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PLAYER-AVATAR IDENTIFICATION IN VIDEO GAMING: CONCEPT AND MEASUREMENT

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Abstract

This paper aims to develop an instrument to measure Player-Avatar Identification (PAI) in video game playing. Survey studies were conducted with over 1000 students in Singapore primary and secondary schools. The results of the studies demonstrated that PAI can be conceptualized and reliably measured in terms of four factors – feelings during play, absorption during play, positive attitudes toward the game avatar and importance of the avatar to one's self identity. The four-factor model showed acceptable model data fit and satisfactory reliability and validity. The construct validity was supported by the relationship between PAI and identity style. The result suggested that students with diffused identity style reported significant higher scores on absorption and importance to identity. The usefulness of the concept and the scale was discussed in relation to behavioral and developmental implications.

Author Keywords

Identification, identity, video game, player avatar relationship, measurement

1. Introduction

As video games become more popular among children and adolescents, there is growing concern that identifying with game avatars may influence the development of self-concept and identity (Klimmt, Hefner, Vorderer, Roth, & Blake, 2010). However, the definition of identification with media characters was usually vague and varied in content from one study to another (Konijn & Hoorn, 2005). There are studies which used identification to represent concepts such as empathy or imitation (Olds, 2006). There are also studies that classify identification into specific categories. For example, Von Feilitzen & Linne (1975) distinguished between wishful identification (the desires to become a character) and similarity identification (shared salient traits with the character). As the definition of identification is not well established, the measurement of identification also varied to a great extent in different studies.

Building upon a comprehensive review of the literature, Cohen (2001) presented a theoretical discussion on the concept of identification with media characters and its consequences on identity development. He also proposed ten items to measure identification with media characters. However, no empirical studies were carried out to validate these items. This paper is thus an attempt to expand on Cohen's conceptualization and apply it to video game context. The concept of Player-Avatar

Identification (PAI) in video gaming is discussed following Cohen's theory; a measure of PAI is then developed and validated using a sample of adolescent game players.

1.1 *Concept of Identification*

The term "identification" was first used by Freud and later other psychoanalysts to explain the process of personality formation through taking the role of the other (Freud, 1938, 1962). Previous definitions of identification with media characters usually followed the vicarious role-taking perspective. For example, in an early study on identification with film characters, Maccoby and Wilson (1957) defined the process as "the viewer, in fantasy, puts himself in the place of a character and momentarily feels that what is happening to that character is happening to himself" (p. 76). Similarly, Livingstone (1998) described identification with TV characters as imagining being in someone else's shoes and seeing the world through his or her eyes.

Cohen (2001) articulated a conceptualization of identification with media characters based on a review of past research. According to this definition, identification is a process that involves perception toward the character, adopts goals of the character, and consists of "increasing loss of self-awareness and its temporary replacement with heightened emotional and cognitive connections with a character" (p.251). He suggested that identification could be measured in four dimensions. The first is empathy or sharing

the feelings of the character, such as "when character X succeeded I felt joy, but when he or she failed, I was sad". The second is sharing the perspectives of the character and understanding the character emotionally as well as cognitively, such as "I felt I knew exactly what the character X was going through". The third component assessed the degree to which the audience member internalized and shared the goals of the character, for example, "I tend to understand the reasons why character X does what he or she does". The fourth component was absorption or the degree to which self-awareness is lost during exposure to media, for example, "while viewing program X, I forgot myself and was fully absorbed".

However, the difference between video games and the traditional media must be noted before applying Cohen's theory in video game research. For one thing, the audience and the media are two different social entities in the traditional media, but the boundary is vague in video games (Klimmt, et al., 2010). Video games with avatars provide higher levels of interactivity, selectivity and personalization (Bryant & Love, 1996). When the avatar encounters a situation, socializes, achieves or fails, it is the player behind the avatar who is making the move and experiencing the emotions attached. In such cases, sharing the game avatars' perspective and goals (the second and

third dimension in Cohen's definition) may not apply[1]. It is also logical to assume that the player will experience certain emotions and get absorbed while taking action in the game world. In a recent study on human brain process about identification with game avatars, Ganesh and colleagues (2011) also used "emotional involvement" to represent feelings and absorption as the essential features of PAI. What matters in this case, is the extent of feelings and absorption the player experiences. Therefore, PAI may be measured in the following two dimensions following Cohen's theory (1) feelings during play and (2) absorption during play. These two dimensions define identification as emotional and cognitive connections between the player and the avatar (Cohen, 2001).

Another important component in the definition of identification, especially when applying to video games, is merged identity. According to Cohen (2001), identification involves the merging of self and other, and repetitive internalization of alternative identities of media characters which are powerful and seductive. In video game studies,

[1] There are different types of avatars found in videogames. The term Avatar was derived from the Sanskrit word avatara, meaning "descent" (Sheth, 2002). Since 1980s, the term was adopted by one of the first multi-player online virtual environment: Habitat (Morningstar & Farmer, 2008). This game used "avatar" to refer to the animated figures of players, which are usually humanoid in appearance. Game players could control the avatar to "move around, pick up, put down and manipulate objects, talk to each other, and gesture" (p.3). In this article, we focus more on the type of avatars found in role playing games described by Kromand (2007) as "central-open" avatars rather than avatars with scripted roles.

researchers have also started to include merged identity in defining PAI. Steen, Greenfield, Davies and Tynes (2006) utilized a concept of identification-as-simulation along the lines of Oatley (1994). In both studies, the player treats the avatar as if it were himself/herself in certain ways. Klimmt, Hefner and Vorderer (2009; 2010) also emphasized the importance of self-concept and identity in defining PAI as a merger of players' self-concept with perceived attributes of the target avatar. They argue that the users adopt (parts of) the identity of the target avatar for the moment of game exposure. As the changes of the players' self-concept may occur without conscious awareness, the identification process might not be measurable by survey or interview method. Instead, the Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998) was used to assess the cognitive associations between avatar-related concepts and the players' self-concept.

In line with studies on wishful identification, identification is believed to occur because an individual desires to incorporate positive traits of the identified into one's self-concept (Reinhard, 2005). People often wishfully identity with media characters who are more successful, more popular, or in other ways rewarding or positive (Hoffner, 1996; Hoffner & Buchanan, 2005; von Feilitzen & Linné, 1975). According to Klimmt, Hefner and Vorderer (2009), game players perceive themselves as more courageous,

heroic, and powerful during identification with a soldier avatar. Informed by these studies, we propose that PAI as self-defining process could also be measured from emotional and cognitive dimensions. First, a player who identifies with his or her avatar should have positive emotions and positive evaluations toward the avatar. Second, a player who identifies with his or her avatar should cognitively recognize the importance of the avatar to the real-life self-concept. In other words, identification occurs when a player accepts and values some aspects of the in-game self (positive attitudes toward avatar) and perceives those aspects as important parts of his or her own real-self (importance to identity).

1.2 *PAI and identity style*

Hence, we would like to expand on Cohen's conceptualization of identification and hypothesize a construct of PAI that involves four components: feelings during play, absorption during play, positive attitudes toward avatar, and importance of the avatar to one's self identity. In other words, PAI in this study is defined as the status when a player is absorbed in video games with heightened feelings and adopts certain aspects of the in-game identity both emotionally and cognitively. Based on this definition, we expect that PAI would influence adolescents' identity development.

An adolescent may build his or her identity through identifying with media characters (Cohen, 2001; McCall & Simmons, 1978). Similarly, young players of video games who are in the diffusion identity status may also explore different identities by identifying with game avatars. Past research has also shown that individuals with diffused identity style tend to employ avoidant-oriented coping strategies, such as wishful thinking (Berzonsky, 1992). Thus, they may be more likely to use video games as "identity workshops" (Turkle, 1994, 2005). It is thus hypothesized that students with diffused identity style will report higher scores of PAI.

1.3 *The Current Study*

Based on the above conceptual definition, two studies were conducted to develop and evaluate an instrument to measure PAI. Items were developed and tested following the procedures of measurement theory validation (Hair, Black, Babin, Anderson, & Tatham, 2006) using both exploratory (EFA) and confirmatory factor analysis (CFA). Besides convergent and discriminant validity, the criterion validity of the scale was also tested between PAI and identity style.

Paper and pencil surveys were conducted in classrooms with the help of school teachers. Informed consent was sought from the parents through the schools. Students whose parents did not give their consent were excluded from the study. The participants

were informed that the study was voluntary and their responses would be read only by the researchers. Confidentiality was assured as the teachers were required to seal collected questionnaires in the envelopes in the presence of the students to insure the privacy of the students' responses. The data was drawn from a larger scale study. Due to the length of the questionnaire, it was administered in four different orders over a period of four days. The order of these questionnaires was counterbalanced so that they wouldn't be done in the same sequence in the same day for different classes. The length and time needed to complete each set was also considered. Besides, the four sets of questionnaires were printed on four coloured papers for each day to facilitate ease of data collection.

Similar to other computer-related behavior, video gaming is known to be a gendered phenomenon (Whitley, 1997). Past studies have shown that adolescent boys usually played more often than girls (Griffiths & Hunt, 1995; Lucas & Sherry, 2004; Phillips, Rolls, Rouse, & Griffiths, 1995). However, there is little research on gender differences in identification with game avatars. Several recent studies either used only male participants or did not consider gender effects (Ganesh, et al., 2011; Klimmt, et al., 2010; Van Looy, Courtois, & De Vocht, 2010). To add to the literature, we conducted a group invariance test between boys and girls in this study. In summary, the main

objectives of the study were to develop an instrument to measure PAI, and to evaluate its validity with adolescent gamers and to test the group invariance between genders.

2 Pilot Study

The purpose of the pilot study was to develop and select a list of potential items for the Player-Avatar Identification Scale (PAIS) that corresponds to the definition of each of the four components of our hypothesized construct: feelings during play, absorption during play, positive attitudes toward avatar, and importance to identity. The Scale was preceded by the following instructions: Think about your favorite game and game character. Read each sentence carefully and choose the answer that best describes you when you are playing video games such as: Maple Story, World of Warcraft, EverQuest, and The Sims.

A total of 42 items were revised or drafted based on previous studies (Cohen, 2001; Hefner, Klimmt, & Vorderer, 2007; Luhtanen & Crocker, 1992). These items were tested with 150 secondary school video game players. Revisions were made to the items based on the feedback from the student gamers as well as a preliminary exploratory factor analysis. Items that did not load well to their designed theoretical factors were deleted.

Some items were revised in wording to reduce confusion. A finalized set of 23 items were selected for the main study (Appendix).

3 Main study

The purpose of the main study was to further reduce the length of PAIS using EFA and to validate the factor structure using CFA. Besides convergent and discriminant validity, the criterion validity of the scale was also tested between PAI and identity style.

3.1 Sample

A total of 1263 students from Singapore primary and secondary schools participated in this study, out of which 935 self-identified gamers completed PAIS[2]. This sample is randomly split into two equal subsamples for exploratory (EFA) and confirmatory factor analysis (CFA) separately. The EFA subsample included 450 students with a mean age of 12.58 (SD = 2.11). This sample consists of 72.2% males, 76.2% Chinese, 11.3% Malay and 9.6% Indian. They spent on average 22.12 hours (SD= 20.22) per week on gaming. The CFA subsample included 485 students with a mean age of 12.55 (SD = 2.28). This sample consists of 74.8% males, 73.8% Chinese, 10.7%

[2] The gender distribution did not differ (70.9% for the whole sample and 73.6% for the self-selected gamers, χ^2 (1) = 2, p = n. s.). For sections on game-related questions, the instruction for students was "if you do not play any games, please check here___& leave this page blank". As PAIS focuses on role-playing games such as Maple Story, we also provided a "Not Applicable" option for each item. Those students who checked "N.A" were not included in the analysis for PAIS.

Malay and 9.1% Indian. They spent on average 22.27 hours (SD = 21.88) per week on gaming.

3.2 *Instrument*

Player-Avatar Identification Scale (PAIS). A total of 23 items were tested in the main study. Students responded on a 5-point Likert scale with 1= "strongly disagree", 2= "disagree", 3= "neither agree nor disagree", 4= "agree" and 5= "strongly agree". The students were reminded to answer the questions based on video games such as: Maple Story, World of Warcraft, EverQuest, and The Sims.

Identity Style Inventory. 40 items of the Identity Style Inventory with simplified language for children was used in the study (White, Wampler, & Winn, 1998). The inventory measures three different ways individuals construct or maintain their sense of identity. Individuals with information-oriented identity style engage in high levels of exploration and correspond to either a moratorium or achieved identity status. Individuals with normative identity style are those with a foreclosed identity status, who conform to authorities or significant others. Individuals with diffuse/avoidance style tend to procrastinate and avoid dealing with personal issues, who are usually in the diffusion identity status. Students responded each item on a 5-point scale from strongly disagree to strongly agree.

3.3 *Results*

3.3.1 EFA

An exploratory factor analysis was conducted using SPSS 19 with an oblique promax rotation. The Kaiser-Meyer-Olkin measure of sampling adequacy index was .91, and Bartlett's test of sphericity was significant, χ^2 (253, N = 450) = 4397.17, p < .01, which indicated that the data were appropriate for factor analysis. An initial solution with five factors explained 60.98% of variance. The result showed that most items loaded as expected with several exceptions of cross loadings. Items were thus selected based on the following criteria: (1) face validity; (2) satisfactory factor loadings (>0.6), communality (>0.5) and diagonal value of the anti-image matrices (>0.7); (3) no substantial cross-loading; (4) variance explained (>60%). The final solution included 15 items with four factors explaining 61.67% of variance (Table 1).

----------Insert Table 1 here----------

3.3.2 CFA

A confirmatory factor analysis using maximum likelihood estimation was conducted with AMOS16. Three competing models were also tested in the CFA analysis, including (a) 1-factor (b) 3-factor and (c) 4-factor second order. The competing 1-factor

model has all 15 items loading on a single factor of identification. The competing 3-factor model was obtained by collapsing importance to identity and positive attitudes toward avatar as one merged identity factor. The 1-factor and 2-factor models represented more parsimonious factorial solutions. The last competing model has the four first-order factors subordinate to a single second-order factor.

Multiple indices were examined to compare the different models, and to determine whether the models had a reasonable fit to the data (Table 2). The χ^2 values, the root mean square error of approximation (RMSEA), the standardized root mean square (SRMR), the comparative fit index (CLI) and the Tucker-Lewis index (TLI) were used for model selection (Hu & Bentler, 1999). For the hypothesized 4-factor model, all values satisfied the recommended level of acceptable fit. In comparison, the model fit was poorer for the competing models except for the 4-factor second order model. The similar fit for the 4-factor model and the 4-factor second order model suggests that while identification is multidimensional, it can still be seen as one general construct.

----------Insert Table 2 here----------

The validity was assessed for the hypothesized 4-factor model. As shown in table 3, all the standardized loadings are between 0.59 and 0.79. Construct reliabilities are

between 0.68 and 0.84. Using the criteria suggested by Hair et al. (2006), these measures support the convergent validity of the model. Table 4 shows the correlation matrix for the constructs. The diagonal elements have been replaced by the square roots of the average variance extracted. For discriminant validity to be judged adequate, the diagonal values should be greater than the off-diagonal values in the corresponding rows and columns. Discriminant validity appears satisfactory for the model. It indicates that each construct shares more variance with its items than it does with the other constructs. Based on the above analysis, the four-factor model representing different aspects of PAI including feeling during play, absorption during play, positive attitudes toward avatar and importance to identity, showed acceptable model data fit, convergent and discriminant validity.

----------Insert Table 3 here----------

----------Insert Table 4 here----------

3.3.3 Group invariance

After the best fitting four-factor model was established, group invariance was tested by gender using the whole sample. Four increasingly restrictive models were tested, with each retaining the equality constraints of the preceding model (Table 5).

Group invariance in factor patterns and factor loadings was supported by acceptable model fit index and a non-significant chi-square difference test between Model 1 and Model 0. Model 2 with constant measurement intercepts was not supported.

----------Insert Table 5 here----------

3.3.4 Criterion validity

3.3.4.1 Identification and identity style

One-way MANOVA was conducted to determine the effects of identity style on the four dimensions of PAI. Significant differences were found among the three groups of identity style, Wilks' $\Lambda = .96$, $F(8, 1750) = 4.10$, $p < .01$, partial $\eta^2 = .02$. Table 5 contains the means and the standard deviations on the dependent variables for the three groups.

----------Insert Table 6 here----------

Using the Bonferroni method, between-subjects effects were tested at the $p = .017$ level for each dependent variable. The effect of identity style on positive attitudes toward avatar and feelings during play was non-significant. On the other hand, the effect on importance to identity ($F(2,878) = 5.12$, $p < .01$, partial $\eta^2 = .01$) and on absorption ($F(2,878) = 10.22$, $p < .01$, partial $\eta^2 = .02$) were significant. Post hoc analysis revealed that

students with diffused identity style reported significant higher scores on importance to identity as well as absorption compared to the other two groups.

4 Discussion

The results of the present studies demonstrated that PAI can be conceptualized and reliably measured in terms of four factors: feelings during play, absorption during play, positive attitudes toward avatar and importance to identity. The four-factor correlated model as well as the second-order model accounted for the data better than the competing one-dimensional or three-dimensional model. The four-factor model showed acceptable model data fit, satisfactory construct reliability, convergent and discriminant validity. Tests of invariance showed that factor patterns and loadings were invariant between genders. The construct validity was supported by the relationship between PAI, and identity style. The result suggested that students with diffused identity style reported significant higher scores on absorption and importance to identity compared to the other two identity style groups.

The inclusion of feelings and absorption to define identification has surfaced repeatedly in the literature (Bandura & Huston, 1961; Cohen, 2001; Hoffner & Buchanan, 2005; Kagan, 1958). Similarly, these two constructs also formed important

parts in defining PAI. A recent brain research has shown that the intense emotional involvement with avatar resembles the level of intimacy one experiences when interacting with a close other (Ganesh, et al., 2011). Coulson and colleagues (2012) found that virtual characters may be liked and even loved by the real people with whom they interact. These finding partly addresses the debate about whether player could have empathic feelings toward one's own avatar. It thus provides support to the inclusion of feelings and absorption to define PAI in this study.

However, future research is still needed to understand the effects of feelings and absorption. The above mentioned brain study only examined PAI from a third-person visual perspective. Past research indicated that empathic feelings often result from deep involvement and shared perspective (Coke, Batson, & McDavis, 1978). It may lead to a person "respond to the behavior of other people or objects by initiating in fantasy or reality the same behavior himself" (Sanford, 1955, p. 109). Hence, future studies could explore the effects of feelings and absorption comparing games played from different visual perspectives. For example, are there any differences between players' level of feelings and absorption when they are playing a first-person or third-person shooting game?

The inclusion of positive attitudes toward avatar and importance to identity was the major contribution of this study. Video game players usually spent months or even years to develop his/her avatar. The continuous absorption in the game world may increase the salience of a gamer identity. Social identity theory and the related self-categorization theory posit that an increase in identity salience leads to an increase in identification with that identity (Hitlin, 2003; Tajfel, 2010). It is especially true when game players collaborate with others in their "clans" or "guilds" and undertake competitive group quests for years. Therefore, PAI may not be just a temporary shift of gamers' self-perception. It may have a long term effect on the players' self-concept and identity development. Hence, the two subscales could provide valuable tools for such studies on the relationship between identification, self-perception and identity development.

Given that the long-term effect of PAI is possible, the discrepancy-reduction model of gaming (Li, Liau, & Khoo, 2011) could be further examined. In this model, players are motivated to escape into games because of a narrowed gap between one's actual self and ideal self during play. The model provided some empirical support for identification and enjoyment theory (Klimmt, et al., 2009; Klimmt, et al., 2010). This theory posits that identification is enjoyable for game players due to the reason that

altered self-perceptions during game exposure reduce self-discrepancies. With a salient gamer identity in mind, the discrepancy-reduction hypothesis could be further tested for both short term as well as long term consequences. For example, is identification causing only "myopia effect" of distorted self-perception similar to alcohol abuse? Will the players experience discomfort or lower self-esteem due to a clear perception of self in "sober" after gaming? Is the change of self-perception sustainable and thus affects their identity development for adolescents?

In this study, the concept of PAI was mainly established from a developmental perspective (Erickson, 1968). In this view, identification is the "cognitive or behavioral activities that serve to establish, maintain, clarify, or modify identities" (Schlenker, 1985, p. 66). Thus, the relationship between PAI and identity style provided supports to the concept of identification from an identity-formation perspective. Another recent study also showed support on the relationship between PAI and identity. Park and Lee (2011) found that player-avatar identification positively affected the intention to purchase game items. As a player internalized the emotions, values and identity of his/her avatar, the player would be more likely to purchase game items to increase the avatars' appearance and competence in order to maintain and enhance that identity. Future studies could thus

examine the effects of PAI and its relationship with identity development using the PAI scale.

On the other hand, the validity of an identification measure can be examined using the cognitive and behavioral framework. In this view, identification is seen as a process of "vicarious learning" or "observational learning" (Maccoby & Wilson, 1957). Following Bandura's theory (1969) , the game player could pattern his/her avatars' actions through this active identificatory process and have resultant behaviors in real-life. For example, a player' who identifies with his/her avatar with leadership skills might show more leadership behaviors in real life (Barnett & Coulson, 2010). Yee and his colleagues (2007), on the other hand, found that a player when given an attractive avatar behaved more confident and sociable independent of how others perceive them. As the interactions between media and real-life behaviors are often complex, future studies could thus explore whether players would identify more with attractive avatars, and whether such Proteus Effect still exist when a player is identified with the avatar.

One of the limitations of the study is that the PAI scale was not compared with other identification scales, for example, the Player Identification Scale (Van Looy, et al., 2010). In this scale, a total of 28 items measures identification in three dimensions, including avatar identification, group identification and game identification. The avatar

identification was further measured in three dimensions of wishful identification, similarity identification and embodied presence. Their result showed that identification was a strong predictor of gaming motivation, empathy and Proteus effect. As the two measures define identification from different perspectives, a comparison between the two could provide more insights about the concept of PAI. Another limitation of this study was that gamers were defined by a single-item question. Future studies could use a more nuanced approach such as the quantitative criteria used by Potosky and Bobko (1998). Also, the influence of fantasy or imaginary companions (Taylor, Carlson, Maring, Gerow, & Charley, 2004) was not taken into account in the current study, and future research can examine their roles in the player-avatar identification process.

In conclusion, this paper presents a preliminary step in validating the PAI Scale. The findings of this study suggested that the scale can be a useful tool for future research. Adolescence is a crucial period for the formation of identity. Video games provide opportunities for adolescents to develop their identity within the game world. They could create different virtual selves with different appearances; they could interact with different people in different worlds; they could also experiment with or explore self-aspects that are potentially undesirable in real life (Kernis & Goldman, 2003). Hence,

utilizing this new scale, future research can examine the role of PAI on the impact of playing video games on children and adolescents.

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Table

Table 1

Communalities, Rotated factor pattern matrices for 15 items of PAI

		FL	AB	PA	ID	h^2
FL1	When my character is facing danger in the game, I feel nervous.	.89				.65
FL2	I feel the same disappointment when my character experiences a failure in the game.	.71				.57
FL3	When my character achieves his/her goals, I feel happy.	.72				.63
FL4	I feel the same joy my character experiences when a task is accomplished.	.62				.51
AB1	I have forgotten my surroundings during the game.		83			.65
AB2	I have forgotten myself during the game.		.81			.68
AB3	I feel as if I am physically in the game world during the game.		.67			.65
PA1	I never regret that I play my game character.			.81		.59
PA2	I am proud to play the character I am playing now.			.79		.59
PA3	Other gamers are happy to be friends with my game character.			.71		.58
PA4	My co-gamers have high respect for my character.			.66		.58
ID1	The characters I play reflect who I am.				.91	.69
ID2	My character and I are one and the same.				.84	.70
ID3	The characters I play influence the way I feel about myself.				.75	.55
ID4	The characters I play are important to my sense of what kind of a person I am.				.67	.66
Percent of variance explained		10.81	7.29	8.54	35.04	

Note: FL: Feelings during play; AB: Absorption during play; PA: Positive attitudes toward avatar; ID: importance to identity.

Coefficients with values of .40 or less are not shown.

Table 2:

Summary of Fit Indices from Confirmatory Factor Analyses

Model	χ^2	df	χ2/df	CFI	TLI	RMSEA	SRMR
Hypothesized 4-factor Oblique	248.59*	84	2.96	.93	.91	.06	.05
Competing 1-factor	784.31*	90	8.67	.70	.65	.13	.09
Competing 3-factor	444.71*	87	5.11	.84	.81	.09	.07
Competing 4-factor Second Order	261.17*	86	3.04	.92	.91	.07	.05

* $p < .01$

Table 3:

Convergent validity

	FL	*AB*	*PA*	*ID*
FL1	.61			
FL2	.69			
FL3	.63			
FL4	.63			
AB1		.62		
AB2		.68		
AB3		.79		
PA1			.59	
PA2			.65	
PA3			.65	
PA4			.66	
ID1				.75
ID2				.79
ID3				.68
ID4				.72
Construct reliability	.68	.70	.78	.84

Note: FL: Feelings during play; AB: Absorption during play; PA: Positive attitudes toward avatar; ID: importance to identity.

Table 4:

Discriminant validity

	FL	*AB*	*PA*	*ID*
FL	.64			
AB	.44	.69		
PA	.52	.36	.64	
ID	.55	.65	.58	.74

Note: FL: Feelings during play; AB: Absorption during play; PA: Positive attitudes toward avatar; ID: importance to identity.

Table 5

Tests of Invariance by gender

Model	Specification	χ^2	df	$\chi 2/df$	CFI	TLI	RMSEA	$\triangle\chi^2$	$\triangle df$
Model 0	No equality constraints; Factor patterns are constant	462.76**	158	2.93	.93	.91	.05		
Model 1	Model 0 & Factor loadings are constant	480.91**	169	2.85	.93	.91	.04	18.15	11
Model 2	Model 1 & Intercepts of the measured variables are constant	521.13**	184	2.83	.92	.91	.04	58.36**	26
Model 3	Model 2 & Residual variances of the measured variable as well as the covariance of the latent variables are constant	597.17**	209	2.86	.91	.91	.05	134.41**	51

** $p<.01$, *$p<.05$

Table 6:

Descriptive of identification and identity style

	Identity style	Mean	SD	N
FL	Information	3.30	0.89	231
	Normative	3.36	1.00	249
	Diffused	3.37	0.85	401
	Total	3.35	0.91	881
AB	Information	2.50	0.91	231
	Normative	2.62	0.98	249
	Diffused	2.84	0.94	401
	Total	2.69	0.96	881
PA	Information	3.55	0.80	231
	Normative	3.59	0.81	249
	Diffused	3.52	0.77	401
	Total	3.55	0.79	881
ID	Information	2.76	0.96	231
	Normative	2.77	0.94	249
	Diffused	2.97	0.89	401
	Total	2.86	0.93	881

Note: FL: Feelings during play; AB: Absorption during play; PA: Positive attitudes toward avatar; ID: importance to identity.

Appendix: 23 items of PAI used in the main study

FL1	When my character is facing danger in the game, I feel nervous.
FL2	I feel the same disappointment when my character experiences a failure in the game.
FL3	When my character achieves his/her goals, I feel happy.
FL4	I feel the same joy my character experiences when a task is accomplished.
FL5	When my character was respected with other gamers, I feel proud.
FL6	When my character was treated unfairly in the game, I feel angry.
FL7	When my character was laughed at for low level or poor equipment, I feel upset.
FL8	I feel the same excitement my character experiences when succeeding in a difficult quest.
AB1	I have forgotten my surroundings during the game.
AB2	I have forgotten myself during the game.
AB3	I feel as if I am physically in the game world during the game.
AB4	The problems I face are the same problems that my character faces.
PA1	I never regret that I play my game character.
PA2	I am proud to play the character I am playing now.
PA3	Other gamers are happy to be friends with my game character.
PA4	My co-gamers have high respect for my character.
PA5	It is worthy to play my character.
PA6	My co-gamers like the character I play.
PA7	My co-gamers consider my character to be attractive.
ID1	The characters I play reflect who I am.
ID2	My character and I are one and the same.
ID3	The characters I play influence the way I feel about myself.
ID4	The characters I play are important to my sense of what kind of a person I am.

Note: FL1 to FL8, drafted and adapted from Cohen (2001).
AB1 to AB4, drafted and adapted from Cohen (2001) and Hefner et al. (2007).
PA1 to ID4 drafted and adapted from Luhtanen and Crocker (1992).