

Living in a Twenty-First Century Virtual Reality: The Effect of Virtual Backgrounds on Perceived Intelligence and Approachability of Video Conferencing Software Users

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Abstract

Previous studies have suggested that it is within human nature for people to seek approval from their peers (Formica, 2014; Hoffman et al., 2015). Now that the COVID-19 pandemic has shifted education and work to virtual platforms, people demonstrate a yearning for approval through curating virtual backgrounds (Burnell, 2020). Accordingly, the present study investigated the effect of virtual backgrounds on the perceived intelligence and approachability of video conferencing software users. Participants (N=218), who were all high school students, were randomly assigned to view a photograph of either a female teenager or a male teenager with one of three virtual backgrounds: a bookshelf background, a solid blue background, or a solid red background. Then, participants rated the perceived intelligence and approachability of the individual that was presented. As hypothesized, the solid blue background led to higher approachability ratings as compared to the solid red background ($p<.05$). Interestingly, males were perceived as marginally more intelligent ($p=.064$) and significantly more approachable ($p<.02$) than females. However, neither the bookshelf background nor the solid colored backgrounds affected the perceived intelligence of the individual in the photograph ($p=.18$). In application to the current “virtual world” in which we are living, the results suggest that it may be beneficial to employ a solid blue background when attempting to seem more approachable, whereas utilizing a solid red background when trying to appear more intimidating.

Keywords: virtual background, perceived intelligence, perceived approachability, gender norms

Introduction

New times call for new measures, and the global pandemic we are currently facing is not an exception. As a result of COVID-19, education and the workplace have shifted to a virtual atmosphere via video conferencing software platforms. Nearly 93% of households with school-aged children report some form of distance learning (McElerath, 2020), with the most popular

conferencing software platform being Zoom Video Communications in 2020 (Columbus, 2020). It is a commonly held belief that people care about how others perceive them (Rose, 2019). This sentiment persists in online settings as well, albeit is expressed in slightly different ways than in person. For instance, users of online platforms may utilize filters and virtual backgrounds to enhance their portrayal (Burnell, 2020; Meyer, 2020). Hence, the present study explored how one’s virtual

background affects perceptions of an individual's intelligence and approachability.

Previous studies suggest that a bookshelf background is perceived as the balance between personal and professional. According to McCracken (1981), a person's personality is revealed through simply observing their bookshelves, giving off a more intelligent perception of that individual. This phenomenon is known as the bookcase flex, where books are related to an individual's expression of learning and knowledge (Mohammed, 2020). These ideas have led to the idea of the "credibility bookshelf." With intentions of establishing their credibility and forming perceptions of intelligence, politicians, company executive officers, and television hosts have employed bookshelf backgrounds across virtual platforms (Hess, 2020). These ideas regarding intelligence are untested assertions which are why this study sought to determine whether bookshelf backgrounds make an individual perceived as more intelligent, as compared to other virtual backgrounds.

Along with a bookshelf background, one of the most commonly used virtual backgrounds is solid color backgrounds, as they are recommended by Zoom Video Communications (Scripps Research, n.d.). Research reveals that the colors red and blue stimulate extremely opposite psychological cues (Manning, 2009). Red elicits generally negative and danger-bearing emotions, while blue elicits generally positive and secure emotions (Cherry, 2020; Elliot, 2015; Gremillion, 2019). While the color blue triggers a perception of calmness, knowledge, and credibility (Crick, 2019; Ferreira, 2019; Wolchover, 2012), red elicits the opposite. These disparate emotions that may be evoked from the red and blue backgrounds pose a question concerning how one's background can determine an individual's perceived approachability. Danger-bearing emotions make an individual perceived as relatively less approachable, whereas calm and secure emotions make an individual perceived as relatively more

approachable (Elliot et al., 2015; Ilie et al., 2008; London Image Institute, 2020). Since the colors red and blue are opposites on the visible light spectrum and elicit an opposite range of emotions, it is worthwhile to test the effect of red and blue solid colored virtual backgrounds on perceived approachability.

Furthermore, research has also demonstrated that females and males are perceived differently in real life: males are generally perceived to be more intelligent than females (Szymanowicz & Furnham, 2013; Rammstedt et al., 2000; Steinmayr et al., 2009; Storek, 2011). This is supported by the gender-brilliance stereotype, where people associate high levels of intelligence with men as compared to women (Storage et al., 2020). However, the toxicity of this stereotype transcends strictly women and men as it further impacts the perceptions and interests of impressionable children. In particular, due to gendered notions of brilliance, 6-year-old girls had a proclivity of avoiding activities they believed were exclusively for "really, really smart" children (Bian et al., 2017). These results suggest that gender-brilliance stereotypes regarding cognitive ability are acquired early on and can influence future occupational aspirations (Bian et al., 2017; Cimpian et al., 2015; Ertl et al., 2019; Leslie et al., 2015).

Moreover, these social constructs are heavily intertwined with the Field-specific Ability Beliefs (FAB) Hypothesis (Meyer et al., 2015). This hypothesis proposes that the combination of field-specific ability beliefs (belief that success in a field relies on raw ability or aptitude) and cultural stereotypes of gender and ability (belief that men are more likely than women to possess raw ability or aptitude) leads to gender gaps in academia (women are underrepresented in fields that emphasize the need for raw ability or aptitude rather than effort). When this hypothesis was tested, the results suggested that biases affiliating the science-related occupations with "brilliance" are pervasive in the modern era and may explain

female underrepresentation in STEM (Deiglmayr et al., 2019; Meyer et al., 2015). See appendix for diagram.

Considering that past research has shown that males are generally perceived as more intelligent than females, observing whether this notion holds across a virtual environment is valuable insight. As a result, it would be essential to test whether different virtual backgrounds may exacerbate or mitigate this phenomenon.

This study explored the differences in perceived intelligence and approachability across different genders and backgrounds, testing the following hypotheses: [1] compared to a female video conference user, a male video conference user will be perceived as more intelligent; [2] compared to a video conference user with a solid color background (red and blue), a video conference user with a bookshelf background will be perceived as more intelligent; [3] compared to a video conference user using a solid red background, a video conference user using a solid blue background will be viewed as more approachable.

Methods

Participants

Participants were recruited from high school mathematics classes at a mid-sized northeastern high school in the United States given that previous studies have only measured differences in perception of intelligence and approachability across adult males and females and children under the age of eight. A survey measuring the effect of different virtual backgrounds on perceived intelligence and approachability was administered to potential participants; participants had a time window of 36 hours to respond. However, the participants were not aware of the precise premise of the study, as a means to avoid participant biases. At the beginning of the survey, potential participants signed an informed assent form which provided information

about the study. Out of 239 participants who completed the survey, 218 participants passed the manipulation check and became a part of the study.

In the final group of 218 participants, there was a relatively even split between females (112) and males (106). The race composition was relatively diverse as well, with White participants (65.6%), Asian participants (23.4%), Hispanic or Latinx participants (6.4%), Black or African American participants (2.3%), American Indian or Alaska Native participants (1.4%), and participants who identified as “other” (0.9%). The average age of participants was 15.2 years old and ranged from 14 to 18 years old.

Experimental Stimuli

The current study compared six conditions (two levels of the gender independent variable and three levels of the background independent variable): a female presenter with a bookshelf virtual background, a male presenter with a bookshelf virtual background, a female presenter with a solid red virtual background, a male presenter with a solid red virtual background, a female presenter with a solid blue virtual background, and a male presenter with a solid blue virtual background. To avert the presence of extraneous variables, hairstyle, clothing, facial expression, posture, and age were consistent between the conditions--the male and female (ages 14) were presented with short, curly brown hair, wearing a black shirt, with an even facial expression, and straight posture. Additionally, the experimental stimuli were presented with a vertical aspect ratio as they were headshot photographs. Participants were randomly assigned to see one of the six conditions and prompted to respond to the items of the survey, shown in the appendix. The software platform, Qualtrics, was utilized to create the survey and randomly assign participants to see one of the six conditions.

Dependent Measures

This study measured two dependent measures: perceived intelligence and perceived approachability. The survey consisted of 10 total items: 5 questions measured the construct of perceived intelligence, and 5 questions measured the construct of perceived approachability. All items were measured on a 5 point Likert scale ranging from “Strongly Disagree,” to “Strongly Agree,” with the additional option of “Prefer not to answer.” The intelligence scale was adopted from an earlier study (Patterson et al., 2016) and reflected strong internal reliability with a Cronbach’s Alpha value of 0.85. In addition, the approachability scale was adopted from a previous study (Montepare et al., 2014) and reflected strong internal reliability with a Cronbach’s Alpha value of 0.84 (all items from both scales were utilized). See appendix for items.

Subsequently, participants completed a manipulation check, asking them “What background did that person use?” and “What was the gender of that person?” to ensure that participants were aware of this information when completing the survey. If participants failed to answer the manipulation checks correctly, they were not included in the data analyzed. Questions following the manipulation check asked for participants’ demographics: gender, age, and race.

Design and Procedure

The design of the study was a 3 (Virtual Background: red, blue, bookshelf) x 2 (Gender of Video Conference User: female, male) between-subjects full factorial design (see appendix). Participants were presented with an informed assent form and then were randomly assigned to view one of the six conditions of the experimental stimuli. After being presented with the condition, they had to respond to the rest of the survey evaluating their perceptions of intelligence and approachability of video conference users. The

results were collected and then downloaded into SPSS Statistics Software for data analysis.

Results

Gender

The study’s first hypothesis on perceived intelligence across different genders was not supported by the data set. Figure 1 shows how males were perceived as only marginally more intelligent than females and consequently these results could be due to chance. As a result, these results were not statistically significant, $F(1, 215)=3.47, p=.064$.

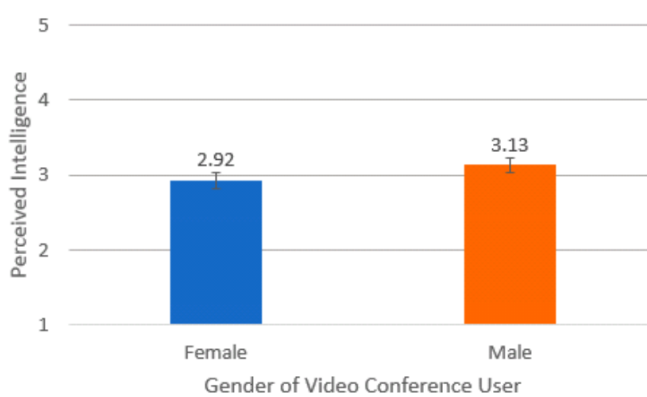


Figure 1. Differences in Perceived Intelligence Between Females and Males

Furthermore, although this finding was not originally hypothesized, the results revealed that there was a significant difference in perceived approachability across females and males $F(1, 203)=5.83, p<.02$. Figure 2 demonstrates how males were perceived as significantly more approachable than females, across all backgrounds.

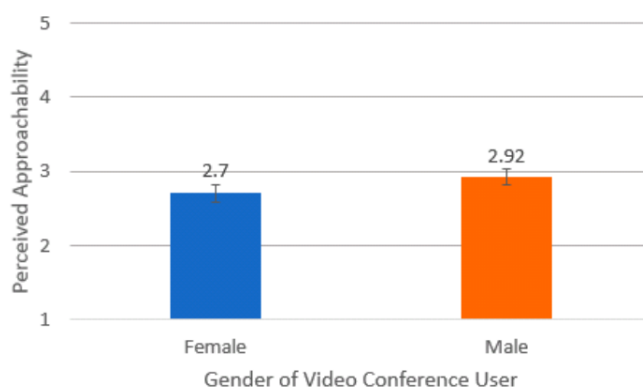


Figure 2. Differences in Perceived Approachability Between Females and Males

Virtual Background

The study's second hypothesis on the effect of virtual backgrounds on perceived intelligence was supported by the data. As shown in Figure 3, individuals who used a bookshelf background were perceived as the most intelligent, followed by the solid blue, and solid red background, respectively. However, the virtual backgrounds did not have a significant main effect on perceived intelligence, $F(2, 215)=1.73, p=.18$.

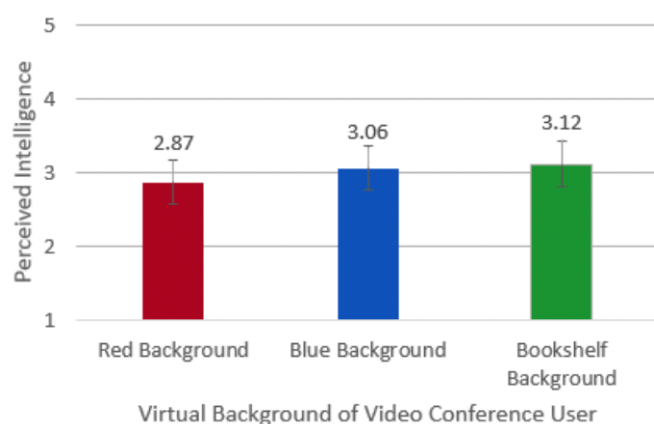


Figure 3. The Effect of Virtual Backgrounds on Perceived Intelligence

Additionally, the solid-colored virtual backgrounds had a significant main effect on the perceived approachability of video conference users, $F(2, 203)=2.14, p<.05$. The means displayed in Figure 4 (2.67 and 2.9) support the third hypothesis and demonstrate that the individuals who used the solid blue background were perceived as significantly more approachable than individuals who used the solid red background.

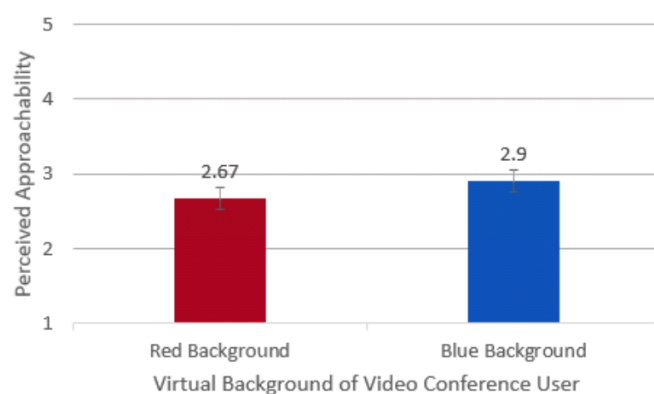


Figure 4. The Effect of Solid-Colored Backgrounds on Perceived Approachability

Discussion

Gender

The lack of differences in perceived intelligence between females and males might be an indication that gender norms are changing as time progresses. In the past, sexism has been a pervasive issue (Ananthaswamy & Douglas, 2018), where males were generally perceived as more intelligent than females (Szymanowicz & Furnham, 2013). In the modern era, these notions and norms may be changing—females may be perceived as equally intelligent as males.

In addition, the results revealed that males were perceived as more approachable than females. Despite efforts to control hairstyle, clothing, facial expression, and posture, it is possible that the male presented in the experimental stimuli may have seemed naturally more approachable than the female. Also, female teenagers may be perceived as less approachable than male teenagers given the fact that females mature earlier, and ergo may look more serious, and less approachable (Bergland, 2013); the female in the experimental stimuli may have appeared to be more mature than the same-aged male and thus could have seemed more serious and less approachable.

Virtual Background

Moreover, an individual using the solid blue-colored background was perceived to be more approachable in comparison to when using the solid red-colored background. This finding is likely since the color blue elicits feelings of calmness, knowledge, and credibility (Crick, 2019; Ferreira, 2019; Wolchover, 2012), while the color red elicits opposite psychological cues—generally danger-bearing emotions (Cherry, 2020; Elliot, 2015; Gremillion, 2019). As a result, the red background could have been perceived as more intimidating, and therefore, less approachable.

Additionally, past studies have established that as people mature, people prefer colors of

shorter wavelengths—blue, green, violet—rather than colors of longer wavelengths—red, orange, yellow—according to Birren in 1950 (Tate Design, 2013). This may explain why the blue virtual background was perceived as more approachable given that the teenage participants of this study are in the stage of maturation into adulthood and could have preferred colors of shorter wavelengths.

Furthermore, there was no significant effect of virtual backgrounds on perceived intelligence. A possible reason for this finding may be that participants taking the survey were more focused on the video conference user that was presented in the photograph, rather than the background itself.

Limitations and Further Study

This study is notable as it was one of the first to examine the collective effects of different virtual backgrounds (including colors and non-colors) on an individual's perceived intelligence and approachability. However, a limitation of this study was that the survey was only distributed to a single northeastern high school's student population. Therefore, in future studies, it would be valuable to extend the distribution size and further investigate the demographic, temporal, and regional factors that may affect perceptions of intelligence and approachability. Additionally, another limitation was the age range of the sample (strictly high school adolescents between the ages of 14 and 18) and the restricted gender identifications (female and male) provided in the survey; as a result, further research can investigate the differences in perceived approachability and intelligence across larger age divisions and other identifications of the gender spectrum (i.e. non-binaries, gender fluids, androgynes, &c.). While this study focused on the solid red and solid blue colors, it would also be interesting to expand the range of solid colored backgrounds utilized. Examining the effect of different shades of colors or patterns could also be instrumental, as they may provide new insights.

In application to the perceptions of virtual backgrounds on web-conferencing platforms, the results of the present study suggest that it may be beneficial to employ a solid blue background when attempting to seem more approachable, whereas utilizing a solid red background when trying to appear more intimidating.

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