awareness with them. Therefore, future research should explore the effects of emojis by incorporating additional messaging platforms and various digital environments alongside KakaoTalk in the analysis.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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