

Animoji Adoption and Use: Gender Associations with an Emergent Technology

Susan C. Herring,¹ Ashley R. Dainas,² Holly Lopez Long,³ Ying Tang⁴

Indiana University Bloomington^{1,2,3,4}

herring@indiana.edu,¹ ardainas@iu.edu,² hdlopezl@iu.edu,³ yt11@iu.edu⁴

Abstract

Advances in facial recognition technology have enabled graphical filters that can track a user's facial expressions in real time. One such application is Apple's Animoji feature for the iPhone. This paper examines gender differences in Animoji use and adoption. In-depth, semi-structured interviews with 33 Animoji users (19 F; 13 M; 1 non-binary) were conducted to understand the users' experiences with Animoji, as well as their reasons for choosing to use them. Women self-reported using Animoji more and were more oriented toward cuteness, whereas men adopted Animoji earlier and experimented with the technology more. Overall, Memoji were used more often by both genders than animal or object Animoji. We conclude by advancing predictions about future Animoji adoption and use.

Introduction

Inspired by the widespread popularity of emoji, Animoji were introduced in November 2017 on the Apple iPhone X, and they have been expanded since then in several updates to the iPhone operating system. Animoji allow users to video chat and send video clips of themselves speaking through large-format emoji that mirror movements of the sender's head, mouth, eyes, and eyebrows in real time. In addition to popular emoji characters such as Poop, Unicorn, and Robot, Animoji users can create and animate custom human "Memoji" that represent their appearance (or how they wish to appear). Sticker sets can also be derived from Animoji and Memoji.¹ When speaking through Animoji in video clips, users tend to modify their voice and perform the Animoji character they are using, as reported by Herring et al. (2020). Aside from that study, however, no research that we are aware of has been conducted on Animoji use.

In this paper, we investigate how men and women use Animoji. Previous studies found that women use emoji more often, in different ways, and have a more positive attitude

toward them than men do (Chen et al. 2017; Prada et al. 2018; Sugiyama 2015). Animoji, as cute, cartoonish representation of animals, objects, and people, should also appeal more to female users, in that women and girls often mention 'cuteness' as a reason for using emoji (Sugiyama 2015). Moreover, the Memoji facial feature options, while exaggerated, better represent (young) female faces than male faces. The face shapes are smooth and rounded, and the Memoji menu options favor feminine hairstyles and make-up.

At the same time, according to the Technology Acceptance Model (TAM) (Davis 1989; Venkatesh and Morris 2000), men tend to adopt new digital technologies earlier than women do and to adopt them for different reasons, e.g., for their utility rather than due to social factors. The iPhone X uses facial recognition and machine learning to map Animoji onto a user's face in real time, emerging technologies that are gaining in importance as more people augment and alter their digital appearance to enhance their self-presentation. These considerations introduce another possibility, namely, that at this relatively early stage in their existence, Animoji might be used more by men than by women.

To explore what gender differences, if any, exist in Animoji adoption and use, we interviewed 33 students (19 women, 13 men, 1 gender non-binary). In a laboratory setting, we asked them how much they use Animoji, their experiences using Animoji, which Animoji they use most and least often, and which Animoji best represents them. We employed thematic content analysis to analyze the participants' responses, as well as the reasons they gave for them.

Overall, the women reported using Animoji more often, but the men appeared more comfortable using and exploring the limits of the technology—although more men than women reported losing interest after trying it. Consistent with gender patterns previously noted for emoji (Prada et al. 2018; Sugiyama 2015), the women reported using Animoji

more often than the men in both text messages and video chat, and they more often said that they use certain Animoji because they are cute. Most interviewees said that they use their Memoji more often than animal or object Animoji, and that they create the Memoji to look as much as possible like themselves. However, the men reported using Memoji more and creating more Memoji, including some variants that do not represent themselves. Conversely, several women reported only creating a Memoji with or because of friends, consistent with the TAM. These patterns, and the theories that predict them, are described more fully in what follows.

Background

Graphicons and Gender

Animoji's smaller predecessors, emoji and emoticons, are often associated with female gender. Women report having more positive attitudes toward them (Prada et al. 2018), using them more often (Chen et al. 2017), and using different icons than men (Chen et al. 2017; Wolf 2000). Moreover, emoji themselves are often perceived as cute and feminine (Herring and Dainas 2020; Sugiyama 2015). This gender association is evident across cultures. Japanese teenage girls use emoji to perform and maintain *kawaii* ('cute') identities in their online communication; such use is considered inappropriate for men (Sugiyama 2015). In the U.S., women use a greater variety of emoticons than men, especially smiling and laughing ones, to express positive emotion and support, while men use the winking emoticon more often to flirt and express sarcasm (Wolf 2000). In Chen et al. (2017)'s international corpus, female participants used more emoji overall; females preferentially used all face-related emoji (indicating a social orientation), while males preferred heart-related emoji (indicating positive emotion).

For newer types of graphicons (Herring and Dainas 2017), however, the association with a particular gender is less clear. Konrad, Herring, and Choi (2020) compared emoji and sticker use by interviewing and surveying users of each type. Five of the nine male interviewees said that stickers are for females or that they contain aspects they perceived as feminine; one commented that "stickers are really girly." However, when messaging their female friends, these men all sent stickers. Indeed, the male interviewees had recently sent more stickers than the female interviewees.²

More relevant to the present study, Herring et al. (2020) examined publicly shared Animoji videos on Youtube.com and Twitter.com. They found that men posted more Animoji videos than women did, although the numbers of Memoji videos were more balanced. There were gender differences in which Animoji were used: Women used the Unicorn, Pig, and Chicken Animoji more than men did, and men used the

Dog and Monkey more. Only men used the Poop, Robot, and Alien Animoji. Men also more often pretended to be a different gender and modified their voice to perform humorous personae when speaking through Animoji.

TAM and Gender

The Technology Acceptance Model (TAM) is one of the first models to explain the psychological factors behind user acceptance and usage behavior of information systems (Davis 1989). Studies of TAM have argued that gender plays a significant role in an individual's technology adoption decisions. They found that in organizations, when introduced to a new technology, men are more focused on their decision-making process and more concerned with the affordances of the technology, while women are more influenced by social factors such as input from peers and superiors (Venkatesh and Morris 2000). Similarly, when investigating the moderating effects of gender in explaining intention to use mobile chat services, Nysveen, Pedersen, and Thorbjørnsen (2005) found that social norms and intrinsic motives such as enjoyment are key factors of intention to use among females, while extrinsic motives including perceived usefulness and expressiveness are important for males.

In addition, males tend to display higher levels of self-efficacy and lower levels of anxiety toward computers and the internet than their female counterparts (Durnell and Hagg 2002), and thus are more likely to be early adopters of new technologies (Glaser and Strauss 1967). This observation has been repeated in studies across various settings, including online stock trading and digital learning tools (Teo, Fan, and Du 2015). Similarly, Herring and Demarest (2017) found that on Voicethread.com, an asynchronous interactive multimodal platform, men chose to comment using video more often than women did, because the asynchronous video mode was novel, and they wanted to try it out.

Based on the above literature, we generated two predictions about Animoji adoption and use by women and men at this point in time:

H1: Women use Animoji more than men do.

H2: Men are adopting Animoji earlier than women are.

Methods

Participant Recruitment and Demographics

To investigate how individuals are using Animoji, in-depth interviews were conducted with self-identified Animoji users between November 2019 and February 2020. Participants were recruited via email and flyers from the population of a Midwestern university town after they responded to a screener questionnaire which asked questions about

² Personal communication with the authors.

their technology background (e.g., device preferences) and demographics (e.g., age, gender). The screener also asked participants to rate how frequently they used Animoji in FaceTime and iMessage on a 5-point scale (i.e., Never, Rarely, Occasionally, Often, Always). Although some participants reported very little Animoji use, actual non-users are not included in this study. Rather, our focus is on existing users and Animoji usage within this group.

A total of 33 participants were interviewed face to face in a laboratory setting and gave informed consent to be included in the analysis. All participants owned an Apple iPhone X or later version and had used or at least tried out the Animoji feature. A majority of participants identified as female (58%, n=19), while 39% (n=13) identified as male, and 3.0% (n=1) identified as non-binary. Since there was just one non-binary individual, only data from the self-identified males and females are included in this study. Participant ages ranged from 18 to 29, with a mean of 21.8 (sd = 3.48). The mean age of female participants was 21.9 (sd = 3.72), and the mean age of male participants was 21.2 (sd = 3.11). A majority of participants reported English as their only native language (55%, n=18). Of those who did not speak English natively, 15% spoke Mandarin Chinese, 21% spoke a South Asian language, and 9% spoke other languages.

The participants were undergraduate and graduate students: 33% were in the School of Informatics, Computing, and Engineering; 27% were in the School of Business; and 18% were in the School of Arts and Sciences. The major area of 21% of the students was unknown.

Interview Procedures

In-depth semi-structured interviews lasting approximately 45-60 minutes were conducted. Participants were asked about their experiences using Animoji, their attitudes toward Animoji, their Animoji preferences, and the process by which they created their Memoji.³ (The questions analyzed for this study are listed in the Appendix.) The interviews were video and audio recorded.

Analysis

The interviews were analyzed using a grounded theory approach (Glaser and Strauss 1967) where the interview responses were open coded, followed by axial and selective coding. Codes were assigned jointly by all the authors. The codes were aggregated to find patterns in participants' perspectives on Animoji, as well as gendered patterns in use and adoption. The results are further broken by comparing native and nonnative speakers. All results are presented using descriptive statistics. Because the study is exploratory in nature, no claims regarding statistical significance are made.

³ Participants were also asked to complete two tasks utilizing Animoji for communication; these are not reported in this paper.

Findings

Frequency of Use

Gender differences were observed in participant responses to the screener questions about frequency of Animoji use. Women reported using Animoji more often in both text messaging and in FaceTime video chat. Eighty-nine percent of the women said they used Animoji in messaging 'occasionally' or 'often' compared to 69% of the men, and 63% of women said they used Animoji in FaceTime 'occasionally,' 'often,' or 'always' compared to only 31% of men. Conversely, men more often than women said that they used Animoji 'rarely' or 'never' (30.8% vs. 10.5% in texting; 68.1% vs. 36.8% in FaceTime); see Figures 1-2. However, more male interviewees than female interviewees reported having ever used Animoji in FaceTime (92% vs. 63%). That is, more men had had the experience of using Animoji to video chat, but women reported doing so with greater frequency.

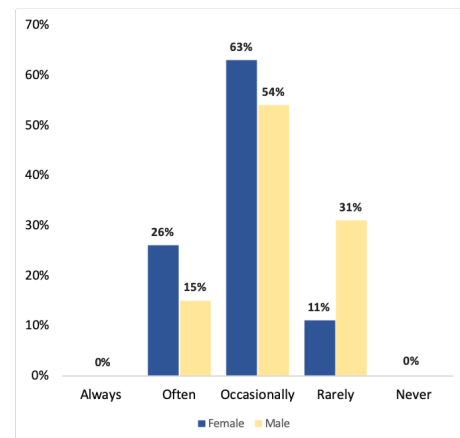


Figure 1: Frequency of Animoji Use in Messaging.

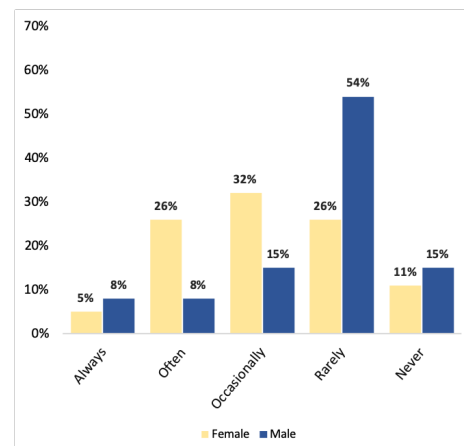


Figure 2: Frequency of Animoji Use in FaceTime.

Experiences with Animoji

We began each interview by asking the participant to tell us about their experience using Animoji. This was an open-ended question that could have been addressed in various ways. Some interviewees responded by describing why (e.g., “they’re fun/funny/playful/engaging”) or with whom (e.g., “younger relatives”) they use Animoji. Others mentioned the platforms (text messaging, FaceTime, etc.) where they used them, and others commented on the technical affordances of Animoji, such as the way they map onto users’ facial movements and can mask their face. Finally, some interviewees reported that they tried them (or “messed around with them”) when they first came out but use them less now. We coded these responses into thematic categories; their gender distribution is shown in Figure 3.

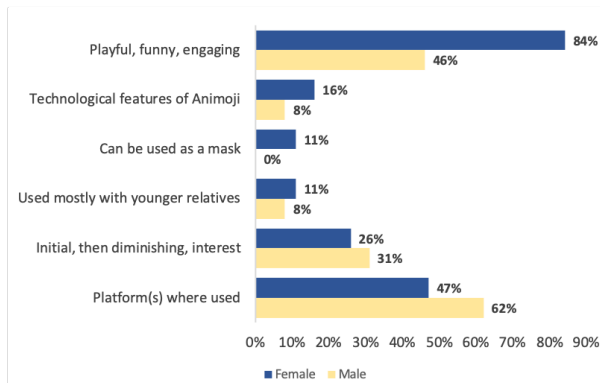


Figure 3: Themes in Animoji Experiences.⁴

The most common theme expressed by female participants was the use of Animoji for fun or to goof off. Women also commented more than men on the technical affordances of Animoji. One female participant said,

“Usually I use them on Facetime for fun. I was talking with my boyfriend and then I think the conversation just got a little dull, so someone would use an Animoji to start to get more fun...[My boyfriend] started using that first, and it makes me laugh a lot. I like how it reacts to your facial expressions. It was really funny when he used it, so I kinda used it in reaction to that.” [P6, F]

It is notable that this interviewee’s boyfriend was the first in the relationship to adopt Animoji.

Male interviewees mentioned sending Animoji for fun, as well, but they did so much less than the women. The men more often mentioned the platforms where they use Animoji. For example, one male participant compared his experience of using the three Animoji formats (video clips, video chat, and stickers) in different applications as follows:

“I’ve used all three obviously. The stickers are the one that I used the most, because I’ll just send them while texting

... The recordings sometimes when I want to play around. Also when I wanted to play someone off on FaceTime, I would like, show [them] a pig, because they would be talking something seriously, and now...It’s fun.” [P29, M]

Somewhat more men than women mentioned initial interest followed by diminished use over time, although this was a fairly common theme for both genders. One male participant said, “I used it before, obviously, played with it...maybe it just lost its newness” [P8, M]. The use of ‘obviously’ in these two male comments is revealing, indicating an expectation that the men would have used the new technology.

Another male participant reported that he had played around with Animoji but had never sent one:

“I haven’t used the thing. I know I can, but I haven’t actually sent them. I played with them. ... It’s sort of weird for me to hear my own voice” [P14, M].

We also coded each participant’s experience overall as positive, negative, or neutral/mixed. Most experiences were positive, although some were more negative. More males than females reported unambiguously liking Animoji (77% vs. 58%), whereas more females expressed not liking Animoji (21% vs. 15%) or having mixed or neutral views (21% vs. 8%). The woman with the most negative view said that she finds them “not funny,” adding that they are cute for a child, but that she doesn’t like adult cartoons and finds the sound of an adult voice with them “jarring.” Thus, while more women than men used Animoji frequently, not all of our female interviewees expressed liking for Animoji.

Animoji Preferences

In their study of Animoji video clips posted to social media, Herring et al. (2020) found that women posted more clips using the Unicorn, Pig, Chicken, and Cat, while men posted more clips with the Dog and Monkey and were the only gender to use the Poop, Robot, and Alien Animoji. To discover if similar preferences are evident in less public uses of Animoji, we asked the interviewees three questions designed to elicit their preferences: which Animoji best expresses you? Which Animoji do you use most often? And which Animoji do you use least often? After each question, the interviewees were prompted to explain their answer.

Participants of both genders (33% for each) said that their Memoji best expresses them, because as a representation of a human being, it looks more like them. One participant felt that the Memoji smile was more properly human than the Animoji smiles because of how it shows teeth [P14, M]. As for other Animoji, more females than males said that the Unicorn (15% vs. 0%), the Giraffe (7% vs. 0%), and the Pig (7% vs. 0%) Animoji best express them. More males, in contrast, said that the Dinosaur (11% vs. 0%), Monkey (17% vs.

⁴ Because the women gave longer responses and mentioned more than one category per response more often than men did, to normalize the categories,

we calculated the percentages in Figure 3 as ratios per interviewee. Thus, the percentages add up to more than 100% for each gender.

7%), and Dog (17% vs. 11%) best express them. These six Animoji are shown in Figure 4. With the exception of the Giraffe and the Dinosaur, which were new at the time Herring et al. (2020)'s data were collected, these gender differences are similar to the patterns reported in that study.



Figure 4: Female (top) and Male (bottom) Animoji Preferences.

Common reasons given for why an Animoji best expressed them included the Animoji's 'cuteness,' as well as how 'funny' or 'goofy' it is. Somewhat more men than women said that an Animoji best expressed them because of how funny or goofy it was (27% vs. 21% respectively). For example, one participant explained why he thought the dog best expressed his personality: "Mostly when I use an Animoji, it's usually light-hearted, or supposed to be funny. That's kinda how I can do with dogs" [P25, M]. However, women and men about equally often said that an Animoji best expresses them because it is cute (21% vs. 23%). One female said the Tiger best expresses her because "the face is so cute, and I think I have a relatively big face...there is some baby fat that it also has. And I like the color" [P12, F].

We also asked participants which Animoji they used most. Again Memoji was the most common response. Fifty percent of male participants reported that they used Memoji the most, compared with 30% of females. Beyond Memoji, only women reported using the Giraffe (17% vs. 0%) and Unicorn (10% vs. 0%), while more men than women reported using the Dog (11% vs. 3%) and Monkey (11% vs. 7%). The rest of the Animoji that were mentioned in answer to this question were distributed widely due to the sheer number of Animoji available (n=27). Common reasons given for why an interviewee used an Animoji most often include the Animoji's cuteness and how funny or goofy it is. Women said they use specific Animoji because they are cute much more often than men did (42% vs. 15%). However, women and men talked about how funny or goofy an Animoji is about equally often (26% vs. 23% respectively).

There was no strong consensus on the least used Animoji overall or by gender. Both males and females mentioned broad categories of Animoji that they use least, for example, "all Animoji," "the last ones" (i.e., the Animoji that appear

at the end of the list of possibilities), and "non-animal Animoji." Males most often said that they used the Robot the least (14% vs. 3%). Beyond this, no gender patterns are noteworthy, given the small numbers of respondents who mentioned each Animoji.

Common reasons given for why an interviewee used an Animoji least included that it was 'not cute,' 'unappealing,' 'uninteresting,' or 'inconvenient.' Women and men equally often said that the least used Animoji are uninteresting (21% vs. 23%). One participant said she did not like the Pig or Owl because they are "not as interesting...not funny enough" [P31, F]. Women and men also gave 'unappealing' as a reason for non-use equally often (32% vs. 31%). For example, one participant said he liked the Poop the least because "I don't see a point. It is like, not an animal or anything, so it's kinda weird" [P18, M]. Only women mention inconvenience as a factor in which Animoji they use least (16% vs. 0%). For instance, one female participant referred to "the sequence," because "they are the last, so I didn't get the chance to switch to them" [P12, F]. Finally, women and men mentioned a lack of cuteness as a reason for not using an Animoji equally often (21% vs. 23%). Although men more than women said they avoided the Robot, a woman said she never uses the Robot because "I never really identify myself as a robot. I definitely like cute things" [P6, F].

Herring et al. (2020) observed that the Animoji clips posted by women and men in their data were of different colors. Women tended to post clips using pastel-colored Animoji (pink, purple, and yellow), whereas men tended to use brown, blue, and gray Animoji, all stereotypically gender-preferential colors. To see if this pattern held true in our interview data, we determined the most salient color of each Animoji that was available as of April 2020. The categories are shown in Table 1. Pink/purple Animoji (e.g., Pig, Unicorn) and yellow/orange Animoji (e.g., Giraffe, Tiger) were the most mentioned for best expressed and most used color categories for women. Brown Animoji (e.g., Dog, Monkey) were the most preferred for use and self-expression for men, followed by green (Dragon, Dinosaur) and silver/gray Animoji (e.g., Robot, Alien). These results broadly reproduce Herring et al. (2020)'s color preference findings. There were no clear color patterns for least used Animoji, however.

Memoji Creation and Use

We also asked participants to talk specifically about Memoji, which are customizable human-looking cartoon heads. We asked participants if they had any Memoji, how many they had, and how they went about making them. Seventy-three percent of the interviewees reported that they had only one Memoji, and they often did not know that they could make more than one. This was particularly true of females. For example, one woman said: "I didn't even know you can make more than one. I have no idea, so I just made

		Yellow/ Orange	Pink/ Purple	Brown	White	Silver/ Gray	Green	Total
Best	Female	4 (22%)	6 (33%)	5 (28%)	2 (11%)	0 (0%)	1 (6%)	18 (100%)
Express	Male	1 (8%)	1 (8%)	6 (50%)	0 (0%)	1 (8%)	3 (25%)	12 (100%)
Most	Female	7 (33%)	5 (24%)	3 (14%)	1 (5%)	4 (19%)	1 (5%)	21 (100%)
Used	Male	1 (11%)	0 (0%)	4 (44%)	1 (11%)	2 (22%)	1 (11%)	9 (100%)
Least	Female	3 (14%)	4 (18%)	8 (36%)	2 (9%)	4 (18%)	1 (5%)	22 (100%)
Used	Male	0 (0%)	2 (18%)	4 (36%)	1 (9%)	4 (36%)	0 (0%)	11 (100%)

Table 1: Color Analysis of Animoji Choices.

the one that looks just like me” [P28, F]. Even once they knew it was possible to make more than one, very few participants expressed interest in doing so or in updating their Memoji once they had made one. One participant explained she had not changed her Memoji since she first created it, because “I haven’t changed much” [P33, F].

Interestingly, males reported having multiple Memoji more often than females did. Forty-six percent of males said they had two or more Memoji, compared to only 5% of females. Eighty-nine percent of the women had only one Memoji compared to 54% of the men. See Figure 5.

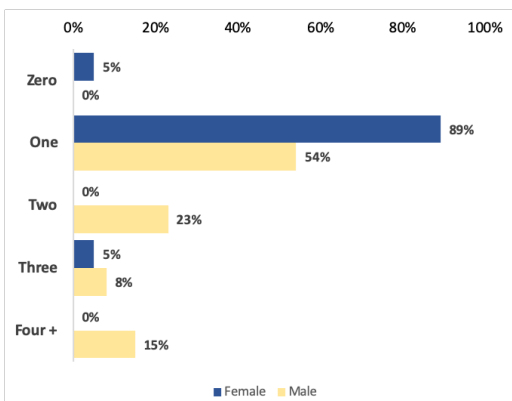


Figure 5: Number of Memoji by Gender.

Examples of participants’ Memoji (used with permission) are shown in Figure 6.



Figure 6: Examples of Memoji.

When describing their experiences of creating a Memoji, several women mentioned that they did it to be sociable—because their friends and family did so. One female participant said she made the Memoji because “My best friend made one. I was impressed by it, and then I tried it” [P27, F]. Another explained, “My friend actually made

it [the Memoji] for me” [P17, F]. And a third said,

“My friends kinda helped me make it, cuz we were all kinda doing it together. We were just kinda like adding color to my lips ...” [P26, F].

Men showed more experimentation than women and a tendency to make multiple Memoji. A male participant with multiple Memoji said that besides his own Memoji, “I have my dad, and then I also have a musical artist that I like” [P25, M]. Another man explained,

“I made one that actually looks like me, and one that just looks like a random person. Usually when I am talking to my friends, they have some different faces that they made too. So it’s kinda funny to see what are the different faces that we can make, and what they look like when they are talking and making facial expressions” [P7, M].

These comments illustrate distinct differences in participants’ motives and drives when it comes to using and creating Memoji. While female participants’ responses often related to social and collaborative motivations, male responses often emphasized experimentation as a drive for creating multiple Memoji that play with visual features and do not necessarily reflect their own appearance.

Both females and males described trying to make their personal Memoji look like themselves. Three main approaches to this were evident in the interviewees’ responses. The first was to make one Memoji that looked like them and not change it. As one female participant said,

“I have not [changed it]. It looks like me. So I just made one that looked like me and I feel like I am sending something on behalf of me. It’s unique. It’s just basically mimicking what I look like” [P32, F].

Some men also adopted this approach to Memoji creation. One man said,

“When I made the one for myself, I would go just like ‘that’s my hair color’, ‘that’s probably what my face looks like, what my eyes look like’, ‘do I want a hat? No’, stuff like that. ... Just what I look like” [P4, M].

A second approach was to have only one Memoji, but update it as needed to correct or reflect changes in the participant’s appearance. One male participant described his Memoji by saying,

“... in the beginning the hair and eyebrow color were the same. I have lighter eyebrow color than the hair. After

that, I switched my eyebrows to a different, lighter shade” [P18, M].

Similarly, a female participant explained that she has changed the Memoji because she “changed highlights” in her Memoji’s hair to match her new hairstyle [P19, F].

A third approach, favored by males (who more often had multiple Memoji), was to create multiple Memoji representing themselves with minor differences or appearance updates, for example, a new hair cut or glasses. One male participant created five such Memoji:

“I’m very creative, I do have more than one. But I don’t actively use three of them. The only other difference between the two I use is ... strictly the glasses. ... The other three have different hair ... two with the same hair and three with the same hair. And the three different versions, one doesn’t have stubble, one does have stubble and one has stubble with glasses. ... They’re all me. ... Yeah I guess I was experimenting.” [P24, Male].

One reason for having multiple Memoji with only minor differences is that it allows the user fine-grained control over how they appear to others. This is in keeping with the tendency for young social media users to express polynymous selves (Herring et al. 2020), in this case through subtle variations in their avatar’s appearance. Another reason is illustrated by a man who said he had multiple Memoji of himself because he did not know how to edit his Memoji:

“I would have probably changed it if I could. I didn’t know I could edit an Animoji ... so a few days ago I made a new Animoji out of it ... without looking at [the other one] and it just happens to be exactly the same except for the glasses” [P20, Male]

Several participants wished for more options in creating a Memoji. Men expressed frustration with the lack of options for short hair styles, facial hair, and glasses. A woman commented, “The first time I was just overwhelmed by the whole experience, but the next few times I was like, I wish they could have a little bit more options, like the face shape and...I hope they have more options in beard [sic].” [P15, F].

Native/Nonnative Speaker Differences

As a first exploratory step toward cross-cultural analysis of Animoji use, we compared our native (U.S.) English speakers (55%) with participants who self-described as bilingual or as having a mother tongue other than English (45%), on the assumption that the latter group had experience with and knowledge of another culture. We refer to this group as NNS (nonnative speakers); most of the NNS were from South and East Asia. Unfortunately, the gender makeup of the native speaker (NS) and NNS groups is unbalanced⁵: 53% (N=10)

of females are NNS compared to 23% (N=3) of males⁶ (excluding the non-binary participant). Accordingly, gender-by-culture differences are not systematically quantified here but rather are noted on a case-by-case basis.

In terms of frequency of use, the NS and NNS reported using Animoji roughly the same amount in text messages. However, the NNS (29%) more often than the NS (5%) said that they ‘never’ used Animoji in FaceTime; this pattern was mainly caused by two out of the three male NNS. The male NNS (67%) were also more negative about their Animoji experiences than any other group, in contrast to the NS males, 90% of whom reported positive experiences. The NNS females were also somewhat less positive about their Animoji experiences than the NS females (50% vs. 67%). And NNS of both genders mentioned using Animoji to be playful or funny less often than their NS counterparts. Many NNS reported also using other chat platforms, such as WeChat and WhatsApp, which are more popular than Apple’s iMessage platform outside the US.⁷ These platforms do not support native use of Animoji, which might explain the NNS’s lesser use of, and enthusiasm for, Animoji.

As for Animoji preferences, three differences are evident between the NNS and the NS groups. First, NNS females, more than any other demographic category, said that they used certain Animoji least because they found them ‘unappealing.’ Second, male NNS most often said that an Animoji best expressed them because it was ‘cute.’ Two of the three NNS males (67%) gave the following reasons for saying an Animoji best expresses them:

“The Monkey[, because it] looks slightly evil, in a cute, comical way.”

“The Octopus, because it is the cutest Animoji.”

Only 20% of the NNS females mentioned ‘cuteness’ as a reason for why an Animoji best expresses them. In contrast, NS women (22%) gave ‘cute’ as a reason twice as often as NS men did (10%) in response to this question.

Third, the Animoji that best expressed participants in each group showed color differences: yellow-orange for female NNS as compared to pink-purple for female NS, reflecting the fact that different Animoji were identified by each group (female NNS identified the Giraffe and the Tiger, whereas female NS identified the Unicorn and the Pig). The NS and NNS males patterned similarly in identifying most with brown-colored Animoji, such as the Dog and the Monkey. The males were also alike in having more Memoji than the females; one NNS male reported having more than four, while the only participant with no Memoji was a NNS female. These patterns both support the overall gender differences described in the previous sections and

⁵ More interviews with NNS males were scheduled but had to be canceled due to COVID-19.

⁶ The NNS females speak Chinese (4), Bengali (2), Malayalam (1), Korean (1), Polish (1), Spanish (1). The NNS males speak Hindi (2), Tamil (1).

⁷ <https://www.messengerpeople.com/global-messenger-usage-statistics/>, retrieved May 17, 2020.

suggest cultural differences, such as gender associations with cuteness, that could be explored in future research.

Discussion

The analysis of our interview responses revealed the following findings related to user gender:

1. The women self-reported using Animoji more than the men did, and more often said they use specific Animoji because they are cute.
2. The men had experimented more with Animoji; they had more often tried using them, and they created more and more varied Memoji.

These findings support our initial predictions. Women reported using Animoji more than men, similar to how emoji and emoticons are used more by females than males (Prada et al. 2018). NS women, in particular, seem attuned to the ‘cuteness’ of Animoji, consistent with previous studies of emoji (Sugiyama 2017). Female interest in Animoji can also be linked to a preference for emotional expression (Allen and Haccoun 1976) and social interaction (White and Gardner 2009), which Animoji facilitate.

Women and men also have different Animoji that they use most and that they feel best express them. These Animoji overlap substantially with those used most in the public clips analyzed by Herring et al. (2020). We also identified differences in the color palettes preferred by women and men similar to those reported in Herring et al. (2020). This suggests that Animoji preferences are shaped, at least in part, by gendered aesthetic considerations.

At the same time, men show evidence of adopting Animoji earlier than women. Further, the men more often reported experimenting with and trying out the features of Animoji and Memoji. This is in line with what TAM predicts, namely, that males will display more interest and a greater confidence in their ability to use technology, while females are generally more cautious and slower to adopt it (Broos 2005). Males are socially conditioned to like technology (Bray 2007). However, while our male participants were happy to play with and explore Animoji, they were relatively less interested in using them to communicate. For the women, creating a Memoji was a social activity, consistent with TAM’s prediction that social factors motivate women to adopt new technologies (Venkatesh and Morris 2000). Waiting for others to adopt a technology first and create a social context for its use could naturally cause a delay in adoption, suggesting an explanation for why women adopt new technologies later. Intrinsic motives such as enjoyment are also key factors of intention to use among female users (Nysveen et al. 2005). This could explain why women more than men said they mostly use Animoji to be funny or goof off (see Figure 3).

Finally, some male interviewees reported creating multiple Memoji and using different Animoji to “perform” different characters as jokes with friends and family. One male NS explained how he varies his voice for this purpose:

“If it’s a serious message, if I am trying to use it to say something to somebody, I will use my own voice. But then, if I am just talking to my friends, I will do a funny voice, or make weird sounds or something. ... If I am using an animal, I might use a higher pitched voice, maybe it makes me sound like an animal” [P7, M].

No woman reported doing this, consistent with Herring et al. (2020)’s finding that more men than women post Animoji video clips to social media in which they perform other characters by modifying their vocal quality.

As noted in the Methods section, our participants were drawn mostly from two schools at our university: one technology focused and one business focused. Thus the participants tended to orient toward technology and technology products. For example, one NS interviewee, a self-described “Apple dork”, explained creating his Memoji as follows:

“I’m a little bit of an Apple dork. And so, I’m one of those weird people that watched the keynotes every summer when they come out with a new software update, and so of course in September when the update came out well “I gotta try this out,” and I’m pretty sure they didn’t instruct, but like prompted you, “here are some new features,” so I was one of those people who knew it was coming when it came out and so I tried it out.” [P24, M]

This man is an extreme illustration of an early adopter.

In addition to the gender findings, four overall findings emerged from our analyses of the interviews:

Most of the study participants are not heavy Animoji users. From their responses, it emerged that Animoji are one tool among others in their graphical communication toolkit. Some interviewees found that Animoji fit well into specific niches in their communication styles (e.g., they use them to bug siblings, send quick messages, avoid paying close attention in FaceTime, etc.). Others found Animoji inconvenient for certain uses (e.g., preferring voice-only messages to ones where they had to pay attention to their face, or feeling that Animoji in FaceTime impede communication by hiding their face) or simply preferred other graphical means of communication (emoji, GIFs, etc.) over Animoji. For now, preferred usages seem to be fairly individualistic, which is perhaps a reflection of how new Animoji still are.

Most participants expressed relatively positive attitudes toward Animoji. Less positive comments included discomfort with using one’s voice with Animoji, and finding them “pointless.” Several users also expressed frustration with the limited options available to customize Memoji. One female NS particularly disliked Animoji, describing them as “jarring.” Another participant, the self-proclaimed “Apple dork,” was among the earliest and most enthusiastic of early

adopters. Most of the other participants fell somewhere between these two extremes.

Most participants used a Memoji more often than the animal and object Animoji, and felt that Memoji best expressed them. Most had created at least one Memoji customized to resemble themselves, and they emphasized the importance of making their Memoji look as much like themselves as possible. This aligns with previous research on self-representation in anonymous and nonymous online spaces which found that most people, when given the possibility to create new avatars, prefer to create ones that look like themselves (Nowak and Rauh 2005).

Animoji use conveys a meta message of playfulness. In this respect, it is similar to other graphical means of communication (see Dresner and Herring 2010 for emoticons; Konrad et al. 2020 for emoji and stickers). Konrad et al. (2020), citing the historical evolution of emoticons and emoji, claim that this pragmatic meta message is very salient in the early stages of a graphicon's life span and weakens over time. Consistent with early stage behavior, the interviewees described using Animoji just to be funny or silly.

Conclusions

This study makes several novel contributions. It is the first scholarly user study of Animoji, a relatively new technology. It elucidates a complex pattern of usage related to user gender, such that men are earlier (and more experimental) users, but women use Animoji more often. For the men, exploration of the new technology appeared to drive adoption of Animoji, while for the women, "fun" and social aspects were more important motivators, consistent with the TAM. The study also identified overall patterns of Animoji use, including a strong user preference for Memoji over other (animal and object) Animoji and for creating Memoji that resemble the users physically.

These findings have implications for the design of Animoji. Additional options should be provided for Memoji customization, especially for hair styles, facial hair, and eye-wear, as several participants complained about their lack. Participants also mentioned using Animoji less that appear toward the end of the list on the phone's interface (Memoji appear first in the list), because it takes longer to scroll to reach them. Automatically generating a "frequently used" portion of the Animoji list or allowing individuals to pin their favorite/most used Animoji to the beginning of the list could encourage users to employ a wider range of Animoji.

At the same time, current usage trends raise questions about the future of Animoji and similar mask-like filters that are starting to appear on phones and in messaging apps.⁸ For some (especially male) iPhone X users, interest in Animoji

use flagged after an initial period of use. And women, the most likely long-term users (based on current use, as well as historical trends for emoticons and emoji), evaluated their experiences with Animoji less positively than the men did. If this trend continues, Animoji use may decline over time.

Meanwhile, other graphical filters such as those available on Snapchat and Instagram are quite popular (e.g., Rios, Ketterer, and Wohn 2018), possibly because they are integrated with and enhance the user's face, rather than replacing it. As one NS participant explained,

"Part of the issue with Animoji...is that it is just completely overlaid. It is just a cartoon character. It's mimicking your face, but there is not any aspect really of you in it. ... And then with Snapchat, you just overlay it over yourself, it is changing you, but it's accentuating what is already there." [P8, M]

On the screener survey, our female interviewees reported using Instagram and Snapchat, and using filters on their selfies, considerably more than the men did. This evidence, taken as a whole, leads us to make three predictions. First, the more Memoji and Memoji-like filters can be customized to approximate (an idealized version of) the user's face, the more popular these filters will become. Second, and relatedly, we predict that the use of Memoji stickers will increase, especially since they are less time consuming to use than video messages or FaceTime. Third, we predict that male use of Animoji (of all three types) will decrease over time, and female use will become more widespread.

A limitation of this exploratory study is that our participant sample was relatively small and based in one university in the Midwestern United States, and thus it may not represent all Animoji users. It is worth noting, however, that existing work shows little geographic variation in self-representational use of emoji (Robertson, Magdy, and Goldwater 2020). Another limitation is the diversity of cultural backgrounds of the NNS group and, especially, the small number of NNS men in our sample, which limits the generalizability of our observations about cultural differences. This is an area that should be explored in greater depth for Animoji and other graphical filters. Finally, this study focused on how owners of late-model iPhones use and think about Animoji. It remains to be discovered how people perceive and interpret messages communicated through Animoji and similar mask-like filters.

Acknowledgements

This work was partially funded by the Office of the Vice Provost of Research at Indiana University Bloomington through the Grant-in-Aid Program. Special thanks are due to Madeline Adams for assisting with the interviews.

⁸ E.g., AR Emoji on the Galaxy phone, and the Mimoji and Facemoji apps.

References

- Allen, J. G.; and Haccoun, D. M. 1976. Sex Differences in Emotionality: A Multidimensional Approach. *Human Relations* 29(8): 711-722. doi.org/10.1177/001872677602900801
- Bray, F. 2007. Gender and Technology. *Annual Review of Anthropology* 36: 37-53. doi.org/10.1146/annurev.anthro.36.081406.094328
- Broos, A. 2005. Gender and Information and Communication Technologies (ICT) Anxiety: Male Self-Assurance and Female Hesitation. *CyberPsychology & Behavior* 8(1): 21-31. doi.org/10.1089/cpb.2005.8.21
- Chen, Z.; Lu, X.; Shen, S.; Ai, W.; Liu, X.; and Mei, Q. 2017. Through a Gender Lens: An Empirical Study of Emoji Usage over Large-Scale Android Users. In Proceedings of the 2018 World Wide Web Conference (WWW '18). Geneva, Switzerland. doi.org/10.1145/3178876.3186157.
- Davis, F. D. 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly* 13(3): 318-339. doi.org/10.2307/249008
- Dresner, E.; and Herring, S. C. 2010. Functions of The Nonverbal in CMC: Emoticons and Illocutionary Force. *Communication Theory* 20(3): 249-268. doi.org/10.1111/j.1468-2885.2010.01362.x
- Durndell, A.; and Hagg, Z. 2002. Computer Self-Efficacy, Computer Anxiety, Attitudes towards the Internet and Reported Experience with the Internet, by Gender, in an East European Sample. *Computers in Human Behavior* 18(5): 521-535. doi.org/10.1016/s0747-5632(02)00006-7
- Gefen, D.; and Straub, D. W. 1997. Gender Differences in the Perception and Use of E-Mail: An Extension to the Technology Acceptance Model. *MIS Quarterly* 21(4): 389-400. doi.org/10.2307/249720
- Glaser, B.; and Strauss, A. L. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine.
- Herring, S. C.; and Dainas, A. R. 2017. "Nice Picture Comment!" Graphicons in Facebook Comment Threads. In Proceedings of the Fiftieth Hawai'i International Conference on System Sciences. Los Alamitos, CA: IEEE. doi.org/10.24251/HICSS.2017.264
- Herring, S. C.; and Dainas, A. R. 2020. Gender and Age Influences on Interpretation of Emoji Functions. *ACM Transactions on Social Computing* 3(2): article 10. doi.org/10.1145/3375629.
- Herring, S. C.; Dainas, A. R.; Lopez-Long, H.; and Tang, Y. 2020. Animoji Performances: 'Cuz I Can Be a Sexy Poop!' *Language@Internet* 18: Article 1. Available from: <https://www.languageatinternet.org/articles/2020/herring>
- Herring, S. C.; and Demarest, B. 2017. "I'm the First Video Voicethread-It's Pretty Sweet, I'm Pumped": Gender and Self-Expression on an Interactive Multimodal Platform. *Alsic* 20(1). Available from <https://journals.openedition.org/alsic/3007>
- Konrad, A.; Herring, S. C.; and Choi, D. 2020. Sticker and Emoji Use in Facebook Messenger: Implications for Graphicon Change. *Journal of Computer-Mediated Communication* 25 (3). doi.org/10.1093/jcmc/zmaa003
- Nowak, K. L.; and Rauh, C. 2005. The Influence of the Avatar on Online Perceptions of Anthropomorphism, Androgyny, Credibility, Homophily, and Attraction. *Journal of Computer-Mediated Communication* 11(1): 153-178. doi.org/10.1111/j.1083-6101.2006.tb00308.x
- Nysveen, H.; Pedersen, P.; and Thorbjørnsen, H. 2005. Explaining Intention to Use Mobile Chat Services: Moderating Effects of Gender. *Journal of Consumer Marketing* 22(5): 247-256. doi.org/10.1108/07363760510611671
- Prada, M.; Rodrigues, D. L.; Garrido, M. V.; Lopes, D.; Cavalheiro, B.; and Gaspar, R. 2018. Motives, Frequency and Attitudes Toward Emoji and Emoticon Use. *Telematics and Informatics* 35(7): 1925-1934. doi.org/10.1016/j.tele.2018.06.005
- Robertson, A.; Magdy, W.; and Goldwater, S. 2020. Emoji Skin Tone Modifiers: Analyzing Variation in Usage on Social Media. *ACM Transactions on Social Computing* 3(2): Article 11. doi.org/10.1145/3377479
- Rios, J. S.; Ketterer, D. J.; and Wohn, D. Y. 2018. How Users Choose a Face Lens on Snapchat. In Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing. New York: ACM. doi.org/10.1145/3272973.3274087
- Sugiyama, S. 2015. Kawaii Meiru and Maronaka Neko: Mobile Emoji for Relationship Maintenance and Aesthetic Expression among Japanese Teens. *First Monday* 20(10). doi.org/10.5210/fm.v20i10.5826
- Teo, T.; Fan, X.; and Du, J. 2015. Technology Acceptance among Pre-Service Teachers: Does Gender Matter?. *Australasian Journal of Educational Technology* 31(3): 235-251. doi.org/10.14742/ajet.1672
- Venkatesh, V.; and Morris, M. G. 2000. Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior. *MIS Quarterly* 24(1): 115-139. doi.org/10.2307/3250981
- White, J. B.; and Gardner, W. L. 2009. Think Women, Think Warm: Stereotype Content Activation in Women with a Salient Gender Identity, Using a Modified Stroop Task. *Sex Roles* 60(3-4): 247-260. doi.org/10.1007/s11199-008-9526-z
- Wolf, A. 2000. Emotional Expression Online: Gender Differences in Emoticon Use. *CyberPsychology & Behavior* 3(5): 827-833. doi.org/10.1089/10949310050191809

Appendix: Interview Questions

We are conducting a study on people's use of Animoji. During [this interview], I will be asking you a few questions about your experiences using Animoji. [...] We ask you to be as honest as you can when answering questions and completing the tasks. There are no right or wrong answers, only thoughts, experiences, and opinions, and we want to hear about your perspective.

1. What have your experiences with Animoji been like so far?
2. Which Animoji do you use most often? Why?
3. Which Animoji do you use least often? Why?
4. Which Animoji do you think best expresses your personality or is most like the real you? Why?
5. Have you ever created Memoji?
6. Can you walk me through your thought process of creating a Memoji?
7. How do your Memoji compare with each other?
8. How would you compare Memoji and Animoji with other filters you might use?