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Effects of Emoji Approach-Avoidance Visual Experience on Valence Ratings via Mobile Interface

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Abstract

We aimed to see if approach-avoidance visual experience would have different effects in the valence rating of emojis. Previous literature has shown that approach-avoidance tendencies have influences people's emotional perceptions. Up until now, research on emojis have been heavily focused on static emojis, which gives room for exploration whether if movement added on to emoji would elicit different emotional responses. In the study, we examined the impact of approach-avoidance visual experience of emojis via mobile interface, categorized into 4 experimental conditions (positive approach, negative approach, positive avoid, and negative avoid), and conducted semi-structured interviews to identify users' reasonings towards their valence ratings on specific emojis with approach or avoid movements. We found that positive approach emojis were the highest valence rating and preferred by the participants, while there were no differences between negative emoji approach or avoidance. Based on these findings, we conclude that positive emojis could be intensified to be more positive with approach motion, yet for negative emojis, individual differences or contextual differences may arise in its emotional ratings.

Keywords: *Human-Computer Interaction, Emoji, Approach-Avoidance, Valence, Mobile Interface*

1. INTRODUCTION

Emojis, which are currently used as a tool to express emotion in computer-mediated communication (CMC), were initially a combination of simple symbols (e.g., :-) or ^_^) [2]. With advances in graphics technology, today's emojis come in a variety of graphic styles and can be used from static images to dynamic animations. This change evolution of emoji through movement brings new perspectives and questions to emoji research. Currently, there are numerous studies on the emotional response and recognition of static emojis, but there is lack of research on emoji with movement. Here, we question: do moving emojis evoke or change our emotional responses? By exploring this question, we intend to initiate a deeper discussion about the emotional response of emoji. In doing so, we applied approach/avoidance movements to examine emotional processing of emoji stimuli, as approach-avoidance tendencies are said to be essential on the scientific study of emotions [9].

A recent study proposed and found an approach aversion effect for moving stimuli. This effect states that

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people feel less positive (or more negative) about a stimulus if they perceive it as approaching rather than distant or static. They found that with emojis, whether the icon was a happy, neutral, or an unhappy face, participants felt more negatively about the icon if they were perceived to be approaching compared to it receding or static [15]. However, the explanation and generalizability of this approach aversion effect remains unclear, especially that emojis have evolved for the past years.

To bridge this gap, the current study seeks to further investigate how the visual experience of approach/avoidance with emoji stimuli influences emotional processing. Building on the findings of the previous study, we aim to determine whether the approach-aversion effect persists in modern emoji usage. Lastly, given the widespread use of emoji as a social networking platform and the fact that most social networks are accessed on mobile devices, we believe it is necessary to examine the visual approach-avoidance effect on mobile interfaces, and thus we limited the stimulus presentation interface to mobile devices.

2. RELATED WORKS

Numerous studies have found that with dynamic stimuli, emotion is better recognized, and is more expressive than static stimuli [16, 31]. Images with movement are known to significantly increase arousal, leading to more attention and focus [6, 27]. Based on this, many researchers have examined motion effects on emotional experience. For instance, fast-paced animations were found to be more attention-grabbing and had a higher physiological arousal. On the other hand, slower-paced animations were found to improve the overall appeal of the website [28]. Such motion effects were also demonstrated in in-vehicle interfaces: experimental research found that motion graphics were felt more "fluid" and "energetic" [19].

Concerning emoji specific works, it is stated that specific motions elicit different emotion recognitions in emojis. Specifically, wave motion was found to increase perceived intensity of positive emojis, while parabolic motion increase the perceived intensity of sad emojis [3]. Another study claimed that animated images or emojis can be a more subtle form of non-verbal communication than static ones [16]. Adding on, it was discovered that animated emojis are perceived as more intense and realistic than static emojis. Animated emojis even enhance the overall emotional experience [32]. This is similar to recent research that demonstrated that emojis with dynamic effects can add a sense of life and immersion, and that participants prefer the richer forms of dynamic emojis [35]. Most recent study found that effect of rhythm on emojis are significant for high-valence emojis but not for low-valence emojis [33]. Putting all these studies together, it can be argued that static emojis are no longer sufficient to fully meet people's various emotion expression needs, and thus, more research should be focused on the emotional response and recognition of dynamic emojis.

Here, we apply the approach-avoidance behavior to extend the current body of research done on emotional response of dynamic emojis. The essential and pervasive role of approach-avoidance motivation on emotion has been widely recognized by the general literature [9]. Fundamental nature of approach-avoidance motivation claims that avoidance motivation is designed to facilitate surviving, whereas approach motivation is designed to facilitate thriving [8]. Therefore, it has been implied that people typically approach stimuli with positive emotions and avoid stimuli with negative emotions [20]. Nonetheless, it is important to note that there is no one agreement on approach-avoidance motivations. For instance, a study proposed an approach-aversion tendency, which states that it is a basic human tendency to avoid stimuli that approaches, as approaching stimuli is more likely to possess danger. This study is of our interest as they tested this effect with emojis and found that participants felt more negatively about the icon (whether they are positive, neutral, or negative) if they were perceived to be approaching as compared to them receding or static [15].

Our study aims to test the approach-aversion tendencies and thus contribute to the current divergent literature of approach avoidance motivation as well as research on emotional response of dynamic emojis. Despite the controversy, the ability to influence people's attitude and feelings has been clearly demonstrated in empirical studies, which makes it plausible to explore in this dimension. In this study, we used visual approach-avoidance experience as a study have shown that simply seeing the screen zoom in (approach) and out (avoid) can affect preference and purchase intention, showing that people can be influenced by visual approach-avoidance experiences alone [17]. Concerning emoji stimuli, the stimuli used in the original study that found approach-aversion tendencies were just a combination simple symbols (face icons with two dots

representing eyes and a line representing a mouth). However, as mentioned earlier, emojis nowadays are platform or system dependent and are various in graphical style. Recent research has found that emojis on the iOS platform are more aesthetically appealing, familiar, clear, and meaningful [26]. Therefore, we will be using iOS emojis in our study.

Given the exploratory nature of this study, it is not necessarily appropriate to form directional hypotheses, but if indeed approach aversion effects were to show, we should observe lower (more negative) valence ratings for approaching emoji stimuli regardless of emoji valence.

Furthermore, the prevalent shift from traditional monitors to mobile interfaces accessible anytime has altered the way people interact with technology. Smartphone instant messaging has emerged as the predominant means of social interaction, replacing traditional monitors [33]. Hence, we limited the visual experience of emoji approach-avoidance to mobile interfaces.

3. METHOD

This study aimed to understand the effects of Emoji approach/avoidance visual experience on valence ratings through mobile interface. We divided the present study into two steps. First, we conducted an offline lab experiment with 4 experimental conditions to see their effect on valence ratings. Then, to further explore the results of the experiment, we conducted a semi-structured interview of participants to obtain qualitative data.

3.1 Experiment Design

We used a 2 (Emoji Valence; Positive vs. Negative) x 2 (Movement; Approach vs. Avoidance) full within-subjects design for this study. The dependent variable was the valence rating of Emojis. We omitted neutral valence emoji stimuli as the perceived emotional intensity of neutral emojis was not evident in many experiments [10]. The experimental setup is shown as below in Figure 1.

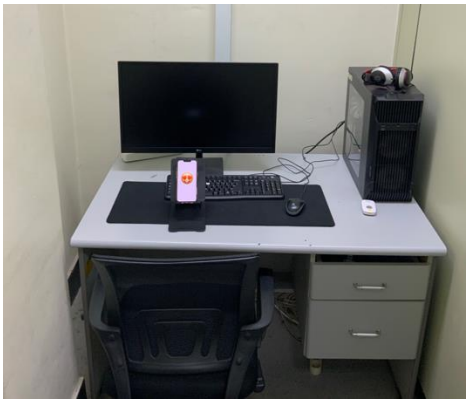

Figure 1. Experiment setup

3.2 Participants

Participants were mainly recruited through the Yonsei Psychology recruiting database, Yonsei Sona System. A final sample of N = 50 participants (19 male, 31 female) took part in this study. The total mean age was 22.14 years old (SD = 2.83; range = 19-31). All participants voluntarily participated in this experiment and undergraduate students were compensated with course credit. For the semi-structured interview, we recruited participants from the experiment who noted that they are willing to participate in further interviews. Those who were available and willing to take part at a particular time were the final participants of the interview. A total of 6 people were gathered and were compensated with 5,000 Korean won for participation. Demographic information of the interview participants is shown in Table 1.

Table 1. Demographic information of interview participants

ID	Occupation	Age	Gender
P1	Graduate Student	28	F
P2	Graduate Student	25	F
P3	Graduate Student	25	F
P4	Graduate Student	26	M
P5	Graduate Student	27	M
P6	Undergraduate Student	21	M

3.3 Materials

Positive and negative emoji (16 in total; 8 positive and 8 negative emoji valence) were selected from previous studies [18, 26]. Emoji stimuli was valenced by asking participants to rate emojis from the Unicode Emoji Chart on valence as well as other affective dimensions such as arousal [26]. The experimental stimuli for emoji visual approach-avoidance visual experience were made through Microsoft PowerPoint. Speed of the movement were controlled to minimize possible speed effects. Size was also controlled for all stimuli: In line with previous research, for approach condition, emoji was initially small, covering about 10% of screen area, and then gradually enlarged to cover about 80% of screen area. The avoidance condition was identical to the approach condition, but the direction of the movement was reversed to that the emoji was perceived as moving away from the participant [15]. All stimuli were saved as an mp4 video file and were stored on the experimental mobile device (iPhone 13 Pro, 2532 x 1170 pixels). All the video stimuli duration was around 4 to 5 seconds maximum. The experiment was presented to the participants on the same mobile device. Finally, to measure the valence ratings of emojis, a one measure 11-point Likert scale (-5 = Very Negative to +5 = Very Positive) was used [18]. This scale was to be responded on the computer and was built on the PsychoPy software to collect responses. The reported scores were added up and measured as the mean valence of each experimental condition.

The semi- structured interview was divided into two phases; (1) questions to build rapport and (2) main questions asking about the emoji visual approach-avoidance experience in detail. To ask main questions, we first took an analysis of the individual participants' data.

3.4 Procedure

The following are the procedure of the experiment session:

1. The participant voluntarily selects the study from the Yonsei Psychology Sona System and arrives at the experimental lab. Then they read the consent form and signs that they agree to participate in the study.
2. Participants are then instructed to not touch the mobile devices that is fixed at the mobile holder. Then they go through three practice trials so that they would get used to the system of viewing the stimulus on the mobile, answering the questionnaire on the computer, then going back to view the next stimulus on the mobile device.
3. They were presented with a total of 32 stimuli, all of which are only presented once, in a random order. Participants are presented with each video stimulus via mobile and then were to complete the survey on a computer, just like the practice trial.
4. After completing all sessions, participants were asked to complete demographic information questionnaire and were finally given explanation about this study. Those who were willing to participate in interviews were also asked to indicate their interest at this time.

The semi-structured interview was conducted about 1-2 weeks after the interviewees had participated in the experiment. Interviews were individually conducted in a lab, which lasted approximately 10 minutes and were audio-recorded for later transcription.

4. RESULTS & DISCUSSION

4.1 Data Analysis

All statistical analysis of the data was performed using the JASP (Jeffereys's Amazing Statistics Program). A 2 x 2 ANOVA (Analysis of Variance) was performed to analyze the effect of approach- avoidance visual experience on participants' valence rating of Emojis. See Table 2 for main and interaction effects. The recorded interviews were transcribed, and finally, thematic analysis was performed.

Table 2. Main and interaction effects

Condition	df	Mean Square	F	η_p^2	*p*
Emoji Valence	1	301.11	202.13	.51	<.001
Movement	1	28.29	18.99	.09	<.001
Emoji Valence x Movement	1	86.15	57.83	.23	<.001

4.2. Results

A significant main effect was found for emoji valence, $F(1, 196) = 202.13$, $p < .001$, $\eta_p^2 = .51$ and A movement, $F(1, 196) = 18.99$, $p < .001$, $\eta_p^2 = .09$. Interaction effects of emoji valence x movement was also found to be significant, $F(1, 196) = 86.15$, $p < .001$, $\eta_p^2 = .23$, as shown in Figure 2.

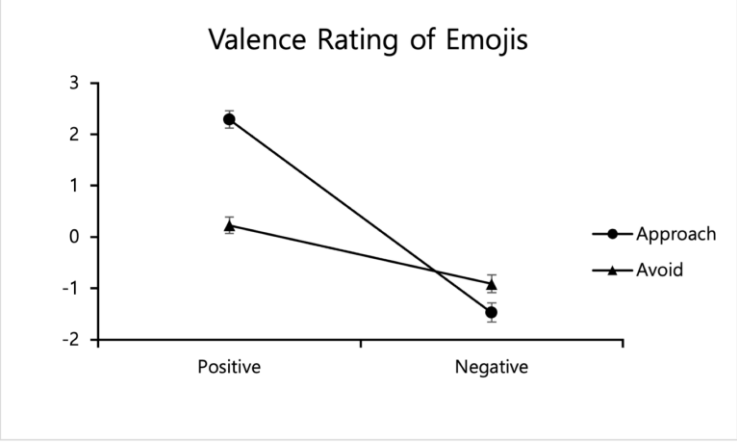

Figure 2. Interaction effects of emoji valence x movement

Simple main effects analysis showed that positive emojis ($M = -1.19$, $SD = 0.75$) had a significantly higher valence rating compared to negative emojis ($M = 1.26$, $SD = 0.16$), while for movement, approach ($M = 0.41$, $SD = 0.17$) had a significantly higher valence rating compared to avoidance ($M = -0.34$, $SD = 0.17$), all *ps* = <.001. To further investigate the interaction effects, we conducted a Bonferroni pos-hoc test. Post-hoc comparisons revealed that the combination of positive emoji with approach movement ($M = 2.29$, $SD = 1.20$) had the highest valence rating compared to positive emoji with avoid movement ($M = 0.23$, $SD = 1.13$), negative emoji with approach movement ($M = -1.47$, $SD = 1.34$), and negative emoji with avoid movement ($M = -0.91$, $SD = 1.21$), all *ps* = <.001. Meanwhile, no differences were found between negative emoji with approach movement and negative emoji with avoid movement. Namely, positive emoji with approach movement was rated most positively compared to any other combinations, while negative emojis were not as much affected by the combination of approach or avoidance movement. These results align with the interview

results, as all interviewees mentioned that when positive emojis were to approach, *"it felt as if the positive emotion was intensified."* Specifically, P6 mentioned that when positive emojis approached, it was *"increasingly smiling."* Thus, approach movement intensifies the overall positive emotion felt by the participants, making the positive emojis with approach movement the most positively rated combination. Positive emoji carrying a lower valence rating could be explained with the interviews as well, as P6 commented that positive emoji with avoidance movement felt as the "*laugh was gradually subsiding."* Some even mentioned that avoidance emoji *"feels fake, and a little forced smile,"* (P2) and *"somewhat mockingly laughing at me,"* (P1) which hints for slight negative feelings felt when positive emojis were to move away from the participants.

For negative emojis, some mentioned that when negative emoji approached it did not feel good. P1 stated that *"negative emoji approaching felt more negative*," and P6 commented that specifically, angry face emoji when approached felt, *"threatening."* Just like when positive emoji approach intensified the positive feeling, when negative emoji approached, the *"negative emotions felt stronger."* P6 specifically explained that *"as emoji is based of human face, just like humans, it feels intimidating when negative faces come closer to you."* On the other hand, it seemed like there was room for different interpretations for negative emoji with avoidance motion. P4 mentioned *"feeling sorry for the emoji moving away,"* which is like P6, where *"avoidance emoji felt like having a timid personality,"* by it literally becoming smaller. P5 even mentioned feeling *"less overwhelmed and more relaxed,"* when the negative emoji is smaller. With their statements, it suggests that negative emoji with avoidance motion were given sympathy, not necessarily a negative emotion. Nonetheless, it is important to note that half of the participants clearly mentioned that avoidance motion did not really mean much, as it is *"just getting smaller,"* (P4) and that *"it didn't really feel like this movement itself was that significant in affecting my feelings,"* (P6). Thus, in general, the avoidance motion itself may have ample room for different interpretations depending on participants individual differences or further, differ by context.

4.3 Discussion & Limitations

The present study aimed to explore the differences in valence rating to emojis that were added with approach or avoidance motion in mobile interface. Additionally, participants that were available were also invited to participate in a semi-structured interviews 1-2 weeks after the experiment to identify the reasonings behind their valence ratings. The results revealed that the impact of approach-avoidance visual experience was significant on the valence ratings of emojis. Specifically, positive emojis with approach movement was rated as highest, then positive emoji with avoidance emoji. Negative emojis were rated significantly lower, yet the differences between approach and avoidance movement was not significant. Our research did not replicate the approach aversion effect of the previous study. They claimed that it is a general and a basic human tendency that arises for any stimuli to move closer, as evolutionary speaking, a stimulus is more likely to pose a greater danger if it is approaching that if it is receding [15]. Nonetheless, such evolutionary tendencies were not found, and as a result, our research supports recent studies of approach avoidance motivation that has been questioning such perspective. Recent studies theorize that approach and avoidance behaviors may not be regulated by distinct motivational mechanisms. Instead, these behaviors are considered to follow general principles of behavioral control. Recent studies theorize that approach and avoidance behaviors may not be regulated by distinct motivational mechanisms. Instead, these behaviors are considered to follow general principles of behavioral control. In contemporary understanding, emotional responses are not merely instinctual reactions, but are instead shaped by cognitive processes, particularly evaluation. Given the contextual nuances inherent in emotional responses to affective stimuli, the processing of emotional information extends beyond the relationship between object valence and movement [7, 22].

Currently, emoji are prevalent in our society and thus are not likely to possess threat to necessarily be avoided. Although emojis may be unnatural, symbolic, and static representations of human facial expressions, they have been a popular resource since 1982 [13]. Emojis have been heavily utilized as a functional tool that helps us to express emotions, understand messages more effectively, facilitate social interactions, and even reduce negative emotions [1, 5, 24, 30]. In this perspective, the evoked approach and avoidance response tendencies are strategically regulated that positive emojis approaching would create positive hedonic responses

compared to other conditions. This highlights the great flexibility in human behavior and emotion.

The current research found that people respond more negatively toward approaching negative stimuli than toward receding negative stimuli. Our study result did not show significant differences between negative stimuli and movement direction, although some participant mentioned that approaching negative stimuli was more intimidating, and that negative emoji receding felt more comfortable. This may be due to different contextual effects considering receding emojis. Several previous research found that people represent distant stimuli more abstractly than they represent proximal stimuli [12, 23]. As emojis with avoidance motion are consequently moving further away, it can be that they have become more abstract to judge its emotional valence, thus resulting in insignificant differences with the approaching negative emoji. In abstract stimuli judgements, individual differences that rely on each and everyone's past experiences may have risen. Just as our semi-structured interview results demonstrated, participants had different reactions and explanations for emojis with avoidance motions.

Practically, understanding how individuals feel about moving stimuli can address a variety of real-life applications, especially in mobile interfaces. Nowadays, various social apps are creating their own dynamic effects for emojis [33]. The emoji industry is also expanding in various ways, where even paid emoji services are available in some social apps. There has not been much research on emoji purchases, but recent research found that fashion, interest, and habit predict emoji purchase behavior [34]. Along with knowing the motivational aspect of the users, correctly nuancing such movement effects with emojis is crucial in the user experience of emojis. Here, many of the interview participants mentioned that they would like to use approaching movements in emojis when they were to intensify their feelings or to show strong affirmation toward the other. Specifically, P1 mentioned that *"I'd use approaching motion when I'm angry or happy to better visualize the emotion, or when I feel I strongly relate to what the other person is saying."* It is important to note that the current research is still groundwork for emoji approach avoidance and leaves many questions unanswered. Thus, nuancing negative stimuli, especially for movement, requires more consideration. Still, our findings give important messages in the practical aspect of creating user interfaces for moving emojis.

Limitations of this study lies in that there is lack of ecological validity for this is an experimental lab study. Specifically, emojis itself are interpreted differently according to context: for example, a study has shown that emoticons are more commonly used in socio-emotional contexts than in task-oriented ones [4]. Thus, further studies should test the approach and avoidance visual experience on several different contexts. Moreover, this study only used iOS emojis. Although iOS emojis are considered the most favorable and clear, results of how emojis are interpreted with approach or avoidance movement may differ as the intensity of emotion or congruence of emotion depends on the rendering used by the platform [11, 26]. Likewise, our study has controlled for speed motion and rhythm effects. Previous studies have found differences in arousal and valence for different speed and rhythm on various stimuli [3, 28]. Lastly, as P3 mentioned possible cross-cultural differences by commenting that, *"my foreign friends would like such movements added on to emojis,"* further research with different cultural backgrounds is suggested. As heavily researched in previous literature, there are already differences found in the use and interpretations of emojis depending on socio-cultural backgrounds [14, 25]. Accordingly, we suggest that visual approach and avoidance experience could be interpreted differently when tested in different ethnic groups.

5. CONCLUSION

The evolution of emojis, propelled by advancements in graphics technology, has led to emoji no longer remaining as static images. This evolution through movement introduces fresh perspectives and inquiries into emoji research. To our knowledge, this is the first study that has explored emotional responses of visual approach-avoidance experience of emojis on mobile interfaces. We first observed that the approach-avoidance visual experience significantly influenced the valence rating of emojis, particularly when positive emoji combined with approach movement, resulting in the most positive ratings. Then we conducted semi-structured interviews to consequently propose some design suggestions. We explored possible applications for social instant messaging applications where features such as micro-interactions combined with the use of emojis. We suggest further research in this dimension as well as exploring different speed, rhythm, and other motion effects

to delve deeper into emoji user experience studies.

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