The Role of Color Contrast and Predominant Primary Color of Icons for Mobile Gaming Apps in Influencing User Reactions

Completed Research Paper

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Abstract

In the past years a huge market for mobile applications has evolved and it is to be expected that this market will considerably grow in the future. Within this market mobile gaming apps are the most important category. Mobile games have accounted for 30.9% of the mobile content market in the U.S. in 2015. Given this enormous potential of mobile gaming apps it is interesting that little is known about the crucial success factors for mobile games. In this paper we investigate the impact of the icon color contrast (analogous contrast vs. complementary contrast, and of the predominant primary icon color (yellow vs. red vs. blue) on user-related outcome variables. The results reveal that an analogous color contrast positively influences the users’ experienced emotions, attitude towards the icon, icon personality, and download intention and that these variables are not affected by the predominant primary color of the icon.

Keywords: Icon color contrast, predominant primary icon color, mobile gaming apps, emotion, attitude, download intention
Introduction

In line with consumers’ adoption of mobile devices such as tablet computers or smartphones, a huge market of applications (apps) for mobile devices has evolved. Overall, in 2014 more than 139 billion apps with a sales volume of more than $46 billion were downloaded worldwide and it is estimated that these numbers will grow up to 268 billion downloaded apps with a sales volume of about $76 billion in 2017 (eMarketer 2015). One of the most important categories of apps within this market are mobile games. For example, mobile games have accounted for 30.9% of the mobile content market in the U.S. in 2015 (eMarketer 2015) and worldwide this segment accounts for more than 41% of the market share and is envisaged to retain its dominating hold over the market due to the availability of low-cost smartphones and tablets with high-end specifications (eMarketer 2015).

Given this enormous potential and the expected growth of the market for mobile gaming apps the questions arise, how should mobile gaming apps be designed and which factors will trigger their success in the market. If a user visits an app store it is likely that one of the first elements of a mobile app that will get her/his visual attention will be the icon that pictorially represents the app. Such icons are designed by the game developer or the publisher with the aim to attract the focus of attention of the user when visiting, e.g., an app store. Hence, the icon of a mobile gaming app might fulfill similar functions as willingness to pay as well as elicit higher bid jumps in online auctions (Bagchi and Cheema 2013). Given this enormous potential and the expected growth of the market for mobile gaming apps the questions arise, how should mobile gaming apps be designed and which factors will trigger their success in the market. If a user visits an app store it is likely that one of the first elements of a mobile app that will get her/his visual attention will be the icon that pictorially represents the app. Such icons are designed by the game developer or the publisher with the aim to attract the focus of attention of the user when visiting, e.g., an app store. Hence, the icon of a mobile gaming app might fulfill similar functions as willingness to pay as well as elicit higher bid jumps in online auctions (Bagchi and Cheema 2013).

In the context of online user behavior, the findings of Lothia et al. (2003) show that color used in banner advertisements influences click-through-rates. The results of Nitse et al. (2004) imply that the colors used in online product presentations elicit specific expectations towards the presented products and if an online shop provider fails to meet these expectations, this will negatively influence users’ satisfaction as well as purchase behavior. Moreover, Bellizzi and Hite (1992) as well as Lichtlé (2007) have shown that color attracts consumers due to certain perceptual qualities, which influence, e.g., attitude towards a product. In this context, colors are often related to the perception and the evaluation of the aesthetic appeal of a product, a web site or an attitude object in general and might trigger users’ cognitive processes towards a presented object, e.g., in an online shop (Bonnardel et al. 2011; Coursaris and van Osch 2016; Deng et al. 2010). The aforementioned studies as well as research in the field of consumer psychology have mainly focused on the influence of specific color dimensions (hue, saturation, and lightness) on user responses. For example, with regard to the hue dimension, red was found to elicit a higher level of arousal compared to blue; interestingly, if products were presented in front of a blue-colored background they will be evaluated more positive than products presented in front of red-colored backgrounds (Bellizzi and Hite 1992) and red-colored background (compared to blue-colored backgrounds) increase the user’s willingness-to-pay as well as elicit higher bid jumps in online auctions (Bagchi and Cheema 2013). Gorn et al. (1997) found that a higher level of lightness led to relaxation, whereas a higher level of saturation led to excitement. Moreover, the background color of a web page influences perceived download quickness and has further consequences for user’s evaluations of the web site (Gorn et al. 2004). Based on these previously mentioned findings, we assume that the color information contained in an icon of a mobile gaming app will influence the users’ perceptions and evaluations and will also have an impact on the intention to download the mobile gaming app.

All of the previous mentioned studies focused on single colors or on single color dimensions, not color combinations, and thus did not consider the relationships between colors. However, most visual stimuli that consumers observe are rarely unicolored. Consequently, there is a lack of research that investigates the impact of color combinations and the resulting contrast (e.g., analogous or complementary) on consumer responses. Only a few studies have analyzed the impact of color combinations or color contrast on user responses (e.g., Noiwan and Norcio 2006). Deng et al. (2010) studied the impact of color combinations on users of the NIKEiD online shoe configurator. Their findings imply that most consumers prefer combinations of colors that either matched or were closely related to each other (i.e., combinations of similar colors), but some consumers chose a contrastive color to highlight some components of the shoe. Overall, the majority of the few existing studies have shown that -- in general -- consumers tend to
prefer a combination of similar colors – an analogous contrast – because such combinations are perceived as more congruent, more harmonious and aesthetically appealing compared to combinations that are more incongruent and result in a complementary contrast (e.g., Schloss and Palmer 2011). In this context, based on the basic assumptions of congruence (congruity) theory (Osgood and Tannenbaum 1955), research agrees that congruent stimuli, e.g., combinations of specific elements within advertisements or combinations of similar colors, should cause a more positive perception and evaluation of an object than incongruent stimuli (Till and Busler 2000). In the context of online user behavior, van Rompay et al. (2010) have investigated the impact of picture-text congruity on the evaluation of an online hotel booking site. The findings of this study show that picture-text congruence has a positive impact on the attitude towards a product due to an increase in the user’s processing fluency of the presented information. Furthermore, the findings of Moore et al. (2005) imply that congruity between banner advertising and web site context positively influence users’ attitudes towards the advertising and that this effect is further influenced by banner color as well as banner color-text color contrast. With regard to the previous discussion, we propose that an analogous color contrast – combinations of similar, congruent colors – in an icon of a mobile gaming app will result in a more positive perceptions and evaluations of the related game and will further have a positive impact on, e.g., the users’ experienced emotion, attitude, as well as download intention. With regard to the influence of color on user behavior in general, we investigate the impact of the predominating primary color of an icon of a mobile gaming app on the user responses under study.

Hence, the present study contributes to knowledge in the field of human behavior in IS, especially in the context of mobile gaming apps in numerous ways: We transfer the framework for the investigation of the mediating impact of experienced emotions on user-related outcome variables proposed by Holbrook and Batra (1987) to the context of icons for mobile gaming apps and systematically manipulate the predictor variables icon color contrast (in terms of a complementary contrast vs. an analogous contrast) and the predominating primary icon color (in terms of primary colors yellow vs. red vs. blue) in an online experiment. More precisely, we expand the findings of previous studies in the field of human behavior and IS by investigating 1) how icon color contrast influences users’ experienced emotions, their attitude towards the icon, the icon’s personality, and download intention and 2) how the predominating primary color of the icon influences these user-related outcome variables. Based on Holbrook and Batra (1987), we 3) analyze the mediating impact of emotion on the relationship between icon color contrast and icon color on attitude, personality perceptions, and download intention.

Theoretical Background and Hypotheses Development

With our study we address the impact of icon color contrast and the moderating impact of the predominating primary icon color of mobile gaming apps on several user-related outcome variables, namely, emotion, attitude towards the app, brand/game personality perceptions, and download intention. We transfer and expand the framework for assessing the role of emotions as mediators of consumer responses from the field of research on advertising effectiveness proposed by Holbrook and Batra (1987) to the context of mobile gaming apps. In the context of innovation and new product development, Noble and Kumar (2010) also suggested to study the mediating impact of emotional value between different design levers of a product (e.g., visual aesthetics, color, graphics) and consumer responses. Moreover, by transferring the basic assumptions of congruence (congruity) theory (Osgood and Tannenbaum 1955) to the context of our study, we assume that individuals positively value harmony of combinations of objects in general or of specific elements of an object (e.g., within an advertisement) and this, in turn, should positively influence experienced emotion, attitude, personality perceptions, and download intention. For example, Shen and Chen (2007) showed that a high degree of congruence between a banner advertisement and the content of a website will result in more favorable attitudes towards the advertisement as opposed to banners incongruent with the website.

The assumption that congruence between different objects as well as between the elements within an object will have a positive impact on user responses is also supported by the “match up” hypothesis (Kamis 1990; Till and Busler 2000). This hypothesis implies that combinations of elements within an attitude object (e.g., an advertisement or an icon of a mobile gaming app) are more effective when there is a high degree of fit or congruence between the single elements. We therefore propose that an analogous color contrast in an icon of a mobile gaming app should be perceived as more congruent as well as
The Role of Icon Color Contrast in Influencing User Reactions

Harmonious and hence, lead to a more positive evaluation of the icon, compared to icons with complementary color contrasts. This implies that combinations of similar colors or an analogous color contrast in an icon of a mobile gaming app will trigger a more positive perception and evaluation of the icon, compared to combinations of dissimilar colors, which produce a complementary contrast. The proposed research model is presented in Figure 1.

![Figure 1. Research Model](image)

Icon color contrast and the predominant primary icon color act as the independent variable in our framework. In our experimental study icon color contrast is manipulated by different color combinations in an icon of a mobile gaming app (complementary contrast vs. analogous contrast). According to Itten (1973), an analogous color contrast is defined as a group of related or similar colors that are close to each other on the color wheel and a complementary contrast is understood as a combination of colors opposed to the other member of the pair on the color wheel, e.g., as green opposed to red or orange opposed to blue. Moreover, the findings of Moore et al. (2005) imply that the impact of color contrast on user-related outcome variables should further be influenced by the colors that create the contrast within an attitude object. This assumption is based on previous research on the impact of color on consumer evaluations and their behavior. Studies in that field have shown that users associate different colors with different meanings and hence, different colors should cause different effects on user evaluations of an attitude object, not only in online environments (Moore et al. 2005; Noiwan and Norcio 2006; Schloss et al. 2013).

To test the proposed impact of icon color, we investigate the impact of the predominating primary color (yellow vs. red vs. blue) within an icon of a mobile gaming app on the user-related outcome variables in the research model by manipulating the predominant primary icon color in the stimuli used in the online experiment respectively. In the context of our study, a color is defined as predominant if it exceeds a critical threshold of 50% on average in relation to the total number of pixels of the icon (300 x 300 pixels). According to Holbrook and Batra (1987) the impact of icon color contrast on attitude formation and the further outcome variables should be mediated by emotional responses of the consumer. In the following, a discussion of the constructs under investigation is presented and hypotheses are derived and tested in an online experiment.

**Impact of Icon Color Contrast and Icon Color on Emotion**

Research in the field of human behavior and IS have shown that a user’s experienced emotions when interacting with a stimulus in an online environment has an influence on evaluation processes and also impacts satisfaction with the product (Sautter et al. 2004; Thüring and Mahlke 2007; Zhou et al. 2007). For example, the findings of Garrett (2003) and Rosen and Purinton (2004) have shown that the visual design of a website, which is – beside others – expressed through colors, will have an impact on the user’s emotional responses. In this context, appraisal theory suggests that individuals first cognitively appraise situations causing the formation of emotions (Lazarus 1984). Cognitive appraisal is based on the evaluation of a specific situation or a specific object and is further influenced by the degree of congruity of different elements within the stimulus. For example, Éthier et al. (2008) have shown that design features of a web interface will have an effect on the cognitive appraisal of a user and this, in turn, will influence...
The Role of Icon Color Contrast in Influencing User Reactions

the user’s experienced emotions when interacting with the website. In the context of our study, the cognitive process triggered by the extent of color congruity, which results in different color contrasts, reflects the cognitive appraisal. If similar colors are combined and match, thus resulting in an analogous contrast of an icon of a mobile gaming app, this should lead to more positive emotional experiences, compared to a complementary contrast. In line with previous research on the impact of color on consumer behavior, Gorn et al. (1997) as well as Ou et al. (2004) provide empirical evidence for the impact of colors on consumer emotional responses and their findings indicate that color combinations also affect emotions. Analogous color contrasts should in general be perceived and evaluated as more harmonious and pleasing from the user perspective compared to complementary contrasts and therefore, should lead to more positive emotional responses (Palmer and Griscom 2013; Schloss and Palmer 2011). We thus assume that an analogous color contrast in an icon of a mobile gaming app has a positive impact on the consumers’ experienced emotions while being exposed to the icon.

Moreover, the findings of previous research in the field of consumer behavior indicate an impact of colors on the user’s experienced emotions when being exposed to an icon of a mobile gaming app in an online environment. Based on the Pleasure-Arousal-Dominance (PAD) emotion model (Mehrabian and Russell 1974), Valdez and Mehrabian (1994) have shown that in general color and its attributes have an influence on all PAD-dimensions but will cause different effects. For example, the primary color blue is perceived as more pleasant compared to the primary color yellow, but yellow will positively impact arousal and is also associated with a stronger effect on the dominance dimension. Furthermore, different colors are associated with different meanings from the perspective of consumers and influence their perceptions and evaluations of products, advertisements or websites in different ways (Cyr et al. 2009; Gorn et al. 1997; Labrecque and Milne 2012). Hence, beside the impact of the icon color contrast, we further propose that predominating primary color of an icon of a mobile gaming app has an influence on the users’ experienced emotions when being exposed to an icon in an online environment. Based on the previous discussion, we hypothesize:

H1a: An analogous color contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) affect the users’ experienced emotions.

H1b: The predominant primary color in the icon of a mobile gaming app will influence the users’ experienced emotions.

Impact of Icon Color Contrast and Icon Color on the Attitude towards the Icon

If users are exposed to a product or an icon of a mobile gaming app in an online environment, the way the product stimulus is presented affects their perception as well as their evaluation, which impacts the attitude towards the product (Hassanein and Head 2007). In general, the results of Mazaheri et al. (2012) indicate that user perceptions of different atmospheric cues (e.g., color and its combinations) of a website will impact attitude formation. The findings of Loken and Ward (1990) imply that a high degree of congruence between the colors in an analogous contrast will positively influence attitude formation towards a specific object. Consumers’ evaluate congruent objects more favorable because they might meet their expectations as well as preferences (Bottomley and Doyle 2006; Moore et al. 2005). Furthermore, the findings of previous studies indicate that an analogous contrast in an icon of a mobile gaming app should be evaluated as more aesthetically pleasing and result in a more favorable attitude towards the game, compared to a complementary contrast (Gorn et al. 1997; Gorn et al. 2004; Schloss and Palmer 2011). Moreover, one might conclude that the color combinations in an icon of a mobile gaming app are likely to positively affect especially the hedonic attitudinal aspects.

Moreover, Meyers-Levy and Peracchio (1995) showed that different colors used in an e.g., advertisement differ in their degree of persuasiveness on consumer evaluations of the stimulus that is presented in an advertisement, which in turn is reflected in differences regarding the consumers’ attitude towards the ad and the advertised product. In the context of user evaluations in online environments, the findings of Moore et al. (2005) and Noiwan and Norcio (2006) indicate similar effects of colors on user attitude formation. For example, the primary color red is often associated with excitement while the primary color blue triggers associations of competence in the minds of the users when being exposed to a stimulus, which should in turn be reflected in different effects on the hedonic and the utilitarian attitudinal dimensions (Labrecque and Milne 2012). Hence, we assume:
**H2a:** An analogous color contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) influence the users’ attitude towards the icon.

**H2b:** The predominant primary color in the icon of a mobile gaming app will influence the users’ attitude towards the icon.

**Impact of Icon Color Contrast and Icon Color on Icon Personality**

The findings of Labrecque and Milne (2012) show that colors have an influence on the consumers’ perceptions and evaluations of the personality of an attitude object (e.g., a brand logo) and hence, the consumers’ expectations towards a branded product. Colors as well as color combinations carry an intrinsic meaning that might become central to the perception and evaluation of a brand or – in the context of the present study – with regard to the perception and evaluation of an icon of a mobile gaming app and hence, of the game itself (Bottomley and Doyle 2006). According to Aaker (1997, p. 347), brand personality is defined as “the set of human characteristics associated with a brand”. Overall, as combinations of similar color resulting in an analogous contrast are expected to be perceived as more harmonious and therefore, will lead to more positive evaluations of a stimulus (Moore et al. 2005; Schloss and Palmer 2011), we assume that an analogous contrast will positively influence consumers’ perceptions and evaluations of the game’s personality.

However, the findings of Labrecque and Milne (2012) demonstrate how single colors influence consumer perceptions and evaluations, specifically the perception and evaluation of the personality of a product or a brand. Previous research on color associations (e.g., Bellizi and Hite 1992; Nitse et al. 2004) implies that if a user is exposed to a stimulus, e.g., an icon of a mobile gaming app, the referential meaning of the (predominant) color activates relevant associations, which should have an impact on the perception and the evaluation of the icon. Thus, we hypothesize:

**H3a:** An analogous color contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) influence icon personality.

**H3b:** The predominant primary color in the icon of a mobile gaming app will influence icon personality.

**Impact of Icon Color Contrast and Icon Color on Download Intention**

If combinations of similar colors lead to more positive emotional responses, they positively influence the attitude towards a mobile gaming app and further have a positive impact on the perception and evaluation of the game’s personality. As a consequence, this should also have an impact on purchase intention or – in the context of our study – the download intention (Labrecque and Milne 2012). Following the logic of the present study, analogous contrasts in an icon of a mobile gaming app should lead to a higher download intention.

Prior research has established that colors influence the perception and evaluation of an attitude object and hence, also alter purchase intentions (Babin et al. 2003; Bellizi and Hite 1992). The findings of Lee and Rao (2010) imply that color acts as an important influencing factor in online environments and has an impact on users’ store choice as well as on their intention to purchase a product from a specific online shop. Furthermore, Bagchi and Cheema (2013) have shown that the background color of a website will have an impact on the users’ intention to purchase a product in an online environment. With regard to previous mentioned studies and following the logic of the present study, perceptions and evaluations of an icon of a mobile gaming app induced by the predominant primary color of the icon should also have an influence on the users’ download intention. Therefore, we assume:

**H4a:** An analogous color contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) influence download intention.

**H4b:** The predominant primary color in the icon of a mobile gaming app will influence download intention.
Mediating Impact of Emotion

Holbrook and Batra (1987) have investigated the mediating impact of emotion on the relationship between stimulus and response. Their findings show that emotional responses act as an important mediator on e.g., the impact of advertisements on the attitude towards the ad and/or on the attitude towards the brand. Lu et al. (2012) have investigated the effects of negative emotions on user behavior. Their findings show that experienced negative emotions are an important mediator between dissatisfaction and repurchase intention in the context of online shopping. If users experience positive emotions while being exposed to the icon of a mobile gaming app, this is likely to result in a positive impact on the effectiveness of the presentation of the icon or the game, e.g., the evaluation of game personality as well as the intention to download the app. Looking at level of interactive online product presentation features, Fiore et al. (2005) found that experiential value and utilitarian value influenced consumer response variables (attitude, purchase intention). Emotional pleasure and arousal have been found to explain the linkage between store environment and user behavior in online as well as offline environments (Eroglu et al. 2001; Menon and Kahn 2002). Eroglu et al. (2003) showed that pleasure and arousal linked to specific design elements in online environments positively affect users’ attitudes and behavioral outcome variables (see also Mazaheri et al. 2012). Accordingly, Menon and Kahn (2002) found that characteristics of products and web sites significantly influence pleasure and arousal, which predict purchase behavior. Thus, we hypothesize:

H5: The experienced emotions mediate the hypothesized relationships between a) the icon color contrast and b) the predominant primary icon color and 1) the attitude towards the icon, 2) the evaluation of the perceived icon personality, and 3) download intention.

Empirical Study: Method and Procedure

Stimuli Design

We tested our hypotheses by using a 2X3 between subject design and manipulated the factors icon color contrast (factor 1: analogous contrast vs. complementary contrast) and predominant primary icon color (factor 2: yellow vs. red vs. blue) of a mobile gaming app in an online experiment. We selected icons of mobile gaming apps as product stimulus because this category is currently one of the most important categories in the app market and this category is expected to grow further in the next years (eMarketer 2015). The manipulation of the icon color contrast was based on the previously introduced definition of a complementary contrast and an analogous contrast by Itten (1973). Furthermore, the manipulation of the second experimental factor was based on the findings of Papachristos et al. (2005), which have shown in the context of web site design that mainly primary colors could be clearly distinguished and identified from the perspective of the user compared to their secondary and especially tertiary mixtures. Furthermore, their results imply that especially the predominant primary color of a stimulus should have a strong impact on user responses.

We selected two icons of existing mobile gaming apps (one displaying a humanoid character and one displaying a sword). The visual style of both icons is very comic like, which is a typical representation of games in app stores. Hence, with our proceeding, we ensure that the icons used in the experimental study equal common icon designs of mobile gaming apps. This proceeding enabled us to control for potential existing confounding effects of specific design elements of an icon, e.g. symbols or familiar characters, and hence, to investigate, whether the hypothesized relationships were primarily triggered by the experimental factors in general. To minimize a potential systematic bias related to, e.g., game awareness, we only selected icons of mobile games that were shortly introduced to the market before we started with the study. Moreover, to minimize a distortion of the results due to possible distraction effects, we did not provide any further information related to the icon of the mobile gaming app, e.g., name of the game, game principle, user reviews or price (Bellizzi and Hite 1992). For the manipulation of the icon color contrast and the predominant primary icon color, we used Adobe Color CC. Adobe Color CC is an application that supports users to try out, create and save various color schemes (e.g., analogous or complementary). The application enables users to manipulate the colors present in an icon as well as the icon color contrast. Using this application, we created six different icons for each of the two mobile gaming apps according to our experimental design. Hence, for each the two icons one version following an
The Role of Icon Color Contrast in Influencing User Reactions

analogous contrast and one version following a complementary contrast were created. The second factor – predominant primary icon color – was operationalized by manipulating the predominant primary color within the icons according to the primary colors yellow, red and blue. In the context of our study, a color is defined as predominant if it exceeds a critical threshold of 50% on average in relation to the total number of pixels of the icon (300 x 300 pixels). An example of the manipulation of one of the two icons of the factorial design is summarized in Figure 2.

<table>
<thead>
<tr>
<th>Icon Color Contrast</th>
<th>yellow</th>
<th>red</th>
<th>blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogous Contrast</td>
<td><img src="image.png" alt="Icon 1" /></td>
<td><img src="image.png" alt="Icon 2" /></td>
<td><img src="image.png" alt="Icon 3" /></td>
</tr>
<tr>
<td>Complementary Contrast</td>
<td><img src="image.png" alt="Icon 4" /></td>
<td><img src="image.png" alt="Icon 5" /></td>
<td><img src="image.png" alt="Icon 6" /></td>
</tr>
</tbody>
</table>

**Figure 2: Experimental Design (Example)**

**Measures and Procedure**

The participants were randomly assigned to one of the six experimental conditions of the online experiment. Before the participants were exposed to the icon of a mobile gaming app, they had to answer a questionnaire about whether they own a mobile device, e.g., a smartphone or a tablet, which enables them to download and install mobile apps and whether they had downloaded and installed mobile apps from an app store in general each with a single-item on a nominal scale (yes/no). Furthermore, they had to answer questions regarding the overall number of apps they have installed, the number of mobile gaming apps, and their willingness to pay for mobile gaming apps in general. Moreover, we measured the participants’ involvement towards mobile apps and their attitude towards mobile apps in general. The involvement towards mobile apps was operationalized according to the semantic differential introduced by Wilcox et al. (2011) on a seven-point scale (3 items, e.g., 1 = not interesting at all – 7 = very interesting, Cronbach’s α = .96). The participants' attitude towards mobile apps was measured by applying the scale of Voss et al. (2003). This proceeding enabled us to differentiate between the utilitarian (5 items, e.g., 1 = unnecessary – 7 = necessary, Cronbach’s α = .89) as well as the hedonic attitudinal dimension (5 items; e.g., = unenjoyable – 7 = enjoyable, Cronbach’s α = .94). We measured the participants’ involvement towards mobile gaming again using the approach of Wilcox et al. (2011) on a seven-point scale (Cronbach’s α = .91). Moreover, the approach of Voss et al. (2003) was also used to operationalize the attitude towards mobile gaming (utilitarian dimension (5 items): Cronbach’s α = .85; hedonic dimension (5 items): Cronbach’s α = .92). Last but not least, the participants had to state whether they have a color vision defect (yes/no) and finally, they had to state if they have a preference for a specific color. All of the above mentioned constructs and variables were used as control variables in the data analysis. If a participant had a color vision defect, we thanked for her/his willingness to participate in the study. Moreover, such respondents were excluded from the data analysis.

After the participants finished the first part of the study, they were informed that in the following they would be exposed to one icon of a mobile gaming app and that they would have to answer questions about their feelings and thoughts with regard to the icon. The participants could inspect the icon as long as they liked, meaning that there were no time-restrictions given. This should have enabled the participants to get a satisfactory impression of the icon. Furthermore, this procedure was chosen to minimize a distortion of the results due to a systematic bias in the experimental design (Bailer et al. 1977). Then, they had to fill out a second questionnaire that included questions about the graphic design of the icon, the predominant primary icon color, their evaluation of the harmony as well as their evaluation of the aesthetic of the icon design, if they were aware of the icon of the mobile gaming app, their emotions, their attitude towards the
The Role of Icon Color Contrast in Influencing User Reactions

As we were mainly interested in the impact of the icon color contrast and in the influence of the predominant primary icon color in general on the constructs under study within the experimental conditions, the participants’ responses were mean aggregated and the aggregated measures were used as dependent variables in the data analysis. As already mentioned, this proceeding enabled us to control for potential confounding effects and to further investigate, whether the hypothesized relationships were primarily triggered by experimental factors in general and not by specific design elements of the icon, e.g., symbols, text or familiar characters. Before the data was aggregated, we tested for differences of the participants’ responses between the different icons within the experimental conditions. The results of this analysis revealed no significant differences with regard to participants’ response to the dependent variables. Therefore, the findings reported in the following include both icons of the mobile gaming apps. Moreover, interaction effects between icon color contrast and predominant primary icon color and the participants’ emotions, attitude, personality perceptions, and their download intention could be expected. Hence, we further exploratory investigate the impact of the interaction between icon color contrast and predominant primary icon color in the data analysis.

Manipulation Check

Transferring the assumptions as well as the implications of congruence (congruity) theory (Osgood and Tannenbaum 1955) to the context of icon of mobile gaming apps, an analogous contrast in an icon of a mobile gaming app should be perceived as more harmonious and more aesthetically appealing compared to a complementary contrast. According to Schloss and Palmer (2011) the perception of harmony should mainly be induced by the combinations of similar, congruent colors on the color wheel and not necessarily by the presence of single colors. Hence, we used the participants’ evaluations of perceived congruency, harmony as well as their evaluation of the aesthetic of the icons as manipulation check for our experimental design. According to Perdue and Summers (1986), ANOVA tests were conducted to check whether the intended manipulation of the icon color contrast, in terms of an analogous contrast vs. a complementary contrast, was successful. As expected, the results indicate that an analogous contrast in an icon of a mobile gaming app was evaluated as more congruent, more harmonious as well as more aesthetically appealing, compared to a complementary color contrast in the icons of the two mobile gaming apps (harmony: M_{analogous} = 5.32 (1.3), M_{complementary} = 4.14 (1.4), F (1,165) = 5.362, p < .01; aesthetic: M_{analogous} = 5.44 (1.2), M_{complementary} = 4.47 (1.4); F (1,165) = 10.842, p < .001, but not affected by the predominant primary color (aesthetic: M_{yellow} = 3.98 (1.5), M_{red} = 4.15 (1.4), M_{blue} = 4.08 (1.6), F (2,165) = 0.193, n.s.; harmony: M_{yellow} = 4.83 (1.3), M_{red} = 4.78 (1.4), M_{blue} = 4.91 (1.4), F (2,165) = 0.984, n.s.). The ANOVA tests with perceived harmony and aesthetic as dependent variables show no significant
interaction effect between the experimental factors. Moreover, the answers of the participants with regard to the graphic design as well as with regard to the predominant primary icon color of the icon were also used to control for a successful manipulation. About 96% provided correct answers regarding the graphic design as well as the predominant icon color and we identified no significant differences between the experimental conditions. Overall, the findings above provide empirical evidence for a successful manipulation due to our experimental design.

Subjects

The participants of our study were recruited in Germany under the pretense that they were needed for a study on the subject “Mobile Apps and User Behavior” by using e-mails and postings on online social networking sites. Overall, the answers of N = 172 participants could be used for the hypothesis testing. These participants reported no color vision defect and completed both questionnaires (women: 55.6%, M\text{age} = 27.02 years, SD = 9.0). 68.2% of the participants were students and 29.9% were employed. Every participant in our study stated to own at least one mobile device (e.g., a tablet computer or a smartphone), which offers the functionality to access an online app store as well as to download and run mobile apps. The average number of mobile apps the participants had installed on their mobile devices was M = 24.35 (SD = 21.16). This relatively high average number of mobile apps results from typical basic pre-installed applications like internet-browsers, messengers and utility programs on mobile devices. Moreover, on an average the participants stated that they had downloaded and installed M = 4.52 (SD = 8.43) mobile gaming apps on their mobile device. Interestingly, only 26.2% of the participants were willing to pay for a mobile gaming app in general (M = 4.02 (SD = 10.3) Euros). Involvement towards mobile apps in general was M = 3.65 (SD = 1.7) and the involvement towards mobile gaming apps was M = 5.32 (SD = 1.2). With regard to the attitudinal measures, the evaluation of utilitarian dimension of the attitude towards mobile apps was M = 3.58 (SD = 1.8) and the hedonic dimension was evaluated with M = 4.29 (SD = 1.7). The participants’ attitude towards mobile gaming was evaluated more positive, especially on the hedonic attitudinal dimension (utilitarian dimension: M = 3.89, SD = 1.4; hedonic dimension: M = 4.72, SD = 1.4).

As expected, the participants’ awareness of the icons selected was considerably low (M = 2.1, SD = 1.2) and did not significantly differ between the two icons selected for our experimental study. Moreover, we obtained no significant differences between the six experimental conditions with regard to the previous mentioned variables. Overall, the participants were nearly equally distributed across the six experimental conditions and we obtained no significant differences with regard to age, gender, and a preference for a specific color between the experimental conditions.

Results

The Effects of Icon Color Contrast and Icon Color on Emotion

In hypothesis H1a and H1b, we assumed that the experienced emotions are affected by the color contrast and the predominant primary color of an icon of a mobile gaming app. The users’ experienced emotions should be positively influenced by an analogous contrast. Furthermore, the predominant primary color of an icon should have an impact on the experienced emotions as well. To test H1a and H1b, we conducted several ANOVAs with the emotional dimensions pleasure, arousal, and dominance as dependent variables. Figure 1 summarizes the mean values for each emotional dimension in the experimental conditions.

The results of the ANOVA analyses show a significant main effect of the icon color contrast on each of the emotional dimensions. Pleasure, arousal, and dominance were positively affected by an analogous color contrast in an icon of a mobile gaming app (pleasure: M\text{analogous} = 4.30 (0.9), M\text{complementary} = 4.01 (0.9), F (1, 163) = 3.980, p < .05, \eta^2 = .023; arousal: M\text{analogous} = 4.07 (1.1), M\text{complementary} = 3.75 (1.1), F (1, 163) = 2.908, p < .1, \eta^2 = .018; dominance: M\text{analogous} = 4.48 (SD = 0.9), M\text{complementary} = 4.11 (1.1), F (1, 163) = 4.814, p < .05, \eta^2 = .029). Hence, we obtained empirical support for H1a. Interestingly, the findings did not show a significant main effect of the predominant primary icon color on the emotional dimensions (pleasure: F (2,163) = 0.685, n.s.; arousal: F (2,163) = 1.378, n.s.; dominance: F (2, 163) = 2.657, n.s.), not supporting H1b. Hence, one could conclude that combinations of colors in an icon of a mobile gaming app might hinder the impact of a single color on the users’ emotions, which were identified in previous studies (e.g., Valdez and Mehrabian 1994), when being exposed to a stimulus consisting of more than one color.
The Role of Icon Color Contrast in Influencing User Reactions

Moreover, the findings show no significant interaction effect between the experimental factors icon color contrast and predominant primary icon color on the emotional dimensions (pleasure: F (2,163) = 0.758, n.s.; arousal: F (2,163) = 0.455, n.s.; dominance: F (2,163) = 2.329, n.s.). Interestingly, in the complementary contrast condition, we identified a significant impact of predominant primary icon color on dominance (F (2,73) = 3.685, p < .05). If a complementary contrast is used, dominance is especially influenced when red is used as predominant primary icon color in an icon of a mobile gaming app.

The Effects of Icon Color Contrast and Icon Color on Attitude towards the Icon

In H2a and H2b, we proposed that the icon color contrast and the predominant primary icon color would influence the attitude towards the icon. According to our assumptions, an analogous contrast should lead to a more positive attitude towards the icon compared to a complementary contrast. Furthermore, the predominant primary icon color should influence the users’ attitude formation as well. The findings in Figure 2 show that specifically the hedonic attitudinal dimension was influenced by the icon color contrast, while the utilitarian dimension was not affected. If color combinations within an icon of a mobile gaming app result in an analogous contrast, this has a positive impact on hedonic attitudinal aspects (M\textsubscript{analogous} = 4.31 (1.3), M\textsubscript{complementary} = 3.82 (1.4), F (1,168) = 5.155, p < .05, \(\eta^2 = .031\)). Overall, this finding partially supports H3a.

Again and contrary to our expectations, we obtained no empirical evidence for the impact of the predominant primary icon color on attitude (hedonic attitudinal dimension: F (2,168) = 0.475, n.s.;
The Role of Icon Color Contrast in Influencing User Reactions

utilitarian attitudinal dimension: $F(2,168) = 0.234$, n.s.) not supporting H2b. Moreover, no significant interaction effect between color contrast and icon color on attitude could be identified (hedonic attitudinal dimension: $F(2,168) = 0.170$, n.s.; utilitarian attitudinal dimension: $F(2,168) = 0.591$, n.s.).

Note: Attitude towards the Icon was measured according to Voss et al. (2003) using a seven-point semantic differential (e.g., 1 = unnecessary – 7 = necessary) A = Mean values (SD in brackets) of the hedonic attitudinal dimension (analogous icon color contrast vs. complementary icon color contrast); B = Mean values (SD in brackets) of the utilitarian attitudinal dimension (analogous icon color contrast vs. complementary icon color contrast).

The Effects of Icon Color Contrast and Icon Color on Icon Personality

With regard to perception and evaluations of personality, we surmised in hypothesis H3a that an analogous contrast would positively influence personality perception and evaluations towards an icon of a mobile gaming app. In H3b we assumed that the predominant primary color present in an icon should also have an influence on personality perceptions. Furthermore, we also controlled for a potentially existing interaction effect. The mean values of the user responses to the different personality dimensions are presented in Figure 3. Overall, the findings show that the personality dimensions sincerity, excitement, competence, and sophistication are influenced by the icon color contrast.

As expected, an analogous contrast in an icon of mobile gaming app positively influences these personality dimensions, while ruggedness was not affected (sincerity: $M_{analogous} = 4.29$ (1.1), $M_{complementary} = 3.81$ (1.3), $F(1,168) = 6.902$, $p < .01$, $\eta^2 = .041$; excitement: $M_{analogous} = 4.20$ (1.3), $M_{complementary} = 3.83$ (1.4), $F(1, 168) = 3.251$, $p < .1$, $\eta^2 = .020$; competence: $M_{analogous} = 4.46$ (1.1), $M_{complementary} = 4.06$ (1.3), $F(1,168) = 4.883$, $p < .05$, $\eta^2 = .030$; sophistication: $M_{analogous} = 3.48$ (SD = 1.2), $M_{complementary} = 3.09$ (1.2), $F(1,168) = 4.333$, $p < .05$, $\eta^2 = .027$). Hence, H3a was partially supported.

Contrary to our expectations, we did not obtain empirical support for the hypothesized impact of predominant primary icon color on the personality dimensions (sincerity: $F(2,168) = 0.856$; n.s.; excitement: $F(2,168) = 0.271$, n.s.; competence: $F(2, 168) = 0.339$, n.s.; sophistication: $F(2,168) = 0.977$, n.s.; ruggedness: $F(2,168) = 0.003$, n.s.). Therefore, H3b has to be rejected. Based on these findings, one might conclude that color combinations will diminish the impact of single colors on the perception and evaluation of the personality dimensions, which have been investigated in previous studies (e.g, Labrecque and Milne 2012).
The Role of Icon Color Contrast in Influencing User Reactions

Figure 3. Analogous Icon Color Contrast Positively Influences User Evaluations of the Personality Dimensions Sincerity, Excitement, Competence, and Sophistication but not significantly of Ruggedness

Note: Icon Personality was measured according to Aaker (1997) using a seven-point scale (1 = I totally disagree – 7 = I totally agree); A = Mean values (SD in brackets) of sincerity (analogous icon color contrast vs. complementary icon color contrast); B = Mean values (SD in brackets) of excitement (analogous icon color contrast vs. complementary icon color contrast); C = Mean values (SD in brackets) of competence (analogous icon color contrast vs. complementary icon color contrast); D = Mean values (SD in brackets) of sophistication (analogous icon color contrast vs. complementary icon color contrast); E = Mean values (SD in brackets) of ruggedness (analogous icon color contrast vs. complementary icon color contrast).
Furthermore, as a result of the data analysis no significant interaction effect between the experimental factors of our study on personality could be identified (sincerity: F (2, 168) = 0.120, n.s.; excitement: F (2, 168) = 1.504, n.s.; competence: F (2, 168) = 0.755, n.s.; sophistication: F (2, 168) = 0.167, n.s.; ruggedness: F (2, 168) = 2.654, n.s.).

**The Effects of Icon Color Contrast and Icon Color on Download Intention**

In hypothesis H4a, we proposed an impact of the icon color contrast on download intention. Overall, 19.8% of all participants stated that they would consider downloading the mobile game onto their mobile device. The findings of a chi-square test reveal that an analogous contrast positively influences the intent to download the game, supporting H4a. In the experimental conditions with the analogous color contrast, 24.5% of the participants stated that they intend to download the game, while in the conditions with a complementary contrast only 14.1% of the participants would consider to download the game (Chi-square = 2.888, p < .1). Interestingly, the findings provided no empirical evidence for the assumed direct effect of predominant primary icon color on download intention, not supporting H4b (yellow: 7.0%, red: 9.3%, blue: 3.5%; Chi-square = 3.838, n.s.). Furthermore, based on our findings no significant interaction between the experimental factors and download intention could be obtained.

![Figure 4. Analogous Icon Color Contrast Increases User Download Intention](Image)

Note: Download Intention was measured with a single item (yes vs. no); * Download Intention (in %) for analogous icon color contrast vs. complementary icon color contrast.

**The Mediating Effects of the Experienced Emotions**

To test the proposed mediating impact of the emotional dimensions between the icon color contrast, the predominant primary icon color and the further outcome variables under investigation (H5), we used PROCESS (model 4) as suggested by Zhao et al. (2010), which enables users to conduct mediation analysis according to the approach of Baron and Kenny (1986). Contrary to our expectations derived from the findings of previous studies, the results did not reveal any significant mediating impact of the emotional dimensions pleasure, arousal, and dominance on the hypothesized relationships. Hence, we obtained no empirical support for our assumptions in H5.

**Discussion and Conclusions**

By transferring the assumptions and implications of congruence theory (Osgood and Tannenbaum 1955) as well as the “match up” hypothesis (Kamis 1990) to the context of icons of mobile gaming apps, the basic idea of our study was that an analogous contrast – a combination of similar colors – used in icon of a mobile gaming app would positively influence the users’ experienced emotions, their attitude towards the icon, their perception and evaluation of icon personality, and their download intention. Moreover, we proposed that the predominant primary icon color would influence the user-related outcome variables under study as well.

We were able to show that analogous contrasts in icons of mobile gaming apps have a positive direct effect on the emotional dimensions pleasure, arousal, and dominance. Furthermore, using an analogous contrast positively influences hedonic attitudinal aspects towards the icon, while the utilitarian attitudinal dimension is not influenced by the kind of the contrast. One reasonable explanation for these effects is
that mobile gaming and hence, mobile gaming applications are in general strongly associated with hedonic aspects from the perspective of the users, e.g., relaxation or entertainment (Lee et al. 2005; Okazaki 2008). Moreover, the results of the present study show that using an analogous color contrast in the icon of mobile gaming apps positively influences several personality dimensions related to the icon and potentially towards the mobile game as well. At least in our research setting, the results of the present study further indicate that using an analogous contrast in an icon of a mobile gaming app will lead to a higher download intention. In this context, the findings of the present study are in line with the results of Gorn et al. (1997) as well as Schloss and Palmer (2011), which have also shown that combinations of similar, congruent colors within a stimulus result in positive consumer-related responses.

Contrary to our expectations, the findings of our experimental study did not support our assumption that the outcome variables under investigation should be influenced by the predominant primary icon color. This result indicates that color contrasts might diminish the effects of single colors on consumers’ perceptions and evaluations as well as on their intentional behavior, which have been identified in previous studies. Emotional responses do not mediate the relationship between the icon color contrast, the predominant primary icon color and emotion, attitude towards the icon, icon personality, and download intention.

According to Miniard et al. (1991) one might conclude that involvement towards the product category might act as a moderator of the strength of the relationship between experimental factors and the user-related outcome variables under study. The operationalization of involvement towards the product category as a potential moderating effect is often applied in empirical research (Eroglu et al. 2001; Miniard et al. 1991; Petty et al. 1983). Involvement is of relevance for a user's information processing and the degree of cognitive elaboration and the persuasive impact of the processed information (Celsi and Olson 1988; Petty and Cacioppo 1986; Swinyard 1993). Hence, we controlled for the potential moderating impact of involvement towards mobile gaming in an additional analysis using moderated regression as suggested by Baron and Kenny (1986). The results show that involvement has a positive impact on emotions, especially pleasure ($\beta = .221$, $p < .01$) and arousal ($\beta = .203$, $p < .01$), on the hedonic dimension of attitude towards the icon ($\beta = .197$, $p < .05$), on the perception and evaluation of competence ($\beta = .189$, $p < .05$), and on download intention ($\beta = .236$, $p < .01$). But, we identified no moderating impact towards mobile gaming between the experimental factors and the dependent variables of our study.

However, the identified positive direct effects of an analogous color contrast on the constructs under investigation are an interesting result for online user research. More precisely, it seems that the interaction with single colors does not matter for app developers, publishers, and app store providers when several colors are combined in an icon of a mobile gaming app. Thereby, our results also provide insights for an effective and efficient design of an icon of mobile applications in app stores with the emphasis on mobile gaming apps.

**Implications for Future Research**

Our results have important implications for future research on the impact of color combinations on user behavior, which are related to the limitations of the present study. First, we only analyzed the impact of icon color contrast and predominant primary icon color in one specific category of mobile applications, namely mobile gaming apps. Hence, future research should investigate if our findings also hold in other categories of mobile apps, e.g., business or education, which are mainly used for utilitarian purposes. Moreover, in general colors are described by specific attributes, namely hue, saturation, and lightness and the impact of color on consumers’ perceptions and evaluations might differ according to the design of these elements (Labrecque and Milne 2012). In our study, we only manipulated color hue of the predominant primary color of an icon of a mobile gaming app. In this context, the findings of Deng et al. (2010) indicate that users’ of the NikeID online shoe configurator de-emphasize lightness, but focus on color hue and saturation, while in the context of brand logo design, the results of Labrecque and Milne (2012) imply that color lightness will also impact consumer-related perceptions and evaluations of the brand. Given these inconsistent findings, future research should consider the impact of a manipulation of the other color attributes (saturation and lightness) not only in isolation but also in combination with different hues on user-related outcome variables. Moreover, it further might be relevant to address the impact of the use of different visual elements used within the icon, e.g., a humanoid character, on the user
decision-making in future studies. Such findings might help to design attractive and appealing icons, which in turn should positively contribute to the success of a mobile gaming app.

In the experimental study the participants were only exposed to one single icon of a mobile gaming app, but in app stores consumers are normally exposed to more than one icon and additional information (e.g., name of the game, verbal information, price, ratings, screenshots, reviews) are provided as well. In an app store the icon of a mobile application is usually not presented without any related information. Hence, future studies should investigate if the findings of the presented study will still hold when the hypotheses are tested in an experimental setting that includes and systematically manipulates additional information related to the app, because it seems to be unclear if, e.g., a user’s intention to download the app is only influenced by the icon color contrast or if it is a linear sum the effects of the color information contained in the icon of a mobile (gaming) application or whether some of the previous mentioned aspects have a stronger impact on or will not significantly contribute to the download intention and further user-related outcome variables. In a follow up study (N = 211), we used a choice based conjoint measurement approach to get a first impression of the potential existing impact of the previously mentioned other aspects displayed in app store on the users’ perceptions and evaluations as well as the potential existing interdependencies between these factors and the icon of a mobile gaming app. For this study, we designed a 10 choice set questionnaire embedded in the conjoint-design. Each choice set contained three hypothetical game apps with six attributes (icon of the mobile gaming app, name of the game, genre, price, average user rating, total number of user ratings), with three levels per attribute, which were systematically randomized and we only included mobile gaming apps that were shortly introduced to the market and therefore, were unfamiliar for each participant. In addition, we ensured that there are no attribute-level combinations, which generate prohibited pairs or unfeasible game alternatives. Based on findings related to the average importance of the six attributes, the results of this conjoint analysis reveal that the icon of a mobile gaming app, the price, and a positive average user rating all significantly contributed to the participants download decision, while the other attributes (name of the game, genre, total number of user ratings) had only a marginal impact on the decision for a mobile gaming app in our conjoint setting. These findings are in line with the assumptions and implications derived from multiattribute theory by Hauser and Urban (1979). In addition to the findings of our experimental study, the findings of the conjoint study provide further empirical evidence that the icon of a mobile gaming app in general seems to be relevant for deciding whether or not to download a mobile game. But, future research – including eye-tracking studies – is needed to better understand the underlying processes of the impact of the different attributes of mobile applications, their interdependencies, as well as of other attributes, which are strongly related to the design of the app store in general (e.g., usability and background color) on user behavior, not only in the context of mobile gaming apps.

Moreover, the sample size of the present study was relatively small. As the sample size determines the amount of error inherent to the results of statistical testing, the effects of an experimental treatment are more difficult to identify in small samples (Cohen 2013). Hence, future research is advised to conduct similar experimental studies with larger sample sizes, which will strengthen the statistical power of the hypothesis testing and potentially help to identify more significant effects of the experimental factors on the constructs under study.

Last but not least, our experiment was limited to mobile applications from one specific category, namely mobile gaming apps and was only conduct in one country. Because of this limited external validity, future research is needed to study the identified effects with different products in different product categories. The sample was conducted among users in Germany. Prior research in personality and consumer behavior shows several important differences in personalities with respect to demographic variables (e.g., age, culture, and education) and differences in general online behavior between countries. Furthermore, previous research on the impact of colors on consumer behavior has shown that consumers with different cultural backgrounds are supposed to have different associations and preferences for specific colors (Aslam 2006). This potentially might result in differences regarding, e.g., consumers’ attitude formation or the evaluation of brand personality of the same product (Block and Kramer 2009). In follow-up research, this and the previously mentioned issues should be addressed.
Implications for Management

App developers, publishers, and app store providers can consider the findings of our study to better attract the user of mobile gaming apps due to an effective and efficient as well as appealing icon design. Our results show that an analogous contrast in an icon of a mobile gaming app could lead to positive effects as they positively influence user-related outcomes.

Beside this, previous research has shown that other additional information, e.g., user reviews, the price of the mobile gaming app, has an impact on the users’ intent to download a game from an app store (Liu et al. 2014; Zhu and Zang 2010). Hence, to better understand the role of color combinations in the design of icons for mobile gaming apps as well as to provide further evidence regarding the importance of color combinations for icon design, we analyzed the color information and collected additional of the top 100 mobile gaming apps in the iTunes-App store in November 2015. The data included information on the icon color contrast, the five most dominant colors present in the icon, the price of the mobile game (also including freemium revenue strategies), the number of user reviews, and the average user rating of the different mobile gaming apps. The first interesting result of the data analysis was that only 24.5% of the icons under investigation followed an analogous contrast. The previously mentioned variables were used as independent variables in a multiple regression analysis with an overall evaluation of the mobile games in the market from the website sensortower.com as dependent variable. The website sensortower.com estimates the value of each mobile gaming app based on, e.g., the position of the app in the ranking of the app store and the expired time from the release date. As expected, the results of the multiple regression analysis revealed a positive impact of the number of user reviews ($\beta = .345, p < .01$) on the value of the mobile gaming app. But interestingly, even while all of the selected top 100 mobile gaming apps were considerably successful, the value of a mobile gaming was significantly influenced by the icon color contrast ($\beta = .161, p < .05$). More precisely, an increase in the similarity of the colors combined in an icon positively influences the value of the mobile game. The other independent variables had no significant impact on the dependent variable. The results of this additional analysis are in line with the findings derived from the previously described choice based conjoint study. Both additional analyses support our implications derived from our experimental study, but they have also shown that app developers, publishers and app store providers should not only be aware of the relevance of the icon and the color combinations used within the icon, but also of other attributes of a mobile gaming app that will contribute to the success of mobile gaming apps, e.g., the number of user reviews, the average user rating, and the pricing strategy.

As mentioned before, the effects of the experimental factors on user-related outcome variables might also be influenced by culture (e.g., Cyr et al. 2009). In the context of website design, the findings of Cyr et al. (2010) reveal that website color appeal is a significant determinant for website trust and satisfaction with differences noted across cultures. Therefore, companies should by aware of potentially existing cross-cultural differences with regard to the impact of colors, color combinations, and further design elements and how icons for mobile gaming apps should be adjusted according to the preferences and requirements of the users based on the cultural background of the target groups in different international markets.

Finally, the findings of our study might not only be of interest in the context of mobile gaming apps, but also for website design in general. According to previous research (e.g., Deng et al. 2010, Bonnardel et al. 2011) as well as based on the findings of the present study, the appeal a user feels toward a particular color scheme can have a significant impact on his or her experience while interacting, e.g., with a website or a product in an online shop, with implications for the users perception and evaluation of the present content as well as for trust, satisfaction, or future interaction with the website (e.g., Cyr 2008; Lee and Rao 2010). In online environments where user confidence is often low and fragile, one might conclude that subtle design differences can push online users toward either completing transactions or abandoning a decision, not only in the context of mobile gaming apps (Cyr et al. 2010).

References


The Role of Icon Color Contrast in Influencing User Reactions


