

# Reflected in a Liquid Crystal Display: Personalization and the Use of Avatars in Serious Games

Shan Lakhmani and Clint Bowers

Department of Psychology, University of Central Florida,  
Orlando, FL, USA 32816  
shan.lakhmani@knights.ucf.edu, bowers@mail.ucf.edu

**Abstract.** Personalization, in the realm of Serious Games, is the extent to which users believe that the digital environment is tailored to their characteristics and preferences. This belief can have major repercussions for a user's experience with the game and can subsequently be used to maximize the return on investment for serious game designers. Other factors that influence users' personalization in games include how the game affects the users' perception of self, presence in the game, and social relationships developed in the game. Users' avatars influence all of these factors. This goal of this paper is to examine the research done into avatars and personalization and presents it in the context of serious games research.

**Keywords:** avatars, personalization, presence, immersion, serious games.

## 1 Introduction

One of the benefits of using games to accomplish goals in addition to entertainment is that the experience can be tailored to the individual user in a way that other means cannot. Developers can personalize the game experience through the use of adaptive content [1] or through the establishment of a relationship between the user and the narrative framework [2]. Not only does this bond yield a motivated user, but also one who more actively cognitively processes the material, and thus finds the material in the game less difficult to understand [2]. The development of a personalized game can yield positive, tangible results from the users [2,3,4,5]; however, what can developers specifically manipulate to make a more personalized game? This text explores the use of player avatars and the effects of design choices, in accordance with existing avatar research.

## 2 Personalization

Avatars can be a useful means of developing a personalized relationship between a user and a game. There are only so many things one can do with avatars. One can shift perspective between first person and third person perspectives and one can implement a means of avatar customizability. One can either have: no customization by giving users an avatar; limited customization by giving users a choice of pre-made avatars; or full

customization in which the user can edit a variety of their avatar's features [5,6]. Advergaming, an interactive marketing technique that combines a game with branded material, have used full avatar customization as a means to make the game more personal [3]. Specifically, by giving users the opportunity to make their avatars represent their identity more accurately, advertisers affect the emotional experience the users have, leading to stronger feelings towards the brand [3]. The degree to which a game can positively influence the "affective dimension" of interactive media usage can be understood, and subsequently examined, as immersion [6]. Furthermore, when users are given more choice, and subsequently more control over the virtual environment, they show increased intrinsic motivation [3]. Humans exhibit social reactions to avatars, even if they do not represent actual users [4]. Not only are other players' avatars the means through which users form social bonds [7], but users have been shown to establish parasocial relationships with their own avatars [8].

Thus, avatars are a means of affecting personalization. Personalization affects how much a user gets out of a serious game. Avatars can also affect other factors—users' performance and interpretation of identity, level of immersion, and social relationships—which in turn affect personalization. This paper will explore these factors, how avatars can affect these factors, and what one can do to maximize the deliverables of serious games using these factors and avatars, in accordance with current literature.

## 2.1 Identity and Personalization

Using an avatar is a means to, quite literally, see oneself in a game. Subsequently, users see the game as a much more personalized experience because they "inhabit" that virtual world. Although, it is not exactly true to say that they, themselves, inhabit that virtual world. People tend to have two sets of schema for themselves; an actual, representative schema and an idealized schema [5,6,7]. When given the opportunity to customize an avatar, users will make a character that more closely resembles their ideal selves than they themselves do [5,6,9]. However, because the avatars that users make will also represent themselves, the avatar ends up being an amalgamation of the ideal and actual selves [7]. In fact, according to Social Cognitive theory, when children are looking for models with whom to identify, they seek models who are like them, thus accessible, but who have more positive characteristics than they have; the avatar, both self-representative and ideal, is the prime focus on which users can identify [5]. Jin [6] found that users who were explicitly asked to create an avatar that reflected their ideal selves reported greater game interactivity, and subsequently greater control over the digital environment, than those who were instructed to create an avatar based on their actual selves. Furthermore, identifying with a subject, also according to Social Cognitive theory, leads to greater learning [5]. So, avatar customization can lead to increased knowledge retention as well as increased feelings of control, which encourages personalization.

Seeing oneself act, even if it is through a digital representation, encourages embodiment, a tendency that can be used by developers to further the goals of their serious game. Avatars are users' virtual bodies, which are thereby cognitively imbued by users with properties of the self [10]. In accordance with existing literature on disembodiment, the same part of the brain used to imbue the action of tools being

used as an extension of the self, the right parieto-temporal occipital junction, is also activated when one controls an avatar [10]. This effect appeared even though the image used was selected by the experimenter. However, unlike simpler foci of disembodiment, like a hammer, the avatar often resembles an individual. Through this representation, the user's mental model of the self, and even the user's behavior outside the virtual environment, can be affected [3]. Allowing users to totally customize their own avatars makes the virtual environment seem more real; however, due to this reciprocal relationship between user and avatar, if users are given a choice of pre-made avatars, their ideas of self are actually altered by the characteristics of those avatars [3].

A minor change in identity and subsequent behavior can be seen when avatars are used in a social networking context. Users who were represented by attractive avatars were more willing to approach members of the opposite sex, when compared to those represented with less attractive avatars [9]. Inducing a self-concept discrepancy, by making more salient the gap between the ideal self and the actual self, can lead to a more noticeable change in behavior [6]. Researchers found that users who viewed their avatars running on a treadmill engaged in significantly more exercise behavior in comparison to users who saw their avatars engage in more indolent activities [5].

So, the choices that developers give users in terms of avatars can affect how strongly the user personalizes with the virtual environment as well as how users see themselves. Needless to say, the ability to affect the user's identity can prove invaluable if the serious game developer is trying to effect behavioral change. If learning is the goal, implementing avatar customization can give users an ideal teacher to look up to: themselves.

## 2.2 Immersion and Personalization

An avatar is the medium through which one can inhabit a virtual world. The experience of actually inhabiting a virtual self—be it a physical representation, as in third-person virtual environment, or a fully psychological representation, as in first-person virtual environments—is described as self-presence [3]. If users feel sufficient self-presence, then they are immersed within their virtual world; if they are sufficiently immersed, they reach a state of flow [11]. To help users reach this flow state, a state where they perform at their optimal level to the exclusion of the outside world and the passage of time, the factors that disturb users' smooth action must be designed out, while factors that allow them to invest themselves must be maximized [12]. Developments that interrupt the experience, such as a poor user interface or an illogical solution to an in-game problem, prevent users from "buying into" the virtual world and prevent flow [12]. If users are provided with adaptive choices, their experience will be much more personalized, and hence be more conducive to eliciting a flow state [13]. So, when the game tailors itself to the user's needs and requirements, the user's immersion into the virtual environment increases. One of the major benefits for immersion is increased time-on-task [14]; as time playing the game increases, so does time exposed to the material in the game.

Avatar customization makes the world more immersive [3] because it allows self-presence to manifest through physical authenticity [15]. A high level of immersion amongst users, in relation to a game, is associated with positive learning outcomes and

intrinsic motivation for the activity [3,15]. Therefore, encouraging personalization through the use of avatar customization can lead to a useful ROI for serious game makers.

### 2.3 Socializing with Avatars

As previously stated, the user can inhabit a virtual world through a mental representation, through a first-person perspective [3]. This design choice can be used to create a compelling game [5] which invokes a user's arousal, presence, and identification; however, when users are given a choice of avatar, they show more arousal, presence, and identification in the third-person perspective than in the first-person perspective [3].

Personalization does not have to be purely about the self. While users can form parasocial relationships with their own avatars, they can also form social bonds with the digital figures that populate a virtual world, be they human-controlled or otherwise. When users see an avatar, be it their own, someone else's, or even one controlled by a computer, they interpret it as they would a human [14]. When playing a game with a digital figure, if the user believes that there is human agency behind the avatar, the anterior paracingulate cortex, the part of the brain known for attributing independent mental states different from our own to others, activates [14]. Moreover, the person perception processes that activate when they see a digital figure are the same as if they saw a videotaped person [16]. When the users believe that they are digitally interacting with a human figure, they show a variety of effects which could be beneficial to the goals of a serious game designer. The development of a relationship with a human-like figure leads to a positive learning experience and increases the users' motivation [16]. It has also led to an increased amount of science information learning in a virtual reality learning experiment [14]. So, allowing users to interact with one another digitally can further the goals of a serious game designer. But, sometimes multiplayer worlds are unfeasible. Will users develop these personalized relationships with computer-controlled agents?

The answer is mixed. If any human-like cues are received from a digital figure, even if there is not human agency behind that cue, people exhibit the same social reactions as they would from human-to-human interaction, with the same parts of the brain activating [16]. People can form parasocial relationships with non-human agents and they subsequently respond as if in a typical relationship [8]. This parasocial relationship can support learning as well; "animated pedagogical agents" can transmit information using nonverbal behavior and thus support student learning [4]. Furthermore, when Moreno's & Mayer's [2] computerized agent used personalized language to aid in teaching users botanical information, users felt more immersed in the virtual environment and they reported that the learning task was easier. So, users respond to computer controlled agents similarly to those controlled by other users and they can benefit from them. However, the use of digital agents has its pitfalls. Users in a virtual reality environment learned less science information from a digital presentation controlled by a computer, than with one controlled by another user [14]. Also, in competitive contexts, people report a greater dislike for computerized agents in comparison to human users [2], and they subsequently feel higher levels of aggression after the game is played [14]. Consequently, heart rate acceleration, a

measure of cognitive effort and positive valence, is higher in comparison to baseline when one plays with a user's avatar rather than a computerized agent; moreover, users lose interest in the game if they compete with a computerized agent and are defeated [14]. For a serious game designer, while computerized agents can be useful, they have some definitive drawbacks.

The important aspect of forming the relationship is, of course, the user's belief. The user's feeling of agency over the virtual world, which is the feeling of being able to affect the world through the avatar, is described as self-presence [15]. The user's feeling of social interaction, regardless of technological mediation is described as social-presence [3,15]. The users' sense of interacting with another social being, their social-presence, seems to be the underlying factor behind the increased personalization and subsequent positive results stated above. Users can be persuaded to accept computerized agents as human—thus gaining the benefits from human-human interaction—but creating a context where this acceptance may occur may be difficult [2].

Individual differences also can play a part in creating social relationships with digital figures. People with interdependent self-construal tend to see themselves in terms of relationships. In the virtual environment, these people form social relationships to other people's avatars (seeing them as an extension of a separate person) and they form a parasocial relationship with their own avatar [8]. Because these relationships are emphasized, these users show a higher level of self-presence, with all the benefits that entail [8]. Developers can reap the benefits of this self-construal, however, by priming interdependent self-construal with multiplayer or group player mechanics [8].

The great effect that computer-controlled avatars can have, both positive and negative, emphasizes the need for strong, careful design in serious games. If a designer can create a computerized agent that can mimic a human relationship, the developer of the serious game can gain the benefit of social presence without the drawbacks. This stronger relationship with the virtual world will strengthen the personalization of the world to the user and will contribute towards the goal of the serious game.

### 3 Conclusion

According to the literature, avatar implementation can affect personalization of the user as well as the factors that feed into personalization. The user's game experience, and what they subsequently receive from the game, can be altered depending on how a designer implements avatar creation in a serious game. A highly customizable avatar can lead to increased immersion and disembodiment, both of which yield certain benefits in terms of user experience. However, a more limited customization or even an avatar choice system requires less effort to implement and can effect behavioral change. Depending on the desired outcome, certain kinds of implementation are more useful than others. However, while some initial recommendations can be made, existing research has only scratched the surface of avatar utility. More research into the specifics of avatar implementation would allow for more specific designer recommendations for avatar implementation, especially in the face of different contexts.

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