REFLECTING AND SHAPING THE SELF THROUGH AVATARS: THE RELATIONSHIP BETWEEN AVATARS, IDENTITY, AND PERSONAL NEEDS

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Abstract

Individuals frequently engage with virtual environments through the use of characters that represent the self, known as avatars. This dissertation focuses on two primary research questions: (1) how do avatars reflect identity and, (2) how does engaging with an avatar shape the self, in terms of personal needs and self-perceptions? We examine the bidirectional relationship between avatars and their users across four studies. Study 1 examines whether customized avatars can accurately communicate the personalities of their creators to others. Expanding on the theme of reflecting identity, Study 2 explores whether avatar preferences are related to individuals' personal psychological needs, specifically the needs for warmth and competence. The results of Studies 1 and 2 indicate that avatars can accurately reflect identity in terms of both personality and psychological needs. However, individuals can also be motivated to use avatars in a way that deviates from one's actual identity, such as avatars that reflect one's ideal self. Study 3 examined whether creating an avatar provides individuals with the opportunity to self-enhance in response to psychological threat. Specifically, we investigated whether there is a tendency to create more idealized avatars following psychological threat and whether this can help mitigate the negative effects of threat on mood and self-concept. The results did not support these ideas, however, with avatar creation seeming to exacerbate rather than improve the negative outcomes of experiencing a psychological threat. That said, it is possible that actively controlling an avatar is an important prerequisite for avatars to have a positive influence on self-perceptions. In Study 4, participants were asked to create either an avatar that reflected their actual self or their ideal self; they were subsequently assigned to either watch or control this avatar. Controlling an avatar, regardless of type, was related to improvements in self-concept (e.g., self-liking), but did not any reduction in discrepancy between the actual self and ideal self.

We discuss the results of these studies with a focus on how they might inform future work and their possible application in the real-world, including interactive social interventions.

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Chapter 1: Introduction

A growing proportion of our lives is taking place online. Day-to-day activities, including communication and recreation, now commonly occur in the digital realm. This includes places such as chat rooms, virtual environments (e.g., Second Life), and videogames. Online spaces can increasingly offer rich and immersive experiences separate from one's offline life. As online spaces become more complex, they can also offer users a growing spectrum of opportunities for how to represent themselves. A common means of representing the self in digital spaces is with an avatar: a graphical representation of the self that can be two- or three-dimensional, static or dynamic (Belisle & Bodur, 2010; Holzwarth, Janiszewski, & Neumann, 2006). Because some individuals report very frequent engagement with their avatars (e.g., over 25 hours a week; Williams, Yee, & Caplan, 2008), it is increasingly important to understand the implications of avatar use. How might avatars relate to our personal identity? Furthermore, what might be the outcomes associated with avatar engagement? The following program of study will explore how creating and using avatars can both reflect the self as well as shape the self by satisfying personal needs and goals.

Media and personal outcomes

The majority of research on media engagement has focused on media consumption for the purposes of enjoyment. For example, mood management theory (Zillmann, 1988) states that the primary goal of media engagement is to seek positive affective experiences and to divert attention from negative affective states. Based on this theory, media experiences should be predominantly pleasurable in nature. In reality, however, media preferences can be driven by a wide array of motives (Ruggiero, 2000). This broad spectrum of motivations can lead to a similarly diverse range of possible outcomes. Importantly, not all of these outcomes are defined

by hedonic or pleasurable experiences. For instance, individuals may at times be motivated to engage with media in order to seek truth and meaning in life, known as a eudaimonic motivation (Oliver & Raney, 2011). So, for example, individuals sometimes seek out media with challenging social themes (e.g., tragedy) in order to explore their beliefs and engage in a meaningful media experience. Although engaging with these types of media may not be what you would describe as typically pleasurable, they can provide valuable and much appreciated experiences (Bartsch & Oliver, 2010; Oliver & Raney, 2011).

Because media consumption is tied to personal motivations, our engagement with media can shape the way we understand and perceive the world around us. For example, different types of long-term media exposure have been associated with both negative (e.g., music videos and sexual objectification, Kistler & Lee, 2009; television and aggression, Paik & Comstock, 1994) and positive social outcomes (e.g., print exposure and interpersonal sensitivity, Mar, Oatley, Hirsch, dela Paz, & Peterson, 2006). Media exposure can also have immediate effects on individuals in the short-term. Engaging with a fictional narrative can be highly persuasive, for example, leading to shifts in both attitudes (Green & Brock, 2000) and behaviour (Kaufman & Libby, 2012). In fact, it can be difficult to resist being influenced by media, even when we are aware that the content is fictional (Green, Garst, Brock, & Chung, 2006). Importantly, and most germane to the focus of this dissertation, media exposure can influence the way individuals see themselves. Specifically, individuals' self-perceptions shift to align with the characteristics and experiences of the protagonist in a narrative (Kaufman & Libby, 2012), influencing how readers see themselves. For example, reading about a character who is unintelligent can result in decreased performance on a cognitive task (Appel, 2011).

This past research on self-perceptual shifts and media exposure has focused primarily on non-interactive media formats such as reading or television. Consumption of non-interactive media generally does not require users to provide any active engagement with the story-world in order to construct a narrative or shape character experiences. For example, in non-interactive narratives, individuals do not instruct the protagonist to have a conversation with another character or to travel to a particular location. It is possible that interactive media, such as virtual environments and videogames, are unique in how these interactive elements influence the outcomes related to media engagement. Initial empirical research has borne out this possibility, with interactivity increasing individuals' feeling of control over a narrative world (Roth, Vermeulen, Vorderer, Klimmt, Pizzi, et al., 2012). In other words, being able to interact with a narrative increases individuals' perceptions that they control elements of both the fictional environment and plot. However, research on the components and outcomes of interactivity in virtual environments is still in its infancy. Better understanding is needed regarding the ways in which individuals engage with interactive media, as well as the outcomes of such engagement.

Avatars.

The interactivity of many virtual environments, including videogames, is afforded by the use of an avatar. Avatars are commonly used to navigate and interact with virtual environments. This helps explain why avatars play an important role in increasing certain media outcomes such as character identification (Turkay & Kinzer, 2014) and flow (i.e., a state of deep and pleasurable engagement with media; Soutter & Hitchens, 2016). Furthermore, being able to control an avatar during interactive narratives leads to an increase in enjoyment (Rogers, Dillman Carpentier, Barnard, 2016). However, less is known about how individuals engage with avatars, particularly with regard to how avatars are chosen or customized, and how these decisions relate to self-

representation, identity, and the satisfaction of psychological needs. Furthermore, little experimental research has investigated how engaging with an avatar might ultimately affect user outcomes such as self-perceptions. Because avatars play a key role in the interactive element of many virtual environments, understanding the relationship between avatars and users is an important step in elucidating the effects of interactive media.

Avatar choice, customization, and use. Engaging with an avatar is unique from engaging with other types of fictional characters (e.g., from a movie or book). Specifically, unlike characters that are merely observed, individuals often have the opportunity to exert varying degrees of control over their avatar. One form of control is the ability to influence an avatar's appearance. User control over avatar appearance can range from selecting from a set of premade avatars to full customization of appearance. In the case of avatar selection, users are typically presented with a limited set of avatars that have been designed ahead of time by the creators of the software. Although there is some variation in these avatars in terms of appearance, each avatar is selected as a complete unit and users do not have additional control over individual aspects of the avatar's appearance. An example of an avatar selection process is the game *Left 4 Dead*, in which players choose from one of four possible avatars to control during gameplay.

Avatar customization, in contrast, provides users with the opportunity to exercise control over individual aspects of an avatar's appearance, often with impressive levels of control over even small details. Selecting avatar characteristics—including gender, age, race, height, weight, muscularity, hair, clothing, and accessories—results in a unique combination of customizations to produce an avatar tailored specifically to a particular user. An example of avatar customization can be found in the virtual environment *Second Life*, which allows users a high

degree of control over every aspect of avatar appearance, including such things as nose width, eye shape, bone structure, and fine gradations of skin tone. Some avatar customization interfaces, such as the one found in the game *The Sims 3*, even allow users to specify personality traits for their avatar.

It is important to note that individuals tend to be very invested in the avatar creation process, taking time to consider how to select and customize their avatars (Yee, 2006). Some researchers have theorized that avatar selection and customization is one of the reasons why avatars are so closely related to identity (Boelstorff, 2008). In other words, control over avatar appearance, either through choice or customization, can play a role in strengthening the relationship between avatars and the self.

Avatar engagement can also extend beyond selection and customization, however. Another form of avatar control involves using the avatar by manipulating its actual behavior, changing the way it interacts with the virtual environment, other characters, and the narrative. This form of control can create a close link between the avatar and the user through the process of embodiment (Yee & Bailenson, 2007). In other words, controlling an avatar's behaviour can create a sense of psychological closeness between the self and the avatar. This psychological closeness can lead to individuals perceiving their avatars as an extension of the self, resulting in self-perceptions shifting to align with an avatar's characteristics. Thus, the relationship between avatars and their users can be considered to be bidirectional: individuals can select and craft avatars to communicate identity, and controlling these avatars can ultimately influence identity. Overall, avatars are closely related to user identity. But are avatars related to other aspects of user motivations and outcomes? One possibility is that controlling the appearance and behaviour of an avatar might be associated with the satisfaction of psychological needs.

Avatars and psychological needs. Past research has indicated that media interactivity increases the extent to which needs are satisfied by media engagement (Tamborini, Grizzard, Bowman, Reinecke, Lewis, et al., 2011). Videogames may therefore afford a powerful opportunity for individuals to satisfy basic psychological needs (e.g., relatedness, competence, and autonomy; Przybylski, Rigby, & Ryan, 2010; Przybylski, Weinstein, Ryan, & Rigby, 2009; Reinecke, Tamborini, Grizzard, Lewis, Eden, et al., 2012; Ryan, Rigby, Przybylski, 2006). Many aspects of videogames—including their achievement structure, interactions with other players, and even their narratives—have already been demonstrated to contribute to the satisfaction of psychological needs (Bormann & Greitemeyer, 2015; Przybylski et al., 2010; Ryan et al., 2006). However, one aspect of videogames that has not been much explored in this respect is the use of avatars. One simple possibility is that by reflecting users' individual differences, avatars serve to satisfy a psychological need to communicate identity. However, it is also possible that avatars may also play a role in the satisfaction of other psychological needs. Past research has indicated that individuals will create avatars that emphasize different characteristics based on the anticipated use of the avatar. For example, an avatar that seems more intelligent will be more likely to be used in a quiz game context (Vasalou & Joinson, 2009). Similarly, individuals may create or select avatars with characteristics that they perceive will help satisfy psychological needs. A friendly avatar, for example, might help an individual satisfy the need for relatedness. Thus, creating an avatar that accurately reflects one's personality or personal motivations can be one strategy to help satisfy psychological needs. But an alternative strategy for using avatars to satisfy psychological needs is to create avatars that are deliberately discrepant from one's offline identity in order to emphasize certain traits and approach certain goals.

One way in which an avatar might not accurately represent our offline self is when it embodies an idealized version of our self. Individuals frequently engage in an idealization process when using their avatars, to some extent (Dunn & Guadagno, 2012). In fact, idealized avatars are often preferred to accurate or representative ones (Jin, 2009). Avatars may provide an accessible opportunity for individuals to approach their ideals, particularly since ideals can be difficult to approach in one's day-to-day life (Boyatzis & Akrivou, 2006). In this way, creating an idealized avatar might be considered to be a form of self-enhancement. Self-enhancement can be broadly defined as the tendency to see the self in a positive light, and frequently serves to buffer the self from negative self-evaluations (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). It is possible that creating an idealized avatar leads to similar psychological benefits as other forms of self-enhancement, such as sheltering self-esteem from psychological threat. Thus, creating an avatar that deviates from the actual toward the ideal may also provide an opportunity to meet psychological needs, such as the need to see the self in a positive light. Furthermore, actively engaging with one's avatar might strengthen the effect of avatars satisfying psychological needs, particularly when individuals are engaging with an avatar that represents their ideals or services their needs. Active engagement increases the extent to which users feel embodied by their avatars (Yee, Bailenson, & Ducheneaut, 2009). In the case of idealized avatars, active engagement may allow users to perceive their actual self as shifting to align more closely with their ideals. A shift that decreases the perceived discrepancy between an individual's actual self and their ideals could result in a number of positive outcomes, including decreased negative affect (Higgins, 1987). Overall, actively controlling an avatar might contribute to the satisfaction of psychological needs by allowing users to perceive that they are approaching the desirable characteristics embodied by their avatar.

Taken altogether, avatar use—including choice, customization, and behavioural control—might influence various aspects of users. The goal of this dissertation is to explore the relationship between avatars and the self, specifically with regard to how avatars might reflect identity, satisfy needs, and influence self-perceptions.

Overview of current project

The current dissertation focuses on two research questions. First, how do avatars reflect identity? Second, how does engaging with avatars help satisfy psychological needs, thereby affecting personal outcomes and self-perceptions? We employed a combination of correlational and experimental methodologies to address these research questions.

The first two studies explore the relationships between identity and how individuals choose to represent themselves using avatars. Although avatar customization allows for a high degree of flexibility in self-representation (Hoffner, 2008), an individual's offline characteristics can still inform avatar customization and selection decisions (e.g., Belisle & Bodur, 2010; Dunn & Guadagno, 2012; Park & Henley, 2007), and individuals prefer avatars that are similar to themselves (Nowak & Rauh, 2006). Do avatar customizations reflect their creator's personality? Furthermore, can avatar customizations convey creator personality accurately to others? Study 1 uses a correlational approach to examine whether individuals create avatars that accurately reflect their personality. In this study, individuals created simple avatars which were then shown to others; we then examine whether the creator's personality could be accurately perceived based solely on the perceptions of their avatar.

Personality is only one aspect of identity, however. Other aspects of the self, such as psychological needs, may also be reflected by one's avatar. Specifically, users may select an avatar that is perceived to convey an aptitude (e.g., an avatar that seems highly warm) in order to

facilitate the satisfaction of a related psychological need (e.g., need for relatedness). Study 2 examines this question with a correlational approach, exploring the relationship between individual needs and avatar preference. Specifically, we investigate whether individual needs for warmth and competence predict avatar preferences. Are people higher in need for warmth more likely to choose an avatar that they perceive to be very interpersonally warm, for example?

Although avatars can accurately reflect one's offline identity, there may be times when an avatar is discrepant from one's true identity. One possible type of discrepancy is the use of avatars that reflect an idealized, rather than actual, version of the self. The final two studies in this dissertation examine motivations and outcomes for creating and engaging with idealized avatars.

First, we consider whether creating an ideal avatar can be considered a form of self-enhancement that protects the self from negative self-evaluation. Does creating an ideal avatar counter the effect of psychological threat? Study 3 employs an experimental design in which individuals are asked to create a self-avatar either before or after experiencing a psychological threat. Does experiencing threat elicit self-enhancement in the form of idealizing a self-avatar? We also investigate whether creating a self-avatar mitigates the negative effects of experiencing a psychological threat, such as negative affect and lowered self-esteem.

Avatar engagement is not limited to choice or customization, however. Individuals often also have the ability to control the behaviour of their avatar within a virtual environment, thereby becoming embodied within their avatar. Embodiment may play a key role in whether individuals' self-perceptions are influenced by their avatar. Study 4 employs an experimental methodology to explore how actively controlling an ideal self-avatar might influence self-perceptions. Changes in self-esteem and distance from one's ideals were examined based on

whether individuals watched or played with an idealized avatar or one that resembled themselves more accurately.

Avatars are a unique feature of virtual environments and contribute to the interactivity of these forms of media. Understanding the relationship between avatars and their users is an important first step in understanding how interactive media, such as virtual environments, might affect personal outcomes. Overall, the aim of this program of study is to provide greater understanding: not only regarding how personal characteristics influence the avatars people use to represent themselves, but also how these avatars may ultimately influence their users.

Chapter 2: Avatars as a reflection of identity

As a proxy of the self in virtual environments, avatars are a bridge between the self and the virtual environment. Avatars can range from simple images (e.g., those found in forums and chats) to complex controllable characters (e.g., those found in videogames). Virtual environments afford varying degrees of control over avatar appearance. Some environments assign users a prefabricated avatar whereas others allow users to control every aspect of their avatar's appearance. There is some evidence that being able to control the appearance of one's avatar is related to increased engagement with virtual environments, such as greater physiological arousal (Lim & Reeves, 2009) or increased motivation to complete videogame objectives (Cordova & Lepper, 1996; Foshee & Nelson, 2004). Choosing one's avatar might also increase engagement by inducing a feeling of agency (Kidd & Harvey, 1974). However, choice can also serve a secondary objective: to allow the avatar to reflect the user's identity.

Communicating identity information via an avatar can serve multiple purposes. In virtual environments, where there are limited opportunities to communicate using nonverbal cues (Walther, 1993), an avatar can provide an opportunity to communicate rich information about the self to others. Additionally, avatars can act to affirm one's own identity, as individuals tend to prefer engaging with self-relevant stimuli. For example, individuals pay more attention to avatars that physically resemble themselves relative to those that look like strangers or celebrities (Seo, Kim, Jung, & Lee, 2017). But does customizing an avatar accomplish more than communicate mere physical appearance? In other words, do customized avatars convey information about their creators' identity and interior qualities, such as trait personality?

There are reasons to believe that individuals use avatars to communicate accurate identity information. Although virtual environments are well-suited to identity exploration, with users

sometimes deliberately choosing avatars that deviate from their offline identity (e.g., Klimmt, Hefner, & Vorderer, 2009), past research suggests that on average avatars may be congruent with their users' true persona. Digital self-representations, including avatars, can be considered part of the extended self (Belk, 2013). As such, it has been argued that avatars are unlikely to be "alternate selves" that are radically different and separate from an individual's true identity. Research has confirmed this idea, with avatars closely related to the self-concept of users (Chandler, Konrath, & Schwarz, 2009) and users generally preferring avatars that are similar to themselves (Nowak & Rauh, 2006). Individuals who are marginalized in the real world can view avatars as an opportunity to express their "true selves", considering avatars to be a more accurate representation of their identity than their offline persona (Williams, Kennedy, & Moore, 2011). Furthermore, discrepancies between an avatar and its user can still provide information about underlying psychological characteristics. For example, previous research has found that user characteristics, such as self-esteem, predicted the types of customizations individuals chose when creating an avatar (Belisle & Bodur, 2010; Dunn & Guadagno, 2012). Overall, the past research suggests that avatar customization can serve the function of making identity claims (i.e., symbolic representations of how an individual would like to be perceived; Gosling, Ko, Mannerelli, & Morris, 2002), similar to the deliberate selection of clothing (Borkenau & Liebler, 1992) and shoes (Gillath, Bahns, Ge, & Crandall, 2012), or even decorations in a dorm room (Gosling et al., 2002).

Customizing an avatar produces a number of visual cues in the form of the physical features of the avatar. Some physical features represent larger social categories such as race or gender, whereas other features such as clothing may serve as more incidental cues. The visual cues provided by avatars play an important role in communicating information, as individuals

tend to form impressions of avatars based on appearance similar to those that would be formed of humans in offline spaces. For example, tattooed avatars are perceived as more sensation-seeking than non-tattooed avatars (Wohlrab, Fink, Kappeler, & Brewer, 2009), analogous to how humans with tattoos are judged in real life. Similarly, using an avatar associated with an outgroup such as a racial minority can elicit prejudiced behaviour in line with real-world biases (Eastwick & Gardner, 2009). Importantly, the impressions formed of avatars tend to be transferred to their users. Avatar androgyny and anthropomorphism (i.e., how human-like the avatar appears) have been found to influence the perceived credibility and attractiveness of avatars (Nowak & Rauh, 2006), as well as the credibility of the individual using the avatar (Nowak & Rauh, 2008). The process by which users select an avatar reflects an awareness of the impressions that avatar makes on others, and how this impression ultimately reflects the user. Specifically, users prefer avatars that are perceived as being more credible, so that they themselves seem more credible by extension (Nowak, Hamilton, & Hammond, 2009; Nowak & Rauh, 2006). The appearance of avatars therefore plays an important role in how individuals choose to represent themselves in virtual environments. But do these visual cues accurately reflect interior qualities such as an individual's real-world personality traits? Furthermore, can perceivers decode visual cues from avatars to form accurate impressions of users?

Study 1 incorporates a Brunswick Lens Model approach in order to investigate how customization choices relate to personality. The Brunswik Lens Model postulates that observable cues found in the environment (e.g., cues present in customized avatars) provide a lens through which perceivers observe constructs that may not be directly observable (e.g., an avatar creator's personality) (Brunswik, 1956). Accuracy in personality perception is driven by two components: (1) cue validity, the relationship between phenomena (e.g., personality) and observable cues; and

(2) cue utilization, the relationship between cues and how they are employed by perceivers. Accuracy occurs when there is a high degree of convergence between cue validity and cue utilization. The Brunswik Lens Model can be used to identify both good and bad sources of personality information, across many types of stimuli. Evaluating individual avatar cues using the Brunswick Lens Model will allow us to assess whether a given customization choice is related to a particular personality trait of the user.

Study 1

Past work by Belisle and Bodur (2010) has indicated that the physical appearance of avatars can be used to make accurate inferences of trait-level information. In other words, avatars can provide accurate information regarding particular personality traits. Specifically, perceivers can accurately infer information regarding levels of trait extraversion and agreeableness in users based on avatars (Belisle & Bodur, 2010). The goals of Study 1 were twofold. First, we aimed to replicate the previous trait-level findings from Belisle and Bodur (2010). Specifically, do avatars convey accurate trait-level information about their users? We hypothesized that avatars could convey accurate trait-level information regarding their users. In line with previous findings (i.e., Belisle & Bodur, 2010) we hypothesized that expressive social traits, such as extraversion and agreeableness, will be accurately assessed based on avatars. We expect that correlations between creator and perceiver trait ratings, as well as the results of the Brunswick Lens analysis, will provide converging support of this hypothesis.

Second, our goal was to expand on previous work by considering profile-level accuracy. In other words, can individuals' overall personalities be accurately perceived from their avatars? To explore this question properly, we additionally took into account the fact that accuracy in personality perception can be driven by normative expectancies (Biesanz, 2010; Furr, 2008).

That is, both self-reported personality and perceiver-rated personality is influenced to some degree by the tendency for a perceived profile to reflect the average profile of the population. For example, our expectations for how extraverted people are in general tend to influence our impressions of how extraverted a particular target is. It is important to account for normative influences when investigating profile similarity (e.g., when calculating similarity between self-reported and perceiver-rated personality profiles), because normative influences tend to inflate similarity scores. In cue-impoverished contexts such as virtual environments (Walther, 1993), it may be especially important to control for the possibility that perceivers are relying on normative knowledge when generating impressions of personality. Based on the prior research, it is not clear whether accuracy in person perception from avatars is due to reliance on normative expectancy, or because avatars communicate unique personality information about their creators. Thus, we included two components of profile similarity in our analysis: (1) overall accuracy, the raw correlation between creator-reported personality and mean rated personality profiles; and (2) distinctive accuracy, the similarity between target and perceiver profiles after accounting for normative influences (Furr, 2008). We hypothesized that profile-level accuracy would be possible in the form of a positive non-zero correlation between the average-rated personality profile and self-reported creator personality profiles. Further, we hypothesized that once the influence of normative expectancy is taken into account, this correlation will be smaller in magnitude but remain positive and non-zero. In other words, we hypothesized that avatars can communicate unique personality information about their users over and above the influence of normative expectancies.

Methods

Overview

In this study, we were interested in whether individuals' personalities could be accurately assessed based on their avatars. Thus, this study involved two phases. In Phase 1 participants created customized avatars and provided ratings of their own personality. In Phase 2 a different set of participants viewed and rated the avatars created in Phase 1.

Participants

Participants in both Phase 1 and 2 were recruited from the undergraduate research participation pool at a large Canadian university and received partial course credit for participation. There were 99 participants (50 male) in Phase 1, who ranged in age from 17 to 40 years, M = 19.76, SD = 3.76. In Phase 2, the initial sample included 305 participants. The Phase 2 sample was first cleaned based on completion time criteria. Participants who completed Phase 2 in less than 15 minutes or more than 60 minutes were removed due to concerns that they completed the study too quickly to be attentive, or that they may have left the computer mid-task. There were 233 participants remaining in the sample after cleaning based on completion time. This remaining sample was cleaned based on incorrect responses to an inattentive responding item, "I sleep more than 3 hours a week." Participants who did not select Agree or Strongly Agree in response to this item were removed from the sample. No data analysis was performed until data cleaning was completed. The final Phase 2 sample included 209 participants (60 male), ranging in age from 16 to 36 years (M = 19.42, SD = 2.68).

Materials

Avatar Creation Task. Participants created an avatar using an online tool: weeworld.com. This website allows people to choose a basic form for their avatar (e.g., sex, skin

tone) and customize it along various dimensions, including hair, clothing, and accessories (Figure 1). All participants consented to having these avatars presented to other research participants.

Figure 1: Example WeeWorld avatar

Big Five Inventory (BFI-44). In order to assess personality, participants completed the BFI-44 (John, Donahue, & Kentle, 1991). The BFI-44 is based on the five-factor model of personality and assesses five major traits: (1) openness, (2) conscientiousness, (3) extraversion, (4) agreeableness, and (5) neuroticism (see Goldberg, 1993 for an overview). This measure consists of 44 descriptive phrases, which respondents rate with respect to self-characterization. Responses are given using a 5-point Likert scale that ranges from 1 (*disagree strongly*) to 5 (*agree strongly*). Example items include, "I see myself as someone who is full of energy" (extraversion) and "I see myself as someone who gets nervous easily" (neuroticism). The BFI-44 is a reliable and valid method of measuring five-factor personality (John & Srivastava, 1999).

Big Five Inventory-10 (BFI-10). Personality was also measured using the BFI-10 (Rammstedt & John, 2007), an abbreviated version of the BFI in which each of the five factor

traits is measured by two items, resulting in a total of 10 items. Each trait is measured by one true-scored and one reverse-scored item. For example, extraversion is measured by the two items, "I see myself as someone who is outgoing, sociable" and "I see myself as someone who is reserved." Respondents rate each statement on a 5-point Likert scale that ranges from 1 (*disagree strongly*) to 5 (*agree strongly*). Despite its brevity, the BFI-10 has demonstrated good test-retest reliability, as well as good convergence with more detailed assessments of personality such as the 44-item BFI (Rammstedt & John, 2007). Raters used the BFI-10 to assess target avatars. Because raters rated multiple targets, the BFI-10 was used instead of the BFI-44 to prevent rater fatigue. The BFI-10 was used to determine profile accuracy, allowing for a direct comparison between self-reported personality profiles and perceived personality profiles.

Procedure

Phase 1 was conducted in a computer lab where participants created an avatar and subsequently completed the BFI-44. All participants received a quick tutorial on how to use the weeworld.com software, and subsequently were given the following instructions: "Please create an avatar representation of yourself." The provided instructions were simple and broad to allow for natural participant variability in goals and strategy for avatar creation. Avatar creators also completed the BFI-10 because this was the measure that perceivers would later employ to infer personality from the avatar. Having the creators' BFI-10 scores allowed us to make a direct comparison between self-rated personality and inferred personality, based on the same measure, when exploring profile-level accuracy. Lastly, demographic information was collected.

Data for Phase 2 was collected online using the Qualtrics survey client (www.qualtrics.com). A second set of participants, with no overlap from Phase 1, were shown a subset of 15–16 avatars created in Phase 1. There were 7 subsets that were created by randomly

distributing the created avatars from Phase 1. Participants in Phase 2 were randomly assigned to a subset to rate when they were recruited from the undergraduate research participant pool. These participants were given the following instructions:

> You will see a series of digital avatars and be asked to rate each one based on the personality of its creator. The questionnaire provided lists a number of characteristics that may or may not describe the individual you've been asked to rate […] Examine each avatar and try to predict the personality of the person who created that avatar.

Each avatar was rated by a minimum of 20 different people. We calculated the mean level of perceiver agreement across raters for each subset (i.e., interrater consensus), ICC (2, *k*) = .87, where *k* (i.e., the number of participants that rated each subset) ranged from 24 and 33.

A set of 111 potential cues was identified based on the avatar customization options and the number of avatars possessing any given cue was noted (Appendix A). All 99 avatars were then coded for these cues by two research assistants who acted as independent raters. These same raters also rated the avatars on 3 additional dimensions based on overall appearance: stylishness, casualness, and formalness. For all continuous cues (e.g., rated stylishness) coder ratings were averaged. Mean inter-judge agreement was calculated by correlating the two raters' scores on each continuous item, then averaging correlations across items. Inter-judge agreement across items averaged .63 and was calculated by correlating the two raters' scores on each continuous item, then averaging correlations across items. For binomial cues (e.g., brown hair), any disagreement between raters was resolved by the author of this dissertation. Cue utilization was calculated by correlating the coded physical cues of the created avatars with the average perceived score for each trait. Calculating cue validity followed a similar procedure, but

employed the avatar cues and self-reported personality traits from the BFI-44. Avatar cues, their cue utilization, and cue validity values can be found in Appendix A.

Results

Can individual personality traits be accurately inferred from avatar cues?

Trait-level accuracy was calculated by correlating the average rating of each trait with centered self-reported creator scores on the BFI-44. This is considered an item-level correlation (Funder, 1999). Because groups of avatars were rated by subsets of perceivers, avatar ratings were non-independent (i.e., a planned missing design) and a multilevel approach was utilized. The fixed-effect from the model was standardized and represents the average relationship between the creator self-report and perceiver ratings of that trait, on average across perceivers (Table 1, column 1). According to this analysis, avatars can provide accurate information regarding trait extraversion, agreeableness, and neuroticism but not conscientiousness or openness (although openness approached traditional threshold for statistical significance, p = .06).

Table 1: Study 1- Trait-level accuracy and cue-based trait-level vector correlations

Trait	Trait-level accuracy (β)	Vector column correlations
Extraversion	.24*	.43*
Agreeableness	.13*	.41*
Conscientiousness	.03	.15
Neuroticism	.10*	.40*
Openness	.04	.18

* $p < .05$

In order to provide some insight into the process of how trait-level accuracy might be achieved, we used the Brunswick Lens model to examine the relationship between cue utilization and cue validity. Using vector-column correlations (Funder & Sneed, 1993), we were able to examine whether cue choices associated with creator personality were also utilized by perceivers. Cue utilization and cue validity correlations were first transformed using Fisher's *r*-

to-*z* formula to form vectors. Cue utilization and cue validity vectors were then correlated across all 114 cues for each of the Big Five traits. This procedure characterizes the extent to which cue-utilization and cue-validity are congruent (Table 1, column 2). Vector correlations for extraversion, agreeableness, and neuroticism were all statistically significant and positive, whereas the vector correlations for conscientiousness and openness did not reach threshold for statistical significance (although openness fell just above threshold, $p = .06$). This indicates that the way individuals customize avatars to reflect their own traits is congruent with how perceivers use avatar cues to infer personality (for all traits except for conscientiousness and perhaps openness). The results of the vector-column correlations from the Brunswick Lens analysis were congruent with the results of the trait-level accuracy correlations.

Can personality profiles can be accurately inferred from avatar cues, in light of normative expectancies?

Moving beyond the accuracy associated with individual traits, we subsequently examined whether entire personality profiles could be accurately inferred from avatars. For this analysis, accuracy is considered a profile-level correlation (Funder, 1999), where each target's BFI-10 responses were correlated with the mean BFI-10 profile provided by the perceivers to directly compare perceived and self-reported personality. The raw associations were considered a measure of overall accuracy and were subjected to a single sample t-test with the null-hypothesis being no correlation between self-reported creator personality and rated personality (test value of 0). Overall accuracy was statistically different from 0, $r = .26$, $t(98) = 7.75$, $p < .001$, 95% CI [.19, .32]. To parse out the effect of normative influence on personality judgment, we calculated distinctive and normative accuracy using a multilevel model following the procedures outlined by the Social Accuracy Model (Biesanz, 2010). Similar to the trait correlations, the multilevel

model allowed us to account for non-independence due to the fact that subsets of avatars were being rated by subsets of perceivers. The fixed-effects from this model were considered. On average, across avatar creators and perceivers, there was statistically significant agreement between self-reported and rated personality profiles after accounting for normative influences (i.e., distinctive accuracy), $b = .04$, $p = .03$. In addition, the results for normative accuracy also reached statistical significance, $b = .31$, $p < .001$, indicating that personality inference from avatars has a normative component.

Discussion

The aim of Study 1 was to begin exploring how avatars relate to the individuals who create them. Specifically, do avatars accurately reflect the personality of their creators? We investigated this question at both the trait and profile level.

First, we investigated whether certain personality traits could be accurately communicated using avatars. The results from this study indicated that the traits of extraversion, agreeableness, and neuroticism could be assessed with accuracy from avatars. Furthermore, the Brunswick Lens analysis indicated that creators and perceivers typically use the same avatar cues to communicate and interpret the traits of extraversion, agreeableness, and neuroticism. These findings were generally in line with our hypothesis and replicated the previous findings from Belisle and Bodur (2010). Accuracy in assessing extraversion has also been observed based on static real-world cues (e.g., pictures; Borkeneau & Liebler, 1992; Funder & Dobroth, 1987; Stopfer, Egloff, Nestler, & Back, 2013), suggesting that extraversion is highly observable in both online and real-world contexts. The fact that we observed accuracy for agreeableness and neuroticism in the avatar context diverged from past work using real-world thin-slice exposure, as cues for these traits are generally less observable in those contexts (Funder & Dobroth, 1987;

Borkeneau & Liebler, 1992). We particularly did not expect that neuroticism would be accurately perceived from avatars, as neuroticism is not often inferred accurately in CMC contexts (Back, Stopfer, Vazire, Gaddis, Schmukle, et al., 2010; Belisle & Bodur, 2010; Gill, Oberlander, & Austin, 2006; Wall, Taylor, Dixon, Conchie, & Ellis, 2013). The finding that conscientiousness and openness were not accurately predicted from the avatars was also consistent with previous findings (Belisle & Bodur, 2010). Additionally, there was a lower level of congruence between cue utilization and cue validity for conscientiousness and openness. One possible explanation is that avatar customization options did not provide enough options to communicate these traits. For example, it was not possible to choose unkempt clothing to communicate a lack of conscientiousness and perhaps there was not enough creative variety in clothing or accessory choices to convey openness. The avatars employed in this study were fairly simple and static, and it is possible that more detailed or complex avatars may increase accuracy for conscientiousness and openness.

Not only can avatars be a source of trait-accuracy, but an individual's unique personality profile can also be perceived accurately, even after accounting for normative expectancy. In other words, avatars can provide accurate information about how its creator is different from the average person. These results supported our hypothesis. Overall accuracy was larger than distinctive accuracy, however, indicating that expectations based on what the average person is like boosted overall accuracy ratings. Taken together with the trait-level findings, the results of Study 1 support the hypothesis that avatars can convey accurate information regarding their creators' personalities, indicating that individuals customize avatars in ways that reflect their identities.

In interpreting these findings, it is important to emphasize that the avatar context is a relatively cue-lean context compared to the real-world. Cues to personality in the real-world can come either directly in the form of identity claims (i.e., choosing to display cues that reinforce one's self-identity, like selecting a particular shirt to wear) or indirectly in the form of behavioral residue (i.e., remnants of behavior driven by personality, such as spilling ketchup on the front of that shirt; Gosling et al., 2002). In the avatar context, only identity claims are available: every customization choice reflects a deliberate decision of what part of one's personality should be expressed (or suppressed). Although there are fewer sources of information available in the avatar context relative to the real-world, the meaning of the available information is also different across contexts because any available cue is not present by chance. Furthermore, despite the opportunity to use avatars in order to control of self-presentation and explore alternate identities (Hoffner, 2008; Klimmt et al., 2009), individuals still create avatars that communicate accurate aspects of the self. Thus, an important aspect of avatar engagement might be fidelity to one's true identity and traits.

In Study 1 we demonstrated that avatars accurately reflect their creators' personality traits. However, an individual's identity can also include important motivations (e.g., needs for warmth or competence). Do avatar preferences also reflect personal motivations in addition to personality? Study 2 investigated whether individuals preferred avatars that conveyed traits that aligned with their personal needs.

Chapter 3: Avatars and psychological needs

Study 1 demonstrates that avatars reflect the interior qualities of users, including their trait personality. However, avatars may also reflect aspects of user identity beyond trait personality. Specifically, how individuals choose to represent themselves using avatars might also reflect users' desires to satisfy core psychological needs. Przybylski, Rigby, and Ryan (2010) have suggested that videogames, which avatars play a prominent role in, are well-suited to facilitate the satisfaction of basic psychological needs. Indeed, the simple act of choosing an avatar is associated with increased feelings of personal agency, which is a core human need (Kidd & Harvey, 1974). However, less is understood about the motivations behind how individuals choose to represent themselves using avatars. Specifically, does avatar selection reflect the individual's psychological needs?

What psychological needs might be met using avatars? Przybylski and colleagues (2010) theorized that videogames might satisfy the psychological needs identified by self-determination theory. Self-determination theory (SDT; Deci & Ryan, 2000) suggests that most behaviour is motivated by the desire to satisfy basic psychological needs, and that satisfaction of these needs contributes to well-being. SDT focuses on three psychological needs: autonomy, relatedness, and competence. The need for autonomy can be defined as the desire to exert control over one's life in order to align behaviours to one's self-identity (Deci, 1975). Behaving in ways that are congruent with one's internal motivations, rather than for external rewards, increases feelings of autonomy (Deci, 1971). In contrast, the need for relatedness refers to the desire for social connection and warmth (Baumeister & Leary, 1995). Individuals easily form social bonds (e.g., Brewer, 1979) and the absence of these bonds, namely feelings of social isolation, has been linked to negative outcomes such as poor health (Kiecolt-Glaser, Garner, Speicher, Penn,

Holliday, et al., 1984). Lastly, the need for competence is the motivation to gain control and mastery (White, 1959), with individuals seeking out opportunities to demonstrate their competence. For example, receiving positive feedback on a task increases individuals' motivation to continuing engaging with that task (Deci, 1971). In contrast, receiving negative feedback regarding task performance tends to decrease motivation to engage with that task (Vallerand & Reid, 1984). Together, these two studies suggest a preference for behaviours individuals feel successful at performing, as feelings of success contribute to feelings of competence. Overall, according to SDT, many conscious and unconscious behaviours and attitudes reflect motivations to satisfy the needs of autonomy, relatedness, and competence.

One particular class of behaviours that may be influenced by psychological needs includes the recreational activities an individual chooses to engage in. For example, the mood management that occurs during media engagement has been associated with a form of need satisfaction (Tamborini, Bowman, Eden, Grizzard, & Organ, 2010). Videogames in particular may be a good fit for meeting the basic psychological needs of autonomy, competence, and relatedness (Przybylski, et al., 2010). For example, past research has found that increasing videogame features that highlight autonomy and competence increases player engagement (Peng, Lin, Pfeiffer, & Winn, 2012), which in turn accounts for a large proportion of variance in game enjoyment (Tamborini, et al., 2010). But the satisfaction of needs in videogames is not only related to having fun, also to having meaningful entertainment experiences with videogames (Oliver, Bowman, Wooley, Rogers, Sherrick, et al., 2016). Some examples of videogame features that demonstrate relations to need satisfaction include achievement signifiers (e.g., badges, leaderboards; Sailer, Hense, Mayr, & Mandl, 2017), competition (Kazakova, Casuberghe, Pandelaere, & De Pelsmacker, 2014), and narratives (Bormann & Greitemeyer,

2015). The opportunity to satisfy basic psychological needs is highly rewarding and contributes to an intrinsic motivation to engage with videogames. For example, individuals who have their intrinsic needs threatened will selectively seek out video games that promotes the satisfaction of those same needs (Reinecke, et al., 2012). Additionally, individuals who identify as heavy gamers also score higher on needs for autonomy, relatedness, and competence (Neys, Jansz, & Tan, 2014). Although research has supported the intrinsic motivation to engage with videogames as a whole, less is understood about how psychological needs relate to differences in how individuals engage with particular aspects of videogames, such as avatars. Avatar character categories can make certain avatars more appealing to certain individuals (e.g., a "healer" role character may be more appealing to someone high in agreeableness; Park & Henley, 2007). However, it is not clear whether visual cues embedded in avatars in the absence of explicit role labels influence avatar choice. Specifically, perhaps an avatar's appearance can affect whether a user selects it based on perceptions that the avatar will help satisfy the user's psychological needs.

Avatars may be particularly well-suited to appeal to the core motivations of a need for warmth and a need for competence in users. Warmth and competence play an important role in social categorization and these categorizations can influence important social consequences such as liking (Fiske, Cuddy, Glick, & Xu, 2002). Individuals tend to ascribe social characteristics to nonagentic and nonhuman targets, such as animals and abstract concepts (Gray, Gray, & Wegner, 2007). Because individuals tend to anthropomorphize computer agents and evaluate them as if they were human agents (Nass & Moon, 2000), evaluations of warmth and competence are likely to play a role during perceptions of avatars as well. Indeed, individuals generally prefer avatars high in perceived warmth and competence because they are seen as more

believable (Demeure, Niewiadomski, & Pelachaud, 2011). However, avatar characteristics may be differentially salient to different users, and may influence users differently based on their initial personal motivations. Once perceptions of the avatar are formed, users may then choose avatars that align with their personal motivations in order to help satisfy their psychological needs. Specifically, individuals may select avatars based on their perceived warmth and competence, aligning these with their own needs for warmth and competence.

Study 2

Study 2 expands on the results of Study 1 by examining whether evaluations and perceptions of avatars are congruent with psychological needs. That is, are chosen avatars an accurate reflection of the self based on alignment with psychological needs? Perceived warmth and competence strongly influence the evaluation of others (Fiske et al., 2002). Thus, we hypothesized that ratings of avatar warmth and competence would be positively correlated with avatar preference. In other words, avatars that are perceived as warmer or more competent would be more desirable. However, we expected that the relationship between perceived avatar traits and desirability would be moderated by psychological needs. Specifically, we hypothesized that avatars that were rated as high in warmth would be more desired by individuals who were also high in need for warmth. Similarly, we hypothesized that avatars that were rated as high in competence would be more desired by individuals who were also high in need for competence.

Methods

Overview

In contrast to the avatar creation paradigm used in Study 1, in Study 2 participants were asked to indicate their avatar preferences based on a corpus of professionally-designed avatars drawn from commercially-released videogames. Avatar selection was employed in this study, in

lieu of customization or creation, in order to broaden the purview of our research to include the common experience of videogame users choosing an avatar from a limited set of options. In addition, we employed avatars from mainstream games in order to increase the ecological validity of this investigation, presenting participants with examples of avatars they might actually encounter in popular media. Participants were each presented with a subset of these avatars and asked to provide ratings on their impressions of, and preferences for, each avatar.

Participants

Participants were recruited from the undergraduate psychology research pool at a large Canadian university and received partial course credit as remuneration for their participation in the study. The initial sample consisted of 359 participants prior to data cleaning. Seven participants were removed due to missing consent data. An additional 65 participants were removed due to incorrect responses to any of the three inattentive responding items distributed across the study. An example inattentive responding item is, "For the following question, please select "Agree" as your response;" any response other than "Agree" on that item would be counted as an inattentive response. All data cleaning was completed prior to data analysis. The final sample included 287 participants (94 male) between the ages of 16 and 30 (M_{age} = 19.30, SD_{age} = 2.42).

Materials

Avatar stimuli. Avatars were selected from commercially-available videogames. Commercially-created avatars were employed in this study to capture more realistically the variety of potential avatars available to real-world avatar users. In order to maximize variability in avatar options, the stimuli were selected so that differences in age, gender, physique, race, and anthropomorphization were present across the avatars. In total, 88 avatars were eventually

selected to be part of the stimulus set. Of these avatars, 47 were male, 35 were female, and 6 were gender neutral.

Avatar ratings. Participants rated avatars on their perceived warmth and competence using 8 Likert-scale items (4 items per trait). These items were derived from the perceived warmth and competence scales developed by Fiske and colleagues (2002). An example item rating warmth is, "How likeable is this character?" An example item rating competence is, "How competent is this character?" All items were rated on a 5-item Likert scale ranging from 1 (*Not at all*) to 5 (*Very*). For a full listing of all items used to measure the warmth and competence of target avatars, please see Appendix B.

To evaluate preference for each avatar, participants were asked a single question, "How likely are you to choose this character to represent yourself in an online context?" Participants responded to this item on a 5-point Likert scale ranging from 1 (*Not at all likely*) to 5 (*Very likely*).

Avatars were also rated on a number of additional characteristics that may influence their evaluation, and therefore should be controlled for during the statistical analysis. These characteristics include familiarity with the avatar, perceived masculinity/femininity, attractiveness, and how humanoid the avatar appears to be. Each of these traits was rated on a 5-point Likert scale (e.g., 1- *Not at all humanoid* to 5-*Very humanoid*).

Need for warmth. Individual differences in need for warmth was assessed using a number of measures related to a desire for social affiliation. The following measures were selected: Need to Belong, the Compassion aspect of the Big Five Aspect Scale, and the Connect subscale of the Inventory of Interpersonal Strengths, which are each discussed in turn.

Need to Belong (NTB). The NTB scale assesses personal desires for social affiliation and group acceptance (Leary, Kelly, Cottrell, & Schreindorfer, 2013). Higher scores on this scale relate to personality traits associated with seeking social contact (i.e., extraversion, agreeableness) as well as emotional reactivity in response to social rejection. The NTB scale consists of 10 items. An example item is, "I try hard not to do things that will make other people avoid or reject me." Participants were instructed to indicate their level of agreement with each item on a 5-point Likert scale ranging from 1 (*Not at all*) to 5 (*Extremely*).

Big Five Aspect Scale (BFAS)–Compassion subscale. Each trait from the Big Five personality model is comprised of two separate components, known as aspects (DeYoung, Quilty, & Peterson, 2007). These two aspects are correlated with each other and together provide a good representation of the overarching personality trait, but remain distinct from one another. Focusing on the aspect level of personality can allow for increased precision in measuring underlying individual differences. In this study, we focused on the Compassion aspect of the Big Five trait of Agreeableness. Compassion is characterized by the motivation to pursue and value emotional affiliation with others. The other aspect of Agreeableness is Politeness, which has a stronger focus on respecting others and is not as relevant for the current study (DeYoung et al., 2007). The BFAS Compassion subscale consists of 10 items. An example item is, "Take interest in others' lives." Participants rated each item on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*) to indicate the extent to which they felt each statement was self-descriptive.

Inventory of Interpersonal Strengths (IIS)- Connect subscale. The IIS (Hatcher & Rogers, 2009) is a scale that measures individual differences along two dimensions: submission/dominance and warmth/hostility. These two dimensions make up the interpersonal

circumplex, which can be divided into octants that reflect varying combinations of the two dimensions (Wiggins, 1996). The Connect subscale consists of eight items that assess the tendency to be high in warmth (e.g., a strong tendency to be friendly) while being neutral regarding the tendency to be submissive or dominant. An example item is, "I feel good when I'm with other people." Participants rated each item on a 6-point Likert scale indicating the extent to which the statement describes them, ranging from 1 (*Very little like me*) to 6 (*Almost always like me*).

Need for competence. Individual differences in need for competence were assessed using measures that related to a desire for mastery. The following measures were used to measure competence: the Lead subscale of the IIS, the Achievement subscale of the Personality Research Form, and the Personal Standards subscale of the Multidimensional Perfectionism Scale, each discussed in turn below.

IIS- Lead subscale. The Lead subscale of the IIS (Hatcher & Rogers, 2009) consists of eight items that assess behaviours and traits related to high dominance, but are neutral with regard to warmth and hostility. An example item is, "I can take charge in a group." Participants rated each item on a 6-point Likert scale indicating the extent that the statement describes them, ranging from 1 (*Very little like me*) to 6 (*Almost always like me*).

Personality Research Form- Achievement subscale. The Personality Research Form (PRF; PRF-E 3rd edition, Jackson, 1984) is a psychological assessment that provides measurement of a wide spectrum of personality traits based on Murray's (1938) original framework of personality. The PRF is most frequently used as a workplace assessment tool to help employers match workers with appropriate tasks based on their psychological motivation. It has been found to be high in reliability, and demonstrates good convergent and discriminant

validity (Mayes & Ganster, 1983). The Achievement subscale consists of 8 true and false statements that describe behaviours and personal characteristics related to aspirations to accomplish difficult tasks and willingness to work hard to achieve one's goals. In order to increase the variability in possible scores, we asked participants to indicate the extent to which they agreed with each statement on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). An example item is, "I enjoy difficult work."

Multidimensional Perfectionism Scale (MPS)–Personal Standards subscale. The MPS (Frost, Marten, Lahart, & Rosenblate, 1990) is a comprehensive measure of behaviours and cognitions related to perfectionism. The Personal Standards subscale in particular assesses tendencies to hold extremely high standards for personal performance. The Personal Standards subscale consists of 7 items. An example item is, "It is important for me to be thoroughly competent in everything I do." Participants indicate the extent to which they agree with each statement on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

Procedure

This study was administered using online survey software, Qualtrics (www.qualtrics.com). The survey software randomly selected a subset of six avatars from the stimulus set to present to each participant, balancing the presentation such that each avatar was presented roughly the same number of times. As a result, after data cleaning, each avatar was rated by between 15 and 23 participants. The mean intraclass correlation (i.e., agreement between participants who rated a particular avatar), ICC (2, *k*), was 0.76. For each avatar, participants saw an image of the avatar and were asked to rate their impressions of and preferences for that avatar. Subsequently, participants were asked to complete the individual

difference measures of need for warmth and need for competence, as well as a brief measure of demographics that recorded basic information such as gender and age.

Results

Descriptives

Descriptives and reliability statistics (Cronbach's alpha) for the individual difference measures of warmth and competence, as well as descriptives of avatar ratings are found in Table 2. Overall, avatars were rated as more competent than warm, and a paired t-test indicated that each avatar was rated more highly on competence than warmth, $t(87) = -5.04$, $p < .001$, 95% CI of difference [-0.72, -0.31]. On average, avatars were rated as feminine, humanoid, unfamiliar, and neither attractive nor unattractive.

Table 2: Study 2- Descriptive statistics of individual differences and avatar ratings

Measure	Mean	SD	Cronbach's α
BFAS- Compassion	3.93	0.52	.82
Need to belong	3.16	0.64	.76
IPS- Connect	4.71	0.94	.88
IPS- Lead	4.15	0.95	.84
IPIP- Need for achievement	3.70	0.63	.80
PRF- Achievement	3.48	0.55	.72
MPS- Personal standards	3.58	0.69	.85
Perceived avatar warmth	2.88	1.09	.90
Perceived avatar competence	3.40	0.97	.79
Perceived avatar attractiveness	2.48	1.29	[a]
Perceived avatar familiarity	1.72	0.47	[a]
Perceived avatar anthropomorphization	2.99	1.48	[a]
Perceived avatar femininity	3.58	1.86	[a]

Note: [a] Measured with a single item and therefore alpha not applicable.

We also calculated the intercorrelations between all the individual difference measures of warmth and competence, and the avatar ratings (Table 3). The individual difference measures of need for warmth (BFAS-Compassion, NTB, IPS-Connect) were positively and statistically significantly associated with one another, as were the measures of need for competence (IPS-

Lead, IPIP-Need for Achievement, PRF-Achievement, MPS-Personal Standards). Avatars that were perceived to be more attractive, familiar, humanoid, and feminine were also perceived to be warmer. Avatars that were perceived to be more attractive, familiar, humanoid, but less feminine were also perceived to be more competent. Perceived avatar warmth and competence had a statistically significant negative association. Specifically, the warmer an avatar was perceived to be, the less competent it was also perceived to be.

Is avatar preference predicted by perceived warmth and competence?

To examine the relationship between avatar perceptions and avatar preference, we calculated the correlations between avatar preference and ratings of avatar characteristics (i.e., perceived avatar warmth, competence, attractiveness, femininity, anthropomorphization, and familiarity). Perceived avatar warmth was positively correlated with the reported likelihood that an avatar would be chosen as a self-representation, $r = .44$, $p < .001$, 95% CI [.30, .60]. Perceived avatar competence was also positively correlated with the reported likelihood that an avatar would be chosen, $r = .47$, $p < .001$, 95% CI [.31, .61]. In other words, the warmer or more competent an avatar was perceived to be, the more likely individuals were to indicate that they would choose this avatar to represent themselves in a virtual environment. This pattern of results supported our hypothesis that avatars perceived to be warmer and more competent would be more desirable.

Other measured avatar characteristics were also associated with avatar preference. Specifically, avatar attractiveness ($r = .80$, $p < .001$, 95% CI [.73, .86]), familiarity ($r = .34$, $p < .001$, 95% CI [.16, .49]), and femininity ($r = .34$, $p < .001$, 95% CI [.17, .52]) were positively correlated with the reported likelihood that an avatar would be chosen. Avatar

Table 3: Study 2- Correlations between individual differences measure of need for warmth and need for competence, and avatar ratings

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
BFAS-Compassion	-												
Need to belong	.24*	-											
IPS-Connect	.50*	.25*	-										
IPS-Lead	.13*	-.06*	.58*	-									
IPIP- Need for achievement	.14*	.00	.12*	.36*	-								
PRF-Achievement	.08	.04	.09*	.24*	.51*	-							
MPS- Personal standards	.01	.04	.12*	.37*	.55*	.53*	-						
Avatar warmth	-.03	.00	-.03	-.06*	-.01	-.01	-.03	-					
Avatar competence	.00	-.02	.03	.05	.02	.02	.02	-.10*	-				
Avatar attractiveness	.04	.01	.03	.03	-.01	.06	-.03	.34*	.28*	-			
Avatar familiarity	-.02	-.01	-.02	-.01	.01	.00	-.02	.37*	.10*	.22*	-		
Avatar anthropomorphization	.06*	.01	.05*	.03	-.04	-.03	-.01	.08*	.23*	.37*	.01	-	
Avatar femininity	-.02	-.01	.00	-.04	-.04	-.01	-.05	.40*	-.11*	.29*	.03	.05*	-

* $p < .05$

anthropomorphization (e.g., how humanoid the avatar was perceived to be) was not related to avatar choice, $r = .08$, $p = .48$, 95% CI [-.13, .32].

Is the relationship between avatar preference and perceived warmth/competence moderated by individual differences?

We employed a series of regression models to investigate whether individual differences moderated the effect of avatar perceptions on avatar preference. Because each participant rated a subset of avatars, avatar ratings were not independent of one another. A multilevel regression model approach was used with avatars nested within participant. A random slopes model was considered, where the effects of perceived avatar warmth and competence were allowed to vary freely across participants.

Additionally, we were interested in the effect of the interaction between perceived avatar warmth/competence and individual differences on avatar choice, above and beyond the influence of other factors that might influence avatar choice. Thus, we included a number of control variables in each regression model: perceived avatar attractiveness, familiarity, anthropomorphization, femininity, avatar gender, perceiver gender, and whether or not the perceiver's gender matched the avatar's gender. We also included perceptions of both avatar warmth and competence in all regression models: for example, perceived avatar competence was also included in regression models examining the interaction between need for warmth and perceived avatar warmth. Given the large number of variables included in each model, we examined the potential for multicollinearity between the variables. The variance inflation factor (VIF) was >4 for all variables in all models, which falls into the acceptable recommended range (Hair, Anderson, Tatham, & Black, 1995). Level 1 variables (i.e., avatar characteristics) were group mean centered and level 2 variables (i.e., rater characteristics) were grand mean centered

prior to being entered into the model. The fixed effects of the variables of interest were considered for these models.

Need for warmth. A composite measure of individual differences in need for warmth was calculated by averaging the scores for the BFAS-Compassion, NTB, and IPS-Connect scales. The mean score for aggregate need for warmth was 3.93, with a standard deviation of 0.53. We then regressed avatar choice on the composite need for warmth score, perceived avatar warmth, as well as the interaction term between these two focal variables. The control variables were also simultaneously entered into the regression model (Table 4).

Table 4: Study 2- Avatar preference regressed on perceived avatar warmth x rater need for warmth (composite score), avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	t	p
Intercept	1.53	0.08	20.32	<.001
Perceived avatar warmth	0.29	0.02	9.14	<.001
Need for warmth	0.15	0.07	1.99	.05
Perceived avatar warmth x Need for warmth	0.12	0.05	2.29	.02
Perceived avatar competence	0.28	0.04	8.04	<.001
Avatar attractiveness	0.12	0.03	2.95	<.001
Avatar familiarity	0.07	0.06	1.18	.24
Avatar femininity	-0.02	0.03	-0.78	.43
Avatar anthropomorphization	0.01	0.02	0.39	.70
Avatar gender	0.03	0.09	0.38	.71
Rater gender	0.09	0.08	1.07	.29
Avatar-rater gender match	0.59	0.05	11.88	<.001

There was a main effect of individual need for warmth such that need for warmth was positively associated with the reported likelihood that an avatar would be chosen as a self-representation. In other words, participants who had a higher need for warmth also tended to rate avatars as being more desirable as self-representations, regardless of the avatar's perceived warmth or competence. There was also a main effect for perceived avatar warmth being positively associated with the likelihood that an avatar would be chosen. In other words, avatars that were perceived as being warmer were also rated as more likely to be selected for self-

representation. Additionally the interaction between individual need for warmth and perceived avatar warmth on avatar choice was significant, indicating that the relationship between perceived avatar warmth and avatar choice was moderated by individual need for warmth.[1]

To understand the moderation, we probed the interaction between need for warmth and perceived avatar warmth. Following the methods outlined by Aiken and West (1991), we re-evaluated the regression model at one standard deviation above and below the mean for need for warmth. For individuals low in need for warmth, perceived avatar warmth was a statistically significant positive predictor of avatar choice, $\beta = 0.23$, $p < .001$. However, for individuals high in need for warmth there was a stronger relationship between perceived avatar warmth and avatar choice, $\beta = 0.35$, $p < .001$. In other words, the perceived warmth of an avatar was more strongly related to whether an avatar would be chosen as a self-representation for individuals who were higher in need for warmth (Figure 2).

[1] Separate regression models were also estimated for each scale used to measure need for warmth. There was only a significant interaction for the NTB scale, although all other interactions were in the predicted direction. Please see Appendix C for results of warmth scale specific regression models.

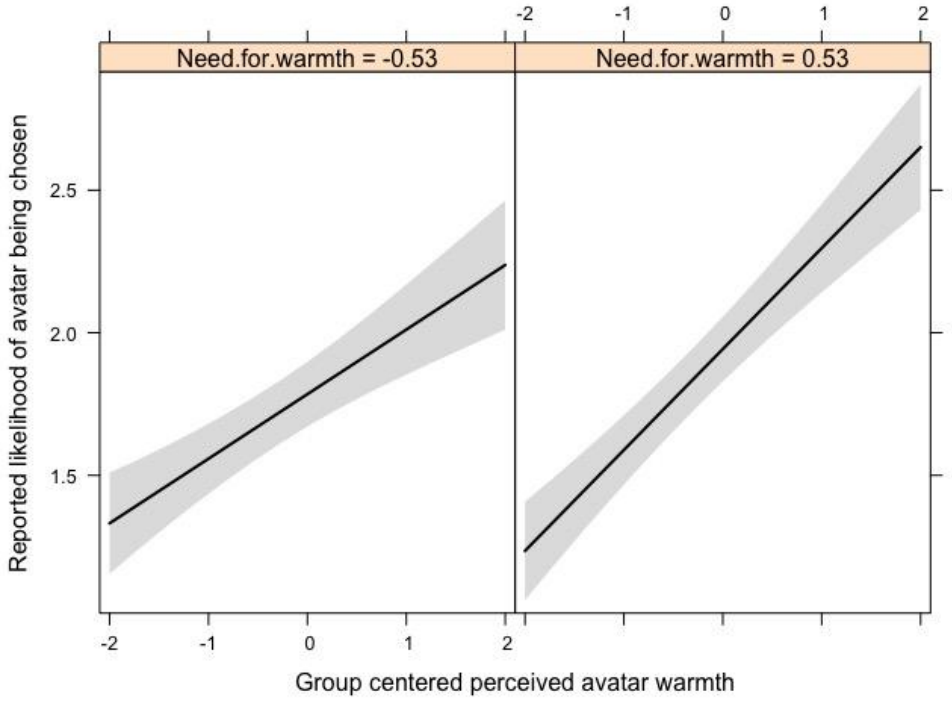

Figure 2: Linear relationship between perceived avatar warmth and avatar preference for individuals one standard deviation (0.53) above and below mean need for warmth.

Need for competence. A composite measure of individual differences in need for competence was calculated by averaging scores for the IPS-Lead, IPIP-Achievement, PRF-Achievement, and MPS-Personal Standards scales. The mean score for this aggregate of need for competence was 3.72 with a standard deviation of 0.53. We then regressed avatar choice on this aggregate for need for competence, perceived avatar competence, and the interaction term between these two predictors. The control variables were also simultaneously entered into the regression model (Table 5).

Table 5: Study 2- Avatar preference regressed on perceived avatar competence, rater need for competence (composite score), avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	*t*	*p*
Intercept	1.54	0.07	20.65	<.001
Perceived avatar competence	0.28	0.04	7.78	<.001
Need for competence	0.01	0.08	0.19	.85
Perceived avatar competence × Need for competence	0.03	0.06	0.56	.57
Perceived avatar warmth	0.31	0.03	9.50	<.001
Avatar attractiveness	0.12	0.04	2.95	<.001
Avatar familiarity	0.02	0.06	0.34	.73
Avatar femininity	-0.03	0.03	-1.22	.22
Avatar anthropomorphization	0.00	0.02	0.24	.81
Avatar gender	0.02	0.09	0.22	.82
Rater gender	0.12	0.08	1.41	.16
Avatar-rater gender match	0.55	0.05	10.99	<.001

Individual differences in need for competence were not a statistically significant predictor of avatar choice. However, perceived avatar competence was a statistically significant positive predictor of avatar choice. In other words, as an avatar was perceived to be more competent, the likelihood that it would be chosen as a self-representation also increased. There was no statistically significant interaction between individual differences in need for competence and perceived avatar competence. In other words, the relationship between perceived avatar competence and avatar choice did not vary based on individual differences in need for competence (Figure 3)[2].

[2] Separate regression models were also estimated for each scale used to measure need for competence. There was no main effect of need for competence based on any of the specific competence scales, nor was there any significant interaction between any of the specific competence scales and perceived avatar competence. Please see Appendix D for results of competence scale specific regression models.

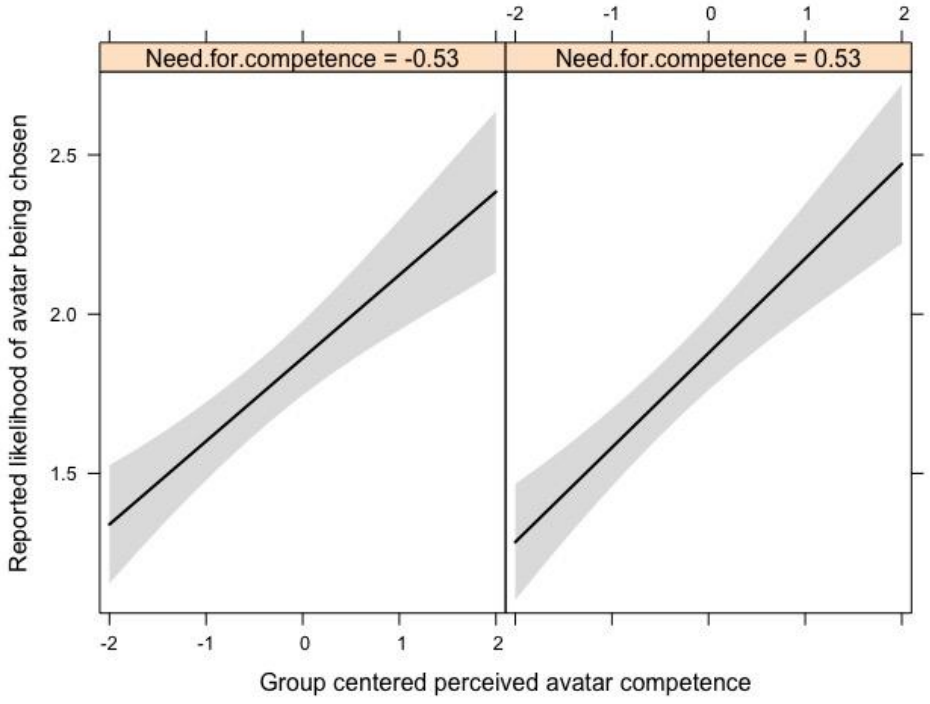

Figure 3: Linear relationship between perceived avatar competence and avatar preference for individuals one standard deviation (0.53) above and below mean need for competence.

Discussion

In Study 2, we investigated whether avatar preferences aligned with overarching psychological needs. Specifically, we were interested in whether avatar preferences reflected the needs for warmth and competence.

First, we examined if perceptions of avatar warmth and competence were predictors of avatar choice. The correlational results indicated that both perceived avatar warmth and competence predicted avatar choice. Specifically, avatars that were seen as warmer or more competent were also rated as being more likely to be chosen as a self-representation. Furthermore, perceived avatar warmth and competence both remained unique predictors of avatar preference after accounting for several control variables (i.e., avatar attractiveness,

familiarity, anthropomorphization, femininity, avatar gender, perceiver gender, and whether or not the perceiver's gender matched the avatar's gender). These results supported our hypothesis and also support previous findings that individuals generally evaluate avatars similarly to how they evaluate humans (Nass & Moon, 2007; Wohlrab et al., 2009). The intercorrelations between ratings of avatar perceptions also supported the hypothesis that evaluation of avatars mirrors the evaluation of humans. For instance, ratings of avatar warmth and competence were inversely related: warmer avatars were seen as less competent and vice versa. An inverse relationship between ratings of warmth and competence has also been found for the evaluation of some social groups (Fiske et al., 2002). Therefore, social cognitive traits that play an important role in social evaluations, such as warmth and competence, also lead to similar social evaluations for avatars. Specifically, these results were consistent with a past study that found that social agents considered to be warmer and more competent were more likely to be positively evaluated (Fiske et al., 2002).

Additionally, these results suggest that avatar representation may contribute to the fulfillment of psychological needs, specifically the need for affiliation. Because individuals generally approach outcomes that help satisfy their basic psychological needs (Deci & Ryan, 2000), selecting avatars that embody these social characteristics may help individuals approach these goals. We examined whether individual differences in need for warmth and need for competence moderated which avatars were considered more desirable. In other words, did individuals high in need for warmth prefer avatars that were high in perceived warmth, and did individuals high in need for competence prefer avatars that were high in perceived competence? Individuals with a higher need for warmth tended to prefer avatars that were perceived to be high in warmth. However, preference for competent avatars did not depend on whether an individual

had a high need for competence. Thus, our hypothesis was only partially supported: avatar preferences were found to align with some, but not all, personal needs (i.e., need for warmth, but not competence).

High need for warmth motivates tendencies towards social affiliation, including behaviours that reduce the likelihood of social exclusion (Leary et al., 2005) and increase the likelihood of social connection (DeWall, Baumeister, & Vohs, 2008). Choosing an avatar that is perceived to communicate characteristics of interpersonal warmth may act as a strategy to approach the overarching goal of social connection. Previous research has found that traits ascribed to avatars are often extended to their users (Nowak & Rauh, 2008). Thus, individuals high in need for warmth might find avatars that communicate warm social characteristics as particularly desirable, as they hope to extend the traits of the avatar to the self. Choosing a warm avatar may act as a signal to others that the user is also warm, thereby encouraging others to approach or befriend the user. This is in line with previous research that has found that avatars created by agreeable individuals were more likely to elicit the intent in perceivers to befriend the creator (Fong & Mar, 2015). Because virtual environments are cue-lean, users must learn to maximize medium-specific tools to control the impression they make with others (Walther, 1993). If a user can leverage their avatar to successfully facilitate social interactions online, this can ultimately result in the satisfaction of goals for affiliation. It is important to note virtual environments are now a common venue for individuals to meet others and foster meaningful social relationships (Steinkuehler & Williams, 2006). Increasing the chances of forming social connection in online contexts is therefore a viable strategy to satisfy one's goals for affiliation in the modern era.

In this study, personal needs for competence did not moderate the relationship between perceived avatar competence and avatar preferences. This was unexpected, as previous research has demonstrated that goal motivation varies as a function of individual differences in the need for competence (Schuler, Sheldon, & Frohlich, 2010). Thus, we expected that individual variability in personal need for competence would influence the evaluation of perceived avatar competence during avatar selection. One possible explanation for this pattern of results is the salience of competence needs in videogame contexts. Videogames are generally highly goal-oriented environments, where primary objectives often encompass mastery of skills in order to overcome obstacles, enemies, or game-level requirements (Oswald, Prorock, & Murphy, 2014; Przylbylski et al., 2010; Schmierbach, Chung, Wu, & Kim, 2014). Thus, exposing participants to videogame content may make the desire for high levels competence particularly salient. It is possible that the avatars in this study, which were primarily obtained from videogames, created a context that elicits uniformly strong motivations for competence, wiping out any possibility of a moderation effect. Anticipation of an upcoming challenge and/or competition may motivate a preference for avatars perceived to be highly competent. In other words, if the user assumes that the avatar will be used in a videogame context, choosing an avatar perceived to be highly competent may be an important motivation regardless one's personal need for competence. The selection of a competent avatar may help users feel as though they are prepared to pursue mastery or success in an upcoming task, thereby allowing for the approach of overarching needs for competence. Indeed, a study by Vasalou and Joinson (2009) found that the anticipation of future contexts influenced the types of features individuals chose to emphasize in their avatar. For example, being told the avatar was going to be used in a trivia game context led participants to choose customizations that communicated intelligence (e.g., glasses). Future studies might

explore the role of anticipated context more explicitly. For example, participants could be given explicit expectations for what the avatar will be used for in order to explore whether different user expectations for avatar-use might affect avatar preference. Future studies might also explore if exposure to videogame characters prime need for competence.

Across Studies 1 and 2, we have explored how avatars can be a reflection of the self in terms of personality and psychological needs. However, the flexibility of avatars affords the possibility that an avatar does not have to be a direct representation of a user's offline identity (Hoffner, 2008; Turkle, 1984). Although Studies 1 and 2 have demonstrated that avatars contain a kernel of truth regarding an individual's offline persona, there is also a possibility that there may be a divergence between one's offline and digital self-representation. In Study 3, we begin to explore the motivations and outcomes for creating avatars that diverge from our real-world selves.

Chapter 4: Avatar construction in response to salient needs

Although avatars can often accurately reflect the identity of users (Study 1 and Study 2), there are times when individuals may deliberately represent themselves in inaccurate ways. For example, participants may choose to exaggerate different traits depending on the context within which the avatar will be used (Vasalou & Joinson, 2009). Context can therefore influence the salience of a motivation to create avatars that don't accurately represent the self. One important context is the presence or absence of a psychological threat (e.g., a stimulus that elicits feelings of anxiety and uncertainty; Sheldon & Kasser, 2008). Psychological threat can take on many forms, including social rejection (Williams & Sommer, 1997), threats to self-image (Leary, Terry, Allen & Tate, 2009), or feelings of mortality (Solomon, Greenberg, & Pyszczynski, 1991). Various forms of psychological threat can lead to different compensatory behaviours, which serve to protect the self. These behaviors include outgroup denigration (Crocker, Thompson, McGraw, & Ingerman, 1987), distorted views of group cohesion (McGregor, Nail, Marigold, & Kang, 2005), and deliberate focus on positive thoughts (Dodgson & Wood, 1998). Another possible compensatory behavior in response to threats is self-enhancement (Vohs & Heatherton, 2001).

The need to self-enhance is a desire to see oneself in a positive light (Sedikides & Strube, 1995). Self-enhancement frequently occurs as a self-protective behaviour, allowing individuals to avoid negative self-evaluation (Baumeister et al., 2001). Indeed, the motivation to self-enhance becomes particularly salient in response to threats to the self. For example, participants who experience a self-threat tend to describe themselves as better than others (Beauregard & Dunning, 1998) and derogate others so that they appear superior in comparison (Wills, 1981). Because avatars allow for flexible self-representation (Hoffner, 2008), they may afford an

accessible venue for compensatory self-enhancement in response to self-threat. Contexts such as the presence of a psychological threat to the self may increase the salience of motivations to self-enhance using avatars, specifically by emphasizing idealized characteristics during avatar creation. In other words, after experiencing a self-threat, individuals may create an avatar that reflects their ideal self rather than their actual self.

The ideal self represents an individual's hopes and aspirations for their future (Higgins, 1987). In essence, the ideal self represents who an individual would ideally like to become. Being closer to one's ideals is related to a number of positive psychological outcomes, including higher positive affect and lower incidence of mood disorders, such as depression (Higgins, 1987). However, it can be very challenging to approach one's ideals in day-to-day life (Boyatis & Akrivou, 2006). Avatars could provide a venue for accessing these self-ideals, which are typically difficult to obtain. There is some evidence that all user-created avatars are related, to some degree, to their creators' ideals. For example, ideal-self avatars tend to be more appealing to individuals than avatars that accurately mirror the self (i.e., actual-self avatars; Jin, 2009). Additionally, individuals generally create avatars with idealized body shapes (Dunn & Guadagno, 2012). However, the desire to create an ideal self-representation may be more salient in a context of threat. In addition, the need or motivation to self-enhance may also vary between individuals.

Correlational research supports a link between ideal avatar use and personal desires to self-enhance. Specifically, ideal avatars may be particularly attractive to individuals who struggle to attain their ideals in real life. For example, individuals who score high on depressive symptomology also tend to favour avatars that are closer to their ideals than their actual self (Bessiere, Seay, & Kiesler, 2007; Dieter, Hill, Sell, Reinhard, Vollstadt-Klein, et al., 2014;

Lemenager, Gwods, Richter, Reinhard, Kammerer, et al., 2013). Additionally, Cacioli and Mussap (2014) have suggested that creating physically ideal avatars could serve a compensatory function for males. However, the causal relationship between avatar idealization and user characteristics is not clear. For example, it is possible that individuals with self-concept deficits engage with idealized avatars in an effort to self-enhance. Conversely, it is also possible that engaging in self-enhancement through idealized avatars leads to perceived deficits in self-concept. Furthermore, it is not known whether psychological outcomes, such as changes in affect or self-esteem, can result from engagement with avatars in response to psychological threat. Experimental work is needed to determine the causal relationship between personal needs, such as the need to self-enhance, and avatar engagement when it comes to ideal avatars.

Study 3

The goal of Study 3 is to investigate how personal needs relate to the motivation to create an idealized avatar, discrepant from one's actual self. Specifically, does experiencing a self-threat motivate users to self-enhance when they create or customize an avatar? We hypothesized that experiencing a self-threat would result in the creation of idealized avatars. Furthermore, does the opportunity to create an avatar alleviate the negative outcomes associated with psychological threat, such as negative affect and reduced self-esteem? We hypothesized that the opportunity to self-enhance by customizing an avatar would repair negative outcomes associated with experiencing threat. Specifically, we expected that individuals who create an avatar following a psychological threat would also exhibit improved mood and self-esteem compared to individuals who did not create an avatar, following the same threat.

Methods

Overview

This study was a two condition experimental study. In the Self condition, participants were asked to create an avatar of the self immediately following a psychological threat. In the Control condition, participants were asked to create a control avatar immediately following a psychological threat. In both conditions, participants were asked to create an avatar (self-avatar in the Control condition, and control-avatar in the Self condition) prior to experiencing the psychological threat for comparison (see Figure 4).

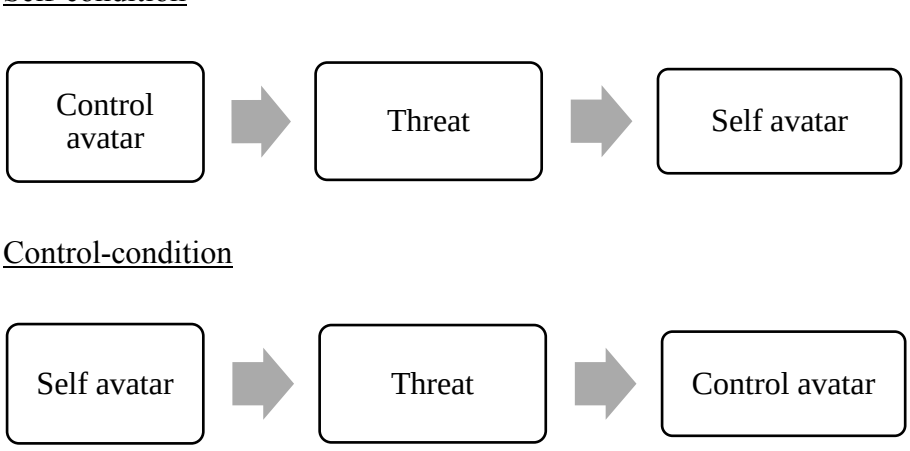

Figure 4: Overview of Study 3 design.

Participants

Participants were recruited from the undergraduate research participant pool at a large Canadian university and received partial course credit as remuneration. The initial sample prior to data cleaning consisted of 216 participants. Because this study involved deception regarding the psychological threat, participants were debriefed at the conclusion of the study and any participant expressing suspicion regarding the threat manipulation was removed from the sample prior to analysis ($N = 20$ removed). An additional 4 participants were removed due to missing

consent data. Next, following the procedure from Study 2, 16 participants were removed based on incorrect responses on the two inattentive responding items. A final 4 participants were removed due to excessive missing data (i.e., scales missing data for 50% or more of the items). All participant removals due to data cleaning were completed prior to data analysis. The final sample consisted of 172 participants (124 female, 1 undisclosed) between the ages of 16 and 37, M_{age} = 19.23, SD_{age} = 2.77.

Stimulus

Remote Associates Test (RAT). The RAT used to induce psychological threat. The RAT is a cognitive task in which participants are asked to find a single word that connects three seemingly unrelated words. For example, the words "skating," "cream," and "water" are all linked by their association with the word "ice." The original RAT was first developed by Mednick (1962) as a means of measuring creative thinking, but has since been employed in a variety ways in psychology studies (see Bowden & Jung-Beeman, 2003 for an overview). In this study, following the procedure used by Heatherton and Vohs (2001), a difficult version of the RAT was used to induce feelings of psychological threat. The RAT employed in this study consisted of 15 items and items were chosen based difficulty determined by normative data reported by Bowden and Jung-Beeman (2003). Of the 15 items, 5 items had an easy/medium difficulty rating and 10 items had a hard/very hard difficulty rating. Participants were given five minutes to complete as many of the items as possible. Once the five minutes had elapsed, participants were shown their score. To induce threat, participants received false feedback regarding their performance on the task. Specifically, all participants were told:

The average undergraduate responded to 13 of the 15 items correctly. Your score puts you in the 13th percentile, meaning 87 percent of participants who completed this task performed better than you.

Avatar creation. Avatars were created using the avatar creation tool in the game *The Sims 3* (Electronic Arts, 2009). *The Sims 3* offers a simple and intuitive avatar customization interface, however we wanted to ensure that participants would be aware of all the customization options available. We created a five-minute tutorial video using screen capture software to record the process of customizing a sample avatar. Specifically, the video walked through every step of the avatar creation process from facial feature selection to clothing customization, and was supplemented by on-screen text annotations to highlight different aspects of the software interface (see Figure 5 for screenshots of the tutorial). All participants were required to watch the tutorial video before engaging in avatar creation.

Measures

Self-liking self-competence scale (SLCS). The SLCS (Tafarodi & Swann, 1995) was used to assess self-esteem. The SLCS conceptualizes self-esteem as consisting of two components: self-liking and self-competence. Self-liking refers to the one's internalized evaluation of the self based on moral and social evaluations. In other words, self-liking is related to considerations of the self as "good" or "bad," and is closely related to our perceptions of how we feel others see us. Self-liking is measured with 10 items with an example item being, "I feel good about who I am." In contrast, self-competence refers to one's assessment of the ability to act as an effective causal agent in life. Self-competence is assessed with 10 items with an example item being, "I perform very well at a number of things." Participants respond to items on both the self-liking and self-competence subscales on a 5-point Likert scale ranging from 1

Figure 5: Screenshots of the annotated avatar creation tutorial video.

(*Strongly disagree*) to 5 (*Strongly agree*). Overall, the SLCS captures self-esteem in terms of individuals being both agentic and social beings. Although self-liking and self-competence are highly intercorrelated, these two subscales are also distinct and have discriminant validity (Tafarodi & Swann, 2001).

Multiple Affect Adjective Checklist-Revised (MAACL-R). A modified version of the MAACL-R (Zuckerman, Lubin, & Rinck, 1983) was used to assess mood. The MAACL-R consists of a list of adjectives that describe various affective states and participants are asked to select the ones that apply to their current emotional state. The number of adjectives selected in each affective category is then summed. In this study, adjectives pertaining to the affective states of happiness and dejection were presented to participants. An example for happiness is "Satisfied" and an example for dejection is "Discouraged." Although the traditional administration of the MAACL-R asks respondents to simply check whether or not they are experiencing that emotion, we asked participants to respond using a 5-point Likert scale for more nuanced measurement, with the scale ranging from 1 (*Not at all how I feel*) to 5 (*Exactly how I feel*). Scores for each affective state were determined by averaging the scores across items pertaining to each state.

Ideals. Participants were asked to respond to 7 face-valid questions regarding how close they felt to their ideal self (Table 6). Participants indicated the extent to which they agreed with each statement on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

Table 6: Study 3- Items measuring closeness to ideals.

	Item
1	Who I am right now is very similar to who I would ideally like to be.
2	Becoming the person I would ideally like to be is an attainable goal.
3	My ideal self is very different from who I am today (reverse coded).
4	My ideal self is unattainable (reverse coded).
5	The person I am right now is ideal.
6	I do not need to improve myself to be the person I ideally would like to be.
7	A lot of self-improvement is needed for me to become the person I would ideally like to be (reverse coded)

Participants were also asked to rate created avatars on a single item measuring how close the avatar was to their ideal self: "This avatar reflects who I would ideally like to be."Participants responded to this item on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

Inclusion of Others in the Self (IOS). Participants were asked to indicate the extent to which the created avatar overlapped with their self-concept using the IOS (Aron, Aron, & Smollan, 1992). The IOS was developed in order to measure relationship closeness, but also as a measure of interpersonal connectedness. The IOS consists of 7 diagrams of two circles (one circle representing the self, the other circle representing an other) that have varying degrees of overlap. Diagrams with greater amounts of overlap between the two circles represent greater interconnectedness between the self and a target other. The IOS is traditionally used to determine closeness in interpersonal relationships such as romantic couples (Aron et al., 1992), but it has also been applied as a measure of conceptual closeness between the self and one's avatar (Chandler et al., 2009).

Avatar liking. Avatar liking was measured using a single face-valid item, "How much did you like the avatar you created?" Participants responded to this item on a 7-point Likert scale ranging from 1 (*Dislike a great deal*) to 7 (*Like a great deal*).

Procedure

This study employed a two condition experimental design and was conducted in a computer laboratory. Participants were randomly assigned to the Self condition or the Control condition. Upon beginning the study, participants indicated their gender and watched a brief tutorial video on using *The Sims 3* avatar creation software, then continued to the first avatar creation task. Participants in the Self condition were asked to create a control avatar based on a picture of someone else, and were instructed to create an avatar that physically matched the control image as closely as possible. To minimize participant similarity with the control avatar, participants always created an avatar of an opposite gender, middle-aged model (Figure 6). In contrast, participants in the Control condition were asked to create an avatar representation of themselves. Because we wanted to allow participants flexibility in self-avatar creation, participants were given very general instructions regarding avatar creation, "Please create an avatar that represents yourself." Participants in both conditions had 10 minutes to complete the avatar creation task. At the end of 10 minutes, a research assistant informed them it was time to move on to the next task.

After completing the first avatar creation task, participants were asked to indicate how much that avatar reflected their ideals, rate avatar liking, and judge avatar overlap with the self. Subsequently, all participants then completed the RAT and received false feedback regarding their performance, constituting the threat to self, before engaging in the second avatar creation task. Participants in the Self condition were then asked to create an avatar representation of themselves; participants in the Control condition completed the control task (i.e., creating an avatar based on a picture of someone else). Again, all participants were given 10 minutes to

complete the avatar creation task. All participants then completed the SLCS, MAACL, and ideal self questionnaires.

Figure 6: Models from stock photography for avatars created in the control task.

Results

A total of 88 participants completed the Self condition (i.e., self avatar created after threat), and 84 participants completed the Control condition (i.e., control avatar created after threat). For analysis, the experimental condition was dummy coded such that the Self condition was 0 and the Control condition was 1.

Descriptives

Descriptives and reliability scores for outcome measures and avatar ratings are found in Table 7. After calculating descriptive statistics, a large amount of missing data was discovered for one item pertaining to the control avatar ("This avatar reflects who I would ideally like to be."). This missing data appears to be due to an undetermined software error; due to the low *N* for this item, this item was dropped from further analysis.

Table 7: Study 3- Descriptives

Measure	*M*	*SD*	α
Self avatar liking	5.61	1.25	[a]
Self avatar idealness	3.14	1.14	[a]
Self avatar IOS	4.45	1.76	[a]
Control avatar liking	4.87	1.44	[a]
Control avatar idealness	1.35	0.75	[a]
Control avatar IOS	2.04	1.57	[a]
Self-liking	3.54	0.73	0.90
Self-competence	3.72	0.53	0.82
Closeness to ideals	3.13	0.56	0.72
Positive affect	3.53	0.64	0.93
Depressive affect	2.05	0.75	0.91

Note: [a] Single item and so alpha not calculated.

As intended, participants performed very poorly on the RAT with a mean of 3.92 puzzles solved correctly out of 15. When asked to how they rated their performance on the RAT, 76% of participants indicated they perceived their performance to be "Poor" or "Very Poor." This indicates that our false feedback was effective in conveying an experience of having done poorly on a cognitive task and should be a psychologically threatening experience.

Differences between self and control avatars.

We first conducted paired *t*-tests to compare participants' perceptions of their self avatar and the control avatar they created. Participants reported liking their self avatar more than their control avatar, $t(169) = 5.77$, $p < .001$, $M_{difference} = 0.74$, 95% $CI_{\text{mean difference}}$ [0.48, 0.99], $d = .45$.

Participants also reported more overlap between their self avatar and themselves than between their control avatar and themselves, based on the IOS, $t(159) = 13.22$, $p < .001$, $M_{difference} = 2.41$, 95% $CI_{Mean\ difference}$ [2.05, 2.77], $d = 1.05$. Overall, participants seemed to feel more positively and closer to avatars created to reflect the self rather than a control avatar created based on a model of a stranger, which is consistent with our aims.

Do individuals self-enhance by creating idealized avatar self-representations after experiencing psychological threat?

We conducted a between groups *t*-test comparing whether participants considered their self avatars to be more ideal based on whether they were created before (Control Condition) or after the ego threat (Self Condition). There was no statistically significant difference in ratings of how ideal participants perceived their self-avatars to be, based on whether they were created before ($M = 3.19$) or after ($M = 3.08$) the threat, $t(168.3) = 0.63$, $p = .53$, 95% CI [-0.23, 0.45], $d = 0.09$. This result does not support our hypothesis that exposure to threat would lead to participants to be more likely to create an idealized self-avatar.

Does creating an avatar self-representation following threat alleviate negative outcomes following threat?

We conducted a series of *t*-tests examining differences in self-liking, self-competence, closeness to ideals, positive affect, and depressive affect between experimental groups (Table 8). There were no statistically significant differences between the two experimental conditions on any of the outcome variables. In other words, creating a self-avatar after experiencing threat did not influence self-liking, self-competence, closeness to ideals, or affect (both happy and depressive). These results do not support our hypothesis that creating a self-avatar could repair negative outcomes associated with experiencing threat. However, it is possible that avatars only

influence personal outcomes when individuals feel particularly close to them (i.e., perceive a greater overlap between the avatar and their self-concept). The possibility that the effect of creating a self-avatar after threat was moderated by closeness between one's self-concept and their avatar was therefore explored in a post-hoc manner using a series of regression models.

Table 8: Study 3- T-tests between groups for self-liking, self-competence, closeness to ideals, positive affect, and depressive affect.

Measure	Group	*M*	*SD*	*t*	95% CI	*p*	Cohen's d
Self-liking	Experimental	3.53	0.72	-0.13	-0.24, 0.21	.90	0.02
	Control	3.55	0.73				
Self-competence	Experimental	3.68	0.60	-0.95	-0.24, 0.08	.34	0.15
	Control	3.76	0.45				
Closeness to ideals	Experimental	3.16	0.64	0.75	-0.10, 0.24	.45	0.12
	Control	3.09	0.48				
Positive affect	Experimental	3.53	0.66	-0.06	-0.20, 0.19	.95	0.01
	Control	3.53	0.62				
Depressive affect	Experimental	2.08	0.82	0.57	-0.17, 0.30	.57	0.09
	Control	2.02	0.68				

The outcome variables of self-liking (Table 9), self-competence (Table 10), closeness to ideals (Table 11), positive affect (Table 12), and depressive affect (Table 13) were regressed separately on the interaction between experimental condition and self-avatar overlap, based on the IOS ratings for the self-avatar. There were no statistically significant interactions or main effects for experimental condition and IOS ratings for self-liking, self-competence, or depressive affect.

Table 9: Study 3- Regression of self-liking predicted by the interaction between self avatar IOS and experimental condition.

Variable	β	*SE*	*t*	*p*
Intercept	3.36	0.23	14.47	< .001
IOS	0.04	0.05	0.79	.43
Condition	0.24	0.31	0.77	.44
IOSxCondition	-0.05	0.07	-0.74	.46

$R^2 = 0.00$, $F(3, 165) = 0.24$, $p = .87$

Table 10: Study 3: Regression of self-competence predicted by the interaction between self avatar IOS and experimental condition.

Variable	β	*SE*	*t*	*p*
Intercept	3.56	0.17	21.16	< .001
IOS	0.03	0.03	0.78	.44
Condition	0.14	0.22	0.64	.52
IOSxCondition	-0.01	0.05	-0.24	.81

$R^2 = 0.01$, F (3, 165) = 0.55, $p = .64$

Table 11: Study 3- Regression of closeness to ideals predicted by the interaction between self avatar IOS and experimental condition.

Variable	β	*SE*	*t*	*p*
Intercept	3.37	0.18	18.95	< .001
IOS	-0.04	0.03	-1.25	.21
Condition	-0.50	0.24	-2.10	.04
IOSxCondition	0.10	0.05	1.98	.05

$R^2 = 0.03$, F (3, 165) = 1.51, $p = .21$

Table 12: Study 3- Regression of positive affect predicted by the interaction between self avatar IOS and experimental condition.

Variable	β	*SE*	*t*	*p*
Intercept	3.44	0.20	16.98	< .001
IOS	0.02	0.04	0.47	.64
Condition	-0.34	0.27	-1.23	.22
IOSxCondition	0.09	0.06	1.53	.13

$R^2 = 0.04$, F (3, 162) = 2.22, $p = .09$

Table 13: Study 3- Regression of depressive affect predicted by the interaction between self-avatar IOS and experimental condition.

Variable	β	*SE*	*t*	*p*
Intercept	1.91	0.24	7.93	< .001
IOS	0.04	0.05	0.78	.44
Condition	0.24	0.33	0.73	.47
IOSxCondition	-0.07	0.07	-0.99	.33

$R^2 = 0.04$, F (3, 162) = 2.22, $p = .09$

There was, however, a statistically significant main effect of experimental condition (Table 11, Figure 7). Creating a self-avatar after experiencing a threat resulted in lower scores on closeness to ideals compared to when the self-avatar was created prior to the threat. In other

words, creating a self-avatar after experiencing a threat led to the perception in individuals of being further from their ideals. This finding is inconsistent with the hypothesis that self-avatars could repair negative outcomes associated with ego threat, but rather would appear to reflect some other process. Additionally, there was a statistically significant interaction between experimental condition and IOS for closeness to ideals. We probed the interaction by comparing the slopes of the relationship between IOS and closeness to ideals for both the Self condition and the Control condition. Because experimental condition was dichotomous, probing the interaction required comparing the original model to a new model where experimental condition was recoded (the Self condition was coded 1, and the Control condition was coded 0). When the self-avatar was created after experiencing threat, there was a weak negative relationship between IOS and closeness to one's ideals ($\beta = -0.04$, $SE = 0.03$, $t = -1.25$, $p = .25$). In other words, the closer participants felt to their avatar when it was created after a threat, the further they felt from their ideals. In contrast, when the self-avatar was created before experiencing threat, there was a weak positive relationship between IOS scores and closeness to one's ideals ($\beta = 0.06$, $SE = 0.04$, $t = 1.55$, $p = .12$). So, the more overlap between self and avatar when the avatar was created before a threat, the closer participants felt to their ideals. The relationships between IOS and closeness to ideals did not reach statistical significance in either model, despite the overall interaction being statistically significant. To rule out the possibility that overlap between the self and any avatar (rather than an avatar of the self, specifically) could lead to feeling closer to one's ideals, a model was estimated examining the interaction between experimental condition and IOS scores for the control avatar (Table 14). There were no statistically significant main effects or an interaction for this regression, indicating that the interaction observed above only applies to avatars representing the self.

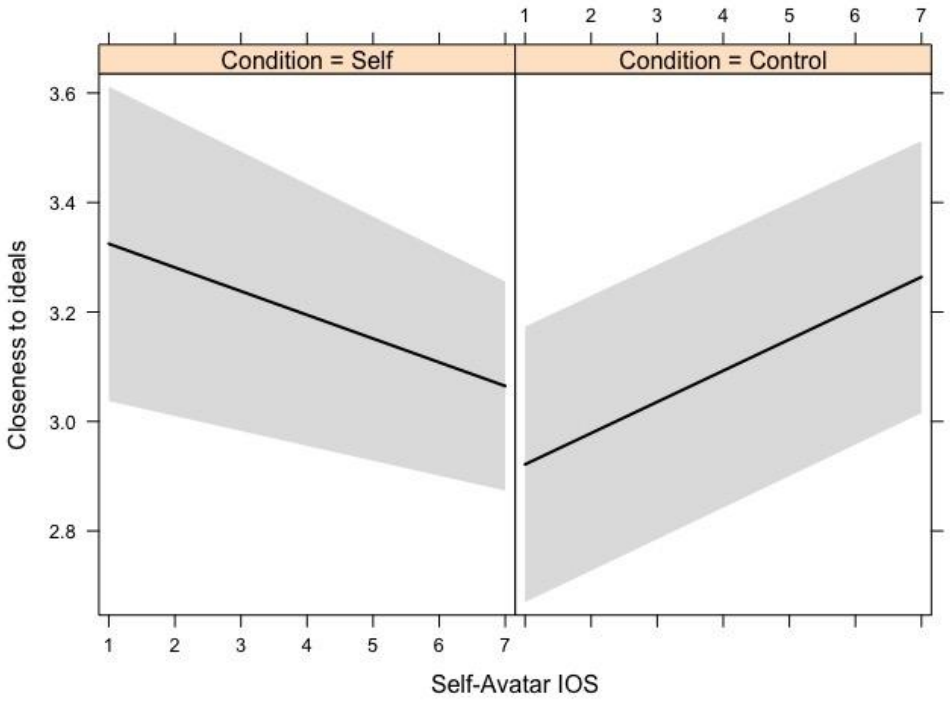

Figure 7: Interaction between self-avatar IOS and experimental condition predicting distance from ideals.

Table 14: Study 3: Regression of closeness to ideals predicted by the interaction between control avatar IOS and experimental condition.

Variable	β	*SE*	*t*	*p*
Intercept	3.21	0.11	29.82	< .001
IOS	-0.02	0.05	-0.41	.68
Condition	-0.07	0.15	-0.45	.65
IOS × Condition	-0.00	0.06	-0.03	.98

$R^2 = 0.01$, $F\ (3, 153) = 0.44$, $p = .72$

Although not statistically significant, a similar pattern of interaction between self-avatar overlap for the personal avatar and experimental condition was observed for positive affect (Table 12, Figure 8). Specifically, when a self-avatar was created following an ego threat, there was no relationship between greater overlap (between self and avatar) and positive affect. However, when a self-avatar was created prior to experiencing an ego threat, greater levels of overlap between the self and one's avatar were related to increased levels of positive affect. In

other words, the more overlap participants reported between themselves and a self avatar they created prior to an ego threat, the happier they reported being after the threat. This pattern of results was also unexpected and was not consistent with the hypothesis that creating a self-avatar could reduce negative outcomes following an ego threat. Instead, it seems feeling close to a self-avatar prior to experiencing psychological threat might result in a boost to positive affect. Importantly, this increase in positive affect is maintained even after experiencing the psychological threat.

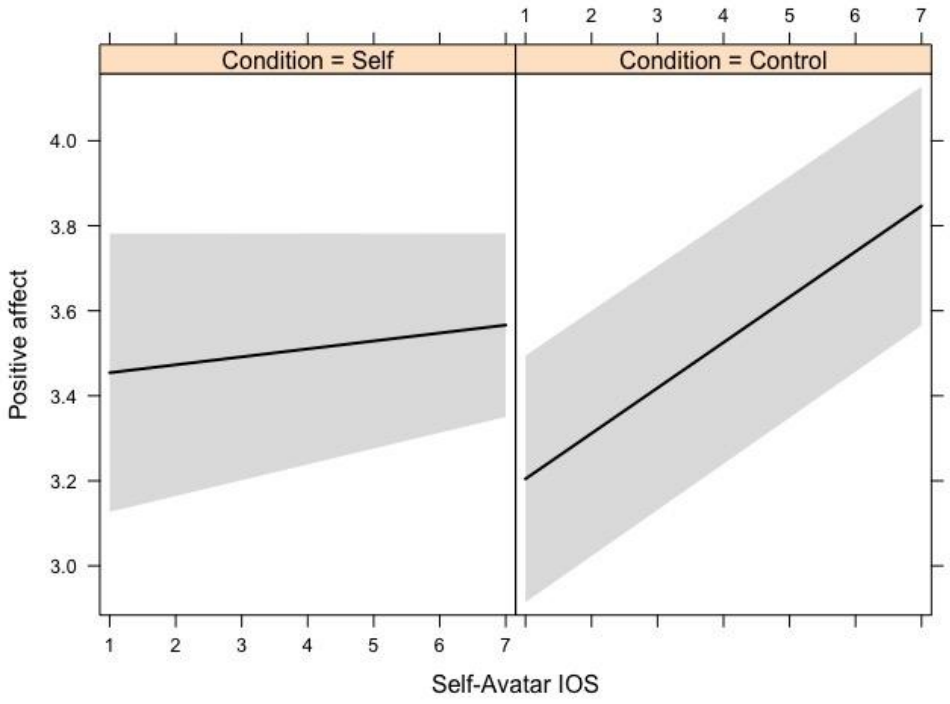

Figure 8: Interaction between self-avatar IOS and experimental condition predicting positive affect.

Discussion

In Study 3, our goal was to investigate the outcomes of avatar creation in response to personal needs. Specifically, do individuals self-enhance by creating idealized avatars after experiencing a self-threat? Additionally, does avatar creation alleviate the negative outcomes

associated with threat? We hypothesized that avatar creation could provide a domain-specific opportunity (i.e., self-concept) to negate feelings of self-threat through self-enhancement. Furthermore, we hypothesized that the opportunity to self-enhance through the creation of a self-avatar could repair the negative impact of exposure to threat, such as lowered self-esteem, reduced closeness to ideal self-concept, and experience of negative affect.

Whether participants created an avatar self-representation before or after a threat to the self did not seem to affect how ideal they perceived their avatar to be. This finding does not support our hypothesis that participants would create more idealized avatars subsequent to an ego threat, and so it is possible that avatar creation is not responsive to ego threat. Additionally, creating a self-avatar after experiencing an ego threat did not impact personal outcomes. Specifically, there was no difference in reported self-liking, self-competence, closeness to ideals, positive affect, or negative affect based on whether participants created a self or control avatar after experiencing a threat. Thus, contrary to our hypothesis, participants did not find the act of creating a self-avatar to be reparative following the experience of ego threat. Whether a self-avatar was created before or after an ego threat did, however, influence participant outcomes when the amount of overlap between the self and one's avatar was considered. For those who felt a greater overlap between the self and their avatar, creating an avatar self-representation before experiencing an ego threat led to feeling closer to one's ideals. In contrast, for these same individuals, creating an avatar self-representation after experiencing an ego threat led to feeling further from one's ideals. This was contrary to our expectation that avatar creation could serve a reparative function. One explanation of our observed findings is that creating an avatar self-representation after experiencing a threat may prolong or even exacerbate the negative outcomes

associated with this threat. Another possibility is that creating a self-avatar prior to ego threat may have acted as a form of buffer. We turn to exploring these two options in more detail.

The threat in this study could be characterized as a competence threat: participants were threatened by their inability to perform well on the RAT. Perhaps creating a self-representation after ego threat encourages repair for those aspects of the self that are currently salient, in this case, one's competence. Thus, avatars created after a threat may focus on idealizing the aspects of the self that have just been threatened (i.e., intelligence). In this fashion, creating an idealized avatar could ironically act as a reminder of the characteristics that one currently doesn't possess, particularly since the act of customizing an avatar can increase self-awareness of one's current state (Kim & Sundar, 2012; Waddell, Sundar, Auriemma, 2015). Previous research has shown that self-comparison with a superior target whose qualities are considered to be unattainable results in negative self-evaluations (Lockwood & Kunda, 1997). Avatars created after threat may therefore have acted as an unattainable target for upward social comparison, leading to negative personal outcomes.

As an alternative explanation, participants creating an avatar prior to the threat did not have any particular aspect of the self made salient, and so were less constrained with regard to what traits to think of or emphasize in their avatars. Therefore, these avatars may have been created with traits other than (recently-threatened) competence in mind (e.g., social skills). Thinking of these positive traits may have provided a buffer against the future threat, as a form of compensatory self-enhancement (Baumeister & Jones, 1978). Specifically, threats to particular aspects of the self (e.g., intelligence) can induce individuals to focus on or enhance other aspects of the self (e.g., social connectedness; Vohs & Heatherton, 2001). Experiencing a competence threat may have induced participants to focus on other traits that had been made

salient during the avatar creation task they completed just before, thereby feeling closer to those ideals and protecting their sense of self-worth.

Based on the pattern of results from this study, both buffering from avatar creation prior to threat and rumination from avatar creation following threat are possible explanations that cannot be disentangled. Buffering and rumination as individual or simultaneous mechanisms are therefore both plausible interpretations of these findings. A future study could disentangle these possible explanations by examining participant perceptions of particular avatar characteristics (e.g., intelligence, sociability) to investigate changes in domain-specific idealization and enhancement.

It is important to note that condition differences in this study only emerged when considering the moderating effect of overlap between the self and one's avatar. This pattern of findings is consistent with previous work indicating that media has a stronger effect on individuals when they report higher levels of media engagement. For example, narratives are more persuasive when individuals are more transported into the story (Bal & Veltkamp, 2013; Green, Brock, & Kaufman, 2004). More germane to the current study, changes to behavioural intentions and personal attitudes after media exposure are more likely to occur when readers feel closer to the protagonist in a target narrative (Kaufman & Libby, 2012). It is not surprising that avatar self-representations in this study only influenced participants as perceived overlap between the avatar and one's self-concept increased. Overall, these findings confirm that degree of engagement with media (e.g., transportation, identification) can play an important role in predicting the outcomes of media exposure.

A significant limitation of this study is that participants did not use their avatars after creation. It is possible that avatar creation without active engagement with those avatars elicits

different outcomes compared to those observed after actively engaging with an avatar. For example, in Cacioli and Mussap's (2014) study, participants reported benefits to personal outcomes such as self-esteem that were specifically tied to when they were online and engaged with their avatar. We therefore explore the role of engagement on outcomes of avatar use in Study 4.

Chapter 5: Personal outcomes after engaging with discrepant avatars

In Studies 1 and 2 we explored how avatars reflect true aspects of their users' identity in terms of their personality and personal motivations. However, although avatars contain a kernel of truth regarding identity, there may also be times when the flexibility permitted by avatar creation allows for the production of avatars that don't represent the true self. In Study 3 we investigated whether certain conditions (i.e., self-threat) might elicit greater self-enhancement via one's avatar, and the relationship between avatar self-enhancement and outcomes such as self-esteem and mood. However, avatar engagement typically does not end after the avatar is created. In many virtual environments, such as video games, individuals will subsequently actively control their created avatars. The active control of avatars may ultimately influence the self-concept of users. Specifically, self-perceptions may shift to align with the perceptions of an avatar based on use. These shifts in self-perception may occur if individuals feel that they are embodying their avatar.

Embodiment can be characterized as a theory of cognition that incorporates bodily states and physical contexts into the processing and retrieval of social and affective information (Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). According to theories of embodiment (Niedenthal et al., 2005), bodily feedback can play an important role in the way we consolidate and retrieve social information. For example, nodding one's head while listening to a persuasive message resulted in greater agreement with the message compared to shaking one's head (Wells & Petty, 1980). Similarly, performing an approach-related gesture (i.e., pulling up on a table) while performing a name-generation task resulted in the generation of more names for liked individuals. In contrast, performing an avoidance gesture (i.e., pushing down on a table) resulted in the generation of more names for disliked individuals (Forster & Strack, 1997).

Embodiment suggests that these findings can be explained because the physical motions performed are closely associated with attitudinal positions (e.g., nodding and agreement), which then become associated with the current environment (e.g., a persuasive message). Thus, physical motions play an important role in how attitudinal information is elicited, stored (Wells & Petty, 1980), and retrieved (Forster & Strack, 1997).

Although engaging with an avatar does not provide an individual with true physical feedback, research on the Proteus Effect (Yee & Bailenson, 2007; Yee et al., 2009) suggests that an avatar can act as a proxy for bodily feedback. The Proteus Effect is characterized by shifts in user self-perceptions after engaging with an avatar: for example, feeling more confident after playing a tall avatar (Yee & Bailenson, 2007). When engaging with an avatar, the qualities of this avatar may become included in the individual's currently activated self-concept. As a result, traits associated with the avatar (e.g., height) may also be incorporated into one's sense of self while the individual is engaged with the avatar. This is how controlling an avatar that is tall can subsequently elicit confident and socially-dominant behavior, both in the virtual environment and in offline contexts immediately afterward (Yee & Bailenson, 2007). Importantly, active control of the avatar plays an important role in shifting self-perception. Mere exposure to an avatar has been found to be insufficient to influence self-perceptions; in other words, changes to self-perception are not a result of simply being primed by exposure to the avatar (Yee et al., 2009). Repeated engagement with a particular avatar can also lead to long-term changes in the self-perception of users. For some individuals, their avatars are chronically activated as part of their self-concepts, even offline (Chandler et al., 2009). These individuals tend to report their BMI to be closer to the BMI of their avatar, suggesting that their avatar's appearance has a

constant influence on self-perception, even after engagement with the virtual environment is over.

Previous work on the influence of avatars on self-concept has largely focused on the impact of engaging with avatars with different physical characteristics such as height (Yee & Bailenson, 2007), attractiveness (Yee et al., 2009), body weight (Chandler et al., 2009), or sexualization (Fox, Bailenson, & Tricase, 2013). However, avatars may influence aspects of the self beyond physical appearance, with individuals perceiving their avatars to possess a number of personality traits and social characteristics (e.g., Bessiere, Seay, & Kiesler, 2007). For example, avatars that were perceived as creative have been found to influence subsequent creative behaviour (Guegan, Buisine, Mantelet, Marazana, & Segonds, 2016). Furthermore, Yoon and Vargas (2014) found that engaging with avatars associated with broad social categories could influence user outcomes. Specifically, controlling a heroic character in a video game resulted in higher rates of subsequent prosocial behaviour in an offline context, whereas controlling a villainous character resulted in higher rates of antisocial behaviour. It is not clear, however, how avatars that are created and customized by users might influence personal outcomes, especially when the avatar possesses coveted internal qualities. In other words, research has not addressed the outcomes of engaging with avatars that represent the ideal-self.

Examining the outcomes of engaging with ideal avatars is especially relevant to understanding the relationship between avatars and identity. Specifically, embodying one's ideals through an avatar might allow users to reduce their actual-ideal self-discrepancy, the gap between the currently perceived self and one's ideal self. It is possible that embodying one's ideals by using an avatar that possesses these ideals may lead to increases in positive affect and self-esteem by reducing this discrepancy between the actual self and ideal self. Additionally,

actively embodying one's ideals using an avatar could make ideals that are typically hard to attain seem more attainable, perhaps even in the real world. An increased sense of attainability plays an important role in ameliorating negative self-perceptions when engaging in upward social comparisons (Lockwood & Kunda, 1997).

Study 4

The current study investigates the outcomes of engaging with avatars that represent the ideal self. Does actively controlling an ideal-self avatar lead to self-perceptual changes such as reduced actual-ideal discrepancies and improved self-esteem? We hypothesized that engaging with such an avatar will increase the psychological closeness between the self and one' ideals, allowing the avatar to ultimately influence one's self-concept. Specifically, we hypothesized that playing with an ideal avatar would vicariously bring the user closer to their own ideals, diminishing their ideal-actual self-discrepancy as well as improving their self-esteem.

Methods

Overview

This study took place in two phases. In Phase 1, participants were asked to complete a number of measures regarding self-esteem and self-discrepancy. In Phase 2, the same participants were randomly assigned to one of four experimental conditions where they interacted with avatars, based on a 2 × 2 experimental design. The two independent variables were avatar type (Actual vs. Ideal) and engagement type (Watch vs. Play). After the avatar exposure manipulation, participants then completed the same self-esteem and self-discrepancy measures as in Phase 1.

Participants

Participants were recruited from the undergraduate research participant pool at a large Canadian university and received partial course credit as remuneration. Only participants who completed both Phase 1 and Phase 2 of the study were included in the sample ($N = 236$). Thirty-five participants were subsequently removed due to software/computer errors or logged research assistant error (e.g., giving participants incorrect instructions). An additional 12 participants were removed for failing to correctly respond to the inattentive responding item, "I am the kind of person who generally sleeps more than three hours a week." Exclusions were made before any statistical analyses were performed. The final sample included 189 participants (127 female) ranging in age between 17 and 39 ($M_{age} = 20.44$, $SD_{age} = 3.66$).

Materials

Self-esteem. Self-esteem was measured using the SLCS (Tafarodi & Swann, 1995), as in Study 3.

Self-discrepancies. The Selves Questionnaire (Higgins, Bond, Klein, & Strauman, 1986) was used to assess whether engaging with ideal avatars can diminish ideal-actual self-discrepancies. The Selves Questionnaire is a unique measure of self-discrepancy that allows assessment of ideals that are personally relevant to each individual. Participants were asked to generate 10 statements that describe their actual self (i.e., who they are at present) and 10 statements that describe their ideal self (i.e., who they aspire to become). Each statement was rated on a 4-point Likert scale indicating how much each statement describes them now ranging from 1 (*Slightly*) to 4 (*Extremely*).

The two lists of statements were then scored based on their conceptual and quantitative similarities following the procedure outlined by Higgins and colleagues (1986). Each statement

made for the actual self is compared with each statement generated for the ideal self. If two statements are synonymous with each other (e.g., kind and compassionate) and the quantitative difference in rating for the synonymous items is less than two, this was counted as a synonymous match and was scored as -1. If the ratings for the synonymous match has a difference of two or more, it was counted as a synonymous mismatch and is scored as a 1. If two statements are antonymous with each other (e.g., kind and mean-spirited), this was counted as an antonymous mismatch and was scored a 2. The total scores for matches and mismatches between actual and ideal statements are then summed for each participant, with higher scores indicating greater actual-ideal discrepancies.

Inspiration. Participants were asked to respond to a single item regarding the effect their avatars had on their outlook for the future. This item was, "Sometimes the avatars we create have an effect on how we feel. Take a moment to consider the kind of effect that your avatar may have had on you: Did she/he make you feel discouraged about your future, or inspired? Now, please rate how the game avatar you created made you feel." This question was rated on a 13-point Likert scale ranging from -6 (*Very discouraged*) to 6 (*Very inspired*).

Assimilation. Participants were asked 6 items to assess the level of overlap they perceived between their self-concept and their avatars. These questions were included to provide a measure of psychological closeness between the participant and their avatar. An example item is, "I feel very similar to the avatar." Participants rated the extent to which each item described them on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

Avatar creation. Avatars were created using *The Sims 3* software, as in Study 3.

Procedure

Study 4 was conducted as a two phase study. In Phase 1, participants completed an online survey on Qualtrics (www.qualtrics.com) that included the SLCS, the Selves Questionnaire, and a brief measure of demographics.

Phase 2 was conducted in a computer lab and involved a 2 × 2 experimental design. The first independent variable was avatar type, Actual or Ideal. The second independent variable was engagement type, Watch or Play. Upon arrival in the lab, participants were randomly assigned to one of the four experimental conditions. All participants watched a short tutorial video on how to create an avatar using *The Sims 3* software. Participants were then asked to create an avatar according to their assigned condition, Actual or Ideal (see Appendix E for full instructions). Participants were given as much time as they wanted to complete their avatar. Subsequently, participants proceeded to the engagement portion of the study.

To operationalize avatar engagement, avatars were placed in an open environment in *The Sims 3* which resembled a city park. This area is populated with game-generated avatars (i.e., non-player characters) and public buildings (e.g., library, café). Participants in the Watch condition simply observed their avatar automatically navigate the virtual environment with the avatar controlled by the game's artificial intelligence. Participants in the Play condition were able to control their avatar's movements and behaviours within the virtual environment. To give structure during the engagement, participants in the Play condition were given a list of simple activities to choose from. This list was based on common behaviours the game's artificial intelligence would use to guide avatars in the Watch condition. Example activities include having a conversation with one of the non-player characters in the game, visiting the library, or

playing in the park. The engagement portion of the study lasted for 5 minutes. All participants then completed the SLCS, Selves Questionnaire, assimilation questionnaire, and inspiration item.

Results

The final distribution of participants into the 4 experimental conditions was as follows: Ideal/Play ($N = 49$), Ideal/Watch ($N = 53$), Actual/Play ($N = 46$), Actual/Watch ($N = 41$). For analysis, the two independent variables were represented by two dummy-coded variables. Avatar type was dummy coded such that Actual was coded 0 and Ideal was coded 1. Avatar engagement was coded such that Watch was coded 0 and Play was coded 1.

Descriptives

Descriptive statistics for pre- and post-test scores for self-liking, self-competence, and self-discrepancy are reported in Table 15, along with descriptives for assimilation and inspiration. Change scores were also calculated for self-liking, self-competence, and self-discrepancy, by subtracting pre-test scores from post-test scores. Descriptives for these change scores are also reported in Table 15. For self-discrepancy change scores, note that higher values indicated greater self-discrepancy during the post-test. Thus, higher self-discrepancy change scores indicate that an individual moved further from their ideal self between the pre- and post-test. In contrast, lower self-discrepancy change scores indicate that an individual had approached their ideal self, becoming closer to his/her ideals, between the pre- and post-test.

Table 15: Study 4- Descriptives.

Variable	*M*	*SD*	α
Pre-test			
Self-liking	3.55	0.84	0.93
Self-competence	3.81	0.59	0.87
Discrepancy	1.18	8.77	[a]
Post-test			
Self-liking	3.51	0.82	0.93
Self-competence	3.73	0.64	0.89
Discrepancy	-1.01	7.59	[a]
Inspiration	8.87	2.54	[b]
Assimilation	3.70	0.60	0.80
Δ Self-liking	-0.04	0.47	
Δ Self-competence	-0.07	0.39	
Δ Discrepancy	1.93	8.14	

Note: [a] Due to the qualitative response format for this scale, reliability was not calculated
Note: [b] Single items and so alpha was not calculated.

Correlations

Pearson correlations were calculated between change scores for self-liking, self-competence, and self-discrepancy, as well as assimilation and inspiration (Table 16). Change in self-liking was positively associated with ratings of assimilation and inspiration. The more participants reported feeling assimilated with their avatar, as well as the more inspired participants felt by their avatar, the greater the increase in self-liking they reported. Neither change in self-competence nor change in self-discrepancy was related to assimilation or inspiration, although a negative relationship between change in self-discrepancy and inspiration approached statistical significance ($p = .06$). Specifically, participants who felt more inspired by their avatar also tended to have their actual self become closer to their ideal self.

Change in self-liking was also positively associated with change in self-competence. As participants' self-liking increased between the pre- and post-test, so too did their self-competence. However, neither change in self-liking nor self-competence was related to change in self-discrepancy.

Table 16: Study 4- Correlations between change in self-liking, change in self-competence, change in discrepancy, assimilation, and inspiration.

Variable	1	2	3	4	5
1. ΔSelf-liking	--	.54*	.03	.16*	.21*
2. ΔSelf-competence		--	.01	.07	.10
3. ΔDiscrepancy			--	-.10	-.15
4. Assimilation				--	.34*
5. Inspiration					--

*$p < .05$

Does avatar type or engagement type influence personal outcomes or closeness to the avatar?

We conducted between subject *t*-tests to examine the impact of the two independent variables on change scores for self-liking, self-competence, and self-discrepancy, as well as inspiration and assimilation. The *t*-tests comparing Actual-Ideal are reported in Table 16 and the *t*-tests comparing Watch-Play are reported in Table 18.

Table 17: Study 4- T-tests comparing Actual-Ideal avatar experimental condition for change in self-liking, change in self-competence, change in self-discrepancy, assimilation, and inspiration.

Measure	Group	*M*	*SD*	*t*	95% CI	*p*	Cohen's d
ΔSelf-liking	Actual	-0.04	0.41	-0.19	-0.14, 0.12	.85	.03
	Ideal	-0.03	0.52				
ΔSelf-competence	Actual	-0.09	0.32	-0.67	-0.15, 0.07	.50	.10
	Ideal	-0.05	0.44				
ΔDiscrepancy	Actual	1.53	8.82	-0.59	-3.40, 1.83	.55	.10
	Ideal	2.32	7.47				
Assimilation	Actual	3.73	0.55	0.72	-0.11, 0.23	.47	.10
	Ideal	3.67	0.64				
Inspiration	Actual	8.60	2.66	-1.32	-1.23, 0.25	.19	.19
	Ideal	9.1	2.43				

Table 18: Study 4- T-tests comparing Watch-Play experimental condition for change in self-liking, change in self-competence, change in self-discrepancy., assimilation, and inspiration

Measure	Group	*M*	*SD*	*t*	95% CI	*p*	Cohen's d
ΔSelf-liking	Watch	-0.12	0.50	-2.57	-0.31, -0.04	.01	.37
	Play	0.05	0.42				
ΔSelf-competence	Watch	-0.11	0.43	-1.42	-0.19, 0.03	.16	.21
	Play	-0.03	0.34				
ΔDiscrepancy	Watch	1.70	9.23	-0.38	-3.07, 2.09	.71	.06
	Play	2.19	6.80				
Assimilation	Watch	3.58	0.68	-2.68	-0.40, -0.06	.01	.39
	Play	3.81	0.48				
Inspiration	Watch	8.35	2.79	-2.86	-1.76, -0.32	.004	.42
	Play	9.39	2.17				

There were no significant differences between groups for Actual-Ideal on any of the outcomes of interest. In other words, whether participants were asked to make an actual-self avatar or an ideal-self avatar did not change their self-liking, self-competence, or distance from their ideal self, nor did avatar type affect how close they felt to their avatar or how inspired they felt by their avatar.

Change in self-liking was higher for participants in the Play conditions compared to those who were in the Watch conditions. In other words, participants who played with the avatar they created reported greater improvements to their self-liking compared to participants who only watched their created avatar. Additionally, consistent with our hypothesis, participants in the Play conditions had reported greater assimilation with their avatars and more inspiration compared to participants in the Watch conditions. That is, participants who played with their created avatar felt more overlap between their self-concept and their avatar and felt more inspired by their avatar compared to participants who only watched their avatar. There was no difference between the Watch and Play groups for changes in self-competence or self-discrepancy.

Is there an interaction between avatar type and engagement type on changing personal outcomes?

We regressed changes in self-liking, self-competence, and self-discrepancy on the interaction between avatar type and avatar engagement in a series of separate regression models. There was no statistically significant interaction between avatar type and avatar engagement for change in self-liking (Table 19, Figure 9) and change in self-competence (Table 20, Figure 10), although the pattern of findings for change in self-liking was consistent with our hypothesis. Specifically, when only able to watch one's avatar, ideal avatars were associated with slight decreases in self-liking compared to actual avatars. However, when engaging with one's avatar, ideal avatars were associated with an increase in self-liking compared to actual avatars.

Table 19: Study 4- Regression of change in self-liking predicted by the interaction between avatar type and engagement type.

Variable	β	*SE*	*t*	*p*
Intercept	-0.09	0.07	-1.24	.22
Avatar type	-0.06	0.09	-0.64	.52
Engagement type	0.09	0.10	0.86	.39
Avatar type x Engagement type	0.16	0.14	1.21	.23

$R^2 = .04$, $F(3, 185) = 2.72$, $p = .05$

Table 20: Study 4- Regression of change in self-competence predicted by the interaction between avatar type and engagement type.

Variable	β	*SE*	*t*	*p*
Intercept	-0.08	0.06	-1.38	.17
Avatar type	-0.05	0.08	-0.64	.52
Engagement type	-0.02	0.08	-0.20	.84
Avatar type x Engagement type	0.18	0.11	1.62	.11

$R^2 = .03$, $F(3, 185) = 1.73$, $p = .16$

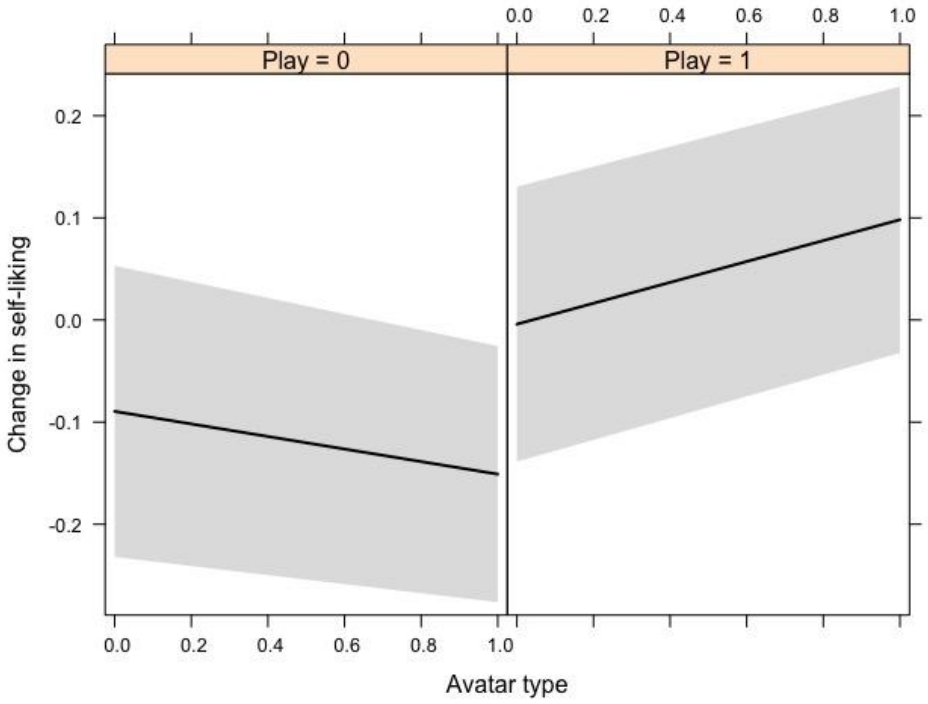

Figure 9: Interaction between avatar type and engagement type predicting change in self-liking.

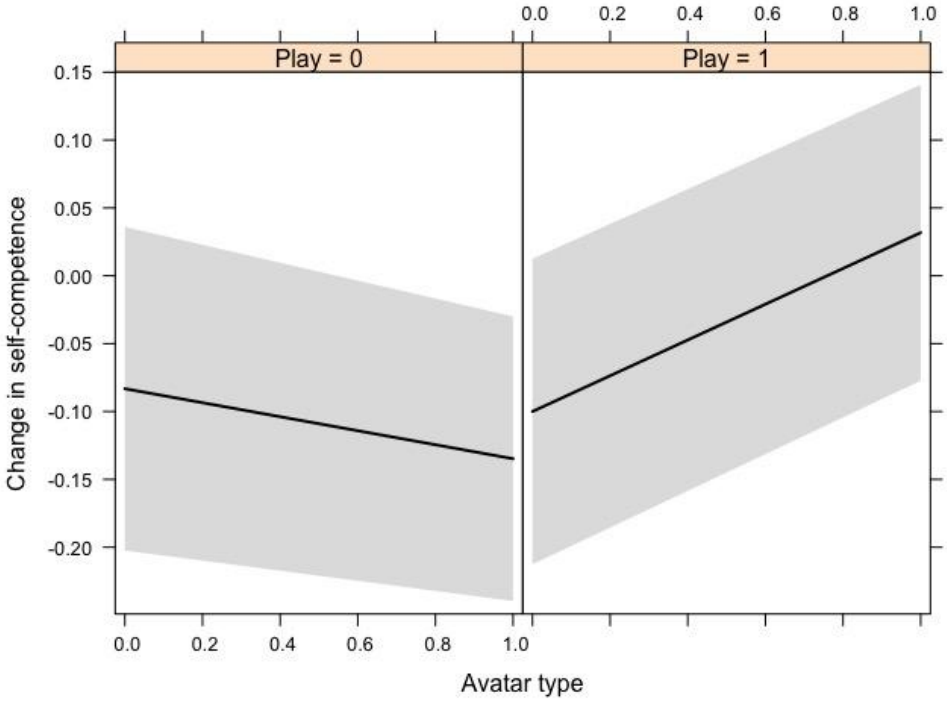

Figure 10: Interaction between avatar type and engagement type predicting change in self-competence.

There was also no statistically significant interaction between avatar type and avatar engagement for change in self-discrepancy (Table 21, Figure 11), although the interaction approached threshold for statistical significance (p = .08). The pattern of results was also consistent with our hypothesis. For those who created actual avatars, avatar engagement had a positive relationship with self-discrepancy. In other words, participants who played with their actual avatar experienced an increase in self-discrepancy (greater difference between their actual and ideal self) compared to participants who watched their actual avatar. In contrast, for those who created ideal avatars, avatar engagement had a negative relationship with change in self-discrepancy. Participants who played with their ideal avatars exhibited reduced increases in self-discrepancy compared to participants who watched their ideal avatar. However, it is important to note that these findings do not align completely with our hypothesis. Specifically, it does not seem that engaging with an ideal avatar allows individuals to feel closer to their ideal self. Rather, it seems that being unable to engage with one's ideal avatar leads to increases in self-discrepancy (i.e., feeling farther from one's ideals) and engaging with one's ideal avatar attenuates this effect.

Table 21: Study 4: Regression of change in discrepancy predicted by the interaction between avatar type and engagement type.

Variable	β	*SE*	*t*	*p*
Intercept	-0.00	1.35	0.00	1.00
Avatar type	2.09	1.83	1.69	.09
Engagement type	2.95	1.88	1.57	.12
Avatar type x Engagement type	-4.72	2.64	-1.79	.08

R^2 = .02, $F(3, 149) = 1.25$, p = .30

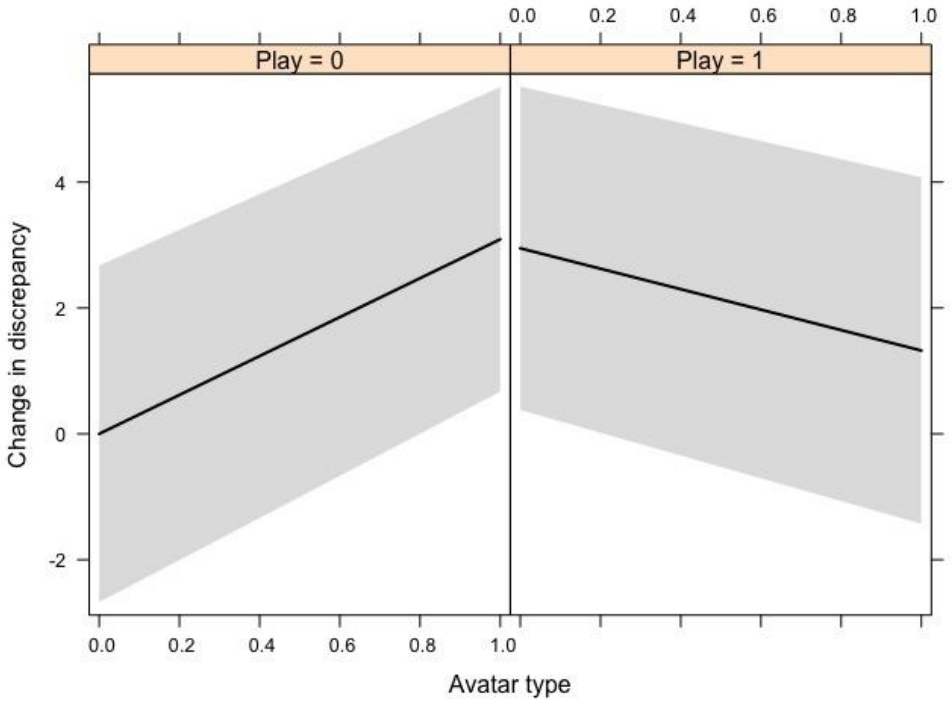

Figure 11: Interaction between avatar type and engagement type predicting change in discrepancy.

Based on the results of the *t*-tests and regression models, it does not seem that avatar type and engagement interact to influence changes in personal outcomes except, possibly, for changes in self-discrepancy. Rather, avatar engagement overall, regardless of avatar type, appears to play a bigger role in affecting perceptions of avatars (i.e., assimilation and inspiration) and also changes in self-liking. We subsequently explored whether avatar assimilation and inspiration could act as a mechanism for changes in self-perception after avatar engagement using a multiple mediation model.

Can the association between avatar engagement and changes in self-perception be accounted for by increased closeness with one's avatar?

The focus of the multiple mediation model was on changes in self-liking, which was found to differ between avatar engagement conditions. We first estimated the simple outcome model of

avatar engagement type regressed on change in self-liking. Consistent with the *t*-tests, avatar engagement type was a positive predictor of change in self-liking scores, $b = 0.17$, $SE = 0.07$, $p = .01$. In other words, playing with one's avatar rather than only watching it resulted in greater improvements in self-liking.

We then estimated a multiple mediation model to test whether assimilation and inspiration mediated the relationship between avatar engagement type and change in self-liking scores (Figure 12). After considering these mediators, avatar engagement type was no longer a predictor of change in self-liking scores, although this relationship approached statistical significance, $b = 0.13$, $SE = 0.07$, $p = .05$, 95% CI [-0.00, 0.26]. The individual indirect effects of assimilation ($b = 0.01$, $SE = 0.01$, $p = .31$, 95% CI [-0.01, 0.04]) and inspiration ($b = 0.03$, $SE = 0.02$, $p = .10$, 95% CI [-0.01, 0.06]) did not reach statistical significance, indicating that neither of these variables alone was a mediator of the relationship between avatar engagement type and change in self-liking. However, the combined indirect effect of assimilation and inspiration was statistically significant, $b = 0.04$, $SE = 0.02$, $p = .04$, 95% CI [0.00, 0.09]. This result indicates that the combination of avatar assimilation and inspiration partially explains the relationship between avatar engagement type and change in self-liking. In other words, this model supports the hypothesis that playing with one's avatar increases feelings of closeness with that avatar as well as how inspired one feels by that avatar, and these two aspects of the user-avatar relationship subsequently increases improvement in self-liking.

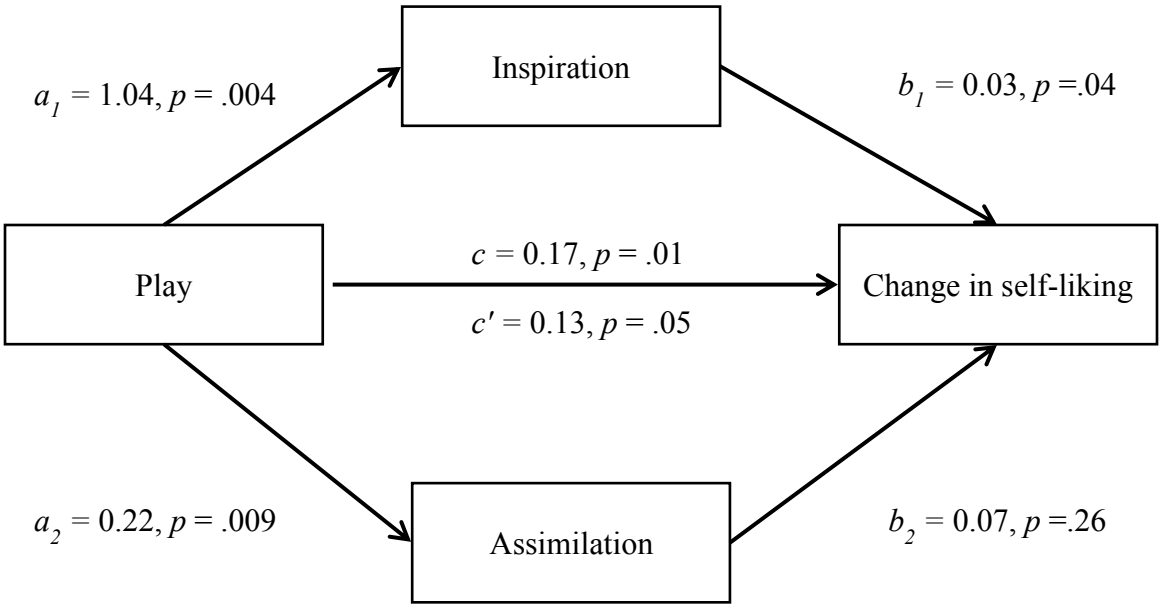

Figure 12: Multiple mediation of play predicting change in self-liking by inspiration and assimilation.

Path model. We hypothesized that playing with one's avatar would lead to increased psychological closeness, that psychological closeness would increase the accessibility of one's ideals, and that this would ultimately influence self-concept. To examine these hypotheses, we estimated a path model to test the relationship between engagement, assimilation, inspiration, and change in self-liking (Figure 13). Model fit statistics were obtained: χ^2 (1) = 1.24, p = .27; root mean square error of approximation (RMSEA) = 0.04, 90% confidence interval [0.00, 0.20]; p-value for test of close fit = .35; comparative fit index (CFI) = 0.99; Tucker-Lewis index (TLI) = 0.97; and standardized root mean square residual (SRMR) = 0.02. Overall, the model fit statistics indicate a good fit to the data. Parameter estimates for this model are found in Table 22, and are consistent with the hypothesized path.

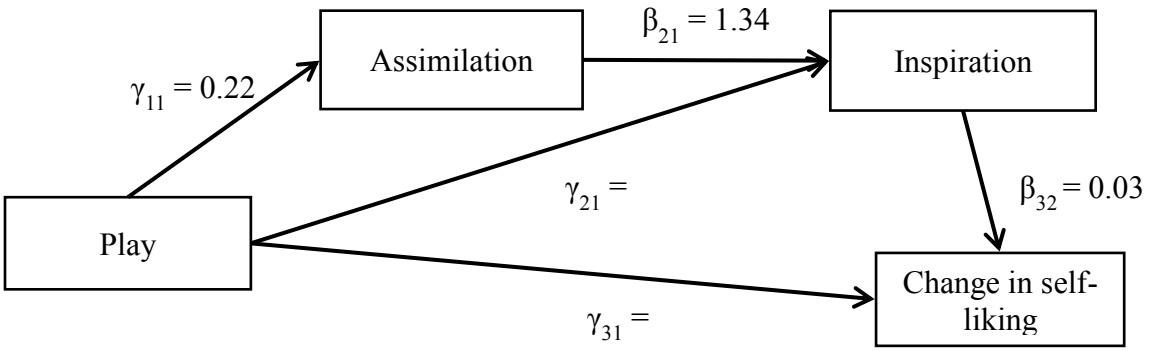

Figure 13: Path model of the relationship between avatar engagement, assimilation, inspiration, and change in self-liking.

Table 22: Study 4- Parameter estimates of path model analysis.

Regression	Estimate	SE	z-value	*p*
ΔSelf-liking				
~Play	0.14	0.07	2.08	.04
~Inspiration	0.03	0.01	2.50	.01
Inspiration				
~Play	0.75	0.25	2.13	.03
~Assimilation	1.34	0.29	4.58	<.001
Assimilation				
~Play	0.22	0.09	2.60	.01

Based on this model, playing with one's avatar was positively related to assimilation with one's avatar, being inspired by one's avatar, and change in self-liking. In other words, individuals who played with their avatars felt more assimilated with their avatar, more inspired by their avatars, and had greater increases in self-liking. Assimilation was a statistically significant positive predictor of inspiration: the more assimilated a participant felt with an avatar, the more inspired they felt by their avatar. Inspiration was also a statistically significant positive predictor of change in self-liking. Specifically, the more inspired participants felt by their avatar, the more their self-liking increased.

Discussion

In this study, we investigated whether engaging with avatars can lead to changes in self-perception, particularly with regard to one's ideal-actual self-discrepancy and self-esteem. First,

we hypothesized that compared to just watching one's avatar, actively engaging with (i.e., playing with) one's avatar would lead to increased feelings of closeness with that avatar. This hypothesis was supported by our findings. Participants who played with their avatar reported feeling both more assimilated with their avatar and more inspired by their avatar compared to those who only watched the avatar. These findings are consistent with previous work on the Proteus Effect, which found that engagement plays a key role in how users relate to their avatars (Yee & Bailenson, 2007; Yee et al., 2009). Personal outcomes following playing with an avatar cannot be attributed to mere exposure or priming effects, since this was controlled for by the Watch condition. Interestingly, avatar type (i.e., ideal or actual) did not influence assimilation or feelings of inspiration. The results from this study also indicated that individuals experienced a greater improvement in self-liking after actively engaging with an avatar (compared to just watching the avatar), regardless of whether it represented their actual or ideal self. This was surprising as we expected improvements in self-perception to be limited to participants who played with ideal avatars. It is possible that when participants are asked to create an avatar, even one of their actual self, it may be difficult to completely avoid engaging in some idealization. Thus, all of the created avatars may reflect particularly desirable or positive traits, even those created in the actual self condition; these positive traits may subsequently be imparted to users during engagement. A second possibility is that the act of active engagement (e.g., play) with an avatar, regardless of the type of avatar it represents, acts to improve self-perceptions. These results are consistent with previous findings that active engagement with an avatar is a key component to changes in self-perception following exposure to interactive media such as video games (Yee et al., 2009). However, more research is needed to clarify the impact of engagement on user outcomes, particularly with regard to when engagement might affect user outcomes, as

well as what domains may be particularly susceptible to change following periods of active engagement with an avatar.

We expected that avatar type and engagement type would interact in their influence on personal outcomes. Specifically, we hypothesized that playing with an ideal avatar would result in increases in self-esteem and reductions in self-discrepancy. Overall, we did not find support for this hypothesis. There was no interaction between avatar type and avatar engagement for change in either the self-liking or self-competence components of self-esteem. Although the interaction between avatar type and avatar engagement approached statistical significance for change in self-discrepancy, the pattern of results was not consistent with the hypothesis. Specifically, although playing with an ideal avatar was negatively associated with changes in self-discrepancy compared to watching an ideal avatar, engaging with ideal avatars did not reduce self-discrepancy. Rather, watching an ideal avatar or playing with an actual avatar increased self-discrepancy. In contrast, both playing with an ideal avatar and watching an actual avatar did not result in changes to self-discrepancy.

One possibility is that both observing one's ideal avatar and engaging with one's actual avatar acts to reaffirm an individual's distance from their ideal self. In the case of playing with an actual avatar, users may feel that the traits of their actual self become embodied, thereby strengthening the salience of these traits relative to ideal traits in the self-concept. In contrast, watching an ideal avatar but being unable to engage with it may elicit feelings of ideals being observable, but not attainable. It could be that exposure to one's ideals (i.e., by being asked to create an ideal avatar) acts as a reminder of how far one truly is from their ideal self. Both these conditions may reaffirm to individuals that elements of one's ideal self are difficult to attain. Actively engaging with one's ideals via an avatar may attenuate, rather than improve, these

feelings of discrepancy. Given that these results did not reach statistical significance, however, they should be interpreted with caution and additional work needs to be done to replicate and expand upon these findings. However this pattern of results is potentially interesting as it diverges from the past literature on avatar-induced self-perceptual shifts and does not support theories of compensatory engagement with avatars (Cacioli & Mussap, 2014; Li, Liau, & Khoo, 2011).

Experimental work that has examined the effects of avatar engagement has found that users tend to shift their self-perceptions and behaviours to be further aligned with their avatar's characteristics. For example, people tend to feel more attractive after using an attractive avatar (Yee et al., 2009) or more prosocial after using a heroic avatar (Yoon & Vargas, 2014). Although there have been no experimental studies investigating the role of ideal avatars, we expected that individuals' self-perceptions would shift to align with their ideal avatars. However, we found that playing with an ideal avatar only maintained individuals' self-perceptions. Why was there a divergence from the previous literature? One possibility arises from an important difference in this study design compared to previous investigations of self-perceptual change. In this study, participants engaged with avatars that they customized as self-representations, whereas previous studies have assigned pre-made avatars to participants. Creating an avatar ensures that the avatar is a more accurate reflection of the self (Study 1) and individuals also tend to like and feel closer to an avatar of the self compared to an avatar of someone else (Study 3, see also Mancini & Sibilla, 2017). The increased self-relevance of a created avatar may increase user engagement, but may also change the way in which users interact with the avatar. Whereas previous studies have focused on external traits specific to the premade avatar (e.g., heroism; Yoon & Vargas, 2014), in this study the avatars were focused on traits that participants already possessed to some

degree and were idiosyncratic to the participants. Initial studies have indicated that self-avatars elicit greater self-awareness and reflection on personal goals and motivations (Mancini & Sibilla, 2017; Waddell et al., 2015). It is possible that influencing traits that are already salient and personally-relevant to an individual is more complex than influencing traits less individually-matched. More research is needed to fully examine how self-avatars may differ from other avatars.

We hypothesized that changes in self-perception after avatar engagement could be explained by closer relationships between the self and one's avatar. The results of our mediation analysis indicated that changes in self-liking following avatar engagement could partially be accounted for by a combination of feelings of closeness with one's avatar and feelings of being inspired by one's avatar (although neither avatar assimilation nor inspiration alone mediated the relationship between engagement and self-liking). A path model analysis provided additional support to the causal model for self-perceptual change following avatar engagement. Specifically, playing with an avatar increased participants' assimilation with their avatar, which increased how inspired they felt by their avatar, which ultimately increased their self-liking. The mediation and path analyses extend previous research on avatar engagement (e.g., Yee et al., 2009) by providing supporting evidence that avatar embodiment (i.e., feeling assimilated with one's avatar) plays a pivotal role in self-perceptual change. It is important to note, however, that the path for self-perceptual change was only supported in the case of self-liking. Future studies should not only aim to replicate these findings but also determine what types of changes in self-perception can be explained by increased closeness between the avatar and the self.

This study was the first experimental investigation of how engaging with ideal avatars might influence personal outcomes. Previous research has depended on correlational methods,

with a focus on how self-esteem relates to video game and avatar use (e.g., Bessiere et al., 2007; Li et al., 2011). These results support the importance of active engagement as a key factor affecting the influence of avatar exposure on personal outcomes. However, we did not find evidence that ideal avatars improve self-perceptions by allowing participants to embody their ideals. Instead of allowing individuals to achieve their ideals virtually, perhaps ideal avatars only motivate individuals to pursue their personal aspirations. Future studies could directly examine the impact of avatar engagement on real-world behavioural intention and motivation, particularly for goals that are difficult to achieve such as attaining one's ideals.

Chapter 6: Discussion

This dissertation focused on two central questions: (1) how do avatars reflect the self (i.e., personal identity); and (2) how does engaging with avatars influence the self, fulfilling psychological needs and thereby influencing self-perception? We explored these overarching research questions across four studies. In Study 1, we found that avatars can convey accurate information about their creators' personality traits. Study 2 expanded on Study 1, demonstrating that avatar preferences also reflect psychological needs, specifically the need for warmth. In Study 3, we explored whether creating a self-avatar could serve a self-reparative function, but found instead that avatar creation may exacerbate, rather than repair, the effects of psychological threat. These results were also amenable to an alternative interpretation, however, that creating an avatar prior to a psychological threat may act as a buffer against negative outcomes associated with that threat. Finally, in Study 4 we found that actively engaging with an avatar increased the perceived attainability of one's ideals. Active engagement with an ideal self-avatar appears to attenuate the distance from one's ideals that emerges after exposure to these ideals, however, rather than produce an overall closeness to ideals.

General discussion

Interacting with self-relevant avatars.

Avatars are unique from other types of fictional agents due to the interactivity they afford. We aren't often in control of what a character does in a book or in a film, but we are often in control of how our avatars behave in videogames and online. In this program of study, we explored two separate ways that individuals can interact with their avatars: (1) through selection or customizing appearance, and (2) by actively controlling the behavior of an avatar in a virtual environment. Actively embodying one's avatar seems to play an important role in transforming

avatars from being mere reflections of the self to effecting change in the self. Specifically, avatar creation alone in Study 3 did not result in changes in self-esteem. In contrast, actively controlling, and thereby embodying, the avatar in Study 4 did influence self-esteem. Additionally, controlling one's avatar in Study 4 increased feelings of assimilation with the avatar. These results support previous findings indicating the importance of active avatar control in fostering psychological closeness between the self and an avatar. For example, active control was found to be important in order for avatar exposure to elicit shifts in self-perceptions (Yee & Bailenson, 2009) and foster emotional closeness with one's avatar (Ratan & Dawson, 2015). Given that interactivity is a central feature of many virtual environments, it is possible that these environments provide a particularly potent means of influencing personal outcomes.

We should be cautious, however, in concluding that interactivity will always strengthen the outcomes associated with media engagement, as interactivity may at times render individuals resistant to media effects. For example, Dodge (2010) found that incorporating interactive features, such as hypertext, into a children's story decreased feelings of empathy towards characters within the narrative. Allowing interaction with the narrative may have created greater mental and emotional distance between readers and the characters, thereby decreasing character identification. It is therefore possible that interactivity may not always benefit engagement processes such as immersion and character identification, which are both important factors for outcomes such as narrative persuasion (e.g., Green & Brock, 2000; Kaufman & Libby, 2012). Ultimately, interactivity in and of itself may not be completely beneficial nor deleterious to the promotion of media engagement and its associated outcomes (e.g., persuasion, perspective-taking). As noted by Klimmt and colleagues (2007), interactive media can consist of a varying combination of features (e.g., avatar use, presence/absence of other individuals), all of which

have the potential to differentially affect the influence of interactivity. In other words, the effect of interactivity may vary based on the content and design of a given interactive media.

The self-relevance of avatars is one important to consider when investigating how interactivity influences the outcomes of media engagement. As demonstrated by our findings, customizing an avatar is one way to increase the self-relevance of an avatar. Interacting with self-relevant avatars has implications for media engagement outcomes such as immersion and identification, as well as shifts in self-perception. We explore these two possible applications of self-avatars in the context of our program of studies.

Self-avatars and media engagement. Across Studies 1 and 2 we found that individuals create and select avatars that reflect personal attributes, whether that be personality traits or valued needs. Although avatars allow for flexibility in how people present themselves (Hoffner, 2008) and afford opportunities to explore different identities (Klimmt et al., 2009), on average individuals create avatars that contain a kernel of truth about their identity. Furthermore, we also found that individuals preferred and felt closer to an avatar they customized to reflect the self, rather than a stranger (Study 3). These findings indicate that users have particularly close relationships with those avatars that are most relevant to their self, reinforcing previous research demonstrating that people identify more with an avatar that is similar to them (Turkay & Kinzer, 2014). Increasing character identification in videogames has been found increase player involvement with the game (e.g., flow; Soutter & Hitchens, 2016) and greater involvement is in turn related to stronger outcomes for media engagement, such as needs satisfaction (Bormann & Greitmeyer, 2015). Thus, interacting with a self-avatar might increase immersion or character identification, which would subsequently strengthen the outcomes associated with media exposure.

Virtual environments and videogames are increasingly being investigated as venues for prosocial change (e.g., improving attitudes towards outgroups; Groom, Bailenson, & Nass, 2009). These trends highlight the importance of better understanding how various aspects of virtual environments and videogames influence media effects, including avatars. For example, if the goal is to improve attitudes towards an outgroup, an interactive medium in which individuals control an avatar representing the outgroup may be counterproductive. Rather, it may be more beneficial for individuals to control an avatar that represents the self and craft a narrative with a compelling theme of intergroup harmony. Another strategy might be to allow users to become embodied in an avatar and only later reveal that avatar's outgroup status (e.g., using first person perspective). With these approaches, one is leveraging the fact that interactivity bolsters media effects when individuals feel close to their avatar (i.e., using a self-relevant avatar). In cases where an avatar is perceived as too different from the individual, interactivity can create psychological distance between the user and the media, attenuating any hoped-for influence. In support of this idea, Kaufman and Libby (2012) found that withholding outgroup-identifying information about a character in a short story strengthened readers' perspective-taking tendencies with respect to that character. In summary, using avatars that are self-relevant—by selecting or customizing one's avatar—has the potential to strengthen media outcomes by reinforcing the link between the self and the narrative. Understanding when and how interactivity influences media outcomes can have important applications, for the design of media interventions in particular.

Interacting with self-relevant avatars and shifts in self-perception. Beyond shaping how individuals see the world, media also has the potential to influence how individuals understand themselves (Appel, 2011). The interactive nature of avatars makes them particularly well-situated not only as a means of identity expression (e.g., Williams et al., 2011), but also as a

means to influence self-perception (Klimmt, Heffner, Vorderer, Roth, & Blake, 2010; Yee & Bailenson, 2007). Study 4 explored the effects of actively controlling a self-avatar that users customized by themselves. Based on previous studies of avatar engagement, we expected that individuals would align their self-perceptions with their avatar's traits (Yee & Bailenson, 2007; 2009), thereby feeling closer to their ideal-self after engaging with an idealized avatar. What we observed, however, was that this predicted change in self-perception was not limited to idealized avatars but instead observed for both the ideal-avatar and the "accurate" avatar. Self-avatars, regardless of whether they are ideal or not, inherently have more similarities with their users than other types of avatars. Therefore, it would not be surprising if the relationship between users and self-avatars is distinct from how users relate to other kinds of avatars (e.g., an avatar they have been arbitrarily assigned). Importantly, the simple act of creating a self-avatar might preclude the possibility of producing an accurate and non-idealized representation, as we are all subject to various forms of self-serving biases that allow us to see ourselves as better than we truly are (e.g., Campbell & Sedikides, 1999; Sedikides, 1993). This possibility is supported by previous findings that avatars, in general, tend to be created to be more socially desirable than the user's offline persona (Mancini & Sibilla, 2017). It may well be, in other words, that all customized avatars are idealized to some extent. If this is true, it would explain why engaging with an avatar, regardless of type, was related to shifts in self-perception in our study.

A second possible difference between self-relevant and assigned avatars is that self-relevant avatars reflect traits that may be quite idiosyncratic to their creator. It is possible that these traits are important core components of a user's identity, which would make these traits difficult to influence. For instance, in Study 4 we asked participants to list traits that were related to both their actual and ideal self. A trait that was listed for both the actual and ideal self is likely

to be a trait that is important not only to the individual's current self-concept, but also to the concept of who they aspire to be (Higgins et al., 1986). These core traits may be highly salient to individuals and very stable aspects of their self-concept, making them less susceptible to any influence arising from avatar exposure. It may therefore be easier to influence a particular trait using an assigned avatar (e.g., heroism; Yoon & Vargas, 2014) compared to the idiosyncratic self-concepts reflected in the customized avatars we examined in Study 4. In addition, global discrepancy between the actual and ideal-self may be quite difficult to influence, especially in comparison to single traits (e.g., confidence; Yee & Bailenson, 2007). To date, there has been no experimental work on how self-relevant avatars influence self-perceptual shifts, however. Study 4 serves as an important first step in exploring how self-avatars affect self-concept. Our findings suggest that avatars, particularly self-avatars, may not be well-suited to influencing some aspects of identity. This raises a broader possibility that avatars may be more closely related to certain parts of self-concept than others, such as social characteristics compared to competence-related traits.

Warmth and competence

This dissertation examined two important components of the self in the core needs for warmth and competence (Deci & Ryan, 2000). In Study 2 we examined how avatar preferences reflect individual needs for warmth and competence, and in Studies 3 and 4 we examined how avatar engagement may impact self-liking (i.e., the social component of self-esteem, related to interpersonal warmth) and self-competence. We found associations between avatar engagement and a need for warmth (Study 2) as well as self-liking (Study 4). However, we did not observe a relationship between avatars and competence in our studies. This finding was somewhat surprising in light of the fact that past research has focused on how self-competence can be

bolstered as a result of videogame engagement (Ryan et al., 2006). In fact, videogame engagement has primarily been associated with fulfilling the psychological need for competence and autonomy (Reinecke et al., 2012; Rieger, Wulf, Kneer, Frischlich, & Bente, 2014; Ryan et al., 2006). It is possible that fulfilling one's need for competence is primarily related to the actions and achievements that occur over the course of playing a videogame, with issues of competence being less salient during avatar selection or creation. For example, winning a videogame contributes to the satisfaction of competence needs (Rieger et al., 2014). Thus, there may be limits to what traits and characteristics are readily transferred to users based on the appearance of an avatar alone, independent of actions undertaken while playing the videogame. More specifically, it seems likely that users may need to be successful in completing tasks, goals, or objectives within the virtual environment before being conferred any boost to feelings of competence. Another possibility is that the lack of influence over self-competence observed may relate to the relative stability of this trait more broadly; self-competence is more stable than self-liking, as self-competence is tied to objective evaluations of actual achievement (Mar, DeYoung, Higgins, & Peterson, 2006; Tafarodi & Swann, 1995; 2001).

In contrast to competence, we observed that avatar preferences reflect personal needs for warmth, with the related construct of self-liking also influenced by controlling a self-avatar. Self-liking reflects the social evaluative component of self-esteem (e.g., are we a "good" person?; Tafarodi & Swann, 1995; 2001) and is more susceptible to influence from self-enhancement (Mar et al., 2006). Thus, avatars may make constructs and motivations related to self-presentation and social evaluation particularly salient. Users know that avatars are a link between themselves and others within a virtual environment and for this reason it is important for users to create an avatar that communicates socially desirable traits, in addition to personally desirable

traits. Crafting a socially attractive avatar can help individuals elicit friendship (Fong & Mar, 2015), which would support the satisfaction of relatedness needs. Overall, it seems that avatars are more closely linked to aspects of the self that are related to social evaluation, compared to those aspects of the self tied to competence and accomplishment.

The findings of this study help to elucidate how different aspects of avatar engagement (e.g., creation versus active control) may lead to diverging outcomes. Oliver and colleagues (2016) found that gameplay characteristics (e.g., gameplay control) are most strongly associated with the satisfaction of competence and autonomy needs. Satisfying competence and autonomy needs were, in turn, associated with enjoying the videogame experience. In contrast, satisfaction of relatedness needs in videogames was associated with experiencing the game as meaningful rather than just for fun. Given the link between avatars and relatedness needs, it could be that individuals' relationships with their avatars play an important role in eliciting meaningful experiences while playing videogames. Very much in line with this idea is the fact that needs satisfaction is associated with more meaningful and thought-provoking experiences with media above and beyond simple enjoyment (Tamborini et al., 2010). In summary, although engaging with avatars may be primarily pleasurable (Rogers et al., 2015), avatars can also help satisfy higher order needs, thereby facilitating the use of media to reflect on one's relationships and experiences (Oliver & Raney, 2011; Oliver et al., 2016).

One possible extension of the current work would be to directly compare how the effects of avatar customization and avatar engagement might differ. Individuals' self-liking and self-competence could be measured prior to avatar customization, after avatar customization, and after controlling the avatar (e.g., playing one level of a videogame). If self-liking is primarily related to avatar creation, we would expect increases in self-liking after avatar creation but not

after avatar control. In contrast, if self-competence is primarily related to avatar accomplishments, we would expect increases in self-competence after avatar control, but not after avatar creation, and even then only if the individual was successful in completing a goal using the avatar (e.g., successfully completing the level). Given the applications of avatar use in therapeutic (e.g., Behm-Morawitz, 2013; Quackenbush & Krasner, 2012) and competence-building contexts (e.g., Buisine, Guegan, Barré, Segonds, & Aoussat, 2016; Tarnanas & Adam, 2004), understanding diverging outcomes from different forms of avatar engagement can have important practical implications. Depending on the type of intervention and its goals (e.g., therapies focusing on improving self-liking versus therapies meant to support perceptions of competency), it is possible that different types of avatar engagement should be employed or emphasized.

Limitations

The studies in this dissertation contain a number of limitations. For instance, the effect sizes across all four studies are fairly small, even in cases where statistically significant findings were detected. On the one hand, small effect sizes could signal the need for caution when interpreting these findings and considering their generalizability. In other words, it's possible that the effects observed in these studies could be small enough that they are trivial in terms of real-world importance. It is also not apparent how robust or replicable these findings are, but this is something that only direct replications can assess. However, it is important to note that the practical and meaningful significance of effect sizes is difficult to assess and not directly tied to effect-size (Meyer, Finn, Eyde, Kay, Moreland, et al., 2001; Rosenthal, 1994). In some contexts, small effects may have important practical significance and sometimes large statistical effects translate into little practical effect. Thus, it would be inappropriate to discount the findings of

these studies out of hand, simply due to the small magnitude of the effects observed. Furthermore, there are additional limitations that may have contributed to the observation of small effect sizes, and these could provide a context for why these small effects may still represent meaningful phenomena.

Personal importance of the avatar

One possible limitation of these studies is how individuals perceived the value of the avatars they created and engaged with. Specifically, individuals were likely aware of the fact that they were creating these avatars for the express purpose of the study they were completing. In other words, the created avatars would not be used again in the future and would also not be used in any social interaction. As a result, it is possible that participants were not highly invested in their avatars and did not develop any strong attachment to or relationship with their avatars. Although Belk (2013) suggests that avatars are considered part of the extended self, it is possible that the relationship between the self and one's avatar is strengthened over time or through intention to use it again in the future. Indeed, previous studies investigating the relationship between the self and avatars examine avatars that have already been in use for long periods of time (e.g., Belisle & Bodur, 2010; Chandler et al., 2009) or avatars that will be used in a subsequent task (Kafai, Fields, & Cook, 2010; Vasalou & Joinson, 2009). It may be that participants in our studies did not form strong connections to their avatars, which makes these avatars less likely to exert an influence or perhaps have a weaker influence. Future studies could use procedures in which participants are given the expectation that the avatar will be used in a following task or repeatedly over a period of time.

Period of engagement

A related limitation is the short period of engagement participants had with their avatars, particularly in Study 4. In Study 4 the participants engaged with their avatars for a period of 5 minutes. Individuals who engage with virtual environments and avatars typically utilize their particular avatar for much longer periods of time. For instance, some reports indicate that on average users engage with their avatars for over 20 hours a week (Belisle & Bodur, 2010; Williams et al., 2008). It is important to note that these reports reflect individuals' use of one specific avatar, suggesting that individuals may be developing a close and intimate relationship with a particular avatar. These long periods of engagement may be what is needed to make an avatar a chronically accessible part of one's self-concept, thereby rendering it influential to self-perception (Chandler et al., 2009).

Importantly, long periods of repeated exposure to an avatar may create a context in which small effects regarding the influence of avatars on personal outcomes becomes particularly potent (e.g., changes in self-discrepancy, self-esteem). For example, even banal activities (e.g., conducting a web search) have been found to be related to personal characteristics and outcomes (e.g., ideology, life satisfaction; Singh & Hansen, 2015). It is possible that longer and repeated engagement with an avatar results in cumulative effects, leading to changes in self-perception that become more pronounced and persist over time as a function of repeated experience. The influence of these small effects may be subtle and difficult to demonstrate after one brief period of avatar engagement. To that end, our studies may be grossly underestimating any effect and in some ways it is remarkable that we observed an influence of avatar engagement with such comparatively brief manipulations. Perhaps future studies could combine experimental methodologies with longitudinal designs to better explore the effects of long-term avatar

engagement. Specifically, participants could be randomly assigned to create an actual or ideal self-avatar and then asked to use this avatar regularly for a period of weeks or months before measuring changes in personal outcomes. Although long-term media exposure studies are challenging to execute, some methodologies have been effectively applied to research media exposure under naturalistic conditions. For example, Pino and Mazza (2016) had participants read either a fiction or non-fiction book for a period of two weeks and found improvements in empathic abilities for those assigned to the fiction condition. Overall, longitudinal experimental studies would help paint a clearer picture of the outcomes of avatar engagement.

Ecological validity

The limitations in how these avatars were valued and the amount of engagement experienced all relate to the question of ecological validity. The procedures of the four studies in this dissertation each diverge in some respects from how individuals are likely to engage with avatars for personal recreation. The laboratory setting, as well as the short and structured periods of avatar use, differs from the flexible and exploratory engagement characteristic of many virtual environments (e.g., Hoffner, 2008; Williams et al., 2008). Although experimental methodologies provide benefits in terms of control and elucidating the causal effects of avatar engagement, they necessitate a trade off in terms of departing from naturalistic behaviours and settings. Correlational methodologies may be one way to access these more naturalistic contexts and phenomena. That said, the results of laboratory and field studies do tend to converge on average, although this varies depending on methodology and topic (Mitchell, 2012). It is therefore important to cross-validate any laboratory results with evidence from field studies to increase confidence in observed relationships.

Considering the ways in which our laboratory studies converge with previous correlational research can help us gain a clearer picture of the relationship between avatars and their users. Specifically, there is correlational evidence that individuals with lower self-esteem or greater self-discrepancies tend to use more idealized avatars (Bessiere et al., 2007, Lemenager et al., 2013; Li et al., 2011). The desire to reduce one's self-discrepancy was suggested as an explanatory motivation for engaging with ideal avatars (Li et al. 2011). Our results suggest that engaging with an ideal self-avatar helps a user to maintain rather than reduce one's self-discrepancy (Study 4). Specifically, engaging with an ideal self-avatar prevents self-discrepancy from increasing. Furthermore, avatars may buffer self-concept prior to experiencing ego threat rather than repairing self-concept following an ego threat (Study 3). Taken in context with the previous correlational findings, it is possible that although individuals may be motivated to engage with idealized avatars to bolster self-concept, the actual efficacy of engaging with an idealized avatar to repair the self-concept might be limited. Instead, engaging with an idealized avatar may prevent one's self-concept from worsening in response to a threat. A preventative motivation for avatar engagement has not yet been explored in the literature, but seems a promising avenue for future work in light of our results for Study 4. Using avatars as a buffer from threats to the self-concept is a potentially valuable application of avatar engagement, perhaps as a proactive coping mechanism.

It is also possible that the effects observed in our laboratory studies are similar to those that would be observed in the field, but are simply smaller in magnitude. Reductions in self-discrepancy after avatar engagement in the field may manifest as maintenance in the lab. Unfortunately, the experimental research examining the effects of avatars on self-concept is currently very limited, but hopefully these promising results will motivate future work.

Self-report

Finally, the studies in this dissertation relied on self-reported phenomenological states (e.g., mood) and personal evaluations (e.g., how accessible one's ideal currently seem). It is possible that these internal states and concepts are difficult for individuals to assess and report honestly and accurately (Gawronski, LeBel, & Peters, 2007). Reliance on self-report might also introduce noise and inaccuracy to the measurement of subtle internal states, making it difficult to detect true effects. Some past studies of avatar influence have employed implicit measures (Klimmt et al., 2010) or behavioural outcomes as proxies for self-perceptual shifts (Yee & Bailenson, 2007; Yoon & Vargas, 2014). Contrary to our own results, evidence for self-perceptual shifts were found consistently across these past studies. Overall, this raises the possibility that implicit or indirect measures of changes in self-perception may be a more appropriate methodology for evaluating this construct. Future studies should consider replicating the conceptual design of these studies, incorporating implicit outcomes related to changes in self-esteem or self-discrepancy. For example, a study might employ an implicit associations test of self-esteem to assess changes in automatic associations between the self and positively/negatively valenced concepts following engagement with an ideal avatar (Greenwald & Farnham, 2000).

Conclusion

We hypothesized that avatars would not only reflect users' identities, but also that engaging with avatars could ultimately influence the way users perceive and understand themselves. In line with our expectations, we found evidence that avatars reflect aspects of user identity, whether it be with regard to personality or psychological needs. Importantly, we found that it was the social aspects of the self that seem to be most related to avatar engagement.

However, the role of these self-relevant avatars in satisfying psychological needs and achieving identity goals (i.e., striving for one's ideals) did not map perfectly onto our initial hypotheses. In particular, creating and engaging with one's ideals in avatar form did not result in self-perceptual shifts that aligned the actual and ideal self. Rather, the results from this dissertation suggest a more protective role of avatar engagement, where creating and using avatars may buffer the individual from future negative self-evaluations. The possibility of avatar engagement as a buffer to self-concept is a novel finding, and provides interesting insights into how avatar use may interact with identity. Overall, it seems that the relationship between avatar engagement and the satisfaction of psychological needs is a complex one. Importantly, the outcomes of engaging with self-relevant avatars seem to diverge from the self-perceptual shifts that can be induced during engagement with an assigned avatar. This program of study underscores the need for greater research exploring the interplay between identity, psychological needs, and avatar use. In particular, more work that distinguishes between various forms of avatars (e.g., self-avatars, assigned avatars) and types of avatar engagements (e.g., choice, customization, and control) is needed.

Avatars and their usage is becoming increasingly ubiquitous. The interactivity of avatars, both in terms of control over appearance and active embodiment, affords virtual environments a promising potential to be an especially influential form of media. Understanding how avatars might help to express the self-concept as well as possibly shape it are important steps in understanding the effects of interactive media.

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Appendices

Appendix A: Complete table of avatar cue utilization and validity.

Target BFI_E	Target BFI_A	Target BFI_C	Target BFI_N	Target BFI_O	Avatar cue	Rated BFI_E	Rated BFI_A	Rated BFI_C	Rated BFI_N	Rated BFI_O
0.13	0.02	-0.10	-0.05	0.09	Rated Casualness	0.06	0.02	-0.20*	-0.14	0.09
-0.14	-0.09	0.10	0.07	-0.12	Rated Formalness	-0.06	-0.06	0.15	0.15	-0.11
0.06	-0.02	-0.01	-0.05	-0.05	Rated Stylishness	0.03	-0.04	0.01	-0.10	-0.20*
0.00	0.08	0.00	0.06	0.02	Oval Face	0.01	0.15	0.28*	-0.02	0.12
-0.12	-0.15	-0.20*	0.21*	-0.11	Round Face	-0.14	-0.01	-0.10	0.13	-0.08
0.15	0.08	0.26*	-0.35*	0.11	Square Face	0.16	-0.20	-0.27*	-0.15	-0.07
-0.04	0.11	0.03	-0.15	0.07	Skin shade	0.06	-0.17	-0.08	-0.15	-0.20*
0.02	-0.08	0.01	-0.01	0.01	Green eyes	-0.01	0.12	0.05	-0.12	0.29*
-0.06	0.03	0.01	-0.04	0.05	Blue eyes	-0.03	0.08	0.09	0.03	-0.12
0.12	0.22*	0.11	-0.02	0.02	Light brown eyes	0.04	0.03	0.07	0.03	-0.10
-0.10	-0.11	-0.14	0.08	-0.06	Dark brown eyes	-0.12	-0.11	-0.11	0.08	-0.10
0.05	0.06	0.04	0.02	0.08	Other eyes	0.18	-0.02	-0.02	-0.06	0.02
0.03	-0.15	0.06	-0.26*	0.17	Short hair	0.06	-0.16	-0.34*	-0.18	-0.16
0.17	-0.13	-0.26*	0.14	-0.30*	Medium hair	-0.17	0.02	0.02	0.16	-0.06
0.06	0.19	0.16	0.15	0.08	Long hair	0.11	0.11	0.28*	0.06	0.20*
-0.05	-0.18	-0.15	-0.17	-0.10	Spiky hair	-0.06	-0.16	-0.19	0.08	-0.27*
0.14	0.27*	0.17	0.12	0.06	Wavy hair	0.01	0.13	0.28*	0.14	0.17
-0.06	-0.12	-0.26*	0.02	-0.18	Straight hair	0.02	0.02	-0.05	-0.06	0.15
0.05	-0.15	0.08	0.06	-0.01	Ponytail	0.11	0.03	0.20	-0.03	-0.02
-0.13	0.08	-0.16	0.22*	0.01	Bangs	-0.16	0.26*	0.17	0.08	0.28*
-0.25*	0.05	0.04	-0.04	0.10	Other hairstyle	-0.07	-0.02	-0.01	-0.03	-0.12
0.10	-0.09	0.05	-0.10	0.03	Natural hair color	-0.10	-0.10	0.05	0.19	-0.08
0.06	0.12	0.05	0.08	-0.02	Nonnatural hair color	0.12	0.16	0.05	-0.15	0.14
-0.30*	0.02	-0.26*	0.32*	-0.04	Visible highlights	-0.03	0.05	0.15	0.17	0.25*
0.02	-0.03	0.08	0.06	0.02	Natural highlights	0.12	0.15	0.15	-0.02	0.07
-0.18	0.13	-0.19	0.18	-0.13	Nonnatural	-0.10	-0.04	0.12	0.19	0.13

Target BFI_E	Target BFI_A	Target BFI_C	Target BFI_N	Target BFI_O	Avatar cue	Rated BFI_E	Rated BFI_A	Rated BFI_C	Rated BFI_N	Rated BFI_O
					highlights					
0.15	-0.06	-0.04	-0.12	-0.14	Hair shade	-0.13	-0.09	0.01	0.20	-0.26*
-0.13	0.09	0.08	-0.05	0.03	Blonde hair	0.11	0.03	0.02	-0.04	0.17
0.24*	-0.04	0.08	0.08	0.06	Brown hair	0.09	0.20*	0.22	-0.07	0.12
-0.12	-0.10	-0.08	-0.13	-0.09	Black hair	-0.17	-0.31*	-0.21*	0.23*	-0.25*
0.02	0.12	0.03	0.10	0.00	Other hair color	0.09	0.18	0.06	-0.17	0.15
0.06	-0.04	0.02	0.09	-0.03	Blonde highlights	0.09	-0.02	0.04	0.06	-0.01
-0.07	0.08	0.08	-0.07	-0.08	Brown highlights	0.02	0.10	0.12	0.08	0.03
0.02	0.12	0.03	0.06	0.01	White highlights	0.08	0.02	0.10	-0.02	-0.02
-0.26*	-0.06	-0.37*	0.33*	-0.03	Other highlights	-0.19	0.12	0.08	0.14	0.27*
-0.06	0.04	-0.08	-0.11	0.22*	T-shirt	-0.12	0.08	-0.07	0.03	0.02
0.14	-0.03	0.11	0.10	-0.15	Tank top	0.29*	-0.15	0.05	-0.11	0.14
0.01	-0.05	-0.02	-0.03	0.09	Hoodie	-0.03	-0.08	-0.26*	-0.10	-0.14
-0.19	0.15	0.02	0.05	-0.05	Sweater	-0.01	0.23*	0.34*	0.03	0.09
0.02	0.10	0.01	-0.03	0.02	Long sleeved	0.02	0.06	0.09	-0.15	-0.07
-0.03	-0.11	0.20	0.06	0.06	Button up shirt	-0.27*	0.01	0.06	0.23*	-0.10
0.00	-0.23*	0.02	-0.02	0.03	Collared shirt	-0.19	-0.04	-0.06	0.10	-0.08
0.08	0.05	0.11	-0.12	-0.08	Vest	0.03	-0.19	-0.27*	-0.05	-0.10
0.12	0.06	0.02	0.02	-0.13	Dress	0.07	0.09	0.14	0.03	0.05
0.14	0.08	-0.03	-0.09	-0.07	Jacket	0.17	-0.04	0.02	-0.21*	0.00
-0.09	0.05	-0.06	0.09	0.00	Layered shirts	-0.24*	0.07	0.12	0.32*	0.07
-0.06	-0.16	0.03	-0.04	0.09	Striped shirt	0.00	0.20*	0.07	-0.11	0.01
-0.02	-0.04	-0.05	0.03	0.07	Checked shirt	-0.02	0.01	-0.09	-0.06	-0.01
-0.13	0.02	0.00	0.09	0.05	Graphics on shirt	-0.06	0.13	0.09	0.07	0.03
0.16	0.09	0.09	-0.14	-0.01	Solid colored shirt	0.12	-0.18	-0.07	-0.06	-0.08
-0.13	0.20*	0.18	0.11	-0.13	Bow on shirt	-0.05	0.06	0.17	0.16	-0.04
0.05	0.04	-0.04	0.02	-0.14	Floral pattern on shirt	0.00	0.18	0.19	0.05	0.04
-0.01	0.08	0.10	0.02	-0.21*	Sequins/sparkles	0.17	-0.14	0.08	-0.06	-0.09
-0.09	-0.26*	-0.10	0.09	0.07	Shirt color shade	-0.19	-0.03	-0.10	0.11	-0.02
0.13	0.01	0.03	-0.08	-0.19	White top	0.18	0.00	0.01	-0.23*	-0.05

Target BFI_E	Target BFI_A	Target BFI_C	Target BFI_N	Target BFI_O	Avatar cue	Rated BFI_E	Rated BFI_A	Rated BFI_C	Rated BFI_N	Rated BFI_O
-0.15	-0.11	-0.01	0.01	0.09	Black top	-0.08	-0.24*	-0.31*	0.03	0.00
-0.08	-0.12	0.04	0.06	0.09	Gray top	-0.19	0.02	-0.05	0.11	-0.14
-0.10	0.00	-0.05	0.30*	0.09	Red top	-0.05	0.15	0.21*	0.09	0.12
0.03	0.11	-0.16	0.02	-0.01	Green top	-0.09	0.15	0.05	0.02	0.18
-0.05	-0.04	0.02	-0.04	0.08	Blue top	0.05	0.17	0.16	-0.04	-0.18
-0.01	0.01	-0.01	0.02	-0.06	Purple top	0.05	-0.04	-0.02	0.03	0.02
0.02	0.06	0.11	0.08	-0.06	Pink top	0.02	0.08	0.01	0.07	0.13
0.17	-0.02	-0.01	-0.16	-0.11	Other top color	0.04	-0.06	-0.15	-0.10	0.15
-0.05	-0.09	0.00	0.05	-0.05	Number of colors on top	-0.01	0.08	-0.10	-0.07	0.02
-0.14	0.09	0.08	0.16	-0.10	Skirt	0.00	0.05	0.11	0.10	0.24*
0.22*	0.17	0.08	-0.07	-0.01	Shorts	0.25*	-0.07	0.04	-0.03	-0.01
-0.05	-0.02	-0.08	0.07	0.10	Jeans	-0.08	0.09	-0.16	-0.05	-0.06
0.05	-0.14	0.00	-0.16	-0.08	Pants	-0.06	-0.21*	-0.04	-0.05	-0.12
0.12	0.05	-0.03	0.06	0.09	Denim	0.08	0.05	-0.13	-0.09	-0.06
0.09	-0.15	0.13	0.08	-0.07	White bottoms	0.07	0.01	0.06	-0.01	0.13
-0.17	-0.15	0.00	-0.08	-0.03	Black bottoms	-0.08	-0.24*	-0.08	0.05	-0.10
-0.17	0.07	-0.05	0.00	-0.16	Other colored bottoms	-0.09	0.07	0.13	0.13	0.18
-0.03	-0.26*	-0.21*	0.16	0.04	Baggy bottoms	-0.29*	-0.11	-0.14	0.15	-0.12
-0.05	0.00	-0.21*	0.20*	-0.08	Distressed bottoms	0.09	0.00	-0.03	-0.11	-0.02
-0.10	-0.16	-0.17	0.16	0.06	Belt	-0.10	-0.01	-0.10	0.08	-0.02
0.03	-0.07	-0.08	-0.31*	-0.13	Runners	0.04	-0.12	-0.30*	-0.15	-0.10
-0.21*	0.02	-0.04	0.23*	-0.05	Boots	-0.01	0.18	0.24*	-0.03	0.22*
-0.05	0.15	0.13	-0.01	-0.09	Heels	0.10	-0.08	0.05	0.06	0.01
0.06	0.19	0.07	0.03	0.18	Flats	0.10	-0.05	0.03	0.02	0.06
-0.06	-0.14	-0.02	0.09	0.04	Loafers	-0.12	0.05	0.00	-0.06	0.06
0.07	0.05	0.02	0.06	-0.18	Sandals	0.09	-0.06	0.06	0.11	-0.10
0.03	-0.22*	-0.02	0.21*	0.04	Boat shoes	-0.20	-0.09	-0.02	0.17	-0.01
0.19	0.16	0.08	-0.22*	0.18	Other athletic shoes	0.08	0.07	-0.13	-0.15	-0.11

Target BFI_E	Target BFI_A	Target BFI_C	Target BFI_N	Target BFI_O	Avatar cue	Rated BFI_E	Rated BFI_A	Rated BFI_C	Rated BFI_N	Rated BFI_O
0.23*	-0.05	-0.04	-0.22*	-0.09	White shoes	0.02	-0.17	-0.31*	-0.08	-0.26*
-0.05	0.01	0.05	-0.19	-0.04	Black shoes	0.08	-0.06	-0.22*	-0.04	-0.06
0.08	0.06	-0.01	0.06	0.07	Brown shoes	0.02	0.07	0.10	-0.09	0.25*
-0.04	0.07	-0.08	0.09	-0.06	Blue shoes	-0.12	0.00	-0.06	0.01	-0.04
-0.14	-0.17	-0.17	0.26*	0.15	Grey or beige shoes	-0.20	-0.03	0.04	0.28*	-0.05
0.13	0.19	0.17	-0.34*	0.10	Other shoe color	0.13	0.08	-0.09	-0.09	-0.03
0.17	0.06	-0.01	-0.27*	0.04	Number of colors on shoes	0.02	-0.10	-0.36*	-0.06	-0.13
0.04	-0.05	-0.05	0.17*	0.03	Scarf	-0.16	0.01	0.18	0.08	0.21*
0.17	0.04	0.05	0.04	0.10	Sunglasses	0.17	-0.35*	-0.28*	-0.13	0.19
-0.12	0.02	-0.07	-0.02	-0.02	Glasses	-0.34*	0.08	0.15	0.21*	-0.09
0.13	0.03	0.04	-0.05	0.08	Hat	0.13	-0.08	-0.13	-0.16	0.29*
0.06	0.03	-0.02	-0.18	-0.16	Pet	-0.07	0.19	0.12	0.03	0.07
0.09	0.04	-0.13	-0.09	0.05	Sports	0.09	0.15	0.10	-0.18	-0.17
0.20*	-0.10	0.12	-0.18	0.00	Jewelry	0.23*	-0.15	-0.24*	-0.16	-0.19
-0.21*	0.00	0.00	0.12	0.08	Bag	0.03	0.07	0.19	0.10	0.10
-0.15	-0.03	-0.09	0.29*	0.18	Wings or Halo	-0.01	0.06	0.03	0.01	0.37*
0.07	-0.03	-0.03	0.14	0.21*	Number of accessories	0.18	-0.10	0.00	-0.12	0.37*
-0.02	0.08	0.22*	0.16	-0.03	Cellphone	0.24*	-0.29*	-0.02	0.02	-0.15
0.06	-0.11	-0.07	0.04	-0.03	iPod	-0.09	0.03	-0.16	0.06	0.07
-0.04	-0.19	-0.17	0.18	0.12	Camera	-0.04	0.06	0.02	0.00	0.34*
-0.05	-0.05	-0.06	0.11	0.15	Laptop	-0.27*	-0.04	0.19	0.24*	-0.02
0.06	0.01	-0.10	-0.02	-0.02	Ice cream	-0.06	0.03	0.08	0.24*	0.04
0.01	0.04	0.02	0.15	0.14	Muffin	0.09	0.16	0.17	-0.09	0.04
0.05	-0.02	-0.03	-0.07	0.09	Fast food	0.17	0.10	-0.04	-0.21*	0.05
-0.06	-0.06	0.00	0.10	0.09	Beverage	0.08	-0.13	0.01	-0.08	0.15
-0.02	0.20	-0.01	0.15	0.06	Smile	0.14	0.32*	0.26*	-0.17	0.20*
0.15	0.07	0.27*	-0.19	0.03	Grin	0.39*	0.11	0.10	-0.30*	0.13
-0.12	-0.10	-0.32*	0.09	-0.03	Other mouth expression	-0.39*	-0.17	-0.15	0.57*	-0.12

Target BFI_E	Target BFI_A	Target BFI_C	Target BFI_N	Target BFI_O	Avatar cue	Rated BFI_E	Rated BFI_A	Rated BFI_C	Rated BFI_N	Rated BFI_O
-0.09	-0.32*	-0.14	-0.02	-0.11	Neutral expression	0.48*	-0.52*	-0.41*	0.30*	-0.40*
-0.02	0.25*	0.12	0.04	0.03	Open eyes	0.32*	0.36*	0.40*	-0.03	0.29*
-0.04	-0.23*	-0.12	-0.28*	0.03	Female	-0.04	-0.19	-0.41*	-0.18	-0.25*

Appendix B: Full list of items measuring warmth and competence of avatars.

Avatar warmth

1. How likeable is this character?
2. How sincere is this character?
3. How good-natured is this character?
4. How warm is this character?

Avatar competence

1. How competent is this character?
2. How competitive is this character?
3. How intelligent is this character?
4. How confident is this character?

Appendix C: Regression models of avatar preference regressed on avatar characteristics and need for warmth scales x perceived avatar warmth

Table C1

Avatar preference regressed on perceived avatar warmth × rater BFAS- Compassion, avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	*t*	*p*
Intercept	1.55	0.07	21.59	<.001
Perceived avatar warmth	0.30	0.03	9.76	<.001
BFAS-Compassion	0.09	0.07	1.21	.23
Perceived avatar warmth × BFAS-compassion	0.09	0.05	1.66	.10
Perceived avatar competence	0.28	0.03	8.25	<.001
Avatar attractiveness	0.14	0.04	3.41	<.001
Avatar familiarity	0.02	0.06	0.40	.69
Avatar femininity	-0.03	0.02	-1.25	.21
Avatar anthropomorphization	0.00	0.02	0.19	.85
Avatar gender	0.01	0.08	0.15	.88
Rater gender	0.10	0.08	1.22	.22
Avatar-rater gender match	0.58	0.05	11.96	<.001

Table C2

Avatar preference regressed on perceived avatar warmth × rater need to belong, avatar characteristics, rater gender, and avatar-rater gender match.

Variable	*β*	Standard Error	*t*	*p*
Intercept	1.55	0.07	20.98	<.001
Perceived avatar warmth	0.29	0.03	9.55	<.001
Need to belong	0.10	0.06	1.66	.10
Perceived avatar warmth × Need to belong	0.12	0.04	2.81	.01
Perceived avatar competence	0.29	0.03	8.24	<.001
Avatar attractiveness	0.13	0.04	3.10	<.01
Avatar familiarity	0.04	0.06	0.74	.46
Avatar femininity	-0.03	0.02	-1.14	.25
Avatar anthropomorphization	0.00	0.02	0.22	.83
Avatar gender	0.01	0.09	0.07	.94
Rater gender	0.08	0.08	0.99	.32
Avatar-rater gender match	0.59	0.05	12.10	<.001

Table C4

Avatar preference regressed on perceived avatar warmth × rater IPS-Connect, avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	t	p
Intercept	1.57	0.05	30.09	<.001
Perceived avatar warmth	0.31	0.03	9.96	<.001
IPS-Connect	0.05	0.04	1.24	.22
Perceived avatar warmth × IPS-Connect	0.04	0.03	1.28	.20
Perceived avatar competence	0.28	0.03	8.31	<.001
Avatar attractiveness	0.13	0.04	3.30	.001
Avatar familiarity	0.02	0.06	0.43	.67
Avatar femininity	-0.02	0.02	-0.98	.32
Avatar anthropomorphization	0.01	0.02	0.40	.69
Avatar gender	0.03	0.08	0.32	.75
Rater gender	0.08	0.08	1.08	.28
Avatar-rater gender match	0.58	0.05	12.11	<.001

Appendix D: Regression models of avatar preference regressed on avatar characteristics and need for competence scales × perceived avatar warmth

Table D1

Avatar preference regressed on perceived avatar competence, rater IPS-Lead, avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	*t*	*p*
Intercept	1.56	0.05	29.71	<.001
Perceived avatar competence	0.28	0.03	8.27	<.001
IPS-Lead	0.01	0.04	0.32	.74
Perceived avatar competence × IPS-Lead	0.01	0.03	0.17	0.86
Perceived avatar warmth	0.30	0.03	9.76	<.001
Avatar attractiveness	0.14	0.04	3.59	<.001
Avatar familiarity	0.01	0.06	0.21	.83
Avatar femininity	-0.03	0.02	-1.37	.17
Avatar anthropomorphization	0.00	0.02	0.08	.94
Avatar gender	0.0	0.08	0.03	.97
Rater gender	0.10	0.08	1.20	.23
Avatar-rater gender match	0.59	0.05	12.18	<.001

Table D2

Avatar preference regressed on perceived avatar competence, IPIP-Achievement, avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	*t*	*p*
Perceived avatar competence	0.28	0.03	8.11	<.001
IPIP-Achievement	-0.03	0.06	-0.41	.68
Perceived avatar competence × IPIP-Achievement	-0.02	0.05	-0.36	.72
Perceived avatar warmth	0.31	0.03	9.73	<.001
Avatar attractiveness	0.14	0.04	3.53	<.001
Avatar familiarity	0.01	0.06	0.20	.84
Avatar femininity	-0.03	0.02	-1.38	.17
Avatar anthropomorphization	0.00	0.02	0.19	.85
Avatar gender	0.00	0.08	0.05	.96
Rater gender	0.08	0.08	1.07	.29
Avatar-rater gender match	0.58	0.05	12.08	<.001

Table D3

Avatar preference regressed on perceived avatar competence, PRF-Achievement, avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	*t*	*p*
Intercept	1.57	0.05	26.65	<.001
Perceived avatar competence	0.29	0.03	8.37	<.001
PRF-Achievement	0.12	0.07	1.75	.08
Perceived avatar competence × PRF-Achievement	0.07	0.05	1.30	.19
Perceived avatar warmth	0.32	0.03	10.18	<.001
Avatar attractiveness	0.13	0.04	3.20	.001
Avatar familiarity	0.02	0.06	0.31	.76
Avatar femininity	-0.03	0.02	-1.30	.19
Avatar anthropomorphization	0.01	0.02	0.37	.71
Avatar gender	0.03	0.08	0.31	.76
Rater gender	0.09	0.08	1.13	.26
Avatar-rater gender match	0.56	0.05	11.66	<.001

Table D4

Avatar preference regressed on perceived avatar competence, MPS- Personal standards, avatar characteristics, rater gender, and avatar-rater gender match.

Variable	β	Standard Error	*t*	*p*
Intercept	1.57	0.05	29.45	<.001
Perceived avatar competence	0.28	0.03	8.10	<.001
MPS- Personal standards	0.01	0.05	0.21	.83
Perceived avatar competence × MPS-Personal standards	0.04	0.04	0.81	.42
Perceived avatar warmth	0.31	0.03	9.69	<.001
Avatar attractiveness	0.13	0.04	3.21	.001
Avatar familiarity	0.01	0.06	0.21	.83
Avatar femininity	-0.03	0.02	-1.23	.22
Avatar anthropomorphization	0.00	0.02	0.18	.86
Avatar gender	0.01	0.08	0.14	.89
Rater gender	0.11	0.08	1.35	.18
Avatar-rater gender match	0.56	0.05	11.58	<.001

Appendix E: Full avatar instructions for creation of actual and ideal avatars.

Actual avatar instructions

We would like you to create an avatar that represents your actual self. While you are creating the avatar, try to make it a representation of who you actually are today. Think of not only of your physical characteristics, but also other current traits (e.g., personality characteristics) you currently possess and try to communicate them using your avatar.

Ideal avatar instructions

We would like you to create an avatar that represents your ideal self. While you are creating the avatar, try to make it a representation of the ultimate goal for yourself. Think of not only your physical ideals, but also your goals, wishes, and aspirations for yourself (e.g., your personality) and try to communicate them using your avatar.