

**Dating Start! Identification Facilitates Relatedness to Non-Player
Characters**

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Submitted in April 2019

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Declaration of scientific integrity:

The author hereby declares that she has read and fully adhered the Code for Good Practice in Research of the University of Basel.

Abstract

The relationship players experience with their avatars has become a central topic in human-computer interaction research. Single-player relatedness, on the other hand, is an understudied topic with only little empirical research. Most research on relatedness has focused on the connection which players experience with other players of the same game, instead. In addition, the interaction between the identification with the avatar and the connection with the virtual characters in game has not yet been empirically examined. As such, in this study we investigate whether relatedness with the non-player characters (NPCs) can be influenced by how strongly the player identified with their avatar. To drive identification, we further implemented avatar customization. We find avatar customization directly increases constructs of identification. Further, our results show that the engagement players have with their avatar drives competence, autonomy and specifically relatedness with NPCs. All measures of need satisfaction in turn predict game enjoyment as well as the importance the game had to the player. We conclude that single-player relatedness, feeling connected to NPCs within video games, can be a driving force in getting people to play and enjoy a video game.

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Introduction

Video games allow for the players to experience a range of connections. So have massively multiplayer online role-playing games (MMORPGs) brought together people from different countries with different cultural backgrounds to fight against the same foe, or achieve the same collaborative goal (Zhong, 2011). Indeed, the connection the player has to the game and its world itself has been explored and analysed previously (Van Looy, Courtois, De Vocht, & De Marez, 2012).

In fact, researchers have proposed that players form a relationship to the avatars they're playing these games as (Banks & Bowman, 2016a). Avatars can be described as an interactive, social representation of a user, commonly understood as their representation in the virtual space Meadows (2007). Identification, on the other hand, is a widely studied topic within games research and refers to the experience of assuming the identity of avatar (Cohen, 2001). This experience can become so impactful that players begin to view themselves as one and the same as their avatar (Banks & Bowman, 2016a; Klimmt, Hefner, & Vorderer, 2009). This engagement players have with their avatar in turn appears to influence their enjoyment of games (Birk, Atkins, Bowey, & Mandryk, 2016; Klimmt, Hefner, Vorderer, Roth, & Blake, 2010). A property of these avatars is their customizability, meaning their appearance, personality or other such traits can be changed as the player desires. (McArthur, 2017; McArthur, Teather, & Jenson, 2015). This can be done in so called character creation interfaces (CCIs).

Another form of emotional engagement in video games is the attachment which players experience towards non-player characters (NPCs) (Coulson, Barnett, Ferguson, & Gould, 2012; Lewis, Weber, & Bowman, 2008; Pink, 2017; Prasertvithyakarn, 2018). These NPCs are important for the engagement players will have with the game. However, this research is lacking in understanding how these connections to NPCs drive and motivate players.

According to self-determination theory, relatedness is one of the three basic

human needs, alongside competence and autonomy (Ryan, 1982; Ryan & Deci, 2000; Ryan, Rigby, & Przybylski, 2006). Humans want to feel connected to others, which translates into a drive to experience this connection. The motivational pull of relatedness in video games has so far been often solely examined in relation to feeling connected to other players of the same game (Przybylski, Ryan, & Rigby, 2009; Vella, Johnson, & Hides, 2015). This has translated into scales which measure relatedness in video games only with other players (Ryan et al., 2006; Van Looy et al., 2012). Emerging from this is a lack of understanding how single-player relatedness with NPCs drives player motivation (Tyack & Wyeth, 2017), despite the possibility having been discussed that these NPCs could satisfy the need for relatedness (Ryan et al., 2006).

However, the way we view ourselves has an impact on the relationships we form, for example having more clarity on one's self-concept will positively affect happiness and commitment in a relationship (Jr., Nardone, & Raines, 2010). This is especially prominent within attachment theory, wherein the way our self-esteem was shaped by the relationship we had with our parents, influences the type of romantic relationship we experience later in life (Feeney & Noller, 1990). We, therefore, further focus on the interaction between the engagement with the avatar and the attachment to the NPC. Of interest is to understand how identification with the avatar shapes the experience of relatedness with NPCs.

Previous research did examine the relationships between identification with the avatar and the experience of relatedness to other players (Birk et al., 2016). However, as there were no NPCs present, there was no possibility for the players to experience single-player relatedness. We address this research gap by examining the interaction between avatar identification and single-player relatedness with NPCs.

The main goal of this study is to understand whether single-player relatedness can be facilitated in the same way as other basic needs. This was done utilising a game which functions by driving this want of connection. Birk et al. (2016) used a CCI to increase identification with the avatar which then led to increased feelings of autonomy and enjoyment. In our study we use the same basic set up of a CCI and a game to

investigate the impact of identification on single-player relatedness, instead. Further, we investigate player-avatar interaction, to extend on previous findings which show that engagement with the avatar increases intrinsic motivation and enjoyment (Birk et al., 2016; Klimmt et al., 2010). As such, we implemented a CCI to understand how avatar customization affects player-avatar interaction and how player-avatar interaction subsequently influences single-player relatedness and other measures of PX.

The contribution of this paper is two-fold: First, we find identification and other constructs of player-avatar interaction positively predicts single-player relatedness within a dating simulator. Single-player relatedness, in turn, predicts game enjoyment, how important a game is to the player and how much effort they are willing to invest. This influence of identification on single-player relatedness has multiple implications. We find the way we engage our own avatar impacts the connection we experience with NPCs in games, similarly to how self-concept shapes our relationship with real people. We, therefore, suggest the importance of understanding the interaction a player has with their avatar when examining the relationships they form in games. Of special importance in regards to connecting with NPCs appears to be how emotionally invested the player is with their own avatar.

Secondly we corroborate previous findings (Birk et al., 2016) of avatar customization increasing constructs of identification significantly when comparing it to players who were assigned an avatar at random. Lastly, we utilised two different CCIs, one with previously identified high-impact features and one with previously identified low-impact features (Ducheneaut, Wen, Yee, & Wadley, 2009; Kafai, Fields, & Cook, 2010), but found no significant group differences between them. As such our findings raise questions about what constitutes high-impact or low-impact customization features in video games.

Related work

Engaging with characters in video games

Most fiction includes characters which are central to the story being told (Eder, Jannidis, & Schneider, 2010). In video games a distinction is often made between so called avatars which are controlled by players (Meadows, 2007) and NPCs which exist outside of the direct control of the player within the game world (Rogers, Aufheimer, Weber, & Nacke, 2018). The way players engage with their avatars is a key topic for player experience (PX) (Banks & Bowman, 2016a; Bessière, Seay, & Kiesler, 2007; Birk et al., 2016; Ducheneaut et al., 2009; Klimmt et al., 2009, 2010; Moyer-Gusé, Chung, & Jain, 2011; Rogers et al., 2018; Wauck et al., 2018).

One of such modes of engagement is identification. Cohen defines identification as the consumer of media taking on the role, identity and perspective of the character they identify with (Cohen, 2001). It has further been specified into multiple constructs concerning what kind of avatar facilitates which kind of identification.

One construct bases identification on a similarity between players and avatar. This construct is called similarity identification (Van Looy et al., 2012). In fact, similarity is regarded as an integral part of the identification model as it facilitates mental rapprochement between player and character. People expect more rewarding interactions with others who are similar to them, it is therefore theorized that players find characters similar to themselves more attractive as well (Van Looy et al., 2012; Wauck et al., 2018).

Another construct functions by means of the avatar being an idealised version of the player, creating a wish to be like this avatar, also referred to as wishful identification (Bessière et al., 2007). These ideal avatars function as role models (Konijn, Nije Bijvank, & Bushman, 2007) and are often associated with low-self esteem players (Bessière et al., 2007).

Other modes of engagement have also been discussed in previous literature. Emotional investment is a further construct of how a player is interacting with their avatar, measuring the emotionality of the engagement between player and avatar.

(Banks & Bowman, 2016b).

However, identification has further more been found to influence PX in multiple ways (Birk et al., 2016; Kao & Harrell, 2018; Klimmt et al., 2010; Walter & Tsfati, 2018). Primarily, as identification means assuming the goals of the avatar for the player, it has been analysed as a motivating factor. So have feelings of autonomy been increased by stronger identification with the avatar in players (Birk et al., 2016). This can be seen reflected in studies that found players who identified more strongly with their avatars also experienced more game enjoyment (Klimmt et al., 2010). In the context of serious games, it has also been found that assuming the perspective of the avatar in an educational game can facilitate learning in children (Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2006). In addition to this, a more recent study found identifying with the avatar, assuming their goals and role, leads to people exhibiting more motivated behaviors (Birk et al., 2016). The same study found effects on identification facilitating enjoyment as well as autonomy, but the effect was not present for relatedness (Birk et al., 2016). Being able to increase need satisfaction is of interest as it leads to increased motivated behavior (Birk et al., 2016), boosts well-being of people (Gagne, 2003) and can aid in their learning (Deci, Ryan, & Williams, 1996).

In games research, relatedness has been overlooked in favor of examining and facilitating autonomy, as well as competence (Tyack & Wyeth, 2017). However, as characters are an integral part of playing games (Adams, 2014), only examining how the player relates to the avatar without investigating how they relate to NPCs and whether this relatedness can be motivating, appears to be incomplete.

Indeed, the video game industry has recently focused heavily on creating valuable player-NPC interactions. So explained Prasertvithyakarn (2018) in his recent GDC talk that fostering an emotional attachment between players and NPCs is one of the most important foci when designing NPCs. However, believability of an NPC is needed to experience this emotional connection. In fact, believable character have been argued to foster emotional bonds in previous research (Ravenet, Pecune, Chollet, & Pelachaud, 2016) and being able to be more to the player than simply useful (Harth, 2017). Players

have noted on having a meaningful emotional experience with NPCs (Emmerich, Ring, & Masuch, 2018), as well as expressed being emotionally moved by characters in games (Bopp, Mekler, & Opwis, 2016). This is further mirrored by research which points to the potential for NPCs to fill the need of relatedness for players (Ryan et al., 2006; Tyack & Wyeth, 2017).

However, the way we present ourselves and in turn view ourselves shapes the way we interact with others. This is especially true as digital spaces allow us to create a completely new self to present (Yee & Bailenson, 2007). Therefore, we are especially focused on understanding how identification with avatars will influence single-player relatedness. In previous research Rogers et al. (2018) explored the impact interaction with NPCs had on identification with the avatar. However, the direction of the impact of player-avatar interaction on the connection we form with NPCs has not yet been investigated.

Customization and effects on PX

Self-representational practices influence the way we interact with others, so have people who were assigned taller avatars negotiated more confidently or those with more attractive avatars interacted more intimately with others in a digital space (Yee & Bailenson, 2007). Furthermore, allowing the player of a game to change the appearance of their avatar, customization, has been previously identified as a means to increase identification with the avatar (Birk et al., 2016). Avatar customization is a broad topic as it encompasses a variety of different agents and components to be customized. Outside of the gaming context, customizable interfaces have been a topic within human-computer interaction and has been found to increase users' feelings of control (Marathe & Sundar, 2011) and customizable web pages have been found to have an increased perceived identity (Kang, Sundar, Kim, & Bae, 2009).

In the context of video games, previous research has examined functional customization of a spaceship (K. Kim et al., 2015) or the visual appearance of a racing car (Schmierbach, Limperos, & Woolley, 2012), with these customization options having

led to greater game enjoyment (K. Kim et al., 2015; Schmierbach et al., 2012). Kim (K. Kim et al., 2015) found that aesthetic customization of a racing car predicted perceived control. This implies customization being able to make a player feel more in control over their avatar in game. However, it is unknown if such an effect persists, should the player be allowed to make their own narrative choices with their avatar and experience agency through committing to narrative (K. Tanenbaum & Tanenbaum, 2010).

Understanding how self-representational practices influence engagement with the avatar and the NPCs is therefore importance to understand how to facilitate engagement with game and the enjoyment derived from it.

Of specific interest is research which shows identification to be facilitated by the customization of a human avatar (Birk et al., 2016). Birk et al. (2016) allowed players to customize the appearance, personality and attributes of an avatar, none of which had any subsequent effect on the game. In spite of this, players who were allowed to customize their avatar still experienced greater identification. No other direct effects on PX were reported.

Beyond the effects customization has on players, initial explorations into what constitutes high identity-fidelity have been done (Ducheneaut et al., 2009; Kafai et al., 2010). Identity-fidelity refers to how close to the vision for the avatar of the player, or how similar to the player themselves, an avatar can be created with the affordances of the used CCI (McArthur & Jenson, 2014). Previously, the most complex CCIs tended to be identified as those with the highest identity-fidelity (Ducheneaut et al., 2009), so has the online game's "Second Life" CCI been noted as high in identity-fidelity because of its complex CCI, however this view has recently come under criticism (McArthur et al., 2015). Often the more intricate customization options were not accessed by novices and as such did not improve their self-representation (Turkay, 2012), this is further interesting as players with not highly customized avatars within "Second Life" are immediately recognisable as novices and subsequently treated as such (McArthur & Jenson, 2014).

Certain affordances have been identified as especially important. Children might believe an avatar is "like them" simply because of sex and hair (Jin, 2009, 2010). Further skin color has been rated as relatively unimportant for avatar customization in MMORPGs (Ducheneaut et al., 2009; Kafai et al., 2010). As such there is a tension between interface affordances and self-representational practices (McArthur & Jenson, 2014; McArthur et al., 2015). Because of this, we identify a need to closer examine exactly whether different features have a different impact on PX (McArthur, 2017).

Aim of the study

In light of the previously discussed research gaps we wanted to investigate whether identification, facilitated by customization, could enhance the experience of single-player relatedness. This study is the first to examine a systematic influence of identification with the avatar on the connection we experience with NPCs.

As the avatar is the virtual agent of the player (Kafai et al., 2010; McArthur & Jenson, 2014) and identification can be as strong as the player understanding themselves and their avatar as one and the same entity (Klimmt et al., 2009). We examine the impact of how closely the player identifies with the avatar had on the relationship formed with NPCs. Furthermore, we find how fulfilling the need of relatedness subsequently creates increased game enjoyment.

We theorized given the possibility for single-player relatedness, an inclusion of believable NPCs with which to interact with, that players would be able to fulfill the need of relatedness in a single-player game. We were especially interested whether increased identification with the avatar would lead to greater feelings of relatedness.

To achieve a variance in identification, we implemented avatar customization. We further wanted to measure the impact of previously identified low-impact features in comparison to high-impact features in a dating simulator. In order to investigate single-player relatedness we wanted to create a context, where interacting with NPCs would not only be possible, but also the main goal for players of the game.

We propose the four following research questions.

RQ1: How does customizing features prior identified as high-impact impact measures of PX differently than features identified as low-impact?

RQ2: How does customization affect identification and overall player experience?

RQ3: How does identification and other measures of player-avatar interaction relate to single-player relatedness and overall player experience?

RQ4: Does single-player relatedness and the other measures of need satisfaction improve intrinsic motivation?

Method

In order to investigate the aforementioned research questions we designed a between-subject design with two experimental groups (high-impact & low-impact customization) as well as a control group (assigned avatar). In the following the design of the game as well as the CCI the participants used is described.

Dating Simulator

Previous studies investigating the effects of identification on relatedness have forgone the potential of relatedness with NPCs and only analysed relatedness with other players, even in single-player games (Birk et al., 2016). There were no NPCs present in the game created for previous research, despite the importance these characters have on the experience players have with a game (Adams, 2014; Prasertvithyakarn, 2018; Tyack & Wyeth, 2017). Our research, however, is not interested in the connection players might experience with other players of the same game, as it focuses on single-player relatedness. We, therefore, chose a type of game in which the connection the players form with the NPCs of the game is central. To extend on previous research we chose a type of game heavily reliant on narrative, rather than mechanics (Birk et al., 2016; K. Kim et al., 2015). This game relies on feelings of relatedness to be enjoyable, as the goal of a dating simulator is to get close to a character and feel connected to them (Picard, 2013).

Dating simulators are a genre of games which are driven by players wanting to build a romantic relationship with an NPC (Song & Fox, 2016). These games function

by motivating the player to want to feel connected to NPCs. As such, while other games traditionally focus on developing mastery of game mechanics, dating simulators focus on the player developing the relationship with the NPCs (Galbraith, 2011; H. Kim, 2009).

For this study a dating simulator was designed, written and created using TyranoBuilder. This included designing and creating the art for the game, writing the dialogue for the avatars and NPCs, as well as programming the different decisions. Dating simulators are often visual novels in which the gameplay consists of narrative choices which lead to different endings the avatar can experience. As there is no mechanical skill involved with playing dating simulators, they are accessible for all participants and game skill should not influence the player experience. The only mechanic necessary to play the game was to use the mouse button to further dialogue and click on different branch buttons to choose dialogue for the avatar.



(a) Example of dialogue within the game.

(b) Example of a narrative choice.

Figure 1. Screenshots of the dating simulator, illustrating dialogue and the narrative choices the players could make.

Character Creation Interface

As we were interested in the relationship between interaction with the avatar and the experience of connection with NPCs, we wanted to influence identification within our experiment design. As previous research found avatar customization to positively impact identification with the avatar (Birk et al., 2016), we decided to implement a CCI

to investigate how self-representational practices impact the connection of players towards their avatars and NPCs.

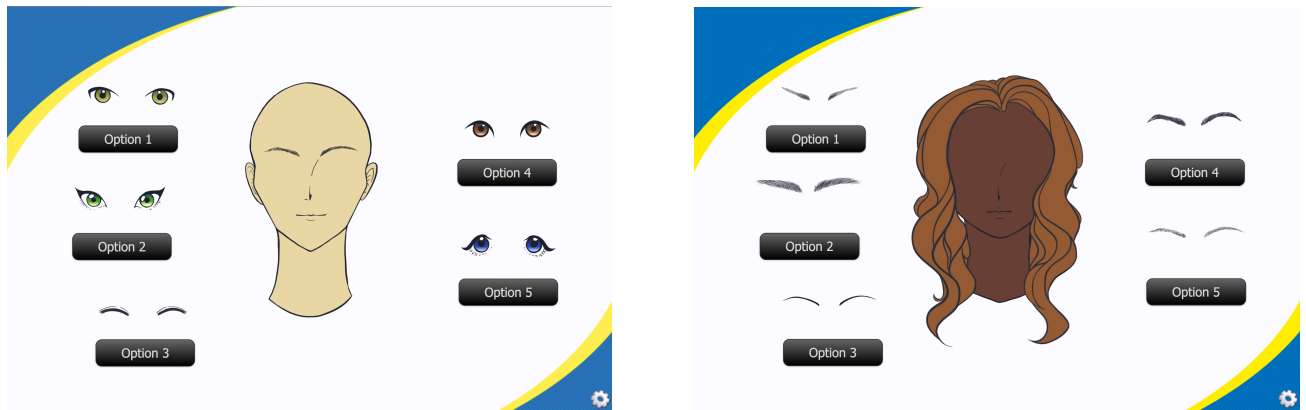
Within TyranoBuilder a CCI was designed and programmed, which seamlessly connected to the game in the experimental condition. This included designing and creating the art, as well as programming the logic of the CCI.

Research on customization shows that simplified self-representation may facilitate identification with the avatar (Jin, 2009, 2010). However, caricature may result in problematic and reductionist portrayal if the interface does not provide a diverse enough grouping of representational options. Therefore we chose a consistent eastern cartoon style to facilitate identification while attempting to avoid caricature.

Before starting the game itself the players in the experiment conditions were first asked to create their own avatar's appearance. Participants were given a choice of different affordances for their hair and face depending on the condition they were in. Everyone could choose their preferred gender presentation for the avatar, given a choice of a feminine, masculine and androgynous. The high-impact group were given a choice of six hair styles, five hair colors and five eye shapes, while the participants in the low-impact group were given a choice of six different head shapes, five skin colors as well as five different eyebrows.

Their appearance was then shown to them in full, but never appeared again throughout the game and had no influence on the gameplay itself. Screenshots of the two CCIs can be seen in Figure 2.

Eye Style. When examining eye tracking studies of people looking at a still face, most people for the first second focus solely on the eyes of the other person (Iskra & Tomc, 2016). Eyes are therefore seen as the most salient facial feature. In many previously researched games, such as World of Warcraft, there is no option to customize the eyes specifically, rather there are different entire faces to choose from (Ducheneaut et al., 2009). Therefore only limited data exists as to how important they are in CCIs. For the purposes of this research, eyes, based on eye tracking research, were chosen as the most important customization option within the face and implemented in the



(a) CCI with high-impact features.

(b) CCI with low-impact features.

Figure 2. Screenshots from the two different CCIs.

high-impact CCI.

Hair Style. Hair customization has consistently been shown to be of greatest importance to players when creating an avatar (Ducheneaut et al., 2009) It is the feature for which users create the most options if the game allows for it (Kafai et al., 2010). In previous research, it has also been shown that people of color have felt excluded due to a lack of hair options (Passmore & Mandryk, 2018; Passmore, Yates, Birk, & Mandryk, 2017), even when skin color customization was present. Customizing hair style was therefore seen as the most impactful.

Hair Color. In early games with customizable avatars, such as the Sims (Consalvo, 2003), hairstyle and hair color were often tied together. In order to give people more options and control, they were separated here, so that every preferred hairstyle could be paired with the preferred hair color. Hair color was the companion customization to hair style. After participants were able to choose a hairstyle they were then allowed to also pick a hair color for this style. This was given as an option to make hair as customizable as possible within technical limitations.

Face Shape. Facial shape is a second-order facial feature according to previous research (Rhodes, 1988) and was deemed as part of the low-impact condition subsequently. The participants were allowed to choose from 6 different facial shapes before skin color.

Customization Options

High-Impact	Low-Impact
Hair style (Ducheneaut et al., 2009)	Face shape (Rhodes, 1988)
Hair color (Ducheneaut et al., 2009)	Skin color (Ducheneaut et al., 2009)
Eyes (Iskra & Tomc, 2016)	Eyebrows (Iskra & Tomc, 2016)
Gender (Ducheneaut et al., 2009)	Gender (Ducheneaut et al., 2009)

Table 1

The implemented customization options per experimental condition.

Skin Color. Skin color was rated as least important within research examining the importance of features of customization in video games (Ducheneaut et al., 2009).

Eyebrows. Eyebrows were chosen as the customizable option of facial features for the low-impact condition based on the same eye tracking research that found eyes to be the feature people focus on the most (Iskra & Tomc, 2016). Eyes were usually looked at first, then noses and mouths. Eyebrows were not inspected within the first four seconds at all. Due to this, noses and mouths were kept consistent across all conditions, while eyebrows were customizable in the low-impact condition.

Gender. Gender expression was the only customization feature present in both experimental conditions. Both the high-impact as well as the low-impact CCI featured a choice of gender, the present options included "feminine", "masculine" and "androgynous". The impact of this choice was not communicated to the player. This was done as gender was often seen as distinct from other customization features in previous research (Ducheneaut et al., 2009). Further, in prestudies we found specifically transgender people feel alienated from avatars of a different gender. As we did not want any participant to feel need frustration, rather than a lack of need fulfillment (Ryan & Deci, 2000), we decided to give both experimental groups the option to align their gender. We will touch on this again later in the discussion.

Procedure

Upon clicking the survey link, participants were introduced to the study and asked for consent. After, they were assigned to one of three conditions, one of two experimental conditions (high-impact or low-impact CCI) or the control condition (assigned avatar) and then directed to their version of the game. When first starting the game, depending on the experimental condition the participant was in, they would first either create an avatar or be shown one of 25 randomly generated avatars. After this they entered a room in the game with three different doors, which represent the three different NPCs to choose between. After choosing a door the participant would play the dating simulator until they had reached one of the nine endings, clearly indicated by an ending screen. The dating simulator was the same over all three experimental conditions.

The participants had to choose between different paths within the game, in which they would meet a singular NPC to have a conversation with. The NPC they could meet was either a woman, a man or a non-binary person, depending on the door they chose. However, their gender was only referenced with the pronouns the game used for them, there were no other gendered references. Each of the NPCs had a distinguishable character and different dialogue. The avatar had multiple choices while talking to their NPCs which lead to three different endings within each NPC path. These three endings were similar across the NPC paths. Multiple endings were written in order to give players a sense of agency, as it allowed for them to commit to a narrative (J. Tanenbaum, 2013). In addition, every line of dialogue of the avatar had to be selected by the players themselves. As to not bias players due to vastly different outcomes, the players would always end up with their chosen NPC, just with differing degrees of intimacy.

After finishing the game, the participants filled out open questions about what happened in the game. Participants then rated their experience using various measures described in the measures section. Further, they answered two open-ended questions about customization in video games: "Could you describe in your own words how

important customization is to you in video games?" as well as "Thinking back to the game you played for this study, how important is customization of the avatar for this specific type of game for you?". Finally participants provided demographic data, including their gender, ethnicity and age.

Participants

Participants were recruited from social media, such as Twitter, Reddit and Discord. A total of 295 participants completed the survey. We excluded 32 participants because they had failed the attention check, indicated they had poor data quality, revoked their consent or had falsely participated as minors. The final sample was therefore comprised of 263 participants. Of those 60 identified as women, 137 as men, 37 as nonbinary, 20 indicating a different gender and 20 participants preferred not to say. The age of the participants had a range of 18 to 59 with an average of 25,17. As skin color was a customization feature, we asked for the participants' ethnicity to see eventual group differences, however 229 participants identified as White, 4 as Hispanic or Latinx, 2 as Black or African American, 1 as Native American, 5 as Asian, 16 indicated mixed ethnicity and 6 other ethnicities, as such no comparison between ethnicities could be made. Participants were not compensated, but they had the chance to enter a raffle for ten amazon gift cards worth 20\$.

Measures

All measures consisted of 7-point Likert scales ranging from strongly disagree (1) to strongly agree (7), unless noted otherwise. Descriptive statistics are listed in Table 2.

The intrinsic motivation inventory (IMI) (Ryan, 1982) was used to measure both intrinsic motivation as well as enjoyment. Three different subscales of IMI were used, Interest & Enjoyment (Cronbach's $\alpha = 0.9$) as well as Effort & Importance (Cronbach's $\alpha = 0.82$) and Tension & Pressure (Cronbach's $\alpha = 0.81$).

The player identification scale (PIS) (Van Looy et al., 2012) was used to measure similarity identification (Cronbach's $\alpha = 0.88$), wishful identification (Cronbach's $\alpha = 0.92$) and embodied identification (Cronbach's $\alpha = 0.88$).

The player experience of need satisfaction scale (PENS) (Ryan et al., 2006) measured the subconstructs of competence (Cronbach's $\alpha = 0.8$) and autonomy (Cronbach's $\alpha = 0.74$). We excluded the relatedness subconstruct from this scale as we were not interested in relatedness with other players and the items did not lend themselves to be adapted for a single-player context.

In order to measure relatedness (Cronbach's $\alpha = 0.93$), the balanced measure of psychological needs (BMPN) (Sheldon & Hilpert, 2012) was adapted to fit the game context, i.e. "I felt close and connected with the characters in the game who are important to me".

We, further, included two subconstructs of the player-avatar interaction scale (PAX) (Banks & Bowman, 2016b) namely emotional investment (Cronbach's $\alpha = 0.84$) and control (Cronbach's $\alpha = 0.79$), i.e. "I love this avatar." and "I control this avatar". These were included as the interaction players have with their avatar and the identification they experience with them is a complex construct with multiple sub-constructs. Further, we included emotional control to measure attachment to the avatar and the control players experience in regards to their avatar as was done in previous research (K. Kim et al., 2015).

Results

We calculated descriptive statistics for each condition separately and described them below in Table 2. The results pertaining to each research questions are described below.

RQ1: Does customizing features prior identified as high-impact increase measures of PX more than features identified as low-impact?

We wanted to see whether there were significant group differences between the experimental groups. As such we calculated a multivariate ANOVA for all measures of PX. We find that using the high-impact CCI does not significantly increase any measure of PX in comparison to the low-impact CCI. The range of the results of the MANOVA

Scale	high-impact (n = 87)				low-impact (n = 92)				control (n = 84)			
	mean	SD	Mdn	Range	mean	SD	Mdn	Range	mean	SD	Mdn	Range
Player-Identification (PIS)												
<i>Similarity identification</i>	3.17	1.39	2.83	1 - 7	2.93	1.18	3	1 - 6.5	2.28	1	2.17	1 - 5.5
<i>Wishful identification</i>	2.724	1.24	2.6	1 - 7	2.7	1.43	2.4	1 - 7	2.2	1.32	2	1 - 7
<i>Embodied identification</i>	2.65	1.46	2.33	1 - 6.5	2.17	1.42	2.57	1 - 7	2.58	1.34	2.58	1 - 6.5
Need satisfaction (PENS, BMPN)												
<i>Autonomy</i>	3.33	1.12	3.25	1 - 5.75	3.46	1.02	3.5	1 - 5.75	3.47	1.24	3.5	1 - 6
<i>Relatedness</i>	3.54	1.69	3.67	1 - 6.33	3.77	1.45	3.67	1 - 6.67	3.45	1.7	3.33	1 - 7
<i>Competence</i>	4.34	1.35	4.25	1 - 6.75	4.38	1.45	4.5	1 - 7	4.59	1.43	4.75	1.5 - 7
Player-Avatar interaction (PAX)												
<i>Emotional investment</i>	3.27	0.61	3.17	1.67 - 5.17	3.27	0.58	3.17	1.83 - 4.83	3.28	0.56	3.17	1.83 - 4.67
<i>Control</i>	5.14	1.52	5.5	1 - 7	5.01	1.7	5.5	1 - 7	5.11	1.52	5.5	1.5 - 7
Intrinsic motivation (IMI)												
<i>Interest & enjoyment</i>	3.47	0.61	3.43	2.29 - 5.29	3.6	0.6	3.64	1.86 - 5.29	3.59	0.69	3.57	2 - 5
<i>Effort & importance</i>	3.35	0.64	3.4	1.8 - 5.2	3.49	0.51	3.4	2 - 4.8	3.42	0.6	3.5	1.6 - 5
<i>Tension & pressure</i>	3.43	0.55	3.4	2 - 5.6	3.44	0.56	3.4	2.2 - 4.8	3.33	0.52	3.4	2 - 4.6

Table 2

Mean, standard deviation, median and range of player experience scales for experiences split by condition. Item sources: 1 PIS (Van Looy et al., 2012), 2PENS (Ryan et al., 2006), 3BMPN, (Sheldon & Hilpert, 2012) and 4PAX (Banks & Bowman, 2016b), 5IMI (Ryan, 1982).

are ($F = 0.002 - 2.2497, p = 0.124 - 0.964, \eta^2 = 0 - 0.001$) The lack of group difference for any measure between the experimental groups can be seen in Table 2.

RQ2: How does customization affect identification and overall player experience?

While we did not find any significant group differences between the experimental conditions, we did observe significant group differences between the experimental groups and the control group.

Our second question was in regards to comparing the experimental conditions to the control condition. Meaning, to identify whether customization would affect the different constructs of identification. We calculated a MANOVA in order to test this

hypothesis and further calculated Tukey's HSD to understand the difference between each experimental group in comparison to the control group separately. The MANOVA was calculated on three measures of identification and with the between-group factors of high-impact customization (n=87), low-impact customization (n=92) and the control group with no customization (n=84).

We find that customization of the avatar increases similarity identification significantly ($F = 12.558, p < 0.001, \eta^2 = 0.088$), with Tukey's HSD being significant for both experimental condition in comparison with the control condition (high-impact: $p < 0.001$, low-impact: $p = 0.01$).

The same is true for wishful identification, which also increases significantly when presented with options for customization ($F = 4.6729, p = 0.01, \eta^2 = 0.04$). Tukey's HSD also found significant group differences for both experimental groups with the control group (high-impact: $p = 0.02$, low-impact: $p = 0.025$).

However, we found no significant group differences when examining embodied identification ($F = 0.0909, p = 0.9, \eta^2 = 0.001$). As such, Tukey's HSD also found no meaningful differences between groups (high-impact: $p = 0.95$, low-impact: $p = 0.99$).

There were no other significant group differences in measures of PX.

RQ3: How does identification and other measures of player-avatar interaction relate to single-player relatedness and overall player experience?

To measure relatedness we adapted the BMPN (Sheldon & Hilpert, 2012). We entered the adapted items into an exploratory factor analysis (EFA) calculation and found support for a single-factor measurement model with satisfactory loadings on the primary factor. Hierarchical linear regressions for the different constructs of player-avatar interaction were calculated to show a relationships between the measures. The detailed statistics for the model including only identification can be found in Table 3.

Similarity identification was the first variable entered, followed by wishful identification and then embodied identification. Results of the regression analysis

provided evidence that identification does significantly predict single-player relatedness, as well as autonomy, competence and interest & enjoyment. Identification, further also predicted the other measures of player-avatar interaction, both emotional investment as well as feelings of control.

Entering emotional investment and feelings of control into the model does explain additional variance, especially high are the explained variance of emotional control for both autonomy ($\beta = 0.439, \Delta R^2 = 0.023, F = 6.952$) and relatedness ($\beta = 0.530, \Delta R^2 = 0.069, F = 10.026$).

Detailed statistics for the inclusion of these variables into the model can be found in Table 4.

	Similarity identification					Wishful identification					Embodied Identification				
	β	R^2	ΔR^2	F	p	β	R^2	ΔR^2	F	p	β	R^2	ΔR^2	F	p
Need Satisfaction (PENS, BMPN)															
<i>Autonomy</i>	0.222	0.059	0.047	2.683	0.0153	0.262	0.107	0.048	4.369	<0.001	0.191	0.129	0.022	4.708	<0.001
<i>Relatedness</i>	0.332	0.125	0.107	6.068	<0.001	0.327	0.199	0.075	9.061	<0.001	0.26	0.24	0.041	10.016	<0.001
<i>Competence</i>	0.216	0.062	0.043	2.837	0.0108	0.189	0.087	0.025	3.483	0.0014	0.116	0.095	0.008	3.346	0.0012
Intrinsic Motivation (IMI)															
<i>Interest & enjoyment</i>	0.182	0.061	0.031	2.783	0.0122	0.327	0.136	0.105	5.744	<0.001	0.268	0.179	0.043	6.938	<0.001
<i>Effort & importance</i>	0.164	0.031	0.025	1.368	0.2278	-0.009	0.031	0	1.171	0.3201	0.044	0.032	0.001	1.061	0.3913
<i>Tension & Pressure</i>	0.059	0.015	0.01	0.657	0.6847	-0.08	0.02	0.005	0.729	0.6479	0.242	0.055	0.035	1.839	0.0703
Player-Avatar Interaction (PAX)															
<i>Emotional investment</i>	0.21	0.05	0.043	2.235	0.0404	0.126	0.061	0.011	2.364	0.0234	0.15	0.075	0.014	2.557	0.0107
<i>Control</i>	0.21	0.078	0.043	3.591	0.002	0.087	0.083	0.005	3.295	0.0023	0.208	0.109	0.036	3.888	<0.001

Table 3

Hierarchical linear regressions of the measures of player-avatar interaction, specifically identification, with the outcome measures of need satisfaction, intrinsic motivation and the remaining player-avatar interaction constructs. First entered were the control variables of age and gender, then similarity identification, then wishful identification and then embodied identification item sources: 1PIS (Van Looy et al., 2012), 2PENS (Ryan et al., 2006), 3BMPN, (Sheldon & Hilpert, 2012) and 4PAX (Banks & Bowman, 2016b)], 5IMI (Ryan, 1982).

	Emotional Investment					Control				
	β	R^2	ΔR^2	F	p	β	R^2	ΔR^2	F	p
Need Satisfaction (PENS, BMPN)										
<i>Autonomy</i>	0.530	0.198	0.069	6.952	<0.001	0.150	0.237	0.039	7.821	<0.001
<i>Relatedness</i>	0.439	0.263	0.023	10.026	<0.001	0.197	0.295	0.032	10.569	<0.001
Intrinsic Motivation (IMI)										
<i>Interest & enjoyment</i>	0.142	0.195	0.016	2.783	<0.001	0.026	0.198	0.003	5.744	<0.001
<i>Effort & importance</i>	0.164	0.069	0.037	2.076	0.0321	-0.009	0.085	0.026	2.34	0.0118
<i>Tension & Pressure</i>	0.145	0.077	0.025	2.346	0.0148	0.017	0.079	0.002	2.166	0.0203

Table 4

Continued hierarchical linear regressions of the relevant measures of player-avatar interaction with the outcome measures of need satisfaction and intrinsic motivation, first entered were the variables of Table 3 then emotional investment and lastly feelings of control, item sources: 1PAX (Banks & Bowman, 2016b), 2PENS (Ryan et al., 2006), 3BMPN, (Sheldon & Hilpert, 2012), 4IMI (Ryan, 1982).

RQ4: Does single-player relatedness and the other measures of need satisfaction improve intrinsic motivation?

Hierarchical linear regressions for the different constructs of need satisfaction were calculated to show a relationships between the measures. Detailed statistical data can be found in Table 5.

We first controlled for age and gender, then we entered autonomy into the model, as it had the strongest theoretical backing, then we entered relatedness to see if it would explain additional variance. Lastly we entered competence.

We found that the model of autonomy, relatedness and competence significantly predicted both interest & enjoyment as well as effort & importance. However, competence barely improved the model and the best model to predict interest & enjoyment and effort & importance was a linear combination of autonomy and relatedness ($R = 0.599, R^2 = 0.359, F = 20.414, p < .0001$).

	Autonomy					Relatedness					Competence				
	β	R^2	ΔR^2	F	p	β	R^2	ΔR^2	F	p	β	R^2	ΔR^2	F	p
<i>Interest & enjoyment</i>	0.518	0.295	0.265	17.839	<0.001	0.316	0.359	0.064	20.414	<0.001	-0.027	0.36	0.001	17.829	<0.001
<i>Effort & importance</i>	0.25	0.067	0.062	3.072	0.0064	0.138	0.079	0.017	3.141	0.0034	0.036	0.08	0.001	2.771	0.0059
<i>Tension & pressure</i>	0.002	0.012	0	0.509	0.801	0.016	0.012	0	0.441	0.8759	-0.196	0.038	0.026	1.251	0.2697

Table 5

Hierarchical linear regressions of the measures of need satisfaction with the outcome measure of intrinsic motivation, first entered were the control variables of age and gender, then autonomy, then relatedness and then competence, item sources: 1 PENS (Ryan et al., 2006), 2 BMPN(Sheldon & Hilpert, 2012), 3 IMI (Ryan, 1982).

Open answers

We received comments on general avatar customization and the CCI within our study. We found that many participants do find customization important in a general context.

Highly important. Inability to play as a character resembling my ideal self would be a relatively damning blight on a game- moreso if the game forced options on my character, e.g look, gender, sexuality, without said character being distinct from an avatar meant to resemble myself. (P92)

Specifically important was the aspect to choose gender and express it faithfully, more so than avatar-player similarity.

As a trans woman, having control over the appearance of my player avatar in video games is an important aspect of my self-expression, since it's a rare opportunity for me to have complete control over the gender I'm perceived as or perceive myself as. (P204)

Discussion

Summary of results

Our results showed that customization significantly facilitated identification. On the basis of that we used identification as a predictor in multiple hierarchical regressions to investigate the indirect effect of customization. We found that increased identification significantly predicts greater autonomy, relatedness, competence, enjoyment, emotional investment and control.

While our effect sizes are considered small ($R^2 = 0.7-0.24$), this is common in games research due to the complexity of the interacting systems of game and player (Birk et al., 2016).

However, we did not find significant differences between a high-fidelity CCI and a low-fidelity CCI. We also continue to support the theory that need satisfaction predicts intrinsic motivation within a gaming context, with the exception of tension. We could not find support for the hypothesis that customization directly increases feelings of control or autonomy.

Single-player relatedness

Single-player relatedness did predict game enjoyment and the effort players were willing to invest, as well as how important and interesting the game was to the players. We therefore provide evidence that the connection with NPCs the players experience, is a driving force within video game motivation and enjoyment. We used a dating simulator to conduct this research, meaning that the game attempted to create a romantic emotional bond between NPCs and avatars. Future research might elaborate on different forms of emotional connections which could drive single-player relatedness.

This evidence has multiple implications. Firstly, we find writing believable NPCs with which players want to connect increases the game enjoyment. This mirrors trends in game design in which commercial game designers have become increasingly interested in designing NPCs that are attractive for players to engage with (Hoge, 2018; Pink, 2017; Prasertvithyakarn, 2018). A recent trend has emerged of "romanceable" NPCs

being included in mainstream titles. Romanceable NPCs are defined by including storylines in which the avatar can interact and communicate romantic interest as well as having that interest reciprocated. These storylines have been recently introduced to *Assassin's Creed* (Ubisoft), while they have been a longstanding core feature of role-playing games such as *Mass Effect* or *Dragon Age* (Coulson et al., 2012; Greer, 2013).

However, as we focused on the impact identification had on single-player relatedness, not only do believable NPCs need to exist to facilitate single-player relatedness, we are the first to find that players' engagement with their avatar also needs to be facilitated. As such, avatars need to be also designed in a way in which characters feel close to them, especially feel emotionally invested in them. Allowing for character customization could allow for this necessary engagement with the avatar, however, as it did not affect emotional investment, there might be more important factors rather than aesthetic avatar customization. Future research could investigate how to facilitate emotional investment with avatars.

This is mirrored in previous research which shows that identification was positively impacted by interaction with NPCs (Rogers et al., 2018). As player-avatar interaction predict single-player relatedness with NPCs positively and interaction with NPCs predicted identification positively, we can further provide evidence for the connection between the ways player engage with their avatars and with the NPCs in game. When one wants to facilitate single-player relatedness they must therefore create both an avatar with which the player wants to engage and believable NPCs for the player to interact with.

Secondly, motivating players to engage with a game by connecting with NPCs could be beneficial to educational games as well as serious games. Serious games seek to educate people on important topics by getting players to engage with them (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; Michael & Chen, 2005). Our findings imply that designing NPCs with which players can connect with, can lead to players of a serious game to experience the games they engage with as more important as well as

worth investing increased effort into. Further, evidence exists that facilitating relatedness with educational media characters and building a parasocial-relationship with them can help teach math to toddlers in a more efficient way (Gola, Richards, Lauricella, & Calvert, 2013). Increasing feelings of single-player relatedness and fostering parasocial-relationships with NPCs in serious games could therefore be beneficial to educate people about an important topic and getting them to engage with it.

However, there are benefits to parasocial-relationships beyond an increased motivation to engage with educational media. For example, there exists evidence that people who build stronger parasocial-relationships generally have a more insecure attachment style in childhood. This is theorized to be due to personas offering people a secure and stable relationship, precisely because of the one-sided nature (Cole & Leets, 1999). These stable relationships can then be helpful to individuals with low self-esteem (Derrick, Gabriel, & Tippin, 2008), as the security these relationships offer help build confidence to seek out less stable two-sided relationships. Further research could investigate whether developing stable relationships with NPCs could be helpful to low-self esteem players, as the evidence suggests for parasocial-relationships with celebrities.

Further, we examined the direct effect customization had on PX and specifically single-player relatedness as previous studies omitted their descriptive statistics (Birk et al., 2016; K. Kim et al., 2015; Schmierbach et al., 2012) and related research finds no direct effect of customization on intrinsic motivation (Birk & Mandryk, 2018).

In our research, we found no direct effect on customization on any other measure of PX except identification. In spite of customization affecting identification and identification predicting intrinsic motivation, we could still find no significant group difference. We explain the lack of group differences in PX between the customization conditions and assigned avatar condition in two ways. Firstly, the construct which explained the most variance in the prediction model, emotional investment, was not influenced by customization. However, emotional investment was predicted by

identification, as such there might be potential mediation effects which are outside of the scope of this study. Secondly, the CCI was limited and the dating simulator was relatively short, leading to low to medium values in player-avatar interaction measures. Identification facilitated more strongly by a less limited CCI could lead to group differences in PX a longer game experience.

Player-avatar interaction

Our hierarchical regressions were calculated to understand whether the intensity with which players engaged with their avatars would influence how fulfilled they felt by relating to NPCs. We utilised identification as the most important construct, as it had the most theoretical backing (Birk et al., 2016).

However, the effect of how emotionally invested a player is into their avatar, was the most important predictor of single-player relatedness. Especially unimportant was the construct of similarity identification, which is interesting, as player-avatar similarity has been a focus in previous research (Dunn & Guadagno, 2012; Midha & Nandedkar, 2012; Ratan & Dawson, 2016).

Research has found that identification is higher (Mancini & Sibilla, 2017) and team performance is better when the avatar is more similar to the player of an online game (van der Land, Schouten, van den Hooff, Feldberg, & Huysman, 2015). However, with the finding of the importance of emotional investment in our prediction model, we corroborate previous research which has already noted the insufficiency of simply measuring identification with the avatar (Banks & Bowman, 2016b). Similarity identification further explained less variance than wishful identification. As such our findings bring into question the importance of allowing players to create an avatar more similar to them in favor of an idealised avatar.

However, this might simply be due to the context of this study. Players were primed that they were playing a dating simulator and would have an NPC interact with them as a romantic interest. This priming could have led to an idealised version of the player being more important. Indeed, when investigating avatar customization

depending on context, it was found that avatars created for a dating context were more attractive than those created for the context of playing a game (Vasalou, Joinson, Bänziger, Goldie, & Pitt, 2008). As research on single-player relatedness is extended, understanding it in different emotional contexts will be vital to further understand the impact player-avatar interaction has on its experience.

High- & low-impact customization

This study attempted to answer the additional question whether different customizable features in a CCI would translate into a different experience for the players. While there has been research done on what players subjectively experience as the most important features, no empirical investigation had been made whether these important features would actually have a larger impact on PX. In our limited investigation, we could find no evidence of such a direct effect. However, we believe this could be explained by other variables, rather than what affordances a CCI offers having no impact on PX.

A main reason we identified was the limited capabilities of both CCIs. We believe neither CCI had the potential for high identity-fidelity for the players, which is mirrored within our relatively low means of identification across all groups. This research can therefore not be seen as conclusive, but rather as a starting-off point from which we can formulate concrete questions for future research. However, as we did still find an effect on identification it asks the questions what features of minimal customization need to be present to increase the engagement of a player experiences with their avatar.

An additional reason for the low scores and small impact of avatar customization could be the fact that players did not see their avatars again within the actual game after the CCI. Again, however, as a small effect still remained the question arises whether customizable features that are not necessarily visual could also have a reliable impact. As we asked the participants for comments on our CCI, we found certain features being named important, which are both minimal and not strictly visual. These features were namely gender, name and pronouns. While our avatar was not addressed

by pronouns or name, players still mentioned they appreciate it, when a game lets them choose these aspects of their identity and presentation. Further research could investigate whether allowing people to customize these features strictly within the narrative, not visually, could still influence player-avatar interaction.

Moreover, every NPC available to interact with reacted positively to the avatar's appearance in the same way by calling them attractive. Further research could investigate whether there is an interaction between customization and comments from NPCs on avatar appearance which would impact single-player relatedness.

Gender and customization. We treated gender as a customization feature in its own right. They were present in both experimental groups, as we did not want to alienate players from their avatar and create need frustration. This was important, as a lack of gender customization options would affect transgender people, for whom feeling forced into having experiences as the wrong gender accounts for a great deal of suffering (Association et al., 2015; Nadal, Whitman, Davis, Erazo, & Davidoff, 2016).

This was affirmed to us in the comments on our CCI by the participants. Many responses included those of transgender people feeling that the customization of gender is very important to them, as avatar customization is one of the only times they can truly control their own gendered presentation. Often included in these desired customization options was the possibility to customize pronouns. Further, we chose to give players an "androgynous" option, which was also appreciated by some participants. This indicates the necessity to not only see gender as a binary category of man or woman when designing a CCI, but consider further options for gender expression to be inclusive to all genders.

Race and customization. Another reason for the lack of significant difference between the experimental groups was skin color having been identified as a low-impact feature in previous research (Ducheneaut et al., 2009). While we implemented it as such within our study, our null results in a sample comprised of mostly White people could indicate this not being a finding which still holds up in our current landscape.

The previous research on low-impact features was done within games which had a

fantasy setting in which the players would choose the "race" of their character before their skin color. Meaning, sometimes skin color change would be different shades of blue, rather than human skin (Ducheneaut et al., 2009; McArthur, 2017). Furthermore, while skin color is a common feature of avatar customization, ethnic hair styles and other customization which account for players of color feeling represented are often not present (Passmore & Mandryk, 2018). In addition, choosing a fantasy race whose experiences is more like those of minorities within our society, might have more impact than choosing visual options which are more similar to those of people of color.

Customizing race can, therefore have multiple meanings and levels of impact to how the avatar is going to relate to the world and further classification, as well as research is required to understand exactly how racial customization features can be defined and classified, as well as how this impacts players of colors engagement with avatar customization and subsequent gameplay. With an increasing push for representation in games, skin color potentially is becoming a more important feature in CCI's.

Future research and limitations

The experimental study presented here supports previous findings of effects of customization on identification and the effects of player-avatar interaction on various PX measures. However, our experiment was not without limitations. Firstly, in comparison to previous research we did not collect any behavioral data during game (Birk et al., 2016) or asked for screenshots of the avatars after customization (Ducheneaut et al., 2009). As such we can make no direct claims of motivated behavior or player-avatar similarity or the actual design of avatars as previous research has done (Ducheneaut et al., 2009; Martey et al., 2015; Turkay, 2012; Villani, Gatti, Triberti, Confalonieri, & Riva, 2016).

Further, our low-impact condition was created using features that were deemed as less important than those on the high-impact research based on research outside of video games. A study which investigates which features are deemed as superfluous by

users by observing users of a CCI could help determine these factors better. Moreover, there was no "all features" condition due to technical limitation. We can therefore make no claim about clutter within CCIs or whether complexity increases or decreases identity-fidelity for players. Future research could compare an all features CCI with a high-impact and low-impact CCI to investigate this further. Thirdly, the game programmed for this study was relatively short, with a play time of up to 15 minutes if the character creator was used extensively, participants noted that it was difficult to become invested into the game due to its length.

Future research should therefore investigate the effect of customization on player-avatar interaction, as well as relatedness and emotional investment in full-length games with a focus on player-NPC parasocial-relationships. However, we still found significant effects of relatedness and identification predicting game enjoyment. This is hopeful news for experimental designs utilizing games, as short and simple games can still generate an observable effect.

Conclusion

The bonds we create within games are an important part of the enjoyment players derive from it, be it the relationships we develop to other players, the emotional investment players have in their avatars or the connection they experience with their NPCs. Especially of importance is how these forms of engagement influence each other. So far, research has mostly concerned itself with the relatedness players experience with other players or the identification players experience towards their avatars. Instead, we examined both the engagement players had with their avatars and the impact of such on the experience of single-player relatedness with NPCs.

As self-determination theory is a key theory within HCI and specifically games research, it is important to understand in what ways we can motivate players and let them experience greater enjoyment while playing games. We find that by increasing identification and emotional engagement in the avatar, players will experience a stronger connection with the NPCs.

We asked 263 people to play a dating simulator, a game reliant on the player wanting to experience an emotional bond between themselves and an NPC, and find that single-player relatedness predicts both game enjoyment as well as how important a game is to the player and how much effort they would be willing to invest into it. Moreover, we found that single-player relatedness can be facilitated by means of increasing player-avatar interaction, as could autonomy be influenced by identification in previous research. We suggest avatar customization as a design implementation to increase identification and find the difference in which specific features are customizable does not create a significant difference in PX.

All in all, we show evidence of the importance of the interplay of player-avatar interaction and single-player relatedness as driving factors of video game enjoyment.

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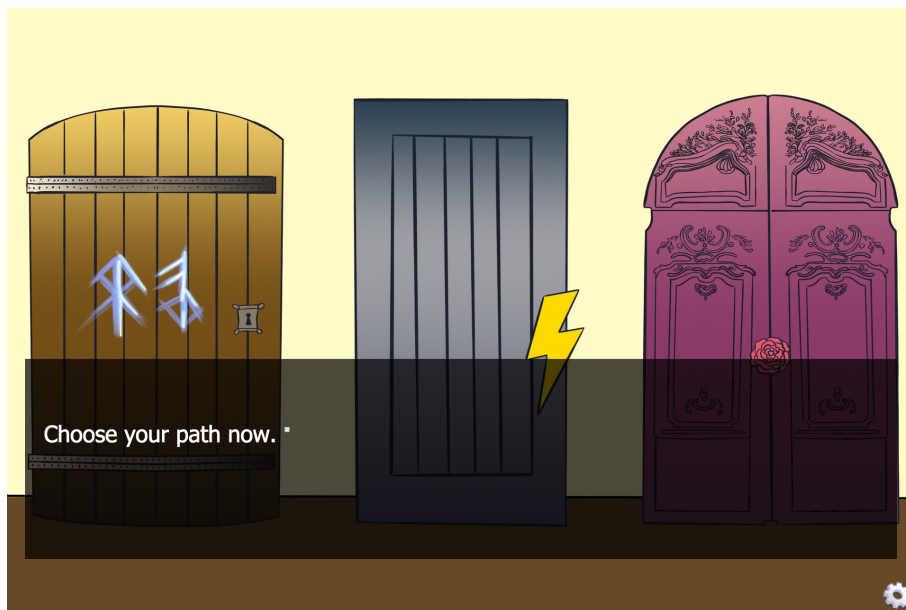
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Appendix A
Game Design



(a) Doors with which to choose which NPC to talk to.

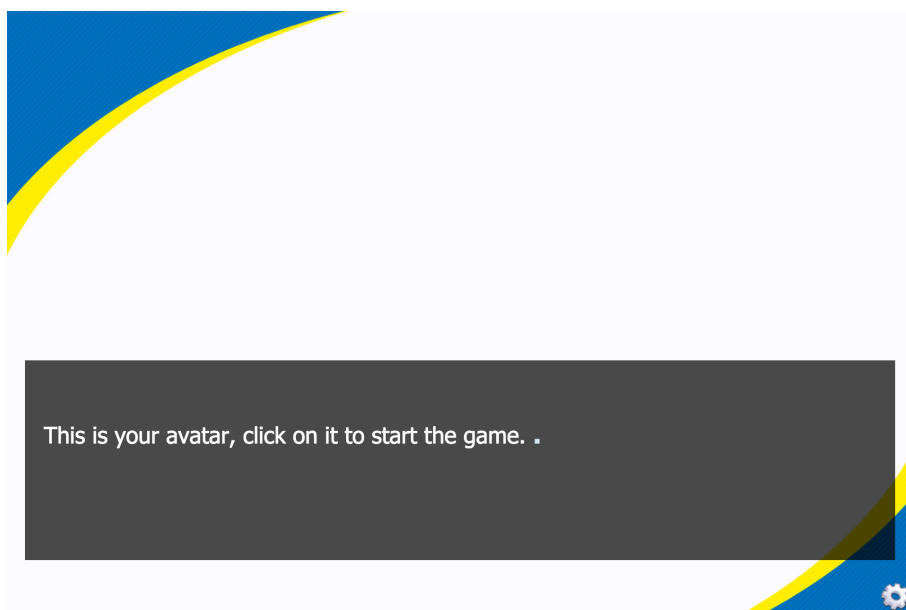


(b) Choice to go back to the doors and choose again.

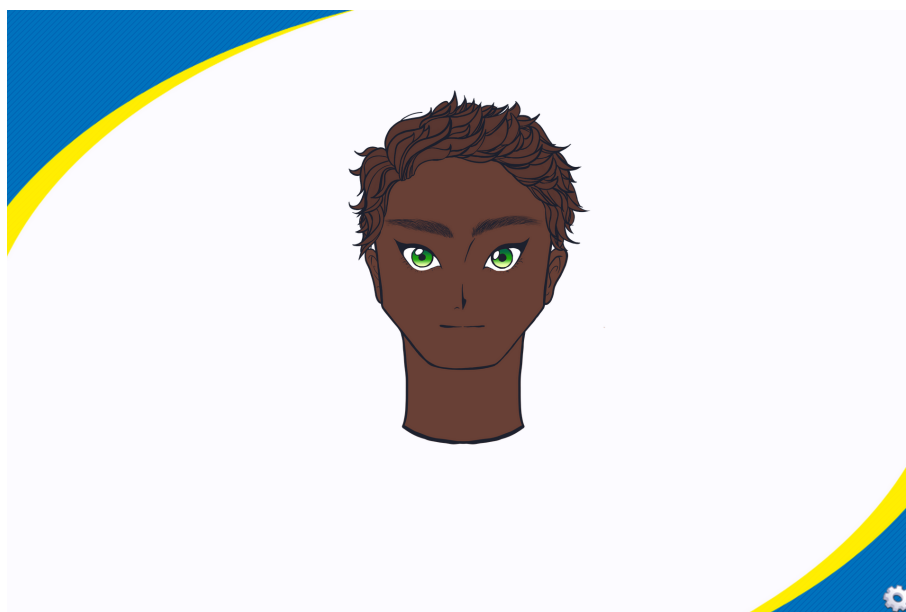
Figure A1. Beginning of the dating simulator in which players first chose a door and were then given the option after seeing the NPC to go back and choose a different door.



Figure A2. Example of an ending, the ending screen indicated clearly to the player that the game was over and they should return to the survey.



(a) Text instructions in the control condition.



(b) Example of an assigned avatar.

Figure A3. Example of the control condition with an avatar assigned before the game starts. There were 25 randomly generated avatars in total which were assigned to players randomly.

Appendix B

Exploratory factor analysis of the adapted relatedness construct of the BMPN (Sheldon & Hilpert, 2012).

<i>BMPN</i>	<i>PA1</i>	<i>h2</i>	<i>u2</i>
I felt a sense of contact with the characters in the game who care for me, and whom I care for.	0.89	0.80	0.20
I felt close and connected with the characters in the game who are important to me.	0.94	0.88	0.12
I felt a strong sense of intimacy with the characters in the game I spent time with.	0.87	0.76	0.24

Table B1

An exploratory factor analysis utilising oblimin rotation of the complete measurement construct for single-player relatedness of the adapted BMPN (Sheldon & Hilpert, 2012).

We find that the constructs fits the single-factor model with strong loading of 0.87 – 0.094