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Fluid boundaries in an Augmented reality game: Incorporation into dreams and gameplay correlates

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Acknowledgements: We would like to thank MacEwan University for their support of this research.

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Abstract

Several studies have demonstrated the incorporation of video game content into dreams, but which factors mitigate the incorporation of the contents of an augmented reality mobile game is poorly understood. The constant shift between the game interface and the real-world scenery in Pokémon Go plus the overlaying of images in the physical world, made the game an ideal candidate for examining the relation between dream incorporation, Game Transfer Phenomena and Self-presence.

Keywords: Dreams, Pokémon Go, Game Transfer Phenomena, Self-presence, augmented reality games

Fluid boundaries in an Augmented reality game: Incorporation into dreams and gameplay correlates

Nowadays video games can be played on a variety of interfaces and in several ways, with augmented reality still being relatively uncommon. Augmented reality is, "the technology of adding virtual objects to real scenes through enabling the addition of missing information in real life" (El Sayed, Zayed, & Sharawy, (2010, p. 1045). It has been argued that augmented reality has potential applications ranging from aid to the elderly in using technology to advertising. While Google Glasses were popular during their development, they never became popular in use, due to law regulations and users privacy. Playing via augmented reality offers another perspective on dream incorporation of digital realms. Gackenbach and colleagues have investigated video game play in 2D and 3D incorporations but never this half-way virtual experience (Gackenbach, White, Rai, Sinyard, Wagner, & Boopalan, 2019).

The application of augmented reality in video games was made popular with the launch in the summer of 2016 of Pokémon Go. As a mobile game, Pokémon Go is one of many now available on tablets and especially smartphones. However, the peculiarity of Pokémon Go is that it combines localization-based technology (Global Positioning System (GPS)) with augmented reality. When it launched Bidaux (2016) noted that the media coverage of its launch was "truly insane". The reporting of Pokémon Go was twice the previous media coverage of a single popular video game and included stories in Time, Forbes, and the Huffington Post.

So why was it so popular? In principal it was due to simple game play that attracted a different population, which got people moving as well as the connection with others (Isbister, 2016). A year later Yang and Liu (2017) developed a scale to inquire about motives to play Pokémon Go. The research showed that the motives for playing were Exercise, Fun, Escapism,

Nostalgia, Friendship Maintenance, Relationship Initiation, and Achievement. Furthermore, "Fun and Friendship Maintenance were positive correlates of well-being, whereas Escapism and Nostalgia were negative correlates (p. 52)." It should be noted that as massive as adoption of this game was, participation declined by September of 2016 (The Conversation, 2016).

Thus because of Pokémon Go's instant and wide appeal, it's novel experience of self in the game, and the constant shift between the game interface and the real-world scenery it was thought to be an ideal candidate to not only examine dream incorporation of one game across many players, but to also consider what individual (i.e., gender) and gameplay intervening variables might mitigate such incorporation.

Gaming and Dreaming: Correlated Variables

In a series of studies, Gackenbach and colleagues (reviewed in Gackenbach, Stark, Boyes, & Flockhart, 2015) have examined the relationship between playing video games and nighttime dreams. Early in their work Gackenbach, Rosie, Bown, and Sample (2011) and Gackenbach and Rosie (2011) examined straightforward dream incorporation from gaming in a laboratory experiment conducted with the video game Mirrors Edge. They found that most did not have a dream where the game was incorporated (63%). Of those who did have such a dream, most saw the dream as the game world. That is, they thought they were in a game rather than in a dream. The rest who had some dream incorporation dreamt of playing a video game or had a dream where gaming was mentioned, as in hearing about a game or seeing a game console in the dream.

Different studies in their series examined different potential individual difference variables that might be related to dream incorporation. These included culture and gender

(Gackenbach, Yu, & Lee, 2018; Gahr, & Gackenbach, 2017; Gackenbach, Yu, Lee, Zhou, & Yu, 2016; Boyes & Gackenbach, 2017), absorption and meditative like experiences (Gackenbach, Swanston, & Stark, 2016), sex role identity (Boyes & Gackenbach, 2017) and psychological boundaries (Gackenbach & Boyes, 2014) among others.

The variables selected in the present inquiry which might intervene in game incorporation into dreams were a type of boundary questionnaire which is focused upon video game play, Game Transfer Phenomena (GTP) and virtual self presence, sense of self incorporated into the virtual realms, had been used in other studies in this series and were thought to be especially conceptually important (for review see Gackenbach & Hakopdjanian, 2016).

Game Transfer Phenomena (GTP) was originally conceptualized by Ortiz de Gortari in (2010), initiating a series of studies focusing on examining the incorporation of sensory perceptions, cognitions and behaviours with video game content into day life routines (for an overview of the GTP studies see Ortiz de Gortari, 2019). Ortiz de Gortari and Griffiths (2017) pointed out that, "video game playing can be observed through transfers in space, inducing, not only, temporary visual, auditory or kinaesthetic sensations while playing, but resulting in sensorial imprints that suddenly occur after playing" (p. 97). Manifestations of GTP include gamers seeing icons hovering above people's heads, hearing game-related sounds coming from objects and feelings of still being in the game. These transfers of game experiences can be challenging to the gamer in terms of the mixture of fantasy and reality (Dill, 2009).

Ortiz de Gortari, Oldfield and Griffiths (2016) found that "those with severe levels of GTP (i.e., experience many forms of GTP and very frequently) were significantly more likely to (i) be students, (ii) be aged 18 to 22 years, (iii) have played videogames every day in sessions of six hours or more, (iv) have played to escape from the real world, (v) have a mental disorder,

sleep disorder, or consider themselves as having dysfunctional gaming, and (vi) have experienced distress or dysfunction due to GTP" (p. 98). Interestingly, studies on GTP have found that recalling dreams is a predictor of severe GTP (i.e., experiencing GTP frequently and several forms) (Ortiz de Gortari, Oldfield and Griffiths, 2016) and dreaming about Pokémon Go has been found to be predictor of GTP (Ortiz de Gortari, 2017).

The GTP Scale (GTPS), which was developed based on gamers self-reports of re-experiencing game content in everyday life (Ortiz de Gortari, Aronsson, & Griffiths, 2011; Ortiz de Gortari & Griffiths, 2013, 2014a; Ortiz de Gortari & Griffiths, 2014b), resemble Hartmann's (1989) boundary questionnaire in that both instruments assess a range of sensory phenomena and mental processes which describe a fluidity of boundaries between external and internal realms. Gackenbach and Boyes (2014) found that high end (i.e., frequecy and intensity of gaming) gamers had thinner boundaries than low end gamers, which are also associated with high dream recall (Hartmann, 1989). Gackenbach, McDonnall, and Estrada (2018) found significant correlations between thin boundaries and high GTP scores for altered visual, body and auditory perceptions. These findings suggest that those susceptible to GTP are more likely to experience synaesthesia, are more aware of thoughts and feelings, are more like to experience transitional states between being awake and sleep and daydreaming where the boundaries between the fantasy and reality are bleary. While those evidencing thin Boundaries on The Boundary Questionnaire (Hartmann & Kunzendorf, 2006) are indicative of how a participant experiences life both inner and outer. Thus "I spend a lot of time daydreaming, fantasizing or in reverie" would be indicative of thin boundaries. The purpose of the questionnaire is to determine if someone has a thin boundary, meaning the participant is "highly sensitive", or a thick boundary, which means the participant is more "stolid" or "rigid". Those with thin boundaries are more in

tune with their environment, whereas those with thick boundaries tend to use logic as opposed to feeling or intuition to act or react to events around them.

The second variable of interest in this inquiry was virtual Self-Presence (Ratan & Hasler, 2009). Self-presence describes how the self is extended into virtual environments through virtual self-representations such as avatars in computer games or cyberspace environments. According to Ratan and Hasler (2009), the amount of self-presence experienced depends on which level(s) of self-presence a person is in, specifically proto (body-schema) self, core (emotion-driven) self, and/or extended (identity-relevant) self. It was hypothesized that high dream incorporation would be associated with all types of self presence. Gackenbach and Guthrie (2016) found that gamers had the highest scores on the Self-Presence Questionnaire (SPQ) for all three subscales. They also found that Self-Presence scores correlated with high Dream Intensity Inventory (i.e.,) and better performance in a series of cognitive attention task.

As pointed out earlier, the game of focus in this inquiry is a Pokémon game. They have a long history as children-oriented games. The latest instalment, Pokémon Go (PG), is a localization-based augmented reality game played on mobile devices which use an avatar as a mediator and includes some role-playing features (e.g., clothes customization).

According to Apperley and Clemens (2017) the central role that the avatar plays in Pokémon Go is profoundly distinct from other augmented reality games or video games played in virtual environments. They point out that, *Pokémon GO* focuses on the avatar as the mediating device between real and virtual space. Traditionally, augmented reality games seek to blend the digital world with the material, using real world environments as a part of the backdrop for digital gaming. In *Pokémon GO*, by contrast, the avatar itself becomes the key element through

which this interplay is organized and experienced. In doing so, it also transforms the status of established realities by inducing its private users to remake public spaces according to the contingent exigencies of a video game globally connected in real time (p. 41-42).

Pokémon GO is played in the real world in a way that is not true of most other video games. Whether or not the function of the augmented reality camera is on or off, the gameplay takes place in physical reality in a way not before present and thus the avatar is the player in the same manner as it always is when one walks somewhere or says hello or whatever. Thus, the increase in possible integration into dreams as the central and most common features of dreams are the dream ego. In this game its enhanced in a spatial way, such that it can be argued the game is more real than other virtual gaming interfaces.

Most research into gaming and dreams has not focused on a single game, with the exception of those conducted in laboratory settings where game play is manipulated (Flockhart & Gackenbach, 2017; Gackenbach, Rosie, Bown, & Sample, 2011; Wijeyaratnam, 2016; Gackenbach, White, Rai, Sinyard, Wagner, & Boopalan, 2019). Therefore, Pokémon Go being a localization-based augmented reality game offered a unique perspective on this question. It is hypothesized that high dream incorporation will be associated with high scores on the GTP and the SPQ. Of particular interest, will be questions concerning confusion of reality in dreams associated with Pokémon Go play.

Method

Participants

The survey respondents were first- and second-year psychology students at a western Canadian university. They received course credit for participating. While this study was run over

two academic terms, most of the 698 participants came from the fall term, 69%. Over the course of an academic year 367 males and 325 females filled out the online survey with gender identification information. Just over half were 19 years of age or younger, while another 44.5% were 20 to 25 years of age. Additionally, 88.9% were single. Those who indicated they had played Pokémon Go were 64.9% or 449.

Measurements

Several questionnaires were used in the survey, this included open questions about Pokémon Go and dreams. They were administered in the order listed below:

1. **Demographic and Media Use History Questionnaire**: Following basic demographic information, a shortened adaptation from previous research collecting video game history (Gackenbach & Rosie, 2009) and social media use history (Gackenbach & Boyes, 2013) was used. There were six video game questions with a Cronbach's Alpha of .755 and 12 social media questions with a Cronbach's Alpha of .503. General gaming questions included frequency of play, length of play session, number of games played, age began playing, and use of gaming social media. Social media questions were age began using media and frequency of use for 11 popular social media (e.g., Facebook).
2. **Pokémon Go History:** After a yes/no question about ever playing Pokémon Go, respondents were asked 22 more questions about their game play if they had responded yes. These covered performance (e.g., How many Pokémon have you caught in total?), preferences (e.g., Do you use the Augmented Reality camera functionality?), motivations (e.g., How likely are you to plan excursions for the strict purpose of playing the game?), and game sophistication (e.g., I wish the game had more depth or complexity). (The

Cronbach's Alpha was .634).

3. **Pokémon Go Dream collection**: Respondents were asked to report a recent dream that they thought included Pokémon Go and provide details on it First, they reported when it occurred and what computer related activities they participated in the day prior to the dream. These six items had a Cronbach's Alpha of .840. This was followed by questions about how the participants identified their dream according to seven dream types (i.e., lucid dream, control dream, nightmare, bad dream, bizarre dream, observer dream, and electronic media dream), which had a Cronbach's Alpha of .623. Additionally, four questions on felt sense of presence and dream enjoyment (Cronbach's Alpha of .413) were next followed by ratings of the intensity of a list of emotions present in the dream (i.e., Anger, Awe, Arousal, Sexual, Anxiety, Fear, Guilt, Frustration, Sadness, Hatred, Happiness, Jealousy, Embarrassment, Ecstasy, Downheartedness, and Terror). The Cronbach's Alpha for these emotions was .836.

4. **Game Transfer Phenomena Scale (GTP):** This is a 20-items scale developed by Ortiz de Gortari, Pontes & Griffiths (2016). This scale assesses experiences after playing video games using a Likert scale of frequency. The subscales included are Altered Perceptions Modality which is sub-divided into visual, auditory and body sensorial perceptions (e.g., "I have visualized or seen video game images with closed eyes", "I have heard sounds, music or voices from the game"), Automatic Mental Processes Modality (e.g., "I have thought about using something from a video game in real-life"), and Actions and Behavior Modality (e.g., "I have sung, shouted or said something from a video game in real life without intending to do so"). An additional item was added in this study asking which of the GTP items were experienced while playing Pokémon Go. The overall

Cronbach's Alpha for this 21-items scale was .921.

5. **Recent dream collection:** This question was the same as for the Pokémon Go dream but it referred to the respondents most recent dream of any kind. The dreamer's evaluation of day before activities and dream assessments were the same as for the Pokémon Go dream collection question.

6. **Self-Presence Questionnaire (SPQ).** This 23-item questionnaire developed by Ratan and Hasler (2009) measures self-presence, the felt sense of how the self is extended into virtual environments through virtual self-representations such as avatars in computer games or cyberspace environments. The questionnaire includes three sub-scales: proto self-presence (body schema), core self-presence (emotion-driven), and extended self-presence (identify-relevant). Participants indicated on a Likert scale on how much they identified themselves with their avatars when online. Cronbach's alpha of 0.943 was found in the current inquiry. Sample items included: (Proto) When using your avatar, to what extent do you feel like you can reach into the game/virtual environment through your avatar? (Core) When happy events happen to your avatar, to what extent do you feel happy? (Extended) To what extent has the experience of using your avatar helped you learn more about your own identity?

7. **Dream Intensity Inventory (DII).** This 26-item inventory was developed by Yu (2008). It focuses on measuring the intensities of various dream experiences. Yu (2008) reported four dimensions of dream intensity (importance, usefulness, vividness, and recall) with seven subscales, which are used in analysis herein. These subscales were quantity (how much dream recall), lucid (types of awareness during dreaming), auto-suggestion (reconnection with the dream), major modalities (vision and hearing in the dream), minor

modalities (odor and taste in the dream), dream work (condensation, displacement, and symbolism) and paramnesia (reality confusion). Participants indicated on a Likert scale the intensity or the frequency of various dreamt activities. Sample items included: Have you ever had multiple dreams (two or more) in a single night? Have you ever known during a dream that you are dreaming? Do you have in general more pleasant dreams, more unpleasant dreams, or the similar amount? In the current inquiry, these 26 items had a Cronbach's Alpha of .845.

Procedure

The survey respondents were screened using SONA, a research program where potential participants create an account and sign up for joining online and in-person studies. All available studies in Psychology at the university are displayed on the SONA site and participants can read a brief description and see if they meet the criteria for a particular study before signing up. All participants who answered the survey signed an informed consent form. Respondents were entirely anonymous as course credit was offered through the SONA system and all identifiers, including IP address, were stripped from the survey upon their entry. The order of questionnaires was as indicated above in the instruments section. The survey clearly stated that it was about video games. It was available via the survey software Qualtrics. There were about 150 questions in the survey, depending if the respondent played Pokémon Go and had a Pokémon Go dream. After agreeing to the informed consent, it took about 50 minutes to finish the scales. At the end of the survey they were presented with a debriefing summary. The study was granted ethical approval from the western Canadian university This was a mixed methods design in that dreams

were evaluated both by the dreamer in closed ended questions and by independent judges using coding scales. **Results**

After a brief examination of variables about Pokémon Go play, important for having a clear profile of the sample, the relationship of such play to Game Transfer Phenomena (GTP) and virtual self presence (SPQ) is examined. Then self reported perceptions of dream experiences were assessed using the Dream Intensity Inventory (DII).This is followed by examining the relationship between DII and the two potential intervening variables, SPQ and GTP. Finally, specific dreams are examined using self report and dream content analysis by independent judges. Gender was controlled with some variables.

Pokémon Go Play

The first variable examined was the nature of Pokémon Go play in the summer/fall of 2016 and winter of 2017. This is all in the year following its initial release. Of the 692 participants, 367 were male and 325 were female. Of the men 74% played Pokémon Go while 54% of the women played. Several questions on the Pokémon Go play style survey were answered in part or in full by the 449 players. Three qualitative type questions are examined initially followed by a factor analysis of the remaining closed ended items on the survey. When asked how they found out about the game 41% said they heard from friends or social circle, 25% said they heard about it through news media, and 30% said they had been following it prior to release as they knew about its forthcoming release.

The impact of the game on players was inquired about offering four responses: No impact at all (42%); little impact (maybe a walk at lunch) (48%); moderate impact (change routine to play more) (9%); and major impact (changed life dramatically to play the game) (1%).

Especially relevant to the central question of this study was the actual usage of the augmented reality function. Most (48%) indicated that they did not use it at all, while another 30% said “yes, but very rarely”. Moderate use was reported by 14% and heavy use by 8%. It should be noted that while the camera (the augmented reality feature) was not used much during playing, the game requires, the player to often look up from the screen while moving through real world physical space to find the Pokémon. This is unlike most other video games where the player sits or stands. Thus, in a sense all Pokémon Go play can be considered as playing in an “augmented” reality[i].

Responses to the remaining questions on the Pokémon Go gameplay and related habits were entered into a varimax rotated Principle Components Analysis. As Table 1 shows four factors emerged with a .5 cut-off for interpretation: Performance, impact, fun and depth of play (i.e., game sophistication). Factor scores were saved for each factor. It was surprizing that the “AR function” or “the involvement of friends/family for keep playing” did not fall together with any of the factors. The “Performance factor” showed correlations to advancement in the game such as number of Pokémon caught, and gym battles won. The “impact factor” showed correlations with regular activities and engagement in exploring by planning excursions or taking different routes to play. The “fun factor” was characterized by Real World Aspect of The Game "Fun" and Real World Aspect of The Game to Be More of An Obstacle To Having "Fun" (High Score No). Lastly, the “depth factor” were constitued by having more depth or complexity and the game was simpler and more efficient.

Table 1

Varimax Rotated Factor Analysis on Selected Pokémon Go Play Questions

	1(perform)	2(impact)	3(fun)	4(depth)

Game Impact on Regular Activities	.161	.773	.013	.110
Use the Augmented Reality Camera	-.207	.260	.207	-.235
Go Out of Way to Play	.191	.781	.122	.052
Plan Excursions for Playing	.180	.752	.166	.026
Continuing to Play Even If Your Friends/Family Stop	.330	.366	.084	-.024
Playing in the Real World is Fun	.086	.309	.743	-.006
Playing in the Real World as an Obstacle to having fun (High Score No)	.091	.016	.874	.027
Wishing for Depth or Complexity in Game Play (High Score No)	-.110	-.079	.156	-.813
Game Was Simpler and More Efficient (High Score No)	-.017	.078	.384	.626
Number Pokémon Have You Caught	.742	.278	.179	.144
Kilometers Have You Logged	.694	.357	.046	-.023
Unique Pokémon Have You Seen	.721	.121	.076	.184
Eggs Have You Hatched	.845	.194	.064	.036
Gym Battles Have You Won	.875	.063	-.016	.025
Trained at Your Own Gym	.787	.018	-.059	-.014

Pokémon Go players versus Non-Pokémon Go players. Before analysing the relationship between playing Pokémon Go and dreams, data was examined comparing players (i.e., those that play Pokémon Go) to non-players (i.e., those who had not played Pokémon Go, although they

can play other video games), on a variety of variables; media use, GTP and SPQ. Because of the widely uneven cell sizes, i.e., cell sizes were made equal to the smallest cell through random selection of participants. A series of multiple-analysis of variance were computed on information about PG players and non-PG players as a function of sex of participant. Only results with the game play variable are reported. Beginning with media use, video game and social media, there were several main effects related to having played Pokémon Go or not and several interactions. These are shown in Table 2.

Table 2

Sex by player MANOVA's F-values and descriptive statistics

Source	Dependent Variable	F-value	Means and standard errors
Pokémon Go play groups	Video game frequency of play	F(1,336)=49.457, p<.0001; η_p^2=0.128	PG players=3.353/0.084 Non-PG players=2.517/0.084
	Video game length of play	F(1,336)=28.610, p<.0001; η_p^2=0.078	PG players=3.357/.088 Non-PG players=2.691/0.088
	Video Game number of games played	F(1,336)=16.596, p<.0001; η_p^2=0.047	PG players=3.082/0.102 Non-PG players=2.497/0.102
	Video Game age began play*	F(1,336)=14.340, p<.0001; η_p^2=0.041	PG players=8.805/0.082 Non-PG players=8.367/0.082
	Social media age began play*	F(1,336)=11.799, p<.001; η_p^2=0.034	PG players=7.106/0.079 Non-PG players=6.725/0.079

	Social media Tumblr frequency	F(1,336)=4.899, p<.028; η_p^2=0.014	PG players=1.876/0.116 Non-PG players=1.514/0.116
	Social media Google frequency	F(1,336)=5.103, p<.025; η_p^2=0.015	PG players=1.954/0.154 Non-PG players=2.446/0.154
Sex X Pokémon Go Play groups	Video game frequency of play	F(1,336)=20.146, p<.0001; η_p^2=0.057	Male PG player= 3.872/0.118 Male Non-PG player= 3.570/0.118 Female PG player= 2.833/.120 Female Non-PG player= 1.464/.120
	Video game length of play	F(1,336)=22.041, p<.0001; η_p^2=0.062	Male PG player= 3.523/0.124 Male Non-PG player= 3.442/0.124 Female PG player= 3.190/.125 Female Non-PG player= 1.940/0.125
	Video Game age began play*	F(1,336)=4.319, p<.038; η_p^2=0.013	Male PG player= 8.895/0.115 Male Non-PG player= 8.698/0.115 Female PG player= 8.714/ .116 Female Non-PG player= 8.036/0.116

	Cell phone texts sent or received	F(1,336)=8.141, p<.005; η_p^2=.024	Male PG player= 4.012/ .166 Male Non-PG player= 3.453/ .166 Female PG player= 4.369/ .168 Female Non-PG player= 4.762, 0.168
	Social media Twitter frequency	F(1,336)=3.999, p<.046; η_p^2=0.012	Male PG player= 3.070/ 0.274 Male Non-PG player= 2.837/ 0.274 Female PG player= 2.345/ 0.277 Female Non-PG player= 3.214/0.277

*high scores are beginning media use at a younger age

Results show that Pokémon Go players were higher on frequency of playing, session length, number of games played, and younger age began gaming and social media use than those who do not play Pokemon Go. For the interactions with gender, for the gaming variables there was little difference in the males between PG players and non-PG players but big differences for females, with less of gaming for female non-PG players. The picture is different for SMS sent and received. Female PG players had the most while male non-PG players had the least. There was not much difference in text usage for players of either gender. Twitter was the only social media that showed any interaction. This was entirely accounted for by females such that non-players had the most use relative to players who had the least.

Sex by Pokémon Go play history MANOVA's were also computed on GTP and SPQ. There were no interactions but main effects for each of the three GTP subscales: Altered Perceptions [including visual, bodily, and auditory], F(1,346)=22.89, p<.0001, η_p^2=.062;

Automatic Mental Processes, F(1,346)=16.85, p<.0001, η_p^2=.046; and Actions and Behaviors, F(1,346)=10.04, p=.002, η_p^2=.028. In all three cases those who played Pokémon Go had higher sum scores (Altered Perceptions, PG players mean=23.98, SE=.631, non-PG players mean = 19.72, SE=.627; Automatic Mental Processes, players mean=8.78, SE=.235, non-PG players mean=7.42, SE=.234; and Actions and Behaviors, PG players mean=7.48, SE=.249, non-PG players mean=6.37, SE=.248). This identification with digital realms for PG players was also evident for the Self Presence scores. SPQ analyses revealed that there were two main effects for Pokémon Go player groups (Core-self presence F(1,324)=10.37, p=.001, η_p^2=.031; Extended-self presence F(1,324)=13.13, p<.0001, η_p^2=.039) and one interaction with sex (Core-self presence F(1,324)=5.86, p=.016, η_p^2=.018). In both SPQ subscale main effects PG players had higher scores than non-PG players (PG players Core self-presence mean=11.95, SE=.358 and non-PG Players Core self-presence mean = 10.29, SE=.372; PG players Extended self-presence mean=27.35, SE=.831 and non-PG Players Extended self-presence mean=23.01, SE=.863). Additionally, for Core self-presence there was a gender by player interaction such that there was no real difference as a function of play for males, while for females there was a large player difference (male PG players mean=11.62, SE=.509; female PG players mean=12.28, SE=.503; male non-PG players mean=11.207, SE=.515, female non-PG players mean=9.368, SE=5.35). The interaction was accounted for in the main by the low core self-presence scores of the female non-PG players.

Game Transfer Phenomena and Self-Presence Not surprisingly all the subscales of the GTP were significantly correlated with all the subscales of the SPQ. The magnitude was mostly moderate but all significant as can be seen in Table 3.

Table 3

Correlations between Game Transfer Subscales and Self Presence Subscales

	Game Transfer Phenomena Sub-scales			
Self Presence Subscales	Altered Perceptions	Automatic Mental Processes	Actions and Behavior	Number of items checked specific to Pokémon Go play
Proto	0.425**	0.368**	0.388**	0.265**
Core	0.413**	0.407**	0.365**	0.198**
Extended	0.294**	0.322**	0.237**	0.135**

**p<.0001; N's ranged from 607 to 648

Game Transfer Phenomena (GTP) and the Self-presence (SP) scales total scores show that 92% of the participants have experienced at least one instance of GTP when playing Pokémon Go or some other video game (N= 650). As for the SP, 90% (n=609) reported have felt self-present when playing Pokémon Go.

In order to examine the relationship between these two variables and one measure of dreams, the subscales scores were entered into a factor analysis with DII subscales. A varimax rotation can be seen in Table 4.

Table 4

Varimax Rotated Factor Analysis on Game Transfer Phenomena, Self Presence and Dreams Intensity subscales.

	1 GTP	2 DII General Dreams	3 SP	4 DII Modalities of Dreams
GTP: Altered Visual Perceptions	0.782	0.019	0.318	0.071
GTP: Automatic Mental Processes	0.714	0.001	0.348	0.043
GTP: Actions and Behavior	0.792	0.030	0.227	0.011
GTP number of items checked specific to Pokémon play	0.666	0.153	-0.017	0.002
SP: Proto	0.338	0.111	0.706	-0.017
SP: Core	0.250	0.017	0.810	0.072
SP: Extended	0.086	0.126	0.814	0.037
DII: Quantity	-0.150	0.707	0.175	0.316
DII: Lucid	-0.043	0.771	0.045	0.029
DII: Autosuggestion	0.164	0.757	0.063	0.071
DII: Major modalities	-0.129	0.122	0.209	0.825
DII: Minor modalities	0.237	0.176	-0.130	0.752
DII: Dream work	0.300	0.432	-0.007	0.244
DII: Paramnesia	0.112	0.712	0.041	0.009

While correlated, GTP and SP did not load together. Nor did either load with the DII subscale factors.

Pokémon Go players: Dream Intensity Inventory, GTP and SP

PG players and non-PG players also differed in their histories of night time dreams. Play group scores on the DIS differed for Auto-suggestion ($F(1,339)=5.61$, $p=.018$, $\eta_p^2=.016$) and Dream Work ($F(1,339)=9.64$, $p=.002$, $\eta_p^2=.028$) with Pokémon Go players scoring higher than non-PG players on both subscales (Auto-suggestion: PG players mean=7.74, SE=.299; non-PG players mean=6.73, SE=.305; Dream Work: PG players mean=7.44, SE=.169; non-PG players mean=6.69, SE=.172).

The responses to the DII for those who played Pokémon Go and its association with GTP, SP, and media use variables will now be examined. These correlations are showed in Table 5.

Table 5

Correlations of Subscale/Factor Scores between the Dream Intensity Inventory and Game Transfer Phenomena, Self Presence, and Media Use Variables

		Dream Intensity inventory (DII)						
Game Transfer Phenomena (GTP)		Quantity	Lucid	Auto-suggestion	Major Modalities	Minor Modalities	Dream Work	Paramnesia
Altered Perceptions	Pearson Corr	0.116*	0.067	0.186**	0.055	0.149**	0.208**	0.146**
	N	416	416	415	417	412	414	418
Automatic Mental Processes	Pearson Corr	0.072	0.042	0.161**	0.035	0.103*	0.122*	0.194**
	N	429	429	428	430	425	427	431
Actions and Behavior	Pearson Corr	0.045	0.092	0.221**	0.015	0.143**	0.210**	0.202**
	N	432	432	431	433	428	430	434
Number of items checked specific to	Pearson Corr	0.097*	0.051	0.190**	0.040	0.151**	0.184**	0.169**
Pokémon play	N	433	433	432	434	429	431	435
Self Presence								
Proto	Pearson Corr	.147**	0.080	.252**	0.075	.104*	.170**	.171**

	N	426	426	426	427	422	424	428
Core	Pearson Corr	0.159**	0.049	0.149**	0.166**	0.070	0.113*	0.091
	N	424	424	423	425	420	422	426
Extended	Pearson Corr	0.175**	0.099*	0.149**	0.172**	0.057	0.119*	0.144**
	N	412	412	412	413	409	410	414
Media Use								
Video game factor scores	Pearson Corr	-0.013	-0.013	-0.074	0.146**	0.063	0.010	-0.028
	N	430	430	429	431	426	428	432
Social media sum score sans video	Pearson Corr	0.131*	0.046	0.141**	-0.031	0.084	0.220**	0.122*
game social media	N	354	354	353	355	350	353	355
Pokémon Go Factor								
Performance indicates	Pearson Corr	-.105*	-0.003	-0.007	-0.001	0.028	0.102*	0.036
	N	410	407	407	408	404	405	409
Purpose to play	Pearson Corr	0.124*	0.077	0.095	0.107*	0.085	0.187**	0.098*
	N	410	407	407	408	404	405	409
Fun types	Pearson Corr	0.111*	-0.012	-0.073	0.130**	-0.044	-0.112*	0.003

	N	410	407	407	408	404	405	409
Depth of play	Pearson Corr	-0.029	-0.087	-0.077	0.077	-0.017	-0.068	-0.066
	N	410	407	407	408	404	405	409

**p<.01; *p<.05

The first thing to notice about these correlations is that of the 91 possible correlations between DII subscale scores and GTP, SP, and media use subscale/factor scores, 47 (52%) were significant. This included 64% of the GTP subscales and 67% of the Self Presence subscales correlated with DII subscales, but only 36% of the media use scales and 32% of the Pokémon Go factor scores. Thus, the strongest associations were for the two types of scales that measure psychological responses to media (i.e., GTP, SP).

It's important to keep in mind that these correlations are across sex. This is particularly evident when comparing the video game factor scores with the social media scores associations to the DII. Women use social media more than men, if not gaming social media, and men tend to game more, at least for combat centric/action-adventure games. Dreams are typically reported more by women. Thus, partial correlations were computed on the same set of variables controlling for sex. These are depicted in Table 6.

Table 6

Partial Correlations of Subscale/Factor Scores between the Dream Intensity Inventory and Game Transfer Phenomena, Self Presence, and Media Use Variables controlling for sex.

		Dream Intensity inventory (DII)						
Game Transfer Phenomena (GTP) Subscales		Quantity	Lucid	Auto-suggestion	Major modalities	Minor modalities	Dream work	Paramnesia
GTP sum score	Partial Corr	0.093*	0.077	0.210**	0.070	0.129**	0.239**	0.169**
	N	542	542	542	542	542	542	542
Altered Perceptions	Partial Corr	0.170**	0.098*	0.225**	0.070	0.152**	0.236**	0.165**
	N	413	413	412	414	409	411	415
Automatic Mental Processes	Partial Corr	0.164**	0.095*	0.230**	0.062	0.110*	0.171**	0.234**
	N	426	426	425	427	422	424	428
Actions and Behavior	Partial Corr	0.102*	0.127**	0.267**	0.031	0.146**	0.242**	0.226**
	N	429	429	428	430	425	427	431

Number of items checked specific to Pokémon play	Partial Corr	0.094*	0.048	0.189**	0.038	0.151**	0.182**	0.168**
	N	430	430	429	431	426	428	432
Self Presence Subscales								
SP sum score	Partial Corr	0.154**	0.135**	0.205**	0.152**	0.072	0.207**	0.128**
	N	542	542	542	542	542	542	542
Proto	Partial Corr	0.155**	0.082	0.258**	0.076	0.104*	0.173**	0.172**
	N	423	423	423	424	419	421	425
Core	Partial Corr	0.163**	0.049	0.150**	0.166**	0.070	0.113**	0.091
	N	421	421	420	422	417	419	423
Extended	Partial Corr	0.185**	0.103*	0.155**	0.173**	0.057	0.122*	0.146**
	N	409	409	409	410	406	407	411
Media Use								

Video game factor scores	Partial Corr	0.127**	0.069	0.012	0.206**	0.074	0.080	0.018
	N	427	427	426	428	423	425	429
Social media sum score sans video game social media	Partial Corr	0.075	0.010	0.103*	-0.050	0.085	0.197**	0.104*
	N	351	351	350	352	347	350	352
Pokémon Go Factor Scores								
Poke factor score 1 performance indicates	Partial Corr	-0.065	0.024	0.024	0.012	0.030	0.127*	0.052
	N	407	404	404	405	401	402	406
Poke factor score 2 purpose to play	Partial Corr	0.131**	0.079	0.099*	0.108*	0.085	0.190**	0.099*
	N	407	404	404	405	401	402	406

Poke factor score 3 fun types	Partial Corr	0.110*	-0.015	-0.078	0.129**	-0.044	-0.115*	0.002
	N	407	404	404	405	401	402	406
Poke factor score 4 depth of play	Partial Corr	0.051	-0.043	-0.025	0.104*	-0.016	-0.031	-0.040
	N	407	404	404	405	401	402	406

**p<.01; *p<.05

It can be seen in Tables 5 and 6 that in general, the magnitude of the correlations stayed the same or increased with the gender control. GTP and SP full scale sum score correlations were added to this table as well. For GTP five of the seven correlations between DII subscales and GTP full scale scores were significant when sex was controlled for. In the case of SP all but one of the DII subscale scores correlated significantly. The average of the correlations for SP with DII was .15 while the average for GTP with DII was .14. While most subscales were significantly correlated, the magnitude of the correlations is weak if all in the positive direction.

Controlling for sex of respondent made the biggest difference in the associations between DII and GTP. Specifically, 17 of 28 possible subscale correlations were significant without gender control. That increased to 23 out of 28 for the subscales partial correlations. More specifically, almost all the DII were correlated with each one of the subscales of GTP, with the exception of DII sub-scales Lucid and Major modalities, but when sex was controlled correlations were found between lucidity and all the sub-scales of GTP. Also dreams quantity were correlated with all the GTP subscales when sex was controlled.

The only other notable change was in the two media use correlations for quantity of dreaming. Without gender control, social media use correlated with recalling more dreams while with gender control it was video game play that correlated and not social media use.

No changes were observed in the correlations between DII and SP when controlling for gender. Correlations without gender control were found between Autosuggestion and Dream work and all the sub-scales of Self-presence; Lucid was only correlated with Extended presence, and Minor modalities was correlated with Proto presence. Major modalities was correlated with Core presence. Lastly, Paramnesia was correlated with Proto and Extended presences. It should

be noted, that the magnitude of the significant correlations was consistently higher with control for sex of respondent if no change in the pattern of correlations.

Regarding the Pokémon Go related variables, dreams quantity was only correlated with Performance when gender was not controlled, and Major modalities was only correlated with Depth of play when gender was controlled. Thus specific game play information was less important than self reported propensities of GTP and SP.

Recent Dreams and Pokémon Go

In addition to getting dream history information from the DII, respondents were asked to provide a Pokémon Go (PG) dream and a recent dream. This allowed a more qualitative than purely quantitative analysis with the dream content analysis. In both cases respondents were asked to rate the dream as to when it occurred, activities of a computer nature the day before the dream, the dream type, emotions felt in the dream, and the sense of felt presence in the dream. A total of 37 respondents reported a PG dream, 19 males and 18 females of the 449 respondents who reported playing PG. That's only 8% of PG players, while 80% of them reported a recent dream. Of those who did not play Pokémon Go**,** the non-PG players, 88% reported a recent dream. Thus, comparisons of dream content are limited to recent dreams of PG players versus non PG players. This was done in two ways, history of PG play and day before the dream played PG. That is, PG player versus non-PG player defined by history of PG play and PG player versus non-PG player for those who played the day before the recent dream (PGplayb4dream). The former split is about respondent's history with PG play, while the latter is specific in that it offers specific pre-sleep play of PG. This pre-sleep split of players would be expected to be most relevant according to the continuity hypothesis of dream incorporation. That is, that dreams reflect experiences from the day prior to the dream.

History of PG Play Analysis. Respondents who provided a recent dream were asked to rate it in various ways. There was no player group effects for self evaluations of type of dream nor for questions regarding specific emotions experienced in their recent dream. Respondents were asked to indicate the percentage of the day that they engaged in each of the electronic media type activities. There were two electronic media use activities in the day prior to the dream which showed gamer group differences (Computer gaming: F(1,643)=11.083, p=.001, η_p^2 =.017; Played PG: F(1,643)=7.967, p=.005, η_p^2=.012). In both cases those who said they played Pokémon Go were more likely to report playing a computer game and playing PG the day before their recent dream (Computer gaming: PG players mean=8.832, SE=.659; non-PG players mean= 5.110, SE=.903; PG Play: PG players mean=.744, SE=.125; non-PG players mean=.146, SE=.171).

The second way that these recent dreams were evaluated was by judges coding. The judge was trained to code all the dreams reported along several dimensions relative to PG in the dream and confusion about reality. The first was an act frequency coding with these gaming queries:

1. explicit reference in the dream to Pokémon or something clearly from the game
2. if there is a plot that seems Pokémon (implicit)
3. any reference to video games or video game play but not explicitly Pokémon Go

There were also these questions about reality confusion in the dream which were coded by a judge along a five-point Likert type scale ranging from no mention (1) to probable mention (3) to definite mention (5):

1. Did they talk about being awake?
2. Did they know they were in a dream?

3. Did they think they woke up only to really wake – false awakening?

4. Was there some form of mixed realities which is augmented reality in the dream?

5. Did they talk about dreams?

6. Did they think they might be in a dream only to conclude in the dream that they were awake?

The judge reached 80% agreement with the trainer before he began the coding. The judge received no information about the dream or the dreamer while coding the dreams. With judges coding of the reality of the dream or inclusion of Pokémon Go imagery in the dream there were no player group effects with one exception. Players (mean=2.352, SE=.14) were coded as talking less about dreams in the dream than non-players (mean=2.546, SE=.137) [F(1,303)=4.49, p<.035, η_p^2=.015].

These analyses are important in that they demonstrate that while memories of dream history (DIS) might differ between PG play player groups as defined by a general self report of play, self and judges' evaluations of a recent dream did not quite follow suit. A few additional questions were asked of respondents regarding their recent dreams and some of these showed effects. Although there were no player group differences in self reported emotions associated with the dream, there were such differences for one question about enjoying the dream (F(1,322)=4.19, p=.041, η_p^2=.013). Players reported enjoying their recent dream more than non-players (players mean=3.79, SE=177; non-players mean=3.28, SE=.179). Additionally, two questions about feeling present in the dream evidenced sex by player group interactions. The pattern was the same for both variables: looks like reality (F(1, 322)=4.63, p=.032, η_p^2 , = .014) and sounds like reality (F(1, 322)=3.84, p=.051, η_p^2 , = .012) in the dream. This is portrayed in Figure 1.

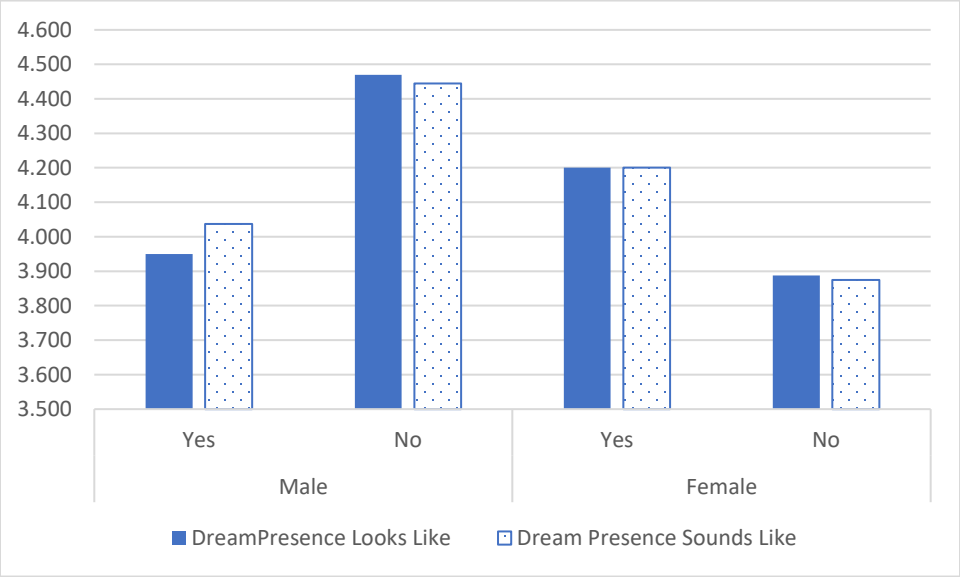

Figure 1. Mean self-report ratings of respondents looking and sounding felt sense of presence, being there, in their recent dreams.

PG play day before recent dream. A more accurate way of examining PG play effects on nighttime dreams is to compare those who played the day prior to their recent dream versus those who did not play it during the day preceding their recent dream. Thus, comparisons of recent dream content are presumably more accurate in terms of the continuity hypothesis than by comparing groups who have or have not played PG at any time. Potential confounds were examined by looking at the relative self reported percentages of computer use for study, computer use for gaming, computer use for social media, telephone/cell phone use, and watching TV/movie videos. A MANOVA on these variables with sex of subject and PG play day before (PGplayb4dream) as the between subject variables were computed. While all the variables showed sex differences that was not the reason for this analysis. Rather the purpose was to see if there were systematic differences in other media use the day prior to the recent dream report that

might confound the effects of PG game play on that day. Two main effects for PGplayb4dream group were significant: Computer Gaming: F(1, 643)= 19.392, p=.0001, η_p^2=.029; watching TV/Movie videos: F(1, 643)= 4.97, p=.026, η_p^2=.008). In both cases, those who played PG the day before the recent dream they reported had more computer gaming (PG play mean = 14.49, SE=1.648; No PG play mean = 6.848, SE=.543) and more TV/movie viewing (PG play mean =16.994, SE=1.996; No PG play mean = 12.309, SE=.658). There were no PG play group or sex group differences in the number of words reported in each dream. Therefore, Computer gaming and TV/movie watching were used as covariates in all dream content analysis comparing PGplayb4dream groups.

As noted earlier, participants were asked to evaluate their own dream in terms of the type of dream they thought it was, their emotions in the dream, their sense of enjoyment of the dream, and their sense of being in the dream (presence). The focus in these results is on the PGplayb4dream groups. There were two main effects for dream type (Lucid: F(1, 589)=5.633, p=.018, η_p^2=.01; Electronic Media Dream: F(1, 589)=2.951, p=.086, η_p^2=.005) with Electronic Media Dream only approaching traditional significance levels. In both cases those who reported some PG play the day prior to their recent dream were higher in evaluating their dream as Lucid (PG play mean =3.269, SE=.250; No PG play mean =2.643, SE=.081) and an Electronic Media Dream (PG play mean =2.399, SE=.193; No PG play mean =2.049, SE=.063). There were no differences in self reported presence in the dreams or enjoyment of the dreams.

A mean for all the positive and all the negative dream emotions asked about were computed and the same sex x PGplayb4dream groups MANOVA with two covariates, as noted, were computed. There was an interaction of sex with PGplayb4dream groups for negative emotions mean which approached traditional significance levels (F(1, 464)=3.568, p=.06, η_p^2

=.008). The interaction was accounted for primarily by those who played PG the day before the dream. Specifically, female PG players had more negative emotions (mean=2.246, SE=.166) than their male PG player counterparts (mean=1.630, SE=.158). Non-PG players had less of a sex difference although in the same direction (female mean=1.953, SE=.057; male mean=1.788, SE=.052).

Of the nine scales four were significant in the sex x PG day before play MANOVA's with the same two covariates. The F-values and means are showed in Table 7.

Table 7

Sex by PG play day before recent dream MANOVA's with covariates F-values and descriptive statistics

Source	Dependent Variable	F-value	Means and standard errors
Gaming in Dream	(act frequency)		
Pokémon Go day before dream groups	Explicit reference in dream to PG	F(1,522)=49.567, p<.0001; η_p^2 =0.087	Players=0.326/0.043 Non-players=0.003/0.015
	Implicit PG reference	F(1,522)=11.08, p<.001; η_p^2 =0.021	Players=.138/.032 Non-players=0.027/0.011
Reality Confusion	(5-point Likert)		
Pokémon Go day before dream groups	Did they know they were in a dream?	F(1,522)=3.911, p<.049; η_p^2 =0.007	Players=1.322/0.095 Non-players=1.124/0.032

Sex x PG play	Did they talk about being awake?	F(1,522)=4.117, p<.043; η_p^2 =0.008	Males: Players=2.898/0.319 Non-players=2.342/0.111 Females: Players=2.082/.332 Non-players=2.502/0.115

Respondents who reported playing PG any amount during the day prior to the recent dream were judged to have more PG explicit and implicit references in their dream. Additionally, the judge coded their dreams as more likely to be lucid. The only interaction with sex was for the Likert item regarding talking about being awake in the dream. Here there was no difference among PG players while the males were considerably more likely to have such queries in their recent dream than the females.

Discussion

The aim of this paper was to examine the dream incorporation of one augmented reality mobile game, Pokémon Go ~~across many players,~~ considering individual and gameplay variables that might mitigate such incorporation. Dream information was gathered using the DII scale, history of dreaming, and by collecting a recent dream.

The reality checking involved in dream lucidity – sometimes associated with video game playing (Gackenbach & Hakopdjanian, 2016). , playing PG, and the relevance of the augmented reality function was of particular interest in this study. While the participants rarely used the camera element of augmented reality, we argue that playing PG requires constant checking of

what is real to be able to move in the physical world, a difference to most other video games. This process is very similar to the lucid dream induction techniques of reality checking (Dyck, Schredl, & Kühnel, 2017).,

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In fact, previous studies on GTP in PG found that gamers have searched for Pokémon beyond the screen while playing and some have believed for moments that the Pokémon could be influenced by physical events such as being driven over. Also, some gamers reported a sensation of Pokémon's physical presence (Ortiz de Gortari, 2017; 2019).Although, in the same studies it was found that the use of the augmented reality feature was only associated with certain forms of manifestation of GTP; re-experiencing sound, music, altered body perceptions, visual and auditory misperceptions and wanting to use a game element in the real world.

Analysis of the lucid subscale of the DII which assesses past expereincesof knowing you are dreaming while you are dreaming shows that none of the GTP subscales was correlated with it, while one of the SPQ subscales was correlated with Extended Self Presence. This appears to reflect the experience in PG of the avatar as mediator between the game and the real world. However, when controlling for gender in all of the partial correlations for DII quantity, all of the GTP and SPQ subscales significantly correlated. Similarly, the lucidity subscale of the DII also improved in the number of correlations with the GTP and SPQ subscales. Now three of the four GTP subscales were significantly, if low magnitude, correlated with lucidity DII subscale and one of the SPQ. These findings suggest that individual differences dimensions of Game Transfer Phenomena and Self Perception in virtual worlds are associated with dream history.

Moreover, it was surprising to find that the major modalities subscale in DII concerned with vision and hearing in dreams were not correlated with any of the subscales of GTP, since it

was expected that those prone to GTP are more receptive to sensory stimuli which in turn facilitate the incorporation of such features into the every day life as well as in dreams. The fact that sensory features like playing with the sound on are not predominant in Pokémon Go, may have played a role at least in the relationship of PG type GTP items.

On the other side, auto-suggestion and paranemsia subscales were as expected correlated with GTP which as previous research has shown involve to certain degree distorted memories, episodic source monitoring errors and dissociations and executing behaviours involuntarly (Ortiz de Gortari & Griffiths, 2019; Ortiz de Gortari & Griffiths, 2014).

PG play was also characterized by performance, impact, fun and depth dimensions in a factor analysis of play items. Regarding the history of video game play and social media use in the current sample, it paralleled findings in previous studies (Gackenbach & Boyes, 2014). PG players were more serious gamers. For the most part there were no differences between PG players and non PG-players on social media. The new ingredient was a game that was attractive to both sexes although more so males (74%), while the majority of females also indicated they played PG (54%).

In the sex by PG group analyses there were no interactions with sex and in five of the six subscales of GTP and SPQ players reported higher scores. Most studies on GTP have not found any significant relationship between GTP and gender (Ortiz de Gortari, 2018; Dindar and Ortiz de Gortari, 2017; Ortiz de Gortari, Griffiths 2015). PG players in comparison to non-PG players, independently of their sex, had more Game Transfer Phenomena and a higher sense of self presence in video games. There was one interaction with sex for core self-presence such that males did not differ in this sense of self in virtual realms across PG play history while females have a higher such sense among PG players than among non-PG players.

It should be noted that when GTP and SPQ subscales were entered into a factor analysis together with Dream Intensity Inventory they loaded on different factors. Thus they are related but not identical.

Not surprisingly the subscales of GTP correlated significantly, with moderate magnitude, with the SP subscales. Immersion, which is closely related to presence in the virtual world has been indicated as predictor of higher levels of GTP (Ortiz de Gortari, Oldfield & Griffiths, 2016). An examination of immersion in PG showed that it is significantly correlated with GTP (Ortiz de Gortari, 2018), particularly forgetting what is happen around oneself, losing track of time, but also searching for Pokémon outside the screen while playing, which in relation to self-presence in PG may suggest the temporal loss of the boundaries between the game and reality while playing PG.

Further analyses between the DII, GTP and SP show that the quantity subscale of the DII (i.e., dream recall factor) and the SPQ was consistently correlated while only altered sensory perceptions in GTP were correlated with quantity subscale of the DII. This finding is surprising since previous studies have showed that dream recall (Ortiz de Gortari, Oldfield & Griffiths, 2016) and dreaming about PG (Ortiz de Gortari, 2017) are predictors of GTP. The discrepancies may be explained by methodological factors to assess dream recall.

Recent Dream

The second and probably more accurate assessment of the impact of PG play on subsequent dreams was the analyses of PG playing the day prior to a recent dream. The marker finding was that those who reported some PG play the day prior to their recent dream were higher in lucidity shown by participants self-evaluation or the judges assessment in blind coding

of the participants dreams. Furthermore, the judge assessed that there were more PG references in the recent dreams of those who played the day before. These findings are strongly suggest that the more a video game embraces the real world it increases awareness of the dream state as a dream.

In several papers the Gackenbach group (Gackenbach, 2008; Gackenbach, Swanston, & Stark, 2016).) has argued that gaming can serve as a type of meditative state with its enhanced absorption and thus result in some of the same outcomes as the practice of meditation, increased lucidity and absorption. These findings offer another perspective on this thesis.

Limitations and Conclusions

By examining correlates with PG and dreams a narrower analysis was possible than with previous inquiries which were primarily about various games. However, limitations in the current study are observed. It should be noted that there was no option for respondents to say they never played a video game since today's students all tend to play games at some point in their lives They also had the choice to participate knowing that the study was about gaming, thus those who absolutely never played would be highly unlikely to have participated. The GTP reported is related to general video game playing including PG, showing the propensity to experience GTP of the participants, however we do not how common GTP was in PG. Previous studies have show that GTP is less prevalent in relation to PG than in game played in the computer or console.

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[i] Another often claimed benefit of this mobile game is its social interaction possibilities. Only 12% reported actively seeking to interact with others and 10% even avoided interactions, with the majority (74%) did not mind; lastly, 3% reported “other”. In terms of physical activity, only 3% said it was the major reason they play while 35% said it was a reason but not the primary one. Most (44%) replied that “I don't even think of that when I play.” In a multiple response item about reactions to this new direction in Pokémon play despite its apparent popularity, 44% replied that they did not want to see gaming head in this direction. A smaller section (38%) said that this new iteration did not affect their opinion of Pokémon at all while 46% indicated that either/both “I've never had a hobby of mine to share with so many people” and/or “I'd love to see more games embrace this level of real world interaction.” Another indication of the seriousness with which they took the game was putting real money into it. Almost a third (28%) indicated they did.