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Tourism, Migration, and the Exodus to Virtual Worlds: Place Attachment in Massively Multiplayer Online Gamers.

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Abstract

Place attachment to both physical and virtual places was investigated in an online survey of massively multiplayer online gamers. Participants (N=740) completed a place attachment inventory once for the place in the physical world which they considered home, and once for a place in a virtual world they felt attached to. In addition, measures of personality, gaming motivation, life satisfaction, attachment style, and identification with online avatars were taken. Results suggested that place identity, place uniqueness, and place social bonding were higher for physical places than for virtual places, but that place affect was higher for virtual places. A small number of participants (N=55, 7%) identified virtual 'homes', which participants felt were more special and which they identified more strongly with than other virtual places, and that were as unique and associated with an equal sense of belonging to physical homes. Results are interpreted through the lens of migration theory, and recommendations made for future research into digital domiciles and migration.

Keywords: Place attachment; Migration; Online and offline; Virtual home.

Public significance statement: This study suggests that people's feelings of attachment to their places of residence are similar for physical homes as for places in virtual online worlds. The movement between physical and virtual homes is a form of migration, albeit one which is easily reversible, and which operates on small timescales. We discuss the implications of this for how people choose to allocate their time between physical and virtual worlds.

Recent estimates suggest that people are spending a lot of time in virtual worlds. While there are at least two broad categories of virtual world, gaming worlds and non-gaming worlds, and many specific exemplars within each category, all are places where people choose to spend time. Large scale surveys have suggested averages of around 18 hours per week for non-gaming worlds (Pearce, Blackburn, & Symborski, 2015), and 23 hours per week for gaming worlds (Cole & Griffiths, 2007). Although this represents a significant amount of time, it is notably less than the amount of time spent watching TV, which in the US is around 33 hours per week (The Nielsen Company, 2018).

There is a myriad of reasons for spending time in virtual worlds, principally because these worlds are constructed (whether by designers or the inhabitants of the world itself) to be attractive and appealing. These appeals are not just aesthetic, as they permit inhabitants to satisfy their needs for self-determination (Ryan, Rigby, & Przybylski, 2006). Consequently, we are experiencing, and look set to continue to experience, what Castronova called the 'Exodus to the virtual world' (Castronova, 2007) as individuals chose to spend significant proportions of their time in virtual as opposed to physical places.

To understand this exodus, it is important to consider the forces which operate in determining whether, and when a person decides to move from one place to another. Migration theory (Bogue, 1969; Bogue, 1977) offers a framework within which the decision to move between any two places, including physical and virtual worlds, can be understood. *Push* migratory factors include local decline, catastrophe, loss of employment and a reduction in future prospects, while *pull* factors largely represent the converse of these. While useful as an explanatory framework, the push-pull model is largely environmentally and situationally (as opposed to psychologically) defined, and as such has difficulties explaining why everyone in a particular place does not up and move when the pushes and pulls are sufficiently strong. Despite the existence of some large-scale migrations, most countries do not experience massive rates of migration, and only 3.4% of the world's population are migrants (United Nations, 2017). As a consequence, modifications to push-pull theory have included the psychological notion of *moorings* (Moon, 1995), which are forces that tend to keep people in the same place. Such forces include current employment and education, social networks, financial and caring

responsibilities, and the psychological sense of belonging, particularly when this is associated with close familial ties (Boneva & Frieze, 2001).

Migrating to a virtual world might seem quite different from the process of physical migration. The costs of moving to a virtual world are minimal and the decision is easily reversed, two things which are decidedly not the case with physical migration. However, recent developments in migration theory suggest there is no principled difference between *static* migration, where the move is unidirectional and/or the costs of returning to the original home are high, and *dynamic* migration, where costs are much lower (Bodvarsson, Simpson, & Sparber, 2015). Migratory forces (push, pull, and mooring) have been used to understand how individuals decide to leave one virtual world for another (Hou, Chern, Chen, & Chen, 2011), and can be directly applied to the decision about how to allocate resources between the physical and the virtual world. As the fidelity and complexity of virtual worlds increases, these resources are likely to expand beyond the amount of time people spend online, and will increasingly involve financial, social and emotional choices. It is therefore important to understand how this exodus operates, as dynamic migration between the physical and the virtual world increasingly becomes the norm for many people. What is more, while dynamic migration in the physical world is subject to the interaction of push, pull and mooring forces, we hypothesise that by dint of their somewhat addictive nature (Barnett & Coulson, 2010; Blinka & Mikuška, 2014; Stavropoulos, Kuss, Griffiths, Wilson, & Motti-Stefanidi, 2017), virtual worlds present very little in terms of push factors, and the decision to migrate back to the physical world may therefore depend far more on the balance of physical pull and virtual mooring.

One specific mooring, addressed in the current study, is the concept of *place attachment* (Gerson, Stueve, & Fischer, 1977; Kyle, Graefe, & Manning, 2005; Lewicka, 2011; Williams & Roggenbuck, 1989; Williams & Vaske, 2003). Place attachment is the collection of beliefs, feelings and attitudes which bind people to specific places, whether homes, birthplaces, or favourite locations. It is associated with a sense of community (Gurney et al., 2017), the willingness to migrate (Gustafson, 2009), pro-environmental behaviour (Ramkissoon, Graham Smith, & Weiler, 2013) and wellbeing in older age (Wiles et al., 2009). Recent research suggests it is a central concept in attempts to understand the complex relationships between people and places (Buonincontri, Marasco, &

Ramkissoon, 2017; Jiang, Ramkissoon, Mavondo, & Feng, 2017; Ramkissoon, Mavondo, & Uysal, 2018). Place attachment is typically seen as a multidimensional construct, with general agreement on the two factors of *place identity* (the degree to which the place forms part of one's identity) and *place dependence* (how unique or special the place is; we adopt the less ambiguous term 'place uniqueness';Williams & Vaske, 2003). Scholars have also suggested *social bonding* (the degree to which places are used to further social needs; Kyle, Graefe, & Manning, 2005), and *place affect* (feelings of belonging and meaning; Ramkissoon, Graham Smith, & Weiler, 2013) as additional factors. While there is evidence that place attachment factors are correlated (Kyle et al., 2005), leading some to suggest they cluster under a single second-order place attachment factor (Ramkissoon et al., 2013), they retain some specific utility in their own right.

To date, little is known about place attachment to virtual worlds and how this compares with place attachment to the physical world. Clearly, an understanding of how and why people choose to stay in virtual worlds contributes to the larger question of what functions are served by online existence. Both physical and virtual places exert forces on individuals whose lives span the physical/virtual border, and understanding how these relate to dispositional and motivational characteristics can enhance understanding of why people chose to move from one venue to another, and what makes them return.

We investigated the role of place attachment in virtual migration by asking players of Massively Multiplayer Online Games (MMOs) about their attachments to both physical and virtual places. MMOs are perpetual virtual worlds which offer many different experiences, but which share the notion of place. Whether these places are peaceful or combative, earthly or otherworldly, aesthetic, social or commercial, players spend time in them and may form meaningful place attachments to them just as they form meaningful attachments to other individuals (both 'real' and synthetic) they meet there (Coulson, Barnett, Ferguson, & Gould, 2012; Coulson, Oskis, Meredith, & Gould, 2018).

While place attachment may play an important role in affecting migratory decisions, we also aimed to examine some of the factors which might predict it. Consequently, we also assessed

participants' personalities, gaming motivation, life satisfaction, attachment style, and identification with their online avatars.

Method

Participants

740 participants completed an online survey (685 men, 44 women, and 11 who declined to provide information about sex). Age ranged from 18 to 63 (average 24.1 years; SD 6.73). Participants were drawn from 60 nationalities, predominantly from the US (234, 32%), the United Kingdom (77, 10%), Canada (41, 6%), Germany (38, 5%), the Netherlands (24, 3%), and Austria (23, 3%). There were fewer than 20 participants for all other nationalities. The total number of individual attempts at the survey was 1994, representing a completion rate of 37%. Participants reported playing a wide variety of MMOs, with many reporting that they played multiple MMOs. The most commonly reported games were Realm of the Mad God (179), EVE online (157), World of Warcraft (79), Final Fantasy (35), Blade and Soul (30), and the Elder Scrolls online (22). No other game received more than 20 responses.

Materials

Participants provided demographic information, and then completed a series of questionnaires outlined below.

Personality. The 10-item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) was used to assess the Big Five personality dimensions. The scale uses a 7-point response format from disagree strongly to agree strongly (example item, "I see myself as critical, quarrelsome"). Scores on the scale evidence moderate reliability coefficients (0.40 – 0.73), as expected with two items per dimension, but show good test–retest and validity.

Life satisfaction. The five-item Satisfaction with Life Scale (SWLS; Diener & Emmons, 1985) was used to assess life satisfaction. The scale uses a 7-point response format from strongly disagree to

strongly agree (example item "In most ways my life is close to my ideal") and test scores show good reliability (.87).

Gaming motivation and history. The 12-item version of the Player Motivation Scale (PMS; Yee, 2006) measures three elements of gameplay motivation (social, achievement and immersion). The scale uses a 5-point response format from not at all important to extremely important (example item, "How important is customizing your character to make them look distinctive, stylish, and unique?"). Test scores have good reliability (all coefficients > 0.70), and the three subscales are moderately positively correlated.

Three separate items asked participants how many years they had been gaming for, how many hours they spent playing MMOs per week, and how many MMO sessions they played each week.

General attachment style. The nine-item Experiences of Close Relationships - Relationships Structures questionnaire (ECR-RS; Fraley, Heffernan, Vicary, & Brumbaugh, 2011) measures general attachment-related anxiety and attachment-related avoidance. The scale uses a 5-point response format from strongly disagree to strongly agree (example item "I usually discuss my problems and concerns with others.") Test scores show good reliability (coefficients >=.85).

Player-Avatar Interaction. The 15-item Player Avatar Interaction scale (PAX; Banks & Bowman, 2016) measures players' relationships with their virtual avatars. It measures emotional investment, anthropomorphic autonomy, suspension of disbelief, and the sense the player has of controlling their avatar. Responses are measured on a 7-point scale from strongly disagree to strongly agree (example item "I have no emotional connection to this avatar"). Test scores show good reliability (all coefficients > .88).

Place Attachment. The 13-item scale developed by Ramkissoon and colleagues (Ramkissoon et al., 2013) was used to measure place attachment. The model sees place attachment as a second-order factor arising from the four components of place identity, place affect, place social bonding, and place dependence (a measure of the uniqueness of the place, referred to here and forthwith as place uniqueness). Responses are measured on a 7-point response format from strongly disagree to strongly

agree (example item "This place means a lot to me"). Test scores show good reliability (all coefficients above .75), and studies have reported moderate correlations between three of the four factors (Kyle et al., 2005).

Additional items asked participants to provide information about: i) where they considered 'home' to be in the physical world; ii) an MMO they played; and iii) their favourite place in that MMO.

Procedure

An online survey tool (www.qualtrics.com) was used to collect data. Participants were recruited through postings on websites, discussion boards and online forums relating to MMOs, and provided with a link where the survey's purpose and ethical approval was outlined. After providing informed consent, participants completed the initial demographic measures followed by the TIPI, the SWLS, the PMS and the three additional items about gaming time, the ECR-RS, and the PAX. They then provided information about where they considered 'home' to be in the physical world,and completed the place attachment scale. They were then asked about one MMO they played, and what their favourite place was in that particular virtual world. This was followed by the place attachment scale for the virtual place they had identified. Finally, participants were provided with contact details for the researchers, debriefed, and thanked for their time.

Statistical analyses

Alpha was set to .05 in all analyses. Post hoc tests used Bonferroni corrections. ANOVA was used to examine differences across dimensions of place attachment (identity, affect, social bonding, and uniqueness) and venue (physical versus virtual). To predict place attachment to both physical and virtual places, hierarchical multiple linear regression was used. For regressions, place attachment to the physical home (hereafter pPA) and the virtual place (vPA) were regressed separately. For pPA, personality was entered as block one, and attachment and life satisfaction as block two. For vPA,

blocks one and two were identical to the analysis for pPA, but gaming motivation was entered as block three, gaming time (years spent playing games, number of hours MMO play per week, and number of MMO sessions per week) were entered as block 4, and PAX was entered as block 5.

Results

Completer analysis

A series of independent groups t-tests was performed to compare completers with non-completers. Completers were on average 0.9 years older, less agreeable, more satisfied with life, more socially- and achievement-motivated but less immersion-motivated, and had been gaming for almost three years longer than non-completers (16.3 years versus 13.6). Due to the imbalance in the numbers of men and women who participated in the survey, analyses of sex differences were not performed. There were no discernible relationships between nationality and completion rate, and non-completers tended to quit the survey in either the first or the third quarter (corresponding to the end of demographic and trait measures, and the beginning of the questions on place attachment, respectively).

Place attachment to physical and virtual places

The four components of place attachment showed the expected intercorrelations (ranging from .47 to .67). As our interest was in differences in components across venue (i.e. physical versus virtual), we retained the separate component scores in the first set of analyses. Correlations between all variables are presented in table 1.

TABLE 1 ABOUT HERE

To examine the differences between physical and virtual place attachment, a 2x4 repeated measures ANOVA was performed with venue (physical versus virtual) and place attachment component (identity, affect, social bonding, and uniqueness) as independent variables. There was a main effect of

venue ($F(1,739)=134.30$, $p<.001$, $\eta_p^2=.15$), a main effect of place attachment component ($F(3,739)=101.08$, $p<.001$, $\eta_p^2=.12$), and a significant interaction ($F(3,739)=179.03$),$p<.001$, $\eta_p^2=.20$). Bonferroni adjusted post hoc tests across each component of place attachment revealed that physical places were rated more highly on identity , uniqueness, and social bonding, while affect was higher for virtual places.

Virtual homes

An unpredicted pattern of responding emerged for virtual places, where a minority of participants (N=55, 7%) identified a virtual 'home' as their favourite online place. Such homes could be player-built houses, player-owned starships, group (guild) homes or bases, or any number of other locations which were in effect exclusive to the player or their immediate group/guild, and whose status is therefore akin to an online private address. This contrasted with the majority of participants who reported attachments to public places such as virtual cities, space stations, and dungeons.

To address whether virtual 'homes' were seen as different from other online places, an (unplanned) comparison was performed. Comparing participants who identified their favourite online place as 'home' with those who identified some other favourite online place revealed a main effect of location ($F(1,738)=8.86$, $p=.003$, $\eta_p^2=.01$), a main effect of place attachment component ($F(1,738)=32.85$, $p<.001$, $\eta_p^2=.04$), and a significant interaction ($F(1,738)=5.01$, $p=.025$, $\eta_p^2=.01$; note, lower bound dfs used throughout). Bonferroni adjusted post hoc comparisons across each component of place attachment revealed that both identity and uniqueness were higher for virtual 'homes' than for other virtual places, while social bonding and affect were statistically indistinguishable in this subset of participants.

To further investigate this effect, a further (unplanned) comparison examined physical and virtual place attachment scores for just the 55 participants who identified a virtual 'home'. There was a main effect of venue ($F(1,54)=4.08$, $p=.048$, $\eta_p^2=.07$), a non-significant effect of place attachment component ($F(3,162)=1.80$, $p=.150$, $\eta_p^2=.03$), and a significant interaction ($F(3,162)=8.31$, $p<.001$, $\eta_p^2=.13$). Bonferroni adjusted post hoc comparisons across each component of place attachment

revealed that both identity and social bonding were higher for physically real homes than virtual 'homes', while uniqueness and affect were statistically indistinguishable.

Predicting place attachment

To explore which variables affect place attachment both in physical and virtual worlds, two hierarchical multiple regressions (hMLR) were performed on overall place attachment for physical and virtual places. A total place attachment score was calculated separately for pPA and vPA by averaging the four components in each. In both regressions all tolerances were acceptable (for pPA >.27, for vPA >.38).

In the first regression, total pPA was regressed onto the five personality scores (block one), age, life satisfaction and attachment-related anxiety and avoidance (block two), gaming motivation (block three), years gaming, MMO hours per week, and MMO sessions per week (block four), and PAX (block five). The regression explained 18% of the variance, and significant predictors included openness (negative), conscientiousness, agreeableness, neuroticism, life satisfaction (negative), general attachment-related avoidance (negative), achievement gaming motivation, number of hours spent playing MMOs (negative), and the emotion component of the PAX scale. For vPA the hMLR structure was identical. The regression explained 26% of the variance, and significant predictors were social gaming motivation, years spent gaming, MMO sessions per week, PAX emotion, suspension of disbelief, and control (negative). Table 2 presents the final model for each regression.

TABLE 2 ABOUT HERE

Discussion

By operationalising the concept of a mooring point as place attachment, it is clear from these results that virtual worlds offer similar, and in one sense stronger places of attachment than the physical world. While social bonding, place uniqueness, and place identity were all higher for physical places than virtual places, the opposite was true for place affect. This is an interesting and surprising result

given that place affect appears to assess quite fundamental aspects about the relationship one has with a place - the fact that it has meaning to the person, that one feels attached to it, and that one belongs there. One can take a 'route' to a virtual world and still be 'rooted' there, and even though we are becoming an increasingly mobile society, these two concepts of routes and rootedness, are not mutually exclusive, as was once thought (Gustafson, 2009). The virtual places our participants told us about seem more like homes than simple digital shelters, and we note the analogy with Harlow's famous wire monkeys (Harlow & Zimmerman, 1959), where the significance of a safe place is as much about emotional support as the securing of resources. The data suggest that 'there's no place like home' is not true. There are many places akin to home, but they might not exist in the physical world. These places are of particular importance to those who have inhabited the world for a long time, who feel strongly about the person they are there, and who migrate to be with other people.

While place attachment to participants' physical homes was assessed, no such requirement was made for virtual places (indeed, the category of 'home' in virtual worlds was unexpected). Although the subsequent analyses of virtual homes were exploratory in nature and included a relatively small number of participants, we note that virtual homes may be unique and perceived as a greater part of self-identity than other virtual places. Indeed, identity-related questions of 'who we are' are often intimately related to questions of 'where we are' (Dixon & Durrheim, 2000, p. 27), and asking someone where they are from is a common way of 'placing' someone. Thus, it would appear that while attachment to virtual places is generally strong, this may be particularly true when the place is viewed as a digital domicile, and this specificity may be important in the transformation of a virtual 'space' into a 'place' (Grey & O'Toole, 2018). Our finding regarding virtual homes might suggest that participants are trying to preserve the continuity of residential experiences by moving to places that resemble their former home places, consequently trying to maintain a form of 'settlement-identity' (Feldman, 1990), which we note may mirror the tendency to design avatars which are like the self (Messinger et al., 2008). To our knowledge there is no literature which examines the choices made in designing online homes.

In the subset of participants, virtual and physical homes were seen as equally unique and generating an equal sense of belonging, while identity and social bonding were greater for physical

homes. This may suggest that when migration to a virtual world involves the acquisition, creation, or engagement with a digital domicile, the consequent attachment to that place is in many ways comparable to attachment to physical homes. For the predominantly male MMO players studied here, the virtual world may offer a home on a par with their physical homes. Future research should see whether these findings can be replicated in a larger sample of participants, and address the effect establishing a virtual home has on attachment to the physical home.

Turning to the factors which predict how attachments are made to places in both physical and virtual worlds, a very different pattern emerged for the two venues. For physical places, overall place attachment was greater for people who were less open, more conscientious, more agreeable, more neurotic, less satisfied with life, less avoidant with respect to attachment, more motivated by gaming achievement, spent less time playing MMOs per week, and were more fond of their online avatars. This profile suggests the kind of MMO player who plays games to win, or become more powerful, rather than to socialise or explore, and who likes but does not identify with their online avatars. Such MMO players could be described as 'tourists' rather than 'migrants' – their relationship to the virtual world is one where they drop in for a visit, do what they want, and leave again. The virtual world is not a place where they live but is instead one they visit for fun.

For virtual places, overall attachment was greater for those who were motivated by social gaming, had been playing games longer, played more MMO sessions per week, liked their avatars more, maintained a greater suspension of disbelief while playing, and felt less in control of their online avatars. These individuals seem more like dynamic migrants – they 'move' from the physical to the virtual, frequently, for social and emotional reasons as they play through an avatar which exists in the virtual world that the player views as home. While tourists 'drop in' to virtual worlds for fun, migrants may 'drop out' back to the physical world because of the pull of families, employment, and other responsibilities. To the extent that these pulls from the physical world exceed the forces of virtual mooring, drawing players back into the physical world, online gaming remains a healthy pursuit. When they are too weak, people may choose to stay online. Taken together, this set of findings resonates with the three relatively distinct sets of scholarly thought on space: space as distance, space as materialized power relations and space as experience (Taylor & Spicer, 2007), and

it may be that how MMO players use space adds to their different profiles. We suggest that future research should examine the balance between these forces with a view to identifying those at risk of problematic gaming.

Patterns of movement across the physical and virtual border result from a complex interplay of forces arising from both venues. The decision to spend time in a virtual world is not simply that it looks good or offers immediate feedback, nor is the decision to leave the physical world just the reflection of a desire to escape. Understanding the fluctuations in an individual's desire to migrate back and forth across the physical/virtual border will require all these forces to be taken into account, and the research reported here represents a small step in this direction.

There were several limitations of the research. First, the sample was predominantly male, despite the sexes being more or less equally prevalent among MMO players (Williams, Yee, & Caplan, 2008). It was therefore not possible to investigate whether men and women differed in both patterns and predictors of place attachment. Second, the findings about virtual homes were unexpected, and therefore exploratory in nature. Future research is needed to more fully explore the notion of online homes, and how these are both similar to and different from physical homes. Third, we did not measure residential history and stability, and so could not investigate the effects of these variables on place attachment. Fourth, while the argument presented here is about dynamic migration, with players moving from the physical to the virtual world more or less unhindered, our measures were static, and taken at a single point in time. It remains to be seen how repeated movement across the physical/virtual border affects migratory behaviour more generally.

We are left with the conclusion that virtual places, and in particular virtual homes, are psychologically very similar to physical ones in some aspects of place attachment, and that movement across the border between the physical and the virtual be seen as a migratory act, albeit a dynamic one with relatively few obstacles. From a globalisation perspective migrants, travellers, and tourists are viewed as people who move around and who do not necessarily 'belong' to the places where, for the moment, they are staying. This has contributed to a dichotomised perspective, where place attachment and mobility are held as opposite, often mutually exclusive, phenomena; highly mobile individuals are meant to experience little or no place attachment and vice versa (Gustafson, 2009). Our virtual data

suggest otherwise. Understanding the dynamic interplay between the push, pull, and moorings of

virtual worlds may go some way to aid an understanding of what makes people spend time in virtual

worlds rather than the physical one, and how this might relate to both positive and negative outcomes.

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Table 1. Intercorrelations between measures.

Variable

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Place attachment																									
1 pPA-Identity	.55†	.60†	.63†	.27†	.18†	.15†	.25†	-.01	.05	.10†	.14†	.04	.10†	.07	.05	-.04	-.12†	.19†	.05	.01	.02	-.15†	-.02	-.08*	-.02
2 pPA-Bonding		.57†	.61†	.12†	.11†	.04	.16†	.10†	.14†	.11†	.14†	-.07	.07	.05	.06	-.09*	-.21†	.09*	.00	.01	.07	-.30†	-.02	-.11†	-.07*
3 pPA-Uniqueness			.66†	.14†	.12†	.18†	.17†	-.03	.09*	.08*	.13†	.03	.05	.15†	.01	-.03	-.11†	.11†	.03	-.01	.01	-.23†	-.07*	-.07	-.03
4 pPA-Affect				.20†	.19†	.12†	.24†	.09*	.19†	.15†	.15†	-.12†	.08*	.09†	.06	-.12†	-.19†	.13†	.06	.01	.01	-.36†	.02	-.07	-.06
5 vPA-Identity					.61†	.47†	.61†	.02	.04	.08*	.07	-.02	.17†	.08*	.20†	.01	-.08*	.38†	.19†	.19†	-.10†	-.02	.11†	.07	.13†
6 vPA-Bonding						.57†	.50†	.05	.00	.12†	.09*	-.05	.36†	.09*	.09*	.04	-.12†	.32†	.16†	.10†	-.09*	.01	.07	.11†	.16†
7 vPA-Uniqueness							.44†	.00	.02	.00	-.03	-.01	.12†	.12†	.09*	.04	-.02	.27†	.14†	.15†	-.04	.05	.03	.10†	.14†
8 vPA-Affect								.11†	.04	.04	.06	.01	.16†	.09*	.21†	.04	-.02	.38†	.15†	.16†	-.03	-.01	.05	.01	.08*
Personality																									
9 Openness									.11†	.27†	.13†	-.14†	.10†	.05	.21†	-.09*	-.16†	.08*	-.05	.04	.13†	-.14†	.11†	-.12†	-.10*
10 Conscientiousness										.05	.09*	-.28†	.00	.02	.00	-.19†	-.11†	-.04	-.04	-.04	.04	-.30†	.06	-.05	-.06
11 Extraversion											.05	-.13†	.13†	.16†	-.09*	-.08*	-.33†	.00	-.02	-.07	.07*	-.18†	.02	-.02	.00
12 Agreeableness												-.09*	.11†	-.06	.05	.00	-.20†	.14†	.03	-.05	-.01	-.10†	.06	-.03	-.05
13 Neuroticism													-.09*	-.08*	.03	.46†	.04	.12†	.14†	.15†	-.13†	.35†	-.06	.00	.00
Player motivation																									
14 Social														.15†	.02	.03	-.15†	.21†	-.01	-.05	.09*	-.07*	-.10†	.20†	.23†
15 Achievement															-.10†	.03	.01	.14†	-.09*	-.03	.11†	-.07*	-.16†	.17†	.18†
16 Immersion																.11†	-.03	.25†	.28†	.37†	-.03	-.01	.10†	-.16†	-.19†
General Attachment																									
17 AR-Anxiety																	.04	.15†	.19†	.21†	-.06	.30†	-.14†	.05	.03
18 AR-Avoidance																		-.05	-.08*	.00	-.02	.28†	-.04	.07	.08*
Player-Avatar Interactions																									

	20	21	22	23	24	25	26
19 Emotion	.33†	.23†	-.05	.09*	-.03	.14†	.16†
20 Autonomy		.40†	-.42†	.08*	-.01	-.06	-.06
21 Suspension			-.13†	.02	-.02	-.03	-.04
22 Control				-.12†	.02	.00	.01
Life Satisfaction							
23 Life satisfaction					.00	.15†	.12†
MMO gaming							
24 Years gaming						-.04	-.06
25 MMO hours							.72†
26 MMO sessions							

† . Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).

Table 2. Hierarchical multiple linear regressions on physically real and virtual place attachment.

	Physically real place attachment	Virtual place attachment
	β	β
Step 1		
Openness	-.07	
Conscientiousness	.06	
Extraversion		
Agreeableness	.11	
Neuroticism	.08	
Step 2		
Age		
Life satisfaction	-.22	
Attachment anxiety		

Attachment avoidance	-.12	
Step 3		
Social motivation		.22
Immersion motivation		
Achievement motivation	.19	
Step 4		
Years gaming		.03
MMO hours per week	-.07	
MMO sessions per week		.08
Step 5		
PAX emotion	.12	.29
PAX autonomy		
PAX susp of disbelief		.06
PAX control		-.09

Total R^2[1]	.18	.26

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[1] Total R^2 is for the best-fit model.