



# Investigating gesture-based avatar game representations in teenagers, younger and older adults<sup>☆</sup>



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## ABSTRACT

In game design, avatars are an important means of representing behavioural traits of the player. Designers are often faced with decisions on how the avatar's appearance may affect the game experience. Despite this, relatively little is known about how age influences self-representation in gesture-based avatars. In this paper, we present the findings of 54 mixed-age participants (i.e. teenagers, younger adults and older adults), who were asked to compare the design of three different avatar-types (i.e. cartoon, humanoid and silhouette). Comprising of a post-game questionnaire and individual semi-structured interviews, participants were asked to rank avatar preferences, and were questioned on their perceptions towards age representation. Our results show that there were significant group differences in the identification and awareness of visual features in the avatars for those below the age of 30, compared to those above 55 years old. This included variations in attention to detail and behavioural representation. The paper concludes by reflecting on game design challenges for these target groups, and recommends further avenues of pursuit.

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## 1. Introduction

Demographically, teenagers and younger adults represent two of the highest digital game playing groups, with older adults comprising of a smaller, yet growing number of gamers. For example, a 2008 U.S. survey identified that 36% of gamers (aged 65 and above) regularly played digital games on a daily or near daily basis [28]. Aligned with more recent statistics from the Entertainment Software Association [10], the growing trend in digital game adoption by older adults has drawn increasing interest in their roles as social mediators and educational tools in the facilitation of interaction between different age groups (e.g. [7,19,39,41]). This includes understanding how the affordances of digital games can help reduce social barriers between the young and old [39], improve the literacy of children in low-income households [7], and foster better engagement between family members and residents of retirement communities [41].

Related intergenerational game studies have varied from the use of augmented environments to mediate collaboration [18,19], to game features that build on the mental models of the players [39]. A common theme across these studies has been a focus on evaluating the usability of prototype games (e.g. [18,39]), with

few known guidelines or recommendations to support intergenerational practices [7,41]. Subsequently, in the context of gameplay usage, relatively little is known in how to leverage on differences in player values, beliefs and technological understanding. This includes knowing how the visual representation of virtual characters and online identities are perceived across different age groups, particularly amongst low and high digital game adopters. Our prior work has identified that modifications in the physical characteristics of on-screen characters may be a playful attribute in reversing roles in intergenerational games [31]. Despite this, it remains questionable the extent that altering the visual representation of players across different generations may influence communication and collaborative goals.

Given the scale of possibilities for players to construct identities in unique and different ways, in this paper we examine how the self-identification and perception of age in avatar representation may vary across three age groups (i.e. teenagers, young adults and older adults). Building on the authors' preliminary research [32], the focus of this study is to identify the extent to which players could associate with three distinct gesture-based avatars (i.e. cartoon, humanoid and silhouette). In doing so, the research compares attitudes and player preferences to determine if there are identifiable group differences. Specifically, we explore avatar representation, in terms of homophily, expressiveness, attractiveness and engagement, using a post-game questionnaire and semi-structured interviews to extrapolate findings, and contribute to a limited body of

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knowledge in this area. Our work makes a number of contributions in terms of understanding how the perceptions of avatar representation vary across age. This includes the types of physical and behavioural attributes of the avatars that players perceive to be important. In addition, we outline the practical implications of these findings in terms of future research and game design.

## 2. Related work

Represented in many different forms, avatars are widely designed to enhance, engage, and to appropriately respond to player actions. Importantly, their presence can involve familiar forms of interaction [3], as players embody avatars, giving a level of realism to how they ‘internally experience’ themselves [37]. Equally, avatars can be instrumental in mediating interaction and increasing the self-awareness of other players within virtual environments. For example, in virtual teams, players have been reported to better identify with other interactants who have similar-looking avatars to themselves [24]. In turn, the ease to change the appearance and bodily representation of one’s virtual self is perceived to be far more versatile than in real world interaction, and can account for interests in gender swapping and more idealised avatar forms (e.g. [9,37]).

Likewise, the type of game domain has been identified to influence the visual depiction of players. For example, a study by Vasalou and Joinson [40] reported that players in an online dating scenario carefully chose avatar features of themselves with the aim of impressing or gaining the attention of others. In a few instances, this included employing deceptive strategies to accentuate the perception of their physical image. Moreover, in relation to visual appearance, virtual players have been found to construct identities in abidance to social norms and practices (e.g. [37]). This includes maintaining a balance between updating appearances to reflect group expectations, while preserving a level of individuality from the group [25].

Alternatively, the virtual replication of a player’s self in the bodily form commonly known as a *doppelganger* has been found to have a persuasive effect in changing the behavioural traits of the player [1]. This includes psychologically influencing player’s willingness to exercise by manipulating the physical appearance of their avatar [12]. In other cases, it has been identified that players with different representations behave differently in virtual worlds. Namely, players with taller or more attractive avatars were more confident in negotiation tasks, or were willing to disclose more information [43].

On the other hand, beyond the use of immersive environments, it is understood that the perceptions of avatars are deeply characterised by their visual appearance. For example, in reviewing the paired interaction in a social chat context, Nowak and Rauh [27] identified that a partner was seen to be more credible when their avatar appeared less androgynous. Similarly, the authors described how more anthropomorphic representations attributed to an increase in partner credibility. In this context, the influence of the physical design of avatars in altering the perceptions of other players is perceived to be comparable to how people formulate impressions of others in the physical world [27]. Subsequently, the blurring between online and offline worlds illustrates the potential advantage of using avatars to enrich personalities and personas [37], to influence the perception of others [27,43], and to behave in a less inhibited manner compared to everyday life [23].

### 2.1. Avatar representation and age

According to Williams et al. [42, p. 816], understanding game character demographics has been described as “a necessary step in applying theories of influence, identity construction and perceived

*social reality*”. Specifically, the authors attribute game representation as an important means of measuring differences in social and cultural identity amongst minority groups. In reviewing the proportion of game characters in over 130 commercial games, Williams et al. [42] found that older adults were highly under-represented. For example, compared to the 12% of older adults that make up the U.S. population, they accounted for less than 2% of the characters in the sampled games. In contrast, the teenage characters existed at a rate similar to their proportion in the general population (7%), while the number of adult characters far exceeded the national average (nearly 87% compared to a demographic census of 59%). Critically, this disparity in age representation was reported to be partially attributed to an industry that is predominately supported by young, male developers, in perpetuating their own identity within digital games [42].

Of the relatively few studies that have attempted to understand the effect of age on avatar representation, two notable exceptions include Griffiths et al. [14] and Blinka [4], both of whom reported age differences when playing virtual avatars. In the case of Blinka [4], it was reported that adolescent players had a stronger identification to avatars compared to players in their mid to late twenties. These findings were attributed to the teenagers need to perform well and to attain success in the gameplay. Separately, Griffiths et al. [14] also compared the differences between adolescence and adults in avatar behaviour and found that younger players were less likely to gender-swap. However, the authors were speculative to what caused such differences in the study.

More recently, the experimental work of Principe and Langlois [30] revealed that undergraduate students and young children share a common preference for attractive looking avatars. Using Nintendo Mii avatars for the visual stimuli, the study identified that preferences for facially attractive characters was reflective of real world practices when engaging in face-to-face communication. Alternatively, in exploring the online relationships of 180 gamers, Ducheneaut et al. [9] found that younger players preferred creating avatars of an age similar to their own, while middle-aged players preferred younger looking avatars. This was accounted to the middle-aged players desire to create an idealised, rather than actual representation of themselves.

Focusing on older adults, Cheong et al. [6] sought to compare identification factors between anthropomorphic and non-anthropomorphic images of humans, animals and objects. The results revealed that older adults faced difficulties in self-relating to image-based avatar representations, but indicated that younger looking avatars appeared more credible in their appearance. This was attributed to the younger avatars inducing more paternal or reminiscent qualities in the older adults. Contrastingly, in exploring age differences in the social presence of a virtual world, Sitaraya and Ang [34] found that a number of both younger (22–33 yrs) and older adults (55–80 yrs) preferred selecting avatars of an age different from themselves, with the older adults perceiving non-human avatars to be lower in social experience. Subsequently, the authors suggest that in designing virtual worlds, game developers should be cautious of using non-human avatars with older players.

In reflection of the work of Cheong et al. [6] and Sitaraya and Ang [34], the results suggest that there is a possible correlation between avatar-type preference and age. However, we believe further research is required to better understand this relationship. Speculatively, age differences in avatar representation may help mediate social interaction between generational cohorts, by conveying aspects of personality and behaviour. However, much of the previous game literature lacks supportive evidence to determine the extent to which perceptions of visual representation may vary across age groups. Subsequently, the goal of this study is to understand the extent participants can self-identify with three

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