Fostering Intrinsic Motivation through Avatar Identification in Digital Games

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ABSTRACT
Fostering intrinsic motivation with interactive applications can increase the enjoyment that people experience when using technology, but can also translate into more invested effort. We propose that identifying with an avatar in a game will increase the intrinsic motivation of the player. We analyzed data from 126 participants playing a custom endless runner game and show that similarity identification, embodied identification, and wishful identification increases autonomy, immersion, invested effort, enjoyment, and positive affect. We also show that greater identification translates into motivated behaviour as operationalized by the time that players spent in an unending version of the infinite runner. Important for the design of games for entertainment and serious purposes, we discuss how identification with an avatar can be facilitated to cultivate intrinsic motivation within and beyond games.

Author Keywords
Games; Avatar; Investment; Player Experience; Motivation

ACM Classification Keywords
K.8.0. General: Games

INTRODUCTION
When people are intrinsically motivated to complete a task – that is, they do so based on the inherent satisfaction derived from the action itself [52] – there are many benefits. Broadly speaking, intrinsically motivated people are willing to invest more effort into a task and derive more enjoyment from it [16]. In the case of interactive technology, fostering intrinsic motivation with our applications should translate into more effort invested in the task at hand and more enjoyment as a result of using the application [52]. This increased engagement has implications for both the designers and consumers of interactive technology. For example, consider an educational application designed to help people learn a language; increased effort invested by the user could translate into improvements in language learning. Or consider a citizen science application in which people contribute to finding new proteins that cure diseases such as HIV/AIDS, Cancer, or Alzheimer's [15]; increased enjoyment using the application could translate into more use, and thus a more complete database of proteins.

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Because of the potential benefits of increased engagement, creators of interactive technology should ask how they can foster intrinsic motivation through design. One place that designers can look for motivation is digital games. Recent estimates suggest that more money is spent purchasing games ($92b) than music ($18b) and movies ($62b) combined [3]. Four out of five American households own a device that is used to play video games and 115 million Americans play games [1]. Internationally, the global game market is expected to exceed $102 billion by 2017 [2]. Although people sometimes assume that it is highly immersive console and computer games that drive the game industry, 35% of those same revenues are expected to be generated through smart phones and tablets, on which people tend to play games that are more casual in nature. With so much time and money being spent (by choice) on digital games, researchers have questioned what it is about games that make them so motivating to play [52] and how we can translate these motivating features into non-game environments – a process known as gamification [18]. Serious games – games that leverage this ability to motivate behaviour and retain attention in serious contexts – have been effective at encouraging behaviour change and fostering activities that lead to learning [50].

There are various theories that explain why games are engaging [59,10]; the most prevalent arises out of self-determination theory (SDT) [52]. Being self-determined describes a state in which people have their basic psychological needs for perceived competence (i.e., demonstrating mastery over challenges), autonomy (i.e., doing so under their own volition), and relatedness (i.e., doing so while feeling connected to others) satisfied through the activity. Satisfying these needs leads to people who are intrinsically motivated to perform the activity. Designing with need satisfaction in mind is one way that we can design better games [61]; however, this solution works on the level of the game itself – it helps us build a better interactive application. There is also an argument for seeking ways to foster motivation through methods and approaches that apply across a range of applications.

For example, Trepte et al. [61] showed that creating an avatar that a player identifies with increases the imagined enjoyment of playing a game with that avatar. And given that so many players invest so much time into creating, equipping, and playing with their virtual representations in massively multiplayer online role-playing games (MMORPGs) [36], it is not unreasonable to assume that extending the use of an avatar that players identify with into multiple new contexts would translate the enjoyment that stems from avatar identification into those new contexts.

However, although it is clear that identifying with an avatar has benefits in the game being played, there are several reasons why it is not feasible that these benefits will extend outside of the specific context of the game. First, there are issues with intellectual property and copyright; second, there could be mismatches between the environment that the avatar was created in (e.g., space fantasy adventure) and the environment in which it would be used (e.g., oil rig training application); third, there is a large proportion of users who do not play the kinds of games that foster avatar identification; and fourth, it is not clear whether there are clear benefits of avatar identification in the kinds of lightweight, casual games that are often used for serious purposes. Thus, it is reasonable to ask whether or not we can leverage the advantages of avatar identification seen in immersive and persistent games and translate them into other games and tasks that are temporary or casual.

In this paper, our goals are to stimulate identification with an avatar in a short interactive application, and then investigate how identification translates in a casual game, as opposed to a game that requires significant and deep engagement. We conducted an online study on Amazon's Mechanical Turk (MTurk), in which we told players that they would be customizing an avatar to use in a series of future tasks. We allowed half of the players to customize the appearance, personality, and skillset of their avatar; the remaining players were assigned a random avatar (of the same sex) and watched a video of another user customizing the avatar. The avatar was then used to play four timed rounds of an exertion-in-the-small [56] infinite runner game, after which we collected measures of affect, intrinsic motivation, and needs satisfaction to determine how avatar identification relates to self-determined play. Finally, we included a behavioural measure of motivation in which we had participants play a final un-timed round of the game that had no ending (there was a quit button in the corner that players could press), which allowed us to gather an objective and behavioural measure of their motivation.

We asked five main research questions:

RQ1: Does avatar customization increase identification?
RQ2: Does avatar identification improve in-game needs satisfaction (i.e., competence, autonomy, relatedness, immersion, and intuitive control)?
RQ3: Does avatar identification improve intrinsic motivation (i.e., enjoyment, effort, and reduced tension)?
RQ4: Does avatar identification increase positive affect or reduce negative affect?
RQ5: Does avatar identification translate into motivated behaviour (i.e., do players who identify with their avatar spend longer in the unending infinite runner?)

Our results showed that avatar customization stimulated identification with the avatar. In terms of game experience, we used hierarchical regressions with the three types of identification (similar, embodied, wishful) as individual continuous predictors to show that greater identification increased autonomy, immersion, invested effort, enjoyment, and positive affect. We also show that greater identification translates into motivated behaviour as operationalized by the time spent in the unending infinite runner.

RELATED WORK

We present research from three areas of interest: identification with media characters, identification with avatars in games, and how intrinsic motivation is fostered in games.

Identification with Media Characters

Identification is the degree to which individuals like a character, empathize with a character, or perceive a character as being similar to themselves [14,63]. Identifying with a character has been shown to increase media enjoyment [61], has increased the persuasiveness of messages [42,43], and has improved health outcomes [32]. Identification has also been shown to increase aggression [35], addiction [57], and depression [40,5]. Although we can make assumptions about how identification with a media character from film or television will translate into a game environment, there is one big difference: in games, the player often controls the actions of a character – exhibiting agency in the digital environment [21] – which is not possible with traditional film or television characters [21]. Klimmt et al. present arguments and evidence to describe avatar identification in video games as a shift of self-perception [33,34] that allows a player to temporarily become one with a character. Murphy [45] argues that games expand television as a space for identification by allowing people to interact with and through characters. In traditional linear narratives like plays and stories, the action of the protagonist defines their characteristics and personality; however, games have the ability to go beyond mere observation by allowing players to create and dynamically evolve their characters [46]. While traditional narratives rely on empathy [60] – the viewer's identification with the emotions of a character – interactive computer games emphasize agency – the direct control of a player over the behavior and development of their character [21]. Balancing empathy and agency in the design of game characters is of essence to create a compelling experience [21], which is positively perceived by the audience [37].

Identification with Avatars in Games

Players of digital games spend extensive hours playing a game, often with a single avatar [36]. Avatars allow players to project their identity into a virtual environment [19], are a means to explore our own identify [65], or to play with different forms of identify (e.g., gender swapping [30]), and are a means to form social relationships in games [36]. It is not surprising that players identify strongly with their digital representation; an avatar is a digital artifact that is valued both personally [36] and financially [11]. Prior research has shown that identifying with an avatar has positive outcomes for play experience and enjoyment [61], shapes our behaviour outside of the game [68], and makes us more susceptible to persuasive messages [43].

Player-Avatar Convergence

Avatars need not just represent us as we are, but also can represent us as we wish to be – otherwise known as wishful identification [28,29]. Convergence between characteristics of an avatar and of the ideal characteristics of a player (their ideal-self [47]) have been shown to create higher levels of immersion and are predictive for intrinsic motivation and positive affect after game play [47]. However, avatars that represent who we are (actual-self [47]) have value: avatar-player similarity has been shown to be positively related to identification [61]. However, researchers have also showed that players sometimes sacrifice avatar-player convergence (harming identification) for strategic reasons in competitive play; e.g., by choosing avatar attributes that are dissimilar to themselves, but that help their chances of winning [64].

The idea behind player-avatar convergence can also be extended to the similarity between the avatar and the player's idea of who they are during play, i.e., their game-self [4]. The discrepancy between who we are and who we wish to be is predictive of negative health outcomes, e.g., depression and anxiety [22], and these results may also extend into our game-selves – players with lower avatar-self convergence also experience lower levels of well-being.

Facilitating Identification

Because of the established benefits of identifying with an avatar, various methods for facilitating this relationship have been suggested. Trepte at al. [61] showed that customizing an avatar increases identification and leads to higher enjoyment, and also that creating an avatar that has high similarity to the player increases identification, and ultimately game enjoyment. Schneider et al. [55] showed that participants who played a first-person shooter game that included a narrative experienced more identification with their avatar than those who played a non-narrative version. Crenshaw at al. [13] showed that when creating an avatar, the given name is important to increase identification.

However, the choices made in avatar creation can be context dependent: whereas identification facilitates enjoyment, players may optimize their characters for a particular game context to maximize their chances of succeeding and to comply with the underlying game mechanism [61, 36]. Vasalou et al. [64], for example, show that an avatar's appearance is adapted to the content of a game, e.g., creating an attractive avatar in a dating game. Literature shows that there are multiple ways to facilitate identification; our goal is to use identification to foster intrinsic motivation.

Intrinsic Motivation in Games

Self-determination theory [52] is a well-grounded theoretical framework that allows us to explain the intrinsic motivation that people have to play games due to having their basic psychological needs satisfied through game interaction. The traditional model proposes three needs [16]: **Competence** is the need to experience mastery and control over the outcome of a challenge, e.g., having a clear objective in a game; **Autonomy** is defined as the need to engage in a challenge under one's own volition, e.g., selecting challenges that are in-line with our personal perception of challenge; **Relatedness** is the universal need to feel connected to others, e.g., playing a game with friends. The model has been extended to capture the unique characteristics of digital games with **Presence/Immersion,** the experience of being transported into a virtual environment; and **Intuitive Control,** which describes the naturalness of the game input.

Game designers [62] have adopted self-determination theory as a model to describe how games facilitate need satisfaction. First, by providing challenging tasks that allow us to experience a sense of mastery; second, by creating autonomy by allowing players to customize their avatars, choose different pathways through a level, or by allowing them to choose the group to play with; and third, by creating social environments that provide a variety of tools to create a sense of relatedness, e.g., in-game messenger, trade systems, and challenges that can only be mastered as a group. The Player Experience of Needs Satisfaction Scale (PENS) [52] was developed to assess the subjective satisfaction of needs in video games and has been broadly applied in research on digital games.

The Intrinsic Motivation Inventory (IMI) defines intrinsic motivation using the following four constructs that comprise intrinsic motivation: interest-enjoyment, pressure-tension, competence, and effort-importance. The need satisfaction constructs and intrinsic motivation constructs are related in the context of gameplay; research has demonstrated that the satisfaction of needs predicts intrinsic motivation [39]. These measures are all derived from players reporting on subjective scales; however, there have also been attempts to measure intrinsic motivation to play games objectively by capturing instances of motivated behaviour.

Behavioral Measures of Motivation

Subjective instruments give important insights into a player's experience and allow us to make assumptions about how a player's reported state might relate to their behaviour – for example, their game choice, the time spent in game, the recommendation to others, or their financial investment. Ryan et al. [51] showed that being intrinsically motivated increases the time spent on a puzzle task. In an online game, Yee et al. [67] demonstrated a relationship between in-game behavior and motivation – that being motivated by achievement resulted in players optimizing their controls. Hars and Ou [25] show that intrinsic motivation drives participation in open source projects, and Childers et al. [12]

show that the enjoyment of online shopping experience translates into shopping behaviour. In the context of games, Birk et al. [7] showed that enjoyment and motivation predicted aspects of in-game behaviour, including more logins and greater social interaction with other players.

In addition to establishing links between subjective reports of motivation and behaviour, researchers have also measured motivated behaviour directly. Abuhamdeh et al. [4] offered participants a choice of continuing to play a game that they won by either a slim or wide margin, and identified this as a behavioural measure of intrinsic motivation. In developing the PENS instrument, Ryan et al. [48] conducted a series of studies and used a behavioural choice for continued play after the study play period (a dichotomous choice) as an indicator of a motivational outcome. Finally, the time spent on boring or repetitive tasks, e.g. knob turning [54], has been used before to measure task motivation.

EXPERIMENT DESIGN

We conducted an online study in which we facilitated avatar identification in half of our participants and then had them play a custom infinite runner game. We measured identification, play experience and motivated behaviour.

Avatar Creator

To manipulate avatar identification, we built a character creator using C# and the Unity 4.6 game engine (Unity Technologies, 2014), Unity Multipurpose Avatar 2 (UMA Steering Group, 2015), the AL Male Civilian Pack for UMA (AlienLab, 2014), UMA Dresses (Lunatic Fringe Games, 2014), UMA Hair Pack 1 (Will B, 2015), and the UMAzing In-Game Character Creator (Strafejump Studios, 2014). During the creation process, participants were asked to create an avatar and adjust the avatar's appearance, personality, and attributes (characteristics). Participants were required to spend a minimum of four minutes in the character creator, but could take longer if they wished. Once appearance, personality, and character attributes were customized, and the 4 minutes had passed, participants were shown a summary of their character and asked to enter a nickname [13] before moving on (see Figure 1).

Appearance

Participants could customize the avatar's sex (2 choices), skin tone (5), hairstyle (4), hair colour (4), eye colour (4), upper clothing (3), lower clothing (3), clothing colours, and shoes (2). While hair colour (brown, blond, black, and red), and eye colour (blue, green, brown, and green), were limited to one of naturally-appearing discrete choices, clothing colours were picked using a colour picker supporting 16.7 million colours.

Personality

Participants were asked to answer ten statements describing their character's personality. The personality characteristics matched the items from the BFI-10 personality questionnaire [49] (e.g., "is reserved", "tends to find fault with others"); the instructions were changed to "I see my avatar as someone who…" Participants rated their agreement on a 5-pt Likert-scale (disagree strongly to agree strongly).

Attributes

Participants were required to assign eighteen points to their character's intelligence, stamina, willpower, charisma, dexterity, and strength, giving them the opportunity to favour certain attributes. The process required participants to assign at least one point in each category.

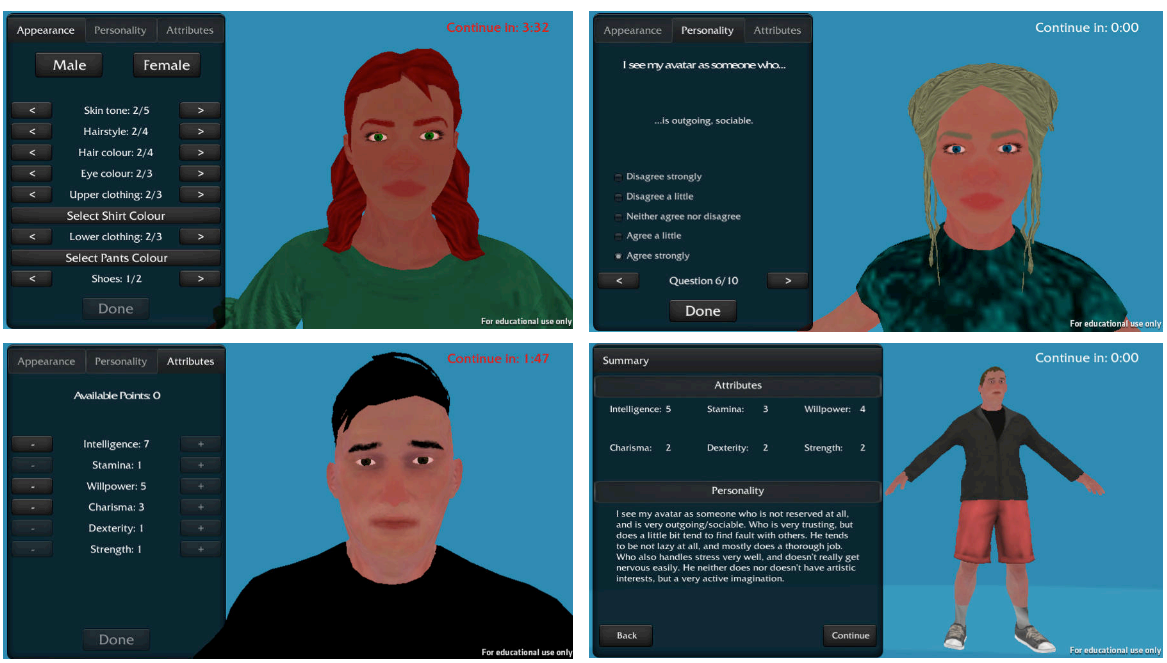

Figure 1. Avatar Creator displaying. Top left (a): Appearance; Top right (b): Personality; Bottom left (c): Attributes; Bottom-right (d): Summary. Similarity to authors is purely coincidental.

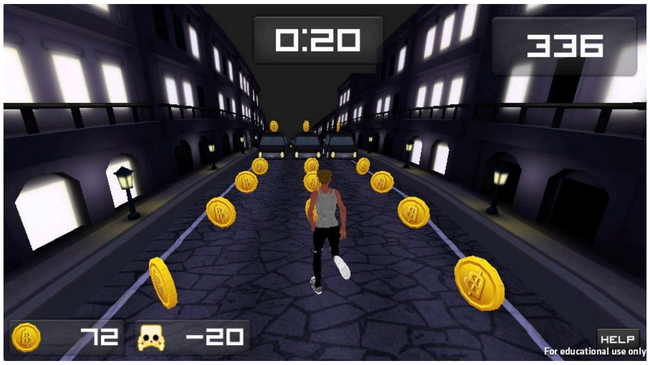

Figure 2. Timed Infinite Runner.

Summary

The summary displayed the created avatar next to the personality and attribute profile. The personality responses were displayed as prose, using the responses from the BFI-10 questionnaire [49]. We adjusted the text, matching it to the avatar's sex, e.g., "She tends not to be lazy, and mostly does a thorough job". The purpose of the summary was to reinforce the characteristics of the created avatar, and give the player the sense that their avatar had a profile. After accepting the summary, participants named their avatar.

Manipulating Avatar Identification

To manipulate identification, we allowed half of our participants to use the avatar customization tool. We told participants (who were MTurk workers) that they would be customizing an avatar to use in a series of MTurk tasks that would be released in the future, using personalized invitations to participate. They were told that in future studies we would make use of the avatar's personality and skills (for example by assigning a task that matched the avatar's abilities), but that the current task was focused on the creation process and thus the avatar would be used in a simple game unrelated to their personality and skills.

The other half of the participants were randomly assigned an avatar of the same sex, from a set of four avatars. We created 2 different personality sets: the first set (*Personality A*) showed low extraversion, high neuroticism, and a tendency for low agreeableness. Openness, and conscientiousness were kept ambiguous. The second set (*Personality B*) was high on extraversion, high on agreeableness, and a tendency to be open. Neuroticism and conscientiousness were kept medium. We also created two sets of attributes for both sexes. The first set (*Attributes A*) emphasized high intelligence (5 points), high charisma (4 points), and elevated dexterity (3 points); the other attributes received 2 points each. The second set of attributes (*Attributes B*) emphasized high strength (6 points), high stamina (5 points) and low intelligence (1 point). The other attributes received 2 points each. The personality and attribute sets were crossed to four different avatars for each sex: *Personality A, Attributes A; Personality A, Attributes B; Personality B, Attributes A; Personality B, Attributes B.* We kept all characteristics of the avatar's appearance very neutral. A mid-range skin tone

Figure 3. Endless Infinite Runner; the timed version had the same layout except with a timer instead of the quit button.

and brown hair was chosen, and avatars of both sexes were dressed in a grey shirt and black pants.

Following the same procedure used in [24] to study the persuasiveness of avatars as virtual salespeople, participants in the randomly-assigned avatar group watched a video of the creation and customization of their avatar. We created four videos for each sex with the four different personality and attribute configuration. Participants could not intervene in the creation process and only passively watched the assigning of appearance, personality, and attributes. In contrast to the customization process, participants who watched the video were not allowed to name their avatar; instead the avatar was represented as "Player 1" throughout the study.

Gaming System: Infinite Runner

Infinite Runner is an infinite runner game in which players run down a street, collecting coins, while avoiding obstacles. The game was implemented in C# using Unity 4.6 (Unity Technologies, 2014) and the 3D Infinite Runner Toolkit (Dreamdev Studios, 2014).

Gameplay: Players run down a dark street by controlling the previously-created or assigned avatar. Players have three kinds of actions to avoid obstacles: change lanes on the street, (i.e., left, middle, or right), jump, and roll. The player's score was increased by collecting coins; each coin added one point to the player's score. The game featured 3 types of obstacles: buses, signposts, and cars. Buses could not be jumped over and forced the player to change lanes. Signposts could be avoided by rolling. Cars could be avoided by jumping over them or moving around them. To increase difficulty, hitting an obstacle slowed the player down for one second and deducted 10 points.

Controls: The player had to alternate between pressing the N and M keys in order to keep the character running forward. Forcing players to constantly press buttons served two purposes: 1) it made the task more tiring, and therefore required more effort to stay invested; and 2) the constant input ensured that participants didn't simply wait until the game time expired – the timer stopped progressing if participants stopped running. Players switched lanes by pressing the A key (left), and the D key (right), and pressed the W key to jump over obstacles and the S key to roll.

Versions: Participants played four rounds of a timed version of the infinite runner (see Figure 2), and also one round of the endless infinite runner (see Figure 3). The only difference between the timed and endless versions was that the timed rounds lasted for 60 seconds, whereas the endless round allowed the participant to play until they pressed a quit button, which appeared in the top left corner (see Figure 3). We set a threshold of 20 minutes of time passing (or 10 minutes of active running time) in the endless runner to ensure that participants had time within the MTurk system to complete the post-experiment questionnaires.

Measures

We collected both subjective and behavioural measures.

Identification

Identification was measured using the avatar-related subscales of similarity identification, embodied identification, and wishful identification from the Player Identification Scale (PIS, [63]). Participants were instructed to rate their agreement to identification-related statements, e.g., *similarity* - "My character is like me in many ways."; *embodied* - "I feel like I am inside my character when playing"; *wishful* - "I would like to be more like my character".

Player Experience

Positive and Negative Affect was measured using the Positive Affect / Negative Affect Scale (PANAS, [66]). Participants were instructed to indicate how they felt "right now" using a list of adjectives, e.g., "active" or "upset", and rating their agreement on a 5-pt Likert scale. PANAS has been used to evaluate games before [44].

Intrinsic Motivation was measured using the Intrinsic Motivation Inventory (IMI, [39]). The IMI measures the constructs *interest-enjoyment* - "I enjoyed this game very much.", *effort-importance* - "I put a lot of effort into this game.", and *tension-pressure* - "I felt tense while playing the game.". Each construct was measured using agreement to statements on a 7-pt Likert-scale. The IMI has been used in games research before [52].

Need Satisfaction, based on Self-Determination Theory [16], is a predictor of intrinsic motivation. Need Satisfaction of competence (i.e., demonstrating mastery over challenges), autonomy (i.e., doing so under one's volition), and relatedness (i.e., doing so while feeling connected to others) as experienced during play, was measured using the *Player Experience of Need Satisfaction Scale* (PENS, [52]). PENS adds two additional constructs: presence and intuitive control that have been identified as being relevant in the context of games [52]. Each of the five constructs were measured using agreement to statements on a 7-pt Likert-scale.

Game Performance

Additional in-game metrics were used to measure performance, i.e., the number of obstacles hit and the number of coins that were collected indicated in-game performance.

Motivated Behaviour

Motivated behaviour was operationalized as time spent actively running in the endless round of the infinite runner; investing more effort into a game and showing higher levels of endurance during an engaging but tiring task have previously been used as an objective measure of motivation [54]. Objective motivation in the context of *Infinite Runner* is measured using time spent actively running in the final endless round (i.e., time spent alternating between M and N presses) before pressing the quit button.

Participants and Deployment Platform

130 participants (40% female) with an average age of 31.62 (*SD=8.12*) participated in our study through Amazon Mechanical Turk (MTurk), a platform that acts as a broker between parties offering a range of *Human Intelligence Tasks* (HITs) (e.g., marketing questionnaires or research studies) and paid workers. Participants received $6 compensation paid through the platform. Although it has been shown that MTurk is a reliable research tool [38], we measured the time spent per questionnaire to evaluate task performance and ensure that participants were attentive despite the online setting [23]. Participants were excluded from further analysis based on the following: if participants filled in more than 2 surveys with zero variance between items, or showed ratings of ±3SD in more than 2 questionnaires. After these filters were applied, 126 participants (38.9% female) with an average age of 31.61 (*SD=8.20*) were included in further analysis. Excluding participants based on quality criteria is a standard approach for data collected via crowdsourcing platforms; the applied criteria were suggested by [38]. Ethical approval was obtained from the University of Saskatchewan behavioural research ethics board, and participants were asked to provide informed consent. To comply with ethical guidelines, the HIT was only made available to workers in the USA who were older than 18. Additionally, only workers with an approval rate above 90% were offered the HIT as a means of quality control.

Procedure

Participants first received information about compensation and the expectation to answer attentively and quickly, and were then asked to give informed consent. Task duration was also revealed; to avoid time as a source of pressure, the allotted time was 20 minutes longer than the average time needed in a pilot study with 18 participants. At the beginning of the experimental phase, participants filled out a demographics questionnaires asking about, e.g., age, and gender, and PANAS to measure baseline affect. Afterwards, participants were randomly assigned to one of two groups: the customization group or the random avatar group. After creating an avatar (or watching an avatar being created), participants answered the identification scale. Next, each participant was told that they were being connected to a group of online players (to increase the social relevance of the situation and stimulate investment in the experiment), and they then played two blocks with two rounds in each block of *Timed Infinite Runner.* Each round lasted 60 seconds. After each round, participants were presented with a manipulated leaderboard showing their progress relative to the other simulated players. The first round in each block presented neutral feedback and the second round presented neutral feedback in block one and losing feedback in block two. Leaderboards have been shown to be effective at manipulating play experience and creating controlled variance in the game experience across participants [9].

After each block, participants filled out the PANAS, PENS, and IMI scales. After answering the questionnaires after the second block, participants played *Endless Infinite Runner* for a maximum of 20 minutes (10 minutes of active running). A red quit button was presented at the top left corner of the screen (see Figure 2) to indicate that participants could quit *Endless Infinite Runner* any time. After 20 minutes, the game ended regardless, and participants were forwarded to the last set of questionnaires, in which we collected the PANAS, and additional demographics questionnaires. Finally, participants stated the purpose of the experiment in their own words, after which the purpose of the experiment was disclosed. We ensured that participants understood the deception of the leaderboard manipulation, and the avatar being used across multiple experiments by asking simple comprehension questions.

Data Analyses

Collected data was analyzed using SPSS 23, with the PROCESS-macro for SPSS from [26]. IMI and PENS data after rounds 2 and 4 of the timed running game were averaged to capture the full the experience of *Timed Infinite Runner*. To capture the change in affect starting before the experiment to after the final round of *Endless Infinite Runner*, we calculated the change in affect (positive and negative individually) from baseline measurements to the values gathered after *Endless Infinite Runner*.

To test the effects of identification (as a continuous variable, rather than a group treatment) on the dependent measures, we conducted hierarchical linear regressions. Because sex and age can affect measured need satisfaction and intrinsic motivation during play [52], we entered these two measures into the first block of the regressions. We then report the R^2-change of adding identification as a predictor of: the five needs satisfaction measures, the three intrinsic motivation measures, the two affect measures, and the measure of motivated behaviour. Separate regressions were conducted for the three types of identification (similarity, embodied, and wishful). We set α at 0.05.

RESULTS

To understand the effects of avatar identification on player experience, intrinsic motivation, and motivated behaviour, we formulated five research questions based on prior work. We present our results according to these five questions.

RQ1: Does avatar customization increase identification?

Our first research question was to check that our manipulation of customization was stimulating a range of identification values. First, we conducted a multivariate ANOVA on the three measures of identification, with customized avatar (n=58) or randomly-assigned avatar (n=68) as the between-groups factor. The slight group size differences are an artifact of random assignment; however, ANOVAs are robust to small group size differences for main effects [20]. We show that customizing the avatar increases similarity-identification ($F_{1,124}$=19.8, p<.001, η^2=.14), embodied-identification ($F_{1,124}$=9.41, p=.003, η^2=.07), and wishful-identification ($F_{1,124}$=7.03, p<.009, η^2=.05) over randomly assigning an avatar, suggesting that the customization process was effective at stimulating avatar identification, as suggested by previous work [24] (see Figure 4). Although there are significant group differences, Figure 4 shows how the differences are created from overlapping distributions of identification (as is expected of group differences [20]). As our interest is not in the results of customization, per se, but in identification (which could be facilitated using a range of methods), we use identification with the avatar as a continuous predictor of experience and motivation measures in the remaining research questions.

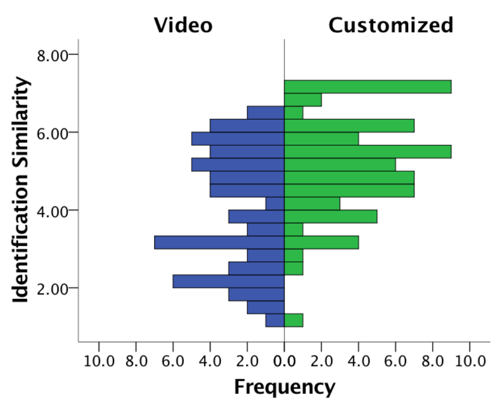

Figure 4. Mirrored Histograms for the Video Condition (left) and the Customized Avatar condition (right).

RQ2: Does avatar identification improve in-game needs satisfaction (i.e., competence, autonomy, relatedness, immersion, and intuitive control)?

The hierarchical regressions (described in the section on data analyses) showed that when controlling for age and gender, identification similarity significantly predicted autonomy and immersion, but not relatedness or competence (see Table 1). The same pattern was true for embodied identification and wishful identification. In addition, intuitive control was significantly predicted by similarity and embodied identification, but not wishful identification.

RQ3: Does avatar identification improve intrinsic motivation (i.e., enjoyment, effort, and reduced tension)?

The hierarchical regressions showed that when controlling for age and gender, identification similarity significantly predicted enjoyment and effort, but not tension (Table 1). The same was true for embodied and wishful identification.

RQ4: Does avatar identification increase positive affect or reduce negative affect?

The hierarchical regressions (Table 1) showed that when controlling for age and gender, identification similarity, embodied identification, and wishful identification all significantly predicted positive affect, but not negative affect.

RQ5: Does avatar identification translate into motivated behaviour (i.e., do players who identify with their avatar spend longer in the unending infinite runner?)

The hierarchical regressions showed that when controlling for age and gender, identification similarity, embodied identification, and wishful identification all predicted the motivated behaviour, which we operationalized as the time spent actively running in the endless infinite runner. Eight participants reached the 10-minute threshold; in these cases the experiment proceeded automatically.

Summary of Results

Our results showed that avatar customization stimulated identification with the avatar, which we then used as a predictor in a series of hierarchical regressions (controlling for age and gender). Greater identification predicted increases in autonomy, immersion, invested effort, enjoyment, and positive affect. We also show that greater identification translates into motivated behaviour as operationalized by the time spent in the endless infinite runner. Finally, we show that these relationships are true for the three constructs underlying identification: similarity to the avatar, a feeling of embodied presence within the avatar, and wishing that one could be more like the avatar.

With R^2-values between .07 and .22, the presented effects are considered as small; however, small effect sizes in games user research are not uncommon, because of the complex interaction between individual characteristics of the player and the game [8, 58, 69].

DISCUSSION

Although our avatar creation process is a pared-down version of the types of character creators seen in role-playing games, such as *World of Warcraft*, we still show differences in identification and subsequent experience and motivated behaviour. The identification that can be created in the lab can be considered as a poor copy of the deep identification with a character that happens when players engage with games through digital representations over the long term.

We assume that the observed motivational and emotional responses would increase if we could investigate identification of players with their longtime digital representations. However, our results suggest that a process as simple as avatar creation is a promising step towards a paradigm that allows us to facilitate identification.

Being intrinsically motivated to play a game has benefits for player experience; however, there are also potential economic and societal benefits. If identification in commercial games fostered intrinsic motivation, players may bemore likely to spend more time in the game and recommend the game to others. Taken together, these aspects are fundamental to a game company growing a customer base, which is highly relevant for success. In terms of the societal benefits, intrinsic motivation to play a game has relevance for games that are used in serious contexts.

Application in Serious Contexts

Although serious game companies also wish to grow their customer base, their goals for fostering intrinsic motivation may be different. Serious games often focus on motivating behaviour change or promoting learning [41]. For example, the persuasive health game *Escape from Diab* (Archimage, 2006) uses persuasive techniques to improve kids' eating behaviour, whereas *DragonBox* (WeWantToKnow AS, 2012) is designed to help kids learn algebra. These systems rely on repetitive use over longer terms to optimize results. Ryan at al. [53] argue that being self-determined – which leads to being intrinsically motivated – can improve the outcomes of health-related interventions, e.g., smoking

	Similarity Identifiction					Embodied Identification					Wishful Identification				
	β	*R^2*	*R^2 (c)*	*F (c)*	*p (c)*	*β*	*R^2*	*R^2 (c)*	*F (c)*	*p (c)*	*β*	*R^2*	*R^2 (c)*	*F (c)*	*p (c)*
	Player Experience of Need Satisfaction (PENS)														
Competence	0.15	0.09	0.02	2.74	0.10	0.12	0.08	0.02	2.04	0.16	0.02	0.07	0.00	0.07	0.79
Autonomy	0.18	0.07	0.03	4.13	**0.04**	0.29	0.12	0.08	11.50	**0.00**	0.23	0.09	0.05	7.27	**0.01**
Relatedness	0.05	0.03	0.00	0.25	0.62	0.10	0.19	0.01	1.17	0.28	0.05	0.03	0.00	0.37	0.55
Immersion	0.20	0.07	0.04	5.25	**0.02**	0.35	0.15	0.12	17.25	**0.00**	0.24	0.08	0.06	7.32	**0.01**
Intutive Control	0.22	0.21	0.04	6.83	**0.01**	0.23	0.22	0.05	8.46	**0.00**	0.08	0.17	0.01	0.98	0.33
	Intrinsic Motivation Inventory (IMI)														
Enjoyment	0.21	0.08	0.04	5.81	**0.02**	0.25	0.09	0.06	8.30	**0.01**	0.19	0.07	0.03	4.50	**0.04**
Effort	0.19	0.11	0.03	4.52	**0.04**	0.28	0.15	0.08	11.15	**0.00**	0.18	0.11	0.03	4.28	**0.04**
Tension	0.00	0.01	0.00	0.00	0.98	-0.03	0.09	0.00	0.12	0.73	0.01	0.01	0.00	0.02	0.90
	Positive Affect/Negative Affect Scale (PANAS)														
Postive Affect	0.28	0.15	0.07	10.64	**0.00**	0.30	0.17	0.09	13.32	**0.00**	0.21	0.12	0.04	5.94	**0.02**
Negative Affect	-0.04	0.02	0.00	0.18	0.67	0.05	0.14	0.00	0.31	0.58	0.06	0.02	0.00	0.47	0.50
	Behaviour														
Time Played	0.15	0.15	0.06	8.07	**0.00**	0.25	0.16	0.06	9.30	**0.00**	0.25	0.15	0.06	8.73	**0.00**

Table 1. Regression properties including β, R^2, change in R^2 from adding identification, F of change, and p of change for PENS, IMI, PANAS, and behaviour for the three identity constructs: Similarity Identification, Embodied Identification, and Wishful Identification. Variables displaying change statistics from adding identification in the second step of the model are marked with (c); significant results are displayed in bold.

cessation on or improved dental hygiene. Our results suggest that identification with the digital representation in a game facilitates intrinsic motivation, as evidenced by more enjoyment and invested effort. We saw this relationship in our subjective data, but also observed it in motivated behaviour – players spent more time interacting with the final phase of the game before pressing the quit button. In the context of games for learning or behaviour change, increased effort in play could translate into real change for players – a learner could better understand and retain information; a player of a smoking cessation game [31] could stop smoking sooner; a player of a digital therapy game [17] could better combat anxiety-related disorders. Serious game designers who wish to inspire invested effort may think about fostering identification with an avatar.

Interestingly, our results suggest facilitating any of the three identification types. Depending on the situation and goal, designers could choose to foster similarity, embodied identification, or wishful identification. For example, in a training game for cashiers who are learning to operate the registers at a large supermarket, fostering similarity might make more sense than nurturing embodied identification; whereas a persuasive game designed to help players reach a goal might use wishful identification. Regardless of how identification is cultivated, applying our results to the context of serious games suggests that increasing identification in a serious game may stimulate real change.

Motivating Crowdsourced Work
Facilitating intrinsic motivation through avatar identification is applicable beyond the context of games. Consider for example if we re-interpret our results in the context of us conducting an experiment on a crowdsourcing platform. We showed that workers invested more effort and experienced more enjoyment in their task when they identified with their avatar. The task itself was a game they played, but this was done as an assignment in a work context. Expanding on these results, it may be possible to provide workers with a stable and representative character that they identify with to increase motivation, productivity, and task enjoyment. Currently, the closest point of identification is the worker profile that stores information about previous task performance; MTurk workers respond very promptly to anything that threatens their profile, because a track record of good performance gives access to better tasks.

Blurring the Player-Avatar Relationship
Our work shows that similarity with the avatar yields benefits to motivation; however, the relationship between player and character can vary. Players can be very attached to their representation in a game or they can see the character simply as a means to achieve in-game goals [36]. The motivation to play likely varies accordingly: a player who feels attached to their character and experiences guilt if the character is neglected has a different motivation compared to a player who uses an avatar simply to get access to game content. The former player may provide their character with a backstory, enjoy inhabiting their character during play, and make choices in appearance and behaviour that are in line with the character's backstory, whereas the latter may simply make choices to beat the system. Our results suggest that identifying with an avatar could result in greater time investment, and also help players enjoy the game more. Even in a game like *World of Warcraft* – where the overall narrative and character development process facilitates identification – the identification of players with their avatars varies [36]. A range of identification in one game is of interest, and so is the variation of identification between games.

Identification with Minimal Representation
Compare, for example, *World of Warcraft* with a Multiplayer Online Battle Arena (MOBA) Game like *League of Legends* (LoL, Riot Games, 2009) or *Defense of the Ancients 2* (Dota 2, Valve, 2013); several differences in designing for identification emerge. *WoW* provides a complex system and environment that allows players to have distinct experiences for an individual character. *LoL* does not allow players to develop one distinct character – the game allows players, called summoners, to select one of over 125 champions to fight in a 5 on 5 team battle. Each champion has different advantages, disadvantages and synergies with other champions. While champions can be customized with items during a match, the customization is temporary and is reset after each game. Thus, unlike in *WoW*, the *LoL* summoner account does not have an affiliated avatar with a unique appearance and history. Customization can only be achieved by giving the account a name, through purchases of champions, different skins for champions, and of course through the performance of the summoner. Identity in MOBAs is a result of the player's performance – the ratio of won and lost games, the ratio of kills and deaths in the game, and other statistics define how a player is perceived and distinguish novices from professionals. While in both the cases of *WoW* and *LoL*, the key to economic success is identification, how this goal is achieved varies. *WoW* uses a digital representation as a proxy that allows players to indulge in the fantasy of the game, while MOBAs leverage a player's personal abilities to facilitate engagement with the game. How designers can foster identification with a profile that represents the player's own skill is an interesting problem that can be addressed through future work.

Identifying with Ideals or Groups
Our work focuses on identifying with an avatar; however, characters in games can represent more than their individual nature, by representing an ideal (e.g., the nameless hero who saves the world through their courage) or a segment of society (e.g., prostitutes in a car theft game) [21]. For example, Abe *(Oddworld: Abe's Oddysee,* GT Interactive, 1997), is a slave who discovers that his fellows are slaughtered and processed as meat. He stands up against the authorities and liberates as many of his fellows as possible. The game allows the player to identify with Abe as a hero, but also with Abe as a slave, a person who is exploited for the good of others and who tries to overcome a hopeless

situation. Fostering identification with an ideal - rather than with an avatar – may have similar benefits for motivation.

This idea of identification with a segment of society speaks to the potential of using membership within a group to facilitate identification. For example, in *World of Warcraft*, players choose either the side of the horde or the alliance; this choice gives access to different races with different histories, who are perceived differently in the world. Or consider the RTS game *StarCraft II* (Blizzard-Activision, 2010), in which players pick one of three races: Terran, exiled humans, known for their adaptability; the Zerg, a race that has advantages through mere numbers; or the Protoss, the most technologically advanced race. Each race has individual strengths and weaknesses. Player can identify with the race that they play often and are most skilled with.

Other games use a more dynamic approach to create a sense of group membership. *Fallout 3* (Bethesda, 2008), for example, uses a "Karma" system that keeps track of a player's good and wrong doings in the game world. "Good" and "Bad" players have similar advantages in the game, but other aspects of play can also change – for example, players in bad standing may purchase different weapons from a slaver than those in good standing ,who purchase from a normal merchant. Group membership could be less reflective of who a player is and more related to who they wish to be (ideal-self). For example, would a player like to be a splendid example of society, or maybe associate more with seedier elements of society and seek advantages through toeing moral lines? Allowing players to explore aspects of identity and allowing them to find the sweet spot of their moral integrity is an advantage of game worlds.

Limitations and Future Work

Our work shows that avatar identification facilitates intrinsic motivation and motivated behaviour. However, there are limitations that can be addressed through future work.

We facilitated avatar identification through a customization process. We offered the players ways of customizing the appearance of an avatar, but they did not have full control over the avatar's appearance. They could change the hair and clothes, but not, for example, the face or body. Allowing players to represent themselves completely could have fostered greater identification similarity. Future work should investigate how the range of options for avatar creation changes identification and resulting motivation in play.

Our game was played in the context of MTurk workers engaged in an experiment. Although our results showed differences in this context, investigating avatar identification in the context of volitional play would provide ecological validity. Because there is a fundamental mismatch between randomly assigning participants to experimental conditions, and simultaneously having them engage in play under their own volition, we plan to take our results from these controlled experiments and apply them to see whether they extend to games played under the user's volition.

We investigated identification with an avatar. Several successful games (e.g., Tetris) do not have an avatar with whom to identify. We have started investigating how to reap the motivational benefits of fostering identification in games that do not have traditional avatars.

Fostering intrinsic motivation through avatar identification has implications for the design of games for serious purposes. We suggest that avatar identification can be used to facilitate invested effort and enjoyment – in fact, our results show that not only were players feeling more invested (subjectively) but were also exhibiting more motivated behaviour when they identified more with their avatar. We plan to investigate whether our results extend into serious applications – for example, by helping players invest in the process of learning a language, playing a therapeutic game, or changing behaviour through gameplay.

CONCLUSION

The goal of our work was to determine whether identification with an avatar could increase intrinsic motivation in a game. We first show that avatar customization stimulates identification with the avatar. In terms of game experience, we used hierarchical regressions with the three types of identification (similar, embodied, wishful) as individual continuous predictors, and showed that greater identification increased experienced autonomy, immersion, invested effort, enjoyment, and positive affect. Interesting for the design of engaging game experiences, we discuss how we can leverage the ways in which commercial games facilitate identification.

In addition to affecting their subjective experience, we also show that greater identification translates into motivated behaviour as operationalized by the time spent in an unending infinite runner at the end of the experiment. Our results show that greater investment in a task through an objective measure of behaviour has implications for the design of games for serious purposes, whether that be to persuade, teach, or help players change their behaviour.

Finally, we show that these relationships are true for each of the three types of identification, which gives designers a range of options for facilitating identification – by increasing feelings of similarity, improving the sense of embodiment within the avatar, or cultivating wishful identification with an avatar who represents the player's aspirations.

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