Original Article

Effects of Human vs. Computer-Controlled Characters and Social Identity Cues on Enjoyment

Mediation Effects of Presence, Similarity, and Group Identification

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Abstract: This study explored how group identification, avatar similarity identification, and social presence mediated the effect of character type (avatars or agents) and social identity cues (presence or absence of avatars wearing participants' school colors) on game enjoyment. Playing with teammate avatars increased enjoyment indirectly by enhancing group identification. In addition, the presence of social identity cues increased enjoyment indirectly by augmenting identification with one's avatar. Unexpectedly, playing in multiplayer mode in the presence of social identity cues decreased enjoyment, whereas playing in multiplayer mode in the absence of social identity cues increased enjoyment. Social presence was not a reliable mediator. The findings supported media enjoyment and social identity theories, and highlighted how virtual character type and identification processes influence enjoyment.

Keywords: enjoyment, avatars and agents, identification, social identity, social presence

When playing video games, people's subjective experience depends on both technical and social factors. For example, playing against human-controlled opponents increases enjoyment compared with playing against computer-controlled characters (Weibel, Wissmath, Habegger, Steiner, & Groner, 2008). Players also show increased physiological arousal when virtual characters are introduced as human-controlled avatars instead of computer-controlled agents (Lim & Reeves, 2009). Players also prefer human instead of computer-controlled partners (McGee, Merritt, & Ong, 2013). Participants played a capture game with an artificial teammate and with a "presumed" human teammate (i.e., an artificial teammate that they believed was a human teammate). Participants chose the "presumed human" over the artificial teammate for a follow-up game even though the teammates were the same (McGee et al., 2013).

In addition, when playing single and multiplayer video games, players take sides and form groups to cooperate with teammates and compete against other groups. In Halo's online multiplayer mode, players are assigned to teams of avatars clad in red or blue armor, and ingroup and outgroup social identity is frequently color coded in video games to ease with player recognition. In this context, social identity and self-categorization theories (SIT/SCT/SIDE) predict that salient social identity cues (e.g., playing video games with avatars or agents wearing participants' school colors) may increase positive ingroup biases and negative outgroup biases (Tajfel & Turner, 1986; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987; Spears & Postmes, 2015). If so, the presence of shared social identity cues may increase video game enjoyment based on the activation of positive ingroup biases compared with playing video games in the absence of shared social identity cues. Virtual characters wearing participants' school colors may also increase similarity-based identification (Cialdini, Borden, Thorne, Walker, Freeman, & Sloan, 1976; Van Looy, Courtois, De Vocht, & De Marez, 2012), which may in turn augment game enjoyment.

This study attempts to integrate the effects of playing with human or computer-controlled virtual characters and social identity cues on players' game enjoyment into a single study. *Enjoyment* is defined as a pleasant response to media use that has physiological, cognitive, and affective components (Vorderer, Klimmt, & Ritterfeld, 2004). Enjoyment is a product of playing with human or computer partners, storyline and characters, the type of game controller (e.g., joystick or motion-based controller), cooperative or competitive game mode, along with games being able to satisfy basic player needs such as competence, autonomy, and relatedness (Schmierbach, Xu, Oeldorf-Hirsch, & Dardis, 2012; Tamborini, Bowman, Eden, Grizzard, & Organ, 2010). In addition, we examine whether playing with human or computer-controlled virtual characters and social identity cues may not only directly augment enjoyment but may also do so indirectly by influencing (a) social presence, (b) identification with one's virtual character, and (c) identification with a gaming group or clan. *Social presence* is a key experience afforded by video games (Lee, 2004; Lombard & Ditton, 1997), and is defined as the degree of awareness, attention, mutual comprehension, and affective and behavioral interdependence in interactions with a real or virtual entity (Harms & Biocca, 2004). Believing that a virtual partner is human-controlled and not a computer-controlled character increases social presence (Guadagno, Blascovich, Bailenson, & McCall, 2007). In addition, playing against humans increases spatial presence (i.e., feelings of being in the game world) compared with playing against the computer (Ravaja, Saari, Turpeinen, Laarni, Salminen, & Kivikangas, 2006). This study seeks to contribute to this literature by studying how social presence mediates the effects of playing with human or computer-controlled characters and social identity cues on game enjoyment. Though these effects have not been examined, experiencing more social presence when employing a virtual reality system is linked to increased enjoyment (Heeter, 1995). In addition, increased social presence is linked to higher enjoyment of e-commerce websites (Cyr, Hassanein, Head, & Ivanov, 2007).

Identification with an online group refers to attraction to a recreational or task-oriented ingroup (Van Looy et al., 2012; Wang, Walther, & Hancock, 2009). In particular, identification with an online gaming group is linked to team satisfaction and intentions to perform well in future matches (Eveleth & Eveleth, 2010). In the present study, players may identify more with their ingroup than with an outgroup, especially if the game ingroup is composed of human-controlled avatars instead of computer-controlled agents, and also if virtual characters display the participants' school colors. Identification with a virtual character refers to players integrating a game character's properties into their self-concept (Klimmt, Hefner, & Vorderer, 2009), and such identification with virtual characters should increase game enjoyment (Van Looy et al., 2012). *Similarity identification* is a key dimension of player identification processes as people are more likely to identify with virtual characters that they perceive as more similar to themselves (Van Looy et al., 2012). Thus, playing with human-controlled characters and interacting with avatars wearing participants' school colors should augment identification with one's avatar, which may in turn trigger increased enjoyment. Below we articulate theoretical models predicting that virtual character type and social identity cues will affect game enjoyment, along with evidence articulating how this process should be mediated by social presence, group identification, and similarity identification.

The Effects of Playing With Human or Computer-Controlled Virtual Characters

Previous studies agree on the prediction that playing with human instead of computer-controlled game partners affects key gaming experiences. For example, playing with humans in multiplayer games is more enjoyable because it is less predictable and more suspenseful in comparison with playing single player games (Klimmt & Hartmann, 2008). Playing with human instead of artificial game partners is also linked to differences in interactivity. Playing with human-controlled avatars may allow more communicating, competing, and strategizing compared with playing with computer-controlled agents (Weibel et al., 2008).

There is a perceptual component involved in this process as players led to believe that they are playing with human-controlled avatars instead of computer-controlled agents show increased enjoyment (Weibel et al., 2008), social presence (Guadagno et al., 2007), and arousal (Lim & Reeves, 2009) in otherwise identical game interactions. Players' mere perception that they are interacting with human instead of artificial characters may affect game experiences even if in reality they have been playing with artificial characters all along. One additional approach is to experimentally manipulate game mode, an objective technological affordance, in order to examine the effects of playing with human or computer-controlled characters (Ravaja et al., 2006). In this context, participants show increased spatial presence or feelings of being in the game world when playing with human instead of computer-controlled characters (Ravaja et al., 2006). Along these lines, Johnson, Wyeth, Clark, and Watling (2015) examine the effects of playing with human or computer-controlled characters by asking participants to play a first-person shooter game in single or multiplayer mode. Playing with human-controlled characters increases relatedness or sense of connection with others and flow or absorption in the game activity (Johnson et al., 2015). Playing a bowling video game with a human partner

also increases feelings of relatedness compared with playing in single player mode, and relatedness is linked to game enjoyment (Tamborini et al., 2010).

Overall, studies examining the effects of playing video games with human or computer characters manipulate either subjective factors (e.g., the belief that one is playing with avatars or agents, Guadagno et al., 2007; Weibel et al., 2008) or objective factors (e.g., game mode as a means to enable single player or multiplayer experiences, Johnson et al., 2015; Ravaja et al., 2006) in order to affect enjoyment, social presence, and relatedness. Consistent with this research, we manipulate game mode to enable interactions with human-controlled avatars or computer-controlled agents. In general, people experience higher enjoyment, social presence, and relatedness when playing with human instead of computer-controlled characters (Johnson et al., 2015; Ravaja et al., 2006). Though the link between playing with human or computer-controlled characters and identification with one's gaming group has not been examined, when considering the relatedness findings above, it is likely that identification with one's game group is facilitated when playing with human instead of computer-controlled characters, and this in turn should increase enjoyment. Note that single and multiplayer game modes may both increase identification with one's avatar as people may identify with their character's storyline, appearance, morals, etc. (Van Looy et al., 2012; Vorderer et al., 2004). However, given the present experiment featuring short-term play, minimal story, and no character development, along with evidence on the preference for playing with human instead of computer-controlled partners, we expect higher similarity identification with one's character after playing with human avatars instead of computer-controlled agents. Thus:

Hypothesis (H1): Participants playing with human-controlled avatars will experience (a) increased enjoyment compared with those playing with computer-controlled agents, and this effect will be mediated by (b) social presence, (c) similarity identification, and (d) group identification.

Social Identity Effects

According to SIT, people's sense of self contains personal and social identity components. Personal identity includes unique individual attributes (e.g., personal taste, style, behaviors), whereas social identity refers to membership in social groups coupled with how self-esteem is linked to group membership (e.g., being a student at a prestigious school, Tajfel & Turner, 1986). Building on SIT, SCT expects that categorizing oneself into a social group leads to perceiving self and partners through the lens of the group's prototype instead of personal traits (i.e., depersonalization effects, Turner et al., 1987). To trigger depersonalization effects, social identity cues must be perceptually salient and fit the person (Turner et al., 1987).

Building on SIT and SCT, the social identity model of deindividuation effects (SIDE) predicts that anonymous online interactions exacerbate social identification effects (Lea & Spears, 1992; Spears & Lea, 1994; Spears & Postmes, 2015). SIDE forecasts that anonymous online partners with a shared social identity (e.g., avatars wearing participant's school colors) should behave more positively to each other compared with anonymous online partners with no shared social identity (Lea & Spears, 1992). In online contexts, social identity cues should weigh heavily when people are anonymous and lack information about each other. SIT/SCT/SIDE studies examine their predictions in minimal group experimental paradigms in which unacquainted participants are sorted into groups and develop positive ingroup biases and negative outgroup biases on the basis of trivial criteria such as preference for photographs or liking of abstract painters (Tajfel & Turner, 1986). Minimal group effects have been observed in online interactions in which communicators remain visually anonymous to each other, as seemingly trivial information including usernames (Tanis & Postmes, 2007) and work instructions emphasizing the individual or the group (Lea & Spears, 1992) operate as cues to social identity in virtual teams. For example, anonymous online communicators that were categorized into a virtual group based on shared zodiac signs report increased group identification compared with participants who did not have the same zodiac sign (Wang et al., 2009; Yilmaz & Peña, 2014).

Based on the activation of a positive ingroup bias, enjoyment should increase when playing in the presence of ingroup social identity cues compared with groups in which avatars and agents share no social identity. Shared social identity cues may also increase social presence as the activation of a positive ingroup bias may lead participants to pay more attention and feel more connected to ingroup characters wearing their school colors, and such increase in social presence may mediate the direct effects of social identity cues on enjoyment. Presence of ingroup social identity cues may also increase group and similarity identification because participants will self-categorize into gaming teams displaying ingroup cues such as participants' school colors in real life (Turner et al., 1987). Thus:

Hypothesis 2 (H2): Participants playing in groups with virtual characters dressed in their school colors will experience increased (a) enjoyment compared with those in groups with avatars dressed in different colors, and this effect will be mediated by (b) social presence, (c) group identification, and (d) similarity identification.

Interaction Effects

As noted above, playing with human-controlled avatars instead of computer-controlled agents should intensify enjoyment, social presence, similarity-based identification with an avatar, and group identification. Additionally, shared social identity cues should also augment players' enjoyment, social presence, similarity identification, and group identification as these cues should trigger positive ingroup biases and self-categorization processes. Considering the above, it is possible that these main effects also result in a statistical interaction effect. Because there is no single theoretical model that encapsulates the synergistic effects of the manipulations, we put forward a research question asking:

> *Research Question 1 (RQ1)*: How does playing with human-controlled avatars instead of computer-controlled agents in the presence or absence of avatar social identity cues influence (a) enjoyment, (b) social presence, (c) similarity identification, and (d) group identification?

Method

Participants

Undergraduate students at a large public university in the U.S. (N = 216) participated in the experiment. 166 participants were female. The participants were 21.5 years old in average (SD = 3.60). Most of the participants were Asian (41.4%), followed by Caucasian (35.3%), Hispanic (12.1%), African-American (4.2%), and other (7%) ethnic origin. There were 109 participants in the social identity cues present condition and 106 participants in the social identity cues absent condition. In addition, 90 participants played with computer-controlled agents and 125 participants played with human-controlled avatars. Computer and video game use was measured in a 1-7 Likert-type scale. The participants used computers (M = 6.92, SD = 0.45) more frequently than video games (M = 2.44, SD = 1.83), $t(215) = 35.83$, $p < .001$.

Materials and Procedure

The video game used in this study was the result of a multidisciplinary collaboration between computer scientists and communication researchers. The video game puts players in the role of plane crash survivors in an island with an active volcano. Players spent in-game days (i.e., game turns) collecting resources to leave the island before the volcano's eruption. The participants could either collect resources that benefitted the group (i.e., wood to build a raft to get out of the island) or individuals (i.e., gold to keep and thus individually "win" the game). While collecting resources, participants would notice that the volcano grew angrier and that there was another group of stranded survivors (i.e., a computer-controlled outgroup, Figure 1).

Before coming to the laboratory, participants filled out an online survey measuring traits and demographic information. The survey took 10–15 minutes to complete. A week later, they played one single or multiplayer video game match in the laboratory. Upon arriving to the lab, the participants were randomly assigned to play the game in either the social identity cues present or absent conditions (Figure 1). The game depicted two three-person groups onscreen (i.e., ingroup and outgroup). In the social identity cues present condition, all ingroup human-controlled avatars and computer-controlled agents wore the participant's school color and outgroup agents wore a rival school's color. In the social identity cues absent condition, ingroup and outgroup avatars and agents wore different colors, and no color was repeated. The game session and exit survey took about 45 minutes. The laboratory had visually anonymous isolated cubicles and was arranged as a small LAN party with four gaming desktop computers with large screens. Experimental sessions included other visually anonymous participants playing the game in adjacent cubicles with dividers. Participants played the game using noise-cancelling headphones and were not allowed to talk. The experimental video game did not allow exchanging in-game messages. Single player game sessions also included other participants in the same room playing the game in single player mode. Single and multiplayer sessions had a maximum of three participants, and the study did not pit groups of participants simultaneously playing against each other. Outgroup agents were controlled by the computer, and they collected supplies from all resource sites to ensure that participants were aware of their presence in the virtual island. After playing the game, the participants completed an exit survey with the dependent variables and an awareness check.

Independent Variables

Human vs. Computer-Controlled Characters

The participants played the experimental video game in single player mode in which the other two members of the ingroup were computer-controlled or in multiplayer mode in which human participants controlled the other two ingroup characters (Figure 1). This procedure is consistent with game mode manipulations as a means to enable interactions with human-controlled avatars or computer-controlled agents (Johnson et al., 2015; Ravaja et al., 2006). In both modes the computer operated the outgroup

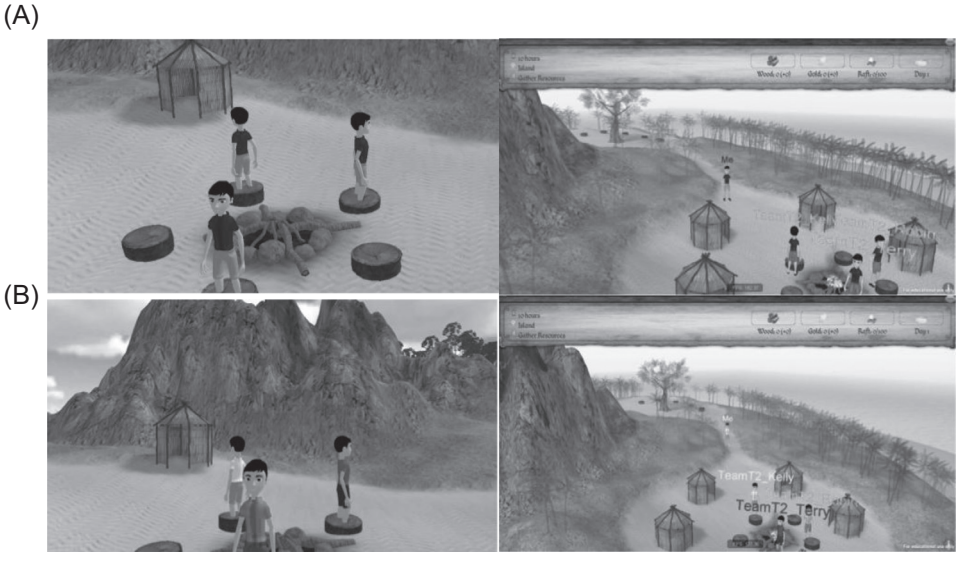

Figure 1. Ingroup and outgroup camps in the social identity cues present condition (A) and in the social identity cues absent condition (B).

characters played and the game looked the same to allow for proper experimental control. The participants were not informed about whether their teammates in the game were controlled by other human players or by the artificial intelligence of the game.

Social Identity Cues

In the social identity cues present condition, ingroup avatars wore the participant's school color whereas outgroup avatars wore the rival school's color. In the social identity cues absent condition, ingroup and outgroup avatars wore different colors, and no two avatars wore the same color (Figure 1). The avatar dress color manipulations were congruent with minimal group conditions outlined above.

Dependent Variables

We used validated scales to measure the key factors representing subjective game experiences. The intercorrelations between the outcome variables appear in Table 1.

Enjoyment

This factor was measured after playing the experimental video game with Lin, Gregor, and Ewing's (2008) 1 to 7 Likert-type scale. The wording of the items was slightly modified to refer to playing a video game instead of visiting websites. The scale had 12 items (e.g., "While playing the game, I was deeply engrossed", "Playing the game was deeply worthwhile", $\alpha = .91$; $M = 4.14$, $SD = 1.00$).

Social Presence

This factor was assessed with Harms and Biocca's (2004) social presence measure. The co-presence and behavioral interdependence subscales (12 items) were selected as they best represented the study's goals. Co-presence is the degree to which an observer feels accompanied and in which self and partners are aware of each other (e.g., "My presence was obvious to my team members", "I caught my team members' attention"). Behavioral interdependence refers to the extent to which user's behavior affects and is affected by partners' behavior (e.g., "My team member's behavior was closely tied to my behavior," "I reciprocated my team member's actions"). The scale was reliable ($\alpha = .89$; $M = 3.13$, $SD = 0.98$).

Similarity Identification

This factor was measured with Van Looy and associates' (2012) subscale. The subscale had 6 items such as "My character resembles me" and "I identify with my character" and it was reliable ($\alpha = .95$; $M = 3.03$, $SD = 1.48$).

Group Identification

This factor was measured with Wang and associates' (2009) 10-item scale and it included items such as "I see myself as a member of this group" and "I felt loyal toward the group." This scale was reliable ($\alpha = .91$; $M = 4.05$, $SD = 1.20$).

Awareness Check

After completing the procedures and scales described above, participants were asked if they knew the aim of the experiment and whether there was a theme or connection between the different sections in the study. The awareness check questions were adapted from Bargh

Table 1. Intercorrelation matrix among outcome variables

		Social presence	Enjoyment	Similarity identification	Group identification
Social presence	Pearson Correlation	1	.29**	.34**	.46**
	Sig. (2-tailed)		.000	.000	.000
	N	216	216	216	216
Enjoyment	Pearson correlation	.29**	1	.32**	.52**
	Sig. (2-tailed)	.000		.000	.000
	N	216	216	216	216
Similarity identification	Pearson correlation	.34**	.32**	1	.37**
	Sig. (2-tailed)	.000	.000		.000
	N	216	216	216	216
Group identification	Pearson correlation	.46**	.52**	.37**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	216	216	216	216

**Correlation is significant at the .01 level (two-tailed).

and Chartrand's (2000) funneled debriefing technique, and it included seven questions (e.g., "What did you think the purpose of this experiment was?" "Did you think that any of the experimental tasks were related in any way? In what way were they related?" "Did you notice any particular pattern or theme in the game?"). To clarify whether participants were aware that they played with human or computer-controlled characters, two of the authors independently read and coded all of the participants' responses. Participants' responses were coded in regards to whether participants showed awareness of having played with other humans or computer-controlled characters (0 = Absence of human player or computer-controlled character references; 1 = Presence of human player or computer-controlled character references). Intercoder reliability was calculated based on a randomly chosen 20% of the total number of awareness checks, and the coding was acceptable (*kappa* = .84).

There were no significant differences in regards to making references about playing with other humans or computer-controlled characters between the single (6 presence of human or computer player references; 85 absence of human or computer player references) and multiplayer mode (7 presence of human or computer player references; 118 absence of human or computer player references, χ^2 (1) = 1.55). There were also no differences in regards to references about playing with human or computer-controlled characters between the social identity cues present (5 presence of human or computer player references; 104 absence of human or computer player references) and the social identity cues absent conditions (8 presence of human or computer player references; 99 absence of human or computer player references, χ^2 (1) = .80). Participants thus did not refer to playing with avatars or agents to be the main goal of the study.

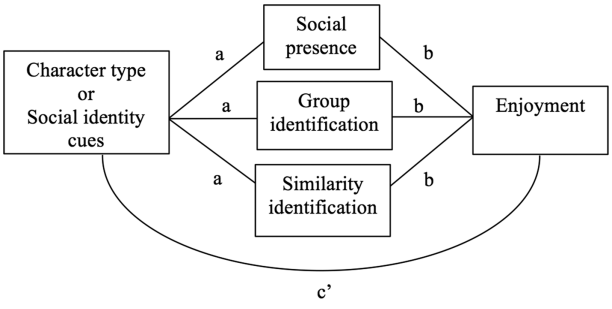

Figure 2. Visual representation of mediation paths among variables.

Results

The Effects of Playing With Human or Computer-Controlled Characters on Enjoyment

We explored the data's independence using the methods recommended by Kenny, Kashy, and Cook (2006) because the participants were run in the presence of others. The results showed that all scores were independent ($Z_{Enjoyment}$ = .05, p = *ns;* $Z_{\text{social presence}}$ = .06, p = *ns;* $Z_{similarity\ \text{identification}}$ = .04, p = *ns;* $Z_{group\ \text{identification}}$ = .07, p = *ns*). To address Hypothesis 1, model 4 mediation analyses were performed with PROCESS (Hayes, 2013). Enjoyment was the focal outcome variable based on the hypotheses above. The predictor variables were the character type and social identity cues manipulations. Group identification, similarity identification, and social presence were run as parallel mediators (see Figure 2). This resulted in a model testing for direct and indirect human vs. computer-controlled character effects and another model testing for direct and indirect social identity effects. Descriptive statistics on the dependent variable and mediators appear in Table 2.

Table 2. Means and (standard deviations) for the experimental conditions

	Character type		Social identity cues	
	Human-controlled	Computer-controlled	Present	Absent
Enjoyment	4.27 (0.98)	3.96 (0.98)	4.11 (1.01)	4.17 (1.00)
Social presence	3.25 (0.61)	2.95 (0.68)	3.22 (0.63)	3.02 (0.67)
Group identification	4.30 (1.14)	3.71 (1.19)	4.12 (1.19)	3.99 (1.21)
Similarity identification	3.17 (1.45)	2.84 (1.50)	3.21 (1.53)	2.86 (1.41)

As seen in Table 3, playing with human-controlled avatars increased enjoyment indirectly by augmenting group identification in comparison with playing with computer-controlled agents. Zero (0) did not fall within the bootstrapped confidence intervals, thus indicating that the playing with avatars – group identification – enjoyment indirect effect was significant (Hayes, 2013). This finding supported H1c. Note that the total effect of playing with avatars on enjoyment was significant and thus, at first glance, this ostensibly supported H1a. However, the direct effect was insignificant. This suggests that the more accurate interpretation is H1c instead of H1a, as significant total effects but insignificant direct effects imply that the relationship between virtual character type and enjoyment would not be significant without the group identification mediator. This further reinforced the importance of the playing with avatars – group identification – enjoyment relationship. In addition, playing with avatars increased social presence compared with playing with agents but social presence was not linked to enjoyment (Table 3). Also, playing with avatars had near-significant positive effects on similarity identification, and similarity identification was linked to increased enjoyment (Table 3). Nevertheless, zero (0) fell within the bootstrapped confidence intervals, thus indicating that the playing with avatars – similarity identification – enjoyment indirect effect was insignificant (Hayes, 2013). Overall, the results supported H1c. The remaining hypotheses were disconfirmed.

In addition, relative to the shared social identity cues absent condition, the social identity cues present condition (i.e., playing with avatars wearing participants' school colors) increased enjoyment indirectly by increasing similarity identification (Table 4). Though the presence of social identity cues had only near-significant positive effects on similarity identification while similarity identification was positively linked to enjoyment, zero (0) did not fall within the bootstrapped confidence intervals, thus indicating that the presence of shared social identity cues – similarity identification – enjoyment indirect effect was statistically significant (Hayes, 2013). Note that the direct effect of social identity cues on enjoyment was insignificant, thus further reinforcing the importance of the social identity cues – similarity identification – enjoyment indirect effect. Group identification was linked to enjoyment but this factor did not mediate the link between social identity cues and enjoyment. In addition, the presence of social identity cues comparatively increased social presence, but social presence itself was not associated with enjoyment (Table 4). The findings confirmed H2d. The remaining hypotheses were not supported.

Interaction Effects of Human or Computer-Controlled Characters and Social Identity Cues

In response to the study's research question, interaction effects between the character type and social identity cues conditions qualified the enjoyment effects reported above, $F(1, 216) = 8.13$, $p = .005$, partial $\eta^2 = .04$. Participants who played with human-controlled avatars in the social identity cues absent condition enjoyed the game the most. When playing with human-controlled avatars, participants in the social identity cues absent condition enjoyed the game more ($M = 4.48$, $SD = 0.91$) than those in the social identity cues present condition ($M = 4.09$, $SD = 1.05$), $t(123) = 2.21$, $p < .05$, $d = .40$. Participants who played with human-controlled avatars in the social identity cues absent condition also experienced more enjoyment than those who played with computer-controlled agents in the social identity cues absent condition ($M = 3.77$, $SD = 0.98$), $t(105) = 3.82$, $p < .001$, $d = .74$. Additionally, among participants playing with computer-controlled agents, those in the social identity cues present condition reported more enjoyment ($M = 4.15$, $SD = 0.95$) compared with those in the social identity cues absent condition ($M = 3.77$, $SD = 0.98$), though this difference was only near-significant, $t(89) = 1.87$, $p = .07$, $d = .39$. There were no enjoyment differences among participants playing with human or computer-controlled characters in the social identity cues present condition, $t(107) = .34$, $p = ns$, $d = .07$. There were no interaction between the character type and social identity cues conditions on social presence $F < 1$, similarity identification $F(1, 216) = 1.55$, $p = ns$, and group identification, $F(1, 216) = 1.16$, $p = ns$.

Table 3. Mediation effects of social presence, group identification, and similarity identification on the link between character type and enjoyment (N = 216)

(a) Social presence model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.22	.05	11.35	1.00	214.00	.0009**
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	2.66	.15	18.20	.0000	2.3683	2.9437
Character type	.30	.09	3.37	.0009**	.1234	.4712
(a) Group identification model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.24	.06	13.59	1.00	214.00	.0003**
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	3.12	.27	11.77	.0000	2.5979	3.6436
Character type	.59	.16	3.69	.0003**	.2751	.9073
(a) Similarity identification model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.11	.01	2.60	1.00	214.00	.11
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	2.52	.34	7.49	.0000	1.8543	3.1790
Character type	.33	.20	1.61	.11	.0728	.7281
(b) Enjoyment model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.54	.30	22.19	4.00	211.00	.0000**
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	2.09	.31	6.63	.0000**	1.4649	2.7045
Social presence	.05	.10	.48	.63	.1526	.2509
Group identification	.38	.06	6.65	.0000**	.2660	.4904
Similarity identification	.10	.04	2.26	.03*	.0125	.1818
(c') Character type	.05	.12	.38	.70	−.1935	.2862
Total effects model on enjoyment model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.16	.02	5.35	1.00	214.00	.02*
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	3.64	.23	16.09	.0000	3.1941	4.0857
Character type	.32	.14	2.31	.02*	.0469	.5859
Total, direct, and indirect effects						
(c) Total effect of X on Y	Effect	*SE*	*t*	*p*	LLCI	ULCI
	.32	.14	2.31	.02*	.0469	.5859
(c') Direct effect of X on Y	Effect	SE	*t*	*p*	LLCI	ULCI
	.05	.12	.38	.70	−.1935	.2862
Indirect effect of X on Y	Effect	Boot *SE*	BootLLCI	BootULCI		
Total	.27	.08	.12	.45		
Social presence	.02	.03	.0434	.0836		
Group identification	.22	.07	.1087	.3774*		
Similarity identification	.03	.02	.0014	.1020		

Notes. Character type (Computer-controlled agent = 1, Human-controlled Avatar = 2). *Correlation is significant at the .05 level (two-tailed). **Correlation is significant at the .01 level (two-tailed).

Discussion

This study set out to examine how people's experience with video games was influenced by technical and social factors. A key technical factor is the ability to play games with human or computer-controlled characters as people can play the same video game in collaboration with human-controlled avatars or with artificial agents, "bots," etc. In the present study we manipulated game mode in order to enable playing with human or computer-controlled characters (Johnson et al., 2015; Ravaja et al., 2006). Playing with human-controlled avatars indirectly increased enjoyment by augmenting group identification in comparison with playing with computer-controlled agents. This finding is congruent with how human-controlled characters increased feelings of relatedness, and implies that playing

Table 4. Mediation effects of social presence, group identification, and similarity identification on the link between social identity cues and enjoyment (N = 216)

(a) Social presence model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.15	.02	4.91	1.00	214.00	.03*
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	2.83	.14	20.19	.0000	2.5542	3.1069
Social identity cues	.20	.09	2.22	.03*	.0216	.3702
(a) Group identification model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.06	.003	.66	1.00	214.00	.42
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	3.86	.26	14.91	.0000	3.3459	4.3653
Social identity cues	.13	.16	.81	.42	−.1895	.4534
(a) Similarity identification model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.12	.01	3.07	1.00	214.00	.08
Model	Coeff	SE	*t*	*p*	LLCI	ULCI
Constant	2.51	.32	7.89	.0000	1.8791	3.1318
Social identity cues	.35	.20	1.75	.08	−.0438	.7463
(b) Enjoyment model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.55	.30	22.75	4.00	211.00	.000*
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	2.31	.32	7.18	.0000	1.6718	2.9380
Social presence	.07	.10	.69	.49	−.1304	.2712
Group identification	.38	.06	6.77	.000**	.2687	.4895
Similarity identification	.10	.04	2.37	.02*	.0169	.1862
(c') Social identity cues	−.15	.12	−1.31	.19	−.3835	.0769
Total effects model on enjoyment model summary	*R*	*R*-sq	*F*	*df*1	*df*2	*p*
	.03	.0007	.16	1.00	214.00	.69
Model	Coeff	*SE*	*t*	*p*	LLCI	ULCI
Constant	4.22	.22	19.48	.0000	3.7932	4.6474
Social identity cues	−.05	.14	−.39	.69	−.3232	.2156
Total, direct, and indirect effects						
(c) Total effect of X on Y	Effect	*SE*	*t*	*p*	LLCI	ULCI
	−.05	.14	−.39	.69	−.3232	.2156
(c') Direct effect of X on Y	Effect	*SE*	*t*	*p*	LLCI	ULCI
	−.15	.12	−1.31	.19	−.3835	.0769
Indirect effect of X on Y						
	Effect	Boot *SE*	BootLLCI	BootULCI		
Total	.10	.08	−.0537	.2616		
Social presence	.01	.02	−.0236	.0722		
Group identification	.05	.06	−.0727	.1674		
Similarity identification	.04	.03	.0009	.1117*		

Note. Social identity cues (Absence = 1, Presence = 2). *Correlation is significant at the .05 level (two-tailed). **Correlation is significant at the .01 level (two-tailed).

with others enhanced membership and loyalty towards one's gaming group, and this in turn augmented game enjoyment. This is also congruent with how MMORPG players showed increased favoritism and trust for ingroup gaming groups or guilds (Guegan, Moliner, & Buisine, 2015; Ratan, Chung, Shen, Williams, & Poole, 2010). This finding resonates with Sassenberg's (2002) distinction between common bond groups (formed by attachment between group members) and common identity groups (formed by attachment to the group as a whole), and highlights the importance of attachment to the online gaming group as a whole as opposed to interpersonal attachment to other players. Considering that it is unlikely that participants formed attachment to players in short-term anonymous gaming groups that could not exchange messages, one contribution of this study is showing how playing

with avatars instead of agents increased identification with a common identity gaming group (Sassenberg, 2002), and how this in turn increased game enjoyment. This link offers an exciting theoretical mechanism for the effects of playing with avatars or computer agents on enjoyment, and thus it deserves future study. For example, note that the indirect effect of group identification was more reliable than the direct effect of playing with avatars or computer agents on enjoyment, and was also stronger than the indirect effects of social presence and similarity identification.

In addition, playing a video game in the presence of social identity cues (i.e., avatars and agents clothed in participants' school colors) increased similarity identification with one's avatar, and similarity identification was associated with increased enjoyment. This indirect effect is congruent with research stressing how similarity identification with virtual characters is fundamentally related to game enjoyment (Klimmt & Hartmann, 2008; Van Looy et al., 2012). The presence of social identity cues – similarity identification – enjoyment indirect effect is also congruent with SIT/SCT predictions that salient social identity cues that fit the perceiver can lead to depersonalization effects. The findings are also consistent with the SIDE prediction that cues to a shared social identity (e.g., salience of participants' school colors) in anonymous online interactions increases ingroup attachment (Spears & Postmes, 2015). This finding expanded the scope of social identity effects from impression formation, social influence and power in online discussions, the formation of norms in virtual groups, and collaboration in virtual teams (for a review, see Spears & Postmes, 2015) to how social identity cues increase game enjoyment by enhancing similarity identification with one's avatar.

It is also worth noting that social presence was a less reliable mediator of the link between playing with avatars or agents and social identity cues on enjoyment in comparison with the indirect effects of group identification and similarity identification. One possibility is that the manipulations were too weak to influence social presence to begin with. This was not the case as playing with human instead of computer-controlled characters increased social presence. Playing in the presence instead of absence of social identity cues also augmented social presence (see Tables 3 and 4). However, social presence was simply not associated with enjoyment in both of these conditions. Another possibility is that social presence and game enjoyment are unrelated mechanisms. Increased social presence may not be a requisite for game enjoyment as players may potentially find a game pleasing without needing to pay attention and coordinate with other players. A final possibility is that social presence has been defined and measured differently across studies (Lee, 2004; Lombard & Ditton, 1997). While previous studies have focused on social presence as immersion and transportation into the game world (e.g., Heeter, 1995), this study focused on social presence as the degree of awareness, attention, and interdependence in mediated interactions (Harms & Biocca, 2004). Future studies should determine exactly which facet of social presence is influenced by playing with avatars, agents, and social identity cues, and also outline precisely which social presence factor is related to game enjoyment.

In addition, participants playing with human-controlled avatars in the absence of social identity cues reported higher enjoyment compared with those playing with human-controlled avatars in the presence of social identity cues. Assuming that playing with humans was more unpredictable and harder to coordinate, it is possible that the presence of avatars wearing their school colors made the participants pay more attention to and expect more from human teammates, thus decreasing enjoyment. This interpretation is congruent with the "black sheep effect," in which deviant ingroup members are more negatively evaluated (Marques & Paez, 1994). In other words, playing with avatars in the presence of social identity cues likely heightened positive ingroup biases that were not fully met because human actions (e.g., collecting resources, finishing a game turn) were less coordinated. In one example of this, participants experienced greater competence when playing with artificial agents instead of other human participants because agents played more effectively (Johnson et al., 2015). This prediction should be tested in future studies, as it implies that shared social identity may not always increase game enjoyment, especially when ingroup members' performance disappoints.

Limitations

This study has several limitations. The participants were not committed gamers and had low video game experience. For instance, women made up the majority of the sample. This may have affected the results as, in general, women dislike games that lack social interactions or feature too much violence or competition (Hartmann & Klimmt, 2006). Additionally, players usually know whether they are playing a single or multiplayer video game. Thus, the generalizability of the findings is not fully guaranteed. The present findings may not generalize to single and multiplayer commercial video games in which players fully know that the characters they encounter are human or artificial. The findings may apply to Turing test-based games in which the real or artificial nature of game partners is kept hidden for people to guess.

Another limitation was that the experimental video game allows for increased experimental control but had lower production values compared with commercial video games.

For example, participants could not communicate using text messages or voice chat, and therefore our findings may not generalize to more sophisticated video games. Participants were not explicitly informed whether they were playing with human or computer-controlled characters and this may also appear as a limitation. In some studies participants were made unequivocally aware of playing with avatars or agents (even if this was not truly the case), whereas in other studies the game mode itself was manipulated. While we found empirical effects of character type (avatar or agent), the participants themselves did not mention game mode or character type to be a main feature of the study. Considering this, why did the participants react differently to avatars and agents if this factor was not made explicit and participants did not mention such factor in the awareness check? One possibility is that participants inferred that they were playing with human or computer-controlled characters based on game behavior and, at the same time, this factor itself was not perceived to be a main part of the study. Players may encounter more coordination issues when playing with human instead of computer-controlled characters (Johnson et al., 2015), and these behaviors may have clued in the participants to the real or artificial nature of their teammates. Participants may have noticed that they were playing with avatars or agents based on game behavior but it is still possible that this factor did not raise enough suspicions for participants to comment on this regard. If participants noted that they were playing with avatars or agents but did not believe this to be a main factor in the study, then by definition they were unaware of the influence of this experimental manipulation (even if it did affect their perceptions or behaviors). Perception and behavior can be affected with no need of awareness of influence (Bargh & Chartrand, 2000).

A final limitation was the effect size of the findings. The indirect effect of similarity identification on the influence of social identity cues on enjoyment was small, whereas the indirect effect of group identification was medium in size (Tables 3 and 4). This is congruent with meta-analyses showing that experimental social identity manipulations range from medium to small sizes, and that experimental studies yield smaller effects than non-causal social identity studies (van Zomeren, Postmes, & Spears, 2008). Overall, the mediation results should be interpreted with caution because of their effect sizes.

Conclusion

Sociotechnical factors can critically affect user experience when playing video games. In particular, game mode and bestowing avatars with social identity cues affected players' game enjoyment. Group and similarity identification were key mediators of the link between virtual character type and social identity cues on enjoyment. Social presence proved to be a less reliable mediator. This sheds light on the psychological mechanisms involved in playing video games, and shines a spotlight on the crucial role of identification with gaming groups and virtual characters in predicting enjoyment. These findings illustrate that we have the capacity to socially create more enjoyable gaming experiences by varying game modes and highlighting or concealing social identity cues.

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