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Chei Sian Lee

Wee Kim Wee School of Communication and Information, Nanyang Technological University, leecs@ntu.edu.sg

Dion Hoe-Lian Goh

Wee Kim Wee School of Communication and Information, Nanyang Technological University, ashlgoh@ntu.edu.sg

Qian Wu

Wee Kim Wee School of Communication and Information, Nanyang Technological University, qian003@e.ntu.edu.sg

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Understanding the Visual Aesthetics of Mobile Apps in Everyday Life: The Influence of Cute Aesthetics

Chei Sian Lee

Dion Hoe-Lian Goh

Nanyang Technological University, Singapore leecs@ntu.edu.sg

Nanyang Technological University, Singapore ashlgoh@ntu.edu.sg

Qian Wu

Nanyang Technological University, Singapore qian003@ntu.edu.sg

ABSTRACT

This paper investigates visual aesthetics (VA) of mobile apps' in everyday life by examining the effects of affect and cute aesthetics. We analyzed two theoretical dimensions of affect, positive affect (PA) and negative affect (NA), and provided an analysis of the relevance of PA and NA by relating them to VA of three interface designs (ID) with varying levels of cute aesthetics (i.e. low, mid and high). Data was collected using a survey. Regression results from 166 participants suggest that cute aesthetics invoke PA (i.e., interested, enthusiastic) and that it is a strong positive predictor for VA across all three IDs. This study contributes to a better understanding of the relevance of positive affect and cute aesthetics on visual aesthetics of mobile apps in everyday life.

Keywords

Cute aesthetics, affect, visual aesthetics, mobile apps, everyday life, interface design.

INTRODUCTION

Incorporating visual aesthetics (VA) into mobile apps is critical as VA determines the pleasing qualities of a design, and ultimately, users' acceptance of the app (Chow, 2013; Robins & Holmes, 2008). Earlier research has established that aesthetic design can improve online user experience (Silvennoinen et al., 2014). Furthermore, it was reported that VA results in higher usage and better user performance in addition to enhancing users' evaluations of the functional qualities (Sonderegger & Sauer, 2010; Tractinsky et al., 2000). Subsequent research further established that VA on mobile apps play an essential role in fostering interest, positive emotions, engagement, and enthusiasm across different domains (e.g., learning, crowdsourcing, health, advertising) (Goh et al., 2021; Ruf et al., 2022; J. Wang & Hsu, 2020). In sum, VA on mobile apps can create a considerable positive impact (Chopdar & Balakrishnan, 2020).

A pervasive aesthetic trend is the use of cute aesthetics (Dale et al., 2016). Cute aesthetics refer to the use of cute visual elements in interface designs (IDs) (Lee et al., 2022). Prior research indicated that using cute elements and bright colors in IDs can be attractive and appealing (Cheok & Fernando, 2012) to users. Hence, it is unsurprising that research on cuteness has attracted scholarly attention from various academic disciplines, from human-computer interaction (HCI) to advertising and education (Dale et al., 2016). In adopting the notion of cute aesthetics of Cheok and Fernando (2012), we propose that cuteness in mobile apps can transform content delivery from a traditional "cold and alienating" user interface to one that is more friendly and appealing (Cheok & Fernando, 2012). The focus on cute aesthetics in mobile apps ensures that users have a pleasurable experience interacting with the app (Rousi, 2009). Broadly, VA is a critical factor for the success of mobile apps (Zen & Vanderdonckt, 2016), yet it remains unclear how we can assess aesthetics, especially cute aesthetics, on mobile apps for everyday life. The rapid development of different mobile app designs and the proliferation of mobile apps for everyday activities justify the current undertaking.

Separately, the viral success of Pokémon Go suggests the general acceptance by adult users towards cute aesthetics. It also indicates the potential of cute aesthetics for deployment in mobile apps in our everyday life. Specifically, the game was based in part on its collection of cute monsters hiding virtually in public places that users seek, capture and use in the game as part of their everyday activities (Marcus et al., 2017). In another example, during the COVID-19 pandemic, an animated cute otter was featured swimming against a green background on a mandatory COVID-19 mobile app in Singapore. This was a government-mandated check-in system to store location information for contact tracing purposes (TNP, 2021). Compared to Pokémon Go, cuteness was more subtly integrated with other everyday information (e.g., personal information, vaccination status, etc.). These examples underscore that cute aesthetics can be deployed in mobile apps for everyday life. However, overusing cuteness in specific contexts (e.g., professional settings) is distracting and can even be interpreted as condescending by some users (Rokey, 2019). Thus, there is a need to understand how users feel about cute aesthetics to minimize any negative feelings.

We propose that cute aesthetics play essential roles in mobile apps for everyday life because they can grab attention, evoke affective responses, and make information that is typically seen as complex and tedious more palatable. Here, we adapt from prior works and argue that mobile apps for everyday life can be classified as a type of mundane software that is beyond the computer and is integrated into a vast range of everyday routines and activity (Morris & Elkins, 2015). This software can be affective, and enjoyable, even if it is for everyday mundane tasks (e.g. sharing of daily information). However, despite the pervasiveness of such apps, it is unclear how users respond to and feel about cute aesthetics on mobile apps in our everyday life.

To fill this gap, this study seeks to understand how adult users respond to cute aesthetics by drawing from the theoretical concepts of PA and NA (Watson et al., 1988) as well as understanding their underlying effects on VA (Lavie & Tractinsky, 2004). Briefly, PA refers to one's propensity to experience positive emotions, while NA involves experiencing negative emotions. We propose that cute aesthetics may elicit a combination of PA and NA, thus influencing perceived VA. Three sets of interfaces with varying levels of cuteness (i.e., low cuteness, mid cuteness and high cuteness) were designed for a mobile community crowdsourcing prototype for everyday use. The crowdsourcing app facilitated everyday information exchange among users in a community (Lee et al., 2017, 2020).

The following section delves deeper into the discussion on VA, affect, and cute aesthetics. The methodology section describes the data collection and evaluation processes. The results section presents the outcome of the evaluation while the discussion section reflects on the findings and provides the implications together with the limitations of this work.

RELATED WORK

Visual Aesthetics and Affect

Conceptually, aesthetics is abstract and subjective and is related to the notion of "beauty", "visual design" and "appeal" (Zen & Vanderdonckt, 2016). Hence, evaluating aesthetics is a subjective and complex process. In this study, VA refers to the beauty or the pleasing appearance of user interfaces of an interactive software system (Robins & Holmes, 2008). Along this line of reasoning, most users tend to believe that objects or products that look better work better ('attractive things work better'), even if they may not be more effective or efficient. On the same token, it is also likely that an aesthetically pleasing

design of an interface can elicit a positive emotional response that makes users more tolerant of the application's minor usability issues (Tractinsky et al., 2000). Prior works have shown that VA is an integral part of a positive user experience and engagement (Jvlhä & Hamari, 2021; Salimun et al., 2010; Tractinsky et al., 2000). Therefore, it is unsurprising that VA has an impact on usability, user satisfaction, and preferences (Tractinsky, 2013). Collectively, prior works indicate that aesthetics appeal to the visceral level of emotions by invoking PA such as pleasure and comfort. While research on VA of Websites or desktop systems has generated notable findings, relatively little research has addressed the VA of mobile apps, especially regarding apps in our everyday life. Such apps are typically different from Websites and desktop applications and hence warrant a separate investigation.

Users' evaluation of cute aesthetics involves assessing positive and negative feelings (i.e., affect). PA and NA are two independent dimensions. PA reflects the degree users experience positive emotional states such as enthusiasm, interest, and pride, while NA denotes the extent that the users experience negative emotional states such as irritability and distress (Watson et al., 1988). Thus, PA is likely related to positive user experience, which is vital for successful human-computer interaction, as the user may abandon an interface or an app due to a negative experience (e.g., when they are frustrated) (Lazar et al., 2006). In this study, we deem that cute aesthetics likely evoke feelings and emotions that may influence how users perceive the aesthetics of mobile apps and their subsequent actions.

Cute Aesthetics

Cute aesthetics is related to the stream of research known as Cuteness Engineering, where cuteness is defined as "a characteristic of a product, person, thing, or context that makes it appealing, charming, funny, desirable, often endearing, memorable, and/or (usually) non-threatening" (Marcus et al., 2017, p. 8). Applying this notion in this study, cute aesthetics in an app for everyday use means that it appeals to users who appreciate cuteness and derive a pleasurable experience with it. Notably, research in cute aesthetics design is a relatively new phenomenon, but the increasing interest in cute aesthetics signals the need to take it seriously and examine it in greater depth (Dale et al., 2016).

At its core, the cuteness in cute aesthetics is a social engagement response that can evoke engagement or affiliative motives (Sherman & Haidt, 2011). In the domain of human-computer interaction, it was reported that the use of cute avatars could significantly reduce users' perceived severity of software errors (Cheng et al., 2020). It was also found that cuteness appeals can be used to promote prosocial and sustainable behavior (T. Wang et al., 2017). Additionally, the perception of cute aesthetics may depend on context and demographic profiles. For instance, cute aesthetic designs were found

to appeal to younger females (Lee et al., 2021). However, cute aesthetics may result in negative experiences, as it was reported that inappropriate use of cute aesthetics could impede information comprehension (Medley et al., 2020).

Consequently, our research aimed to analyze the relationship between cute aesthetics (i.e., low, mid, and high) and VA, and the mediating effect of affect (both PA and NA). Thus, we put forward the research question: How do positive affect and negative affect mediate the relationship between cute aesthetics on visual aesthetics?

METHODOLOGY

Research Design

A total of 166 participants were recruited to take part in this study. The participants ranged in age from 21 to 65, with a mean age of 27.17. Most participants were female (62.65%), and 37.35% were male. Participants received \$5 SGD in compensation for their participation. All participation was voluntary and anonymous.

Participants were invited to attend a presentation where they were briefed about the purpose of our mobile app prototype. They were informed that its purpose was to allow users in a community to share and retrieve comments about everyday happenings in their community. Examples of exchanges include everyday information seeking and sharing, as well as seeking community volunteers or helping other community members. After the presentation, participants were presented with three sets of mobile interface designs with varying levels of cute aesthetics. The designs incorporated different cuteness elements, and participants were asked to rate the designs and to provide three words to describe each interface. Participants also provided explanations for their responses. The main theme of ID 1 is the use of cute typefaces with pastel colors, while the idea for ID 2 is on cute shapes (round edges) with bright colors. Finally, cute icons with warm color tones were the focus of ID 3 (refer to Figures 1, 2, and 3).

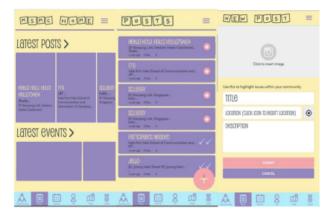


Figure 1. Interface Design 1 (ID 1)



Figure 2. Interface Design 2 (ID 2)



Figure 3. Interface Design 3 (ID 3)

Measurements

Participants were asked to complete a survey with questions from the Positive and Negative Affect Scale (PANAS) and Perceived Aesthetics scales (PAS). The PANAS includes 20 items, 10 of which refer to PA and the other 10 to NA, distributed in two Likert scales from 1 to 3 (Watson et al., 1988). The PAS was adapted to measure VA of all the IDs (Lavie & Tractinsky, 2004).

For ID 1, the value of α was 0.90 for PA, 0.88 for NA and 0.87 for VA; for ID 2, the value of α was 0.91 for PA, 0.94 for NA and 0.88 for VA; and the value of α was 0.89 for PA, 0.92 for NA and 0.89 for VA for ID 3.

Perceived cuteness was measured using a 3-item scale. We ranked the cuteness level of the three IDs (low cuteness, mid and high cuteness) based on the score of perceived cuteness. Participants were also asked to indicate their preferred ID for usage and their reasons.

We utilized regression analysis to examine the relationship between PA and NA on VA. Three regression models were conducted for the three IDs. We also

conducted a content analysis to analyze participants' responses to the interfaces. In the survey, participants are asked to use three words to describe the interfaces. Their words are classified into three categories: (1) positive (e.g., warm, awesome), (2) negative (e.g., ugly, messy), and (3) neutral descriptions (e.g., purple, round). Two coders majoring in the field of Information Studies were recruited to classify the words. The value of Cohen's Kappa is 0.80 for ID 1, 0.84 for ID 2 and 0.81 for ID 3.

RESULTS

General Evaluation

Table 1 shows the preferred IDs indicated by the participants for usage and their perceived cuteness scores for all the three designs. Interestingly, ID 2 is the most preferred followed by IDs 3 and 1, although the cuteness score is the highest for ID 3 followed by IDs 2 and 1. Participant 2 explained that "The colours used in design 2 were soft and cute, and they complemented each other well. The rounded edges made the interface look friendly and cute as well" and participant 9 confirmed that "Design 3 is the cutest simply because there were more usage of cute icons versus designs 1 and 2.".

	Interface Use	Cuteness Score
	Count (%)	Mean (s.d.)
ID 1: Low Cuteness	9 (5.42)	1.6 (0.76)
ID 2: Mid Cuteness	71 (42.77)	1.87 (0.69)
ID 3: High Cuteness	67 (40.4)	2.51(0.72)
None of the above	19 (11.45)	

Table 1. General Evaluation

Evaluation of Positive and Negative Affect

Figures 4 and 5 show the PA and NA associated with the three interfaces. ID 1 has fairly consistent PA while IDs 2 and 3 were rated the highest for "Interested". In terms of NA, ID 2 and 3 were fairly consistent across the NA. The highest score for NA is "irritable" for ID 1. Overall, more intense PA than NA was found for all the three interfaces with cute aesthetics.

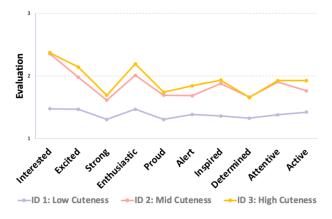


Figure 4. PA associated with the Interface Designs.

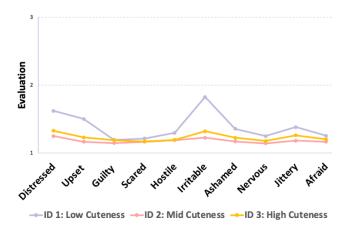


Figure 5. NA associated with the Interface Designs.

Regression Results

Before conducting regression analyses, all variables were normalized. To ensure the absence of multicollinearity among all variables, we examine the Variance Inflation Factor (VIF). We found that VIF of all variables ranged from 1 to 1.10, indicating the absence of multicollinearity (Pituch & Stevens, 2016). The results from the regression analyses are reported in Tables 2 to 4.

Independent Variables	standardized beta	t-values
Positive Affect (PA)	0.70	13.20***
Negative Affect (NA)	-0.33	-6.26***
Adjust R2	0.54	
R	0.74	
R2	0.55	

^{***} p < 0.001; Dependent variable = VA

Table 2. Results for ID 1: Low Cuteness (N = 166)

Independent Variables	standardized beta	t-values
Positive Affect (PA)	0.71	11.76***
Negative Affect (NA)	-0.19	-3.19**
Adjust R2	0.45	
R	0.68	
R2	0.46	

^{***} p < 0.001, **p < 0.01; Dependent variable = VA

Table 3. Results for ID 2: Mid Cuteness (N = 166)

Independent Variables	standardized beta	
Positive Affect (PA)	0.61	10.55***
Negative Affect (NA)	-0.28	-4.73***
Adjust R2	0.44	
R	0.67	
R2	0.45	

*** p < 0.001; Dependent variable = VA

Table 4. Results for ID 3: High Cuteness (N = 166)

Results shown in Table 2 indicate that PA and NA accounted for 55% variances of VA for the interface with low cuteness. With regards to interfaces with mid cuteness and high cuteness, PA and NA respectively accounted for 46% and 45% of the variances of VA (refer to Tables 3 and 4).

Regardless of the level of cuteness of the interfaces, PA had significant positive effects on VA (p < 0.001), while NA had significant negative effects on VA (p < 0.01). With regards to the strength of association, the association between PA and VA was stronger than that between NA and VA. Thus, PA is a stronger predictor for VA for the use of cute aesthetics on mobile applications.

Results for Content Analysis

We content analyzed the adjectives participants used to describe the three IDs to complement our quantitative finding. We coded for positive, negative, and neutral responses based on the adjectives provided to derive a more insightful understanding of the participants' perceptions. The responses indicated that participants considered many factors including individual preferences (e.g., colors) and overall usability of the app in their evaluation. Results (refer to Tables 5 to 7) indicate that more positive adjectives were associated with mid and high cuteness (i.e., ID 2 and 3) than low cuteness.

Descriptions	Examples	Counts (%)
Positive	Neat, nice, cool	39 (23.49%)
Negative	Boring, ugly, sad	112 (67.47%)
Neutral	Basic, round, purple	15 (9.04%)
Total		166

Table 5. Content Analysis Results for ID 1: Low Cuteness.

Descriptions	Examples	Counts (%)
Positive	Sweet, pretty, cheerful	145 (87.35%)
Negative	Cluttered, imbalanced, eye-sore	10 (6.02%)
Neutral	Pink, girly, feminine	11 (6.63%)
Total		166

Table 6. Content Analysis Results for ID 2: Mid Cuteness.

Descriptions	Examples	Counts (%)
Positive	Bright, fun, warm	129 (77.71%)
Negative	Messy, clustered, complicated	20 (12.05%)
Neutral	Bees, yellow, thematic	17 (10.24%)
Total		166

Table 7. Content Analysis Results for ID 3: High Cuteness.

DISCUSSION

The results of our exploratory work yielded the following findings. First, we found perception of cuteness does not directly translate into preference to use the app. Notably, ID 3 (high cuteness) had the highest cuteness score while ID 2 (mid cuteness) was the most preferred. Instead, participants cautioned that excessive cuteness might negate usage intention. One participant stated that "The bee motif of 3 is too cute and not professional enough." and another participant pointed out that "For an application related to volunteering, it will be better if the interface is more simple and clean.". This study underscores that cute aesthetics evoke affect, which has consequences. Examples shared by two participants on ID 2 include, "I think design 2 gives the warm vibes, which is in line with what volunteering means to me - to be warm to others" and "The rounded edges made the interface look friendly and cute as well". Importantly, app designers can leverage affect in their design but must exercise caution as excessive cuteness may have adverse effects.

Second, our findings indicate that PA and NA play essential roles in influencing the VA of cute aesthetics. We found that PA is primarily associated with "interested", "excited", and "enthusiastic" for mid and high cuteness, while NA is mainly related to "distressed" and "irritable" for low cuteness. Compared to NA, PA has a more substantial effect on users' perception of VA. Importantly, our results indicate that the influence of PA is more substantial for low and mid-cuteness. The reasons could be that the participants in the study considered the app for the community to be "serious" and "formal" and cute aesthetics needed to be aligned with the perceived seriousness of the app. Unlike apps for entertainment or gaming (e.g., Pokémon Go), participants felt that subtle use of cuteness is appropriate for a community app for everyday use. One participant stated that "I think interface design 2 is very unique, neat, the pink is not too bright, but yet it is cute, calm and pleasing. The others seem a bit more serious in terms of formatting or too cute or too bright that it makes it hard to use in a long term". Taken together, there is a need to balance cuteness in the interface aesthetics on everyday apps for the masses.

CONCLUSION

The contribution of this work is two-fold. First, it enhances our understanding of the relationships among VA, affect, and cute aesthetics. It sheds light on the consequences of integrating cute aesthetics on mobile apps in our everyday life and contributes to the literature on mobile app design (Goh et al., 2016). Second, it elicits users' perceptions of cute aesthetics on mobile apps by examining the nuances of cute aesthetics at varying levels

(i.e., low, mid and high). This will help define and conceptualize cute aesthetics for mobile apps across different domains. Specifically, our findings indicate that mid-cuteness with a calming color palette and rounded edges are relevant in the context of everyday life usage.

Our exploratory study shows that cute aesthetic design on mobile apps is a viable approach to appeal to the masses beyond advertising and entertainment. Findings reveal how users feel about cute aesthetics and how different cuteness elements can be blended appropriately to invoke affect. However, the limitations of this study should also be noted. First, the user evaluation was based on perceptions and not continuous usage. Prior works have indicated that long-term usage of applications will be required to understand sustained behavioral outcomes (Durga et al., 2014). Therefore, it is pertinent to conduct a longer-term study to examine users interacting with our cute aesthetic features and designs. Second, this study was conducted in Asia, and the profile of the participants might limit the generalizability of this study. Therefore, replicating this study in other countries outside Asia will be necessary. Nevertheless, the study advances knowledge on the relationships between PA, NA, VA, and cute aesthetics in mobile app designs for everyday life.

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