

Adult Reports of Pokémon GO Play: Stronger Parasocial Relationships Predict Increased Nostalgia and Decreased App Play

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Abstract

Lack of physical activity is often associated with electronic media use. However, augmented reality exergames require player movement, making them a potential health application (app). In the exergame Pokémon GO, characters were embedded into the external environment through a live camera feed and viewed through a player's smartphone screen. Online surveys from adults ($N = 230$) who played the Pokémon GO app reported about their childhood emotionally tinged, parasocial relationships with a favorite Pokémon character, motivations to play Pokémon GO, and frequency of Pokémon GO play. Those who had stronger childhood parasocial relationships with a Pokémon character reported playing the Pokémon GO app for nostalgic reasons but reported less frequent app play. Older participants were motivated to play Pokémon GO to increase their physical activity levels and reported more frequent app play. The findings suggest that the age and motivations of players are important considerations for exergame design.

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Physical activity is an important determinant of human health. Although being physically active is associated with lower risk for heart disease, diabetes, obesity, and other health disorders (Althoff, White, & Horvitz, 2016), only 21% of U.S. adults achieve the recommended daily amount of physical activity (Althoff et al., 2016; Nigg & An, 2016). One contributor to sedentary behavior is increased engagement with electronic media, including the mobile phones and devices owned by 90% of American adults (Nigg & An, 2016). Mobile game designers have recently been using mobile devices to promote exercise through mobile *exergames*, which are electronic games that require physical activity to play, often relying on pedometers and global positioning systems (GPS) built into mobile devices (Boulos & Yang, 2013). While prior exergames required players to remain indoors to play, advancements in augmented reality allow players to interact with virtual visual elements in the outside, real-world environment via live camera feed (Westlin & Laine, 2014).

One example of a successful exergame that utilizes augmented reality technology is Pokémon GO, which was first developed in July of 2016 and embraced worldwide by over 40 million active users (Althoff et al., 2016). Using GPS technology and the cameras built into mobile devices, Pokémon GO allows players to embody the roles of *Pokémon Trainers*, navigating their physical environments to capture, hatch, and battle various Pokémon characters (Nigg & An, 2016). Two particular notable features of Pokémon GO are as follows: (a) inclusion of compelling, multigenerational, and familiar Pokémon characters and (b) promotion of physical activity through frequent app play in an augmented reality exergame format.

The use of familiar Pokémon characters in the exergame may serve a motivational role for players. More specifically, as children, these adults may have formed parasocial relationships (PSRs) with Pokémon characters, which are close emotionally tinged relationships that viewers form with media characters (Hoffner, 2008; Horton & Wohl, 1956). The Pokémon characters and television program first became popular in the United States around the turn of the 21st century (Calvert & Kotler, 2003), making these characters potential candidates for PSRs for children who are now adults. Favorite characters of children have the potential to fill children's needs at different points in time (Bond & Calvert, 2014). For adults who grew up with Pokémon characters, some might feel

nostalgia about their former *childhood friends*, thus motivating them to interact with these characters via the augmented reality exergame. Through frequent app play, player movement could then lead to incidental or intentional health benefits.

The purpose of this study was to describe the retrospective memories of young adults' PSRs with a favorite Pokémon character in relation to their motivation to play and reported frequency of use of the Pokémon GO app. The age of players was considered as a potential reason for differential motivations and outcomes of game use, as different cohorts of children may or may not have been in the target age range for exposure to the Pokémon program and associated products, such as collecting cards and figurines of the characters.

Pokémon GO: An Augmented Reality Exergame

Exergames are digital games that combine exercise with game play, often increasing caloric expenditure, heart rate, and coordination by requiring participants to engage in physical activity in order to complete the tasks of the game (Calvert, 2015; Staiano & Calvert, 2011). Exergames like *Wii Sports* allowed players to mimic sports movements that controlled onscreen characters through a remote controller and sensor bar (Staiano & Calvert, 2011). Wii exergame play became integrated into physical education interventions like *The Wii Club*, an afterschool program that led to reduced weight for overweight and obese adolescents who played as a cooperative team, thereby improving physical activity levels and overall health (Staiano, Abraham, & Calvert, 2012, 2013). Nevertheless, Wii exergames like *Wii Fit*, which were integrated into some gyms and health clubs, were stationary and immobile, restricting players to indoor environments (Staiano & Calvert, 2011).

The stationary nature of exergame technology was eventually transformed by mobile technology, which utilizes built-in GPS systems and pedometers, as well as mobile apps, to promote physical activity in the outside world (Boulos & Yang, 2013). Early mobile exergames that relied on smartphone geolocation technology include Dokobots, EpicMix, and Microsoft HealthVault, which tracked player location and allowed for virtual social interactions with other players (Boulos & Yang, 2013). Other early mobile exergames included complimentary, wearable accessories that tracked heart rate and physiological changes during activity, like the Oakley Airwave Goggle used when *skiing* (Boulos & Yang, 2013).

A recent technological advancement in mobile exergame technology involves the inclusion of augmented reality, in which a game adds virtual elements to a live camera feed from a smartphone to integrate the real, external environment (Westlin & Laine, 2014). Over the past several years, several mobile exergames utilizing augmented reality technology have been developed. In *Zombies, Run!*, players traverse the real-world environment gathering virtual supplies to defend

against zombies (Westlin & Laine, 2014). In *Health Defender*, players imitate movements from the popular arcade game, *Space Invaders*, through exercise (Westlin & Laine, 2014). In *GeoBoids*, players explore real-world environments in search of virtual geometric creatures, capturing them through exercise (Westlin & Laine, 2014).

Pokémon GO and Motivation for Physical Activity

Despite findings of positive impacts on physical activity from exergames, some researchers argue that exergames provide insufficient motivation to sustain exercise or engage in exercise over time (Lyons, 2009). Since motivation is an important factor influencing individuals' participation in physical activity (Kilpatrick, Hebert, & Bartholomew, 2005), it is important to explore the link between player motivations to increased reports of app use, an index of physical activity. Two motivations for using Pokémon GO app play are considered in the current study: the players' prior PSRs with a favorite character, and a desire to increase physical activity.

PSRs with Pokémon GO characters. Pokémon GO features nearly 400 Pokémon characters spanning multiple generations ("List of Pokémon (Pokedex)," 2017), including first-generation Pokémon and a Pokedex to track captured characters. Many of the characters included in the mobile exergame are the same characters that children from the late 1990's and early Millennials interacted with via Pokémon trading cards and video game consoles at the turn of the 21st century (Stine, 2016). These Pokémon characters are so familiar that in the initial version of Pokémon GO released, the 150 Pokémon included were recognizable to players by their silhouettes alone, even before the complete visual images appeared with their capture (Keogh, 2017). As a result of this familiarity with Pokémon characters, it is possible that young adults playing Pokémon GO today had emotionally close PSRs with these characters when they were children.

PSR theory is the theoretical foundation for this research study (Hoffner, 2008). Children often perceive their favorite media characters as trustworthy friends, and these positive perceptions can influence those characters' abilities to convey important messages related to prosocial behavior and learning of academic content (Calvert & Richards, 2014). The change from strictly observational technologies, such as television, to interactive technologies, such as exergames, means that the media characters are now potentially able to alter physical health by encouraging players to engage in active app play. Put another way, through interactions with Pokémon characters in exergames, PSRs may improve physical health by serving as reinforcers during app play.

PSRs are multidimensional constructs (Bond & Calvert, 2014). Both parent and child measures of PSRs include the dimensions of *attachment and friendship*,

social realism, and *human-like needs* (Aguiar, Richards, Bond, Brunick, & Calvert, 2018; Richards & Calvert, 2016, 2017). *Attachment and friendship* is an individual's emotional connection to a favorite media character, which includes trusting one's favorite media character and treating that character like a friend (Richards & Calvert, 2016, 2017). *Social realism* refers to the assessment of media characters as real or pretend, and *human-like needs* refers to the belief that media characters can experience wants and needs, like feeling hungry or sleepy (Richards & Calvert, 2016, 2017).

Retrospective memories of individuals' favorite media characters from childhood elicit heightened feelings of nostalgia when the individuals had PSRs with those characters (Wulf & Rieger, 2017). In the case of Pokémon GO, reliving past childhood PSRs with familiar Pokémon characters may provide adults with a new way to access these characters (Keogh, 2017), thereby increasing feelings of nostalgia (Keogh, 2017; Nigg & An, 2016). Augmented reality adds a new layer to players' PSRs with Pokémon characters by providing players with opportunities for enhanced social interaction with their favorite characters that are embedded in the game (Koroleva, Kochervey, Nasonova, & Shibenko, 2016).

Motivation for weight control or weight loss. A second possible motivation for Pokémon game play may be for exercise that can aid participants in sustaining their current weight or that helps them lose weight. Physical activity can become boring for people over time, and games can make physical activity more fun and enjoyable. Specifically, in Pokémon GO, characters populate the everyday environments of players, and there is an element of challenge that can distract them from feeling like physical activities become monotonous over time. Older adults are more likely to be overweight and obese than younger adults (Ogden, Carroll, Kit, & Flegal, 2014), which may increase their motivation for deliberate exercise strategies, including the use of exergames, which are challenging and engaging. However, older adults may have been less involved with Pokémon characters when they were children because they were not the target age for Pokémon when it was popular.

Pokémon GO Exergame Play and Physical Activity Levels

Just as Wii exergame play requires physical activity which can lead to weight loss (Staiano et al., 2012), Pokémon GO requires players to navigate real-world environments searching for virtual Pokémon characters that could lead to weight loss. Indeed, Pokémon GO incorporates physical activity into nearly every function that players can complete within the mobile app. Collecting Pokémon requires physical movement to a nearby *Poké Stop*, and battling other Pokémon in a gym requires navigation to a particular location in the neighborhood, all within the context of augmented reality (Nigg & An, 2016).

Even hatching Pokémon eggs requires players to walk anywhere from 2 to 10 km, with the rarer Pokémon, such as the popular Pikachu and Charmander, emerging after players walk 10 km to hatch eggs (Nigg & An, 2016). Not surprisingly, then, recent studies have suggested that playing Pokémon GO can improve the physical activity levels of its players (Althoff et al., 2016), as considerable movement is required for effective game play outcomes.

In a study investigating Pokémon GO's impact on physical activity, researchers measured physiological changes using Microsoft Bands and found a significant increase in physical activity over a period of 30 days, as measured by the number of steps taken daily (Althoff et al., 2016). This result applied to men and women of all ages and involved a sample that initially was low in activity level (Althoff et al., 2016). In a 2016 pilot study, researchers utilized a pretest, posttest survey design to investigate self-reported increases in days per week and minutes per day of physical activity (Nigg & An, 2016). Overall, playing Pokémon GO decreased reported sedentary behavior and increased the amount of time that participants reported moderate to vigorous physical activity by approximately 50 minutes per week (Nigg & An, 2016).

The motivation to play exergames is of considerable importance, as it may be linked to sustained activity levels. Adolescents reported that the strongest motivation for playing Wii active games was the motivation to be with their friends (Staiano et al., 2012). No one, however, has examined the potential of the game characters themselves to serve as the *friends* of players through PSRs. When an individual has a strong PSR with a media character, they may be motivated to engage in behaviors that can lead to positive outcomes (Calvert & Richards, 2014), which in this case is moving, as measured by frequent Pokémon Go app play.

The Current Study

With its positive reception worldwide, its inclusion of familiar Pokémon characters and augmented reality technology, and its reliance on physical activity, Pokémon GO has the potential to engage players while also improving their physical activity and health. The purpose of this study was to describe PSRs with Pokémon characters, the motivations reported by players for playing Pokémon GO, and reported frequency of game play, an index of physical activity. Our research questions (RQ) were as follows: (RQ1) What factors emerge when players' recollections of PSRs with their favorite Pokémon characters are assessed? (RQ2) Do PSRs and players' age predict their nostalgic and physical activity motivations to play Pokémon GO? (RQ3) To what extent is the reported frequency of Pokémon GO app play predicted by nostalgic and physical activity motivations to play, PSRs with favorite characters, and age?

Method

Participants

The participants were comprised of 230 adults (mean age = 24.29 years, $SD = 6.28$, age range = 18–54 years; 142 females, 87 males, 1 nonbinary) who completed the survey and were eligible to participate. Participants who reported their ethnicity ($N = 218$) identified themselves as predominantly Caucasian or European American (60.4%), with the remaining participants identifying as Asian (11.5%), Hispanic or Latino (6.4%), Mixed (6.8%), Black or African American (5.1%), Filipino (1.3%), Middle Eastern (0.9%), and Puerto Rican (0.4%).

Participants were recruited via e-mail, Facebook, or other forms of social media sharing. College student participants at a university in the D.C. metropolitan area were able to participate in the survey through SONA, an online database that provides university-specific opportunities for engaging in psychological research. This study was approved and conducted in accordance with the university's institutional review board.

Measures

PSRs measure. Participants reported their retrospective memories of their PSRs with Pokémon GO characters during their childhood using questions adapted from the child self-report and parent survey measures of children's PSRs (Bond & Calvert, 2014; Richards & Calvert, 2016, 2017). Child and parent measures of children's PSRs were used because of the retrospective nature of the questions being asked of our adult participants, which emphasized the relationship that they had with a favorite Pokémon character during their childhood.

The child self-report PSR measure included three dimensions: *attachment and friendship*, the attribution of qualities including trustworthiness, empathy, and friendship to the favorite media character; *human-like needs*, the belief that a media character can experience wants and needs, including hunger and sleepiness; and *social realism*, the belief that media characters are real or pretend (Richards & Calvert, 2016, 2017). The parent survey on children's PSRs also yielded the dimensions of *human-like needs* and *social realism*, as well as an *attachment and character personification* (Richards & Calvert, 2016). The *attachment and character personification* ($\alpha = .75$), *human-like needs* ($\alpha = .90$), and *social realism* ($\alpha = .89$) subscales of the parents' survey were internally consistent (Richards & Calvert, 2016), and the child parasocial subscale of *attachment and friendship* was internally consistent at $\alpha = .70$ for 4- to 6-year-old children (Richards & Calvert, 2017).

To answer the questions on the PSR measure, participants were first asked if they had a favorite Pokémon GO character and provided his or her favorite character's name, if applicable. Next participants reported on a 5-point Likert

scale (*strongly disagree*, *disagree*, *neither agree nor disagree*, *agree*, and *strongly agree*), their levels of agreement to statements related to the attachment and friendship and human-like needs PSR subscales (Richards & Calvert, 2016, 2017). If a participant had selected Pikachu as their former favorite character, for example, that name populated the rest of the survey. In this instance, a sample survey question for *attachment and friendship* was, “When I was younger, Pikachu made me feel comfortable.” For the *human-like needs* dimension, a sample question was, “When I was younger, I believed that Pikachu got hungry.” Due to experimenter error, the social realism dimension could not be assessed in the current study because of failure to ask all questions on this subscale.

Motivation to play Pokémon GO. Participants ranked on a 5-point Likert scale (*not at all*, *a little*, *somewhat*, *a lot*, and *a whole lot*) the extent to which their motivation to play Pokémon GO was based on a PSR with a childhood favorite character, nostalgia (i.e., playing to relive childhood experiences), and a desire to increase their physical activity level.

Reported frequency of App play. Participants ranked on a 5-point Likert scale how frequently they used the Pokémon GO app in the prior week.

Procedure

Participants completed the survey through Qualtrics (Qualtrics Research Suite©, 2017), which provides software for conducting survey research. Participants were required to provide informed consent for survey participation by electronic signature. The survey consisted of 100 questions, including a childhood favorite Pokémon GO character, their PSR with that Pokémon GO character, motivation for Pokémon GO app play, reported frequency of Pokémon GO game play, and the participant’s demographic information. On average, the survey took approximately 21 minutes to complete. College student participants were awarded a small amount of course credit for participation; other participants did not receive an incentive.

Results

Prior PSRs With Pokémon GO Characters

All participants in this sample reported a favorite Pokémon character. The most frequently reported favorite characters were Pikachu (9.7%), Eevee (6.1%), and Charmander (4.3%). Using the adapted questions from the PSR measure (Richards & Calvert, 2016, 2017), a principal components analysis with a varimax rotation was conducted to determine the dimensions of participants’ PSRs

with Pokémon GO characters. As shown in Table 1, two factors—attachment and friendship and human-like needs—reached eigenvalues greater than 1.0.

The attachment and friendship factor consisted of four items, and the human-like needs factor consisted of three items. These two factors accounted for 75% of the total variance, with both factors exhibiting strong internal consistencies (attachment and friendship: $\alpha = .895$ and human-like needs: $\alpha = .793$). Two additional items, one assessing trust and the other sadness when the character made a mistake, were dropped because both crossloaded across two dimensions.

PSRs and Age as Predictors of Motivations for Pokémon GO App Play

A regression analysis was conducted with average attachment and friendship scores and age in years as independent variables and nostalgia as a reason for play as the dependent variable. The overall model was significant, $F(2, 226) = 15.98$, $p < .001$, adjusted $R^2 = .12$. Feelings of attachment and friendship with a favorite Pokémon character ($b = .23$, $SE = .09$) and age ($b = -.06$, $SE = .01$) were significant predictors of playing Pokémon GO for nostalgic reasons. Those with higher attachment and friendship scores with their favorite Pokémon character were more likely to play for nostalgic reasons, $t(226) = 2.61$, $p = .01$. Older adults were less likely to play the Pokémon GO app for nostalgia reasons, $t(226) = -4.34$, $p < .001$.

A second regression model was conducted with age and attachment and friendship scores as independent variables and motivation to increase physical activity through Pokémon GO app play as the dependent variable. The overall model was significant, $F(2, 226) = 11.08$, $p < .001$, adjusted $R^2 = .08$. Age in years ($b = .06$) was a significant, positive predictor of motivation to play Pokémon GO to increase physical activity, $t(226) = 4.56$, $p < .001$ (8.4% of the variance). Attachment and friendship to a favorite Pokémon character ($b = -.01$) did not significantly predict motivation to play Pokémon GO to increase physical activity, $t(226) = -0.17$, $p = .87$.

Predictors of Reported Pokémon Go App Play

A regression analysis was conducted with frequency of app play as the dependent variable and motivation to play for nostalgia, motivation to play to increase physical activity, age, and attachment and friendship as independent variables. The overall model was significant, $F(4, 224) = 28.21$, $p < .001$, adjusted $R^2 = .32$. The reported frequency of app play was positively predicted by higher motivations to play to increase physical activity ($b = .27$), $t(224) = 4.88$, $p < .001$, and being older ($b = .08$), $t(224) = 6.23$, $p < .001$. However, attachment and friendship ($b = -.19$) negatively predicted the reported frequency of play, $t(224) = -2.66$, $p = .008$. Playing for nostalgia reasons ($b = .06$) was not significant, $t(224) = 0.84$, $p = .40$.

Table 1. Factor Analysis of Participants' Perceptions of Their Own Parasocial Relationships With Their Favorite Pokémon GO Character:

Factor	Eigen values	% of variance explained	Item	Factor loadings	M	SD
Attachment and friendship $\alpha = .895$	4.063	58.05	"When I was younger, (*Pokémon GO' character ^{*)} soothed me."	.89	2.83	1.11
			"When I was younger, (*Pokémon GO' character ^{*)} made me feel comfortable."	.88	2.96	1.20
			"When I was younger, (*Pokémon GO' character ^{*)} made me feel safe."	.87	2.59	1.15
			"When I was younger, I treated (*Pokémon GO' character ^{*)} as a friend."	.70	3.02	1.20
Human-like needs $\alpha = .793$	1.169	16.70	"When I was younger, I believed (*Pokémon GO' character ^{*)} Got hungry."	.22	2.83	1.23
			"When I was younger, I believed (*Pokémon GO' character ^{*)} Got sleepy."	.30	3.02	1.24
			"When I was younger, I believed (*Pokémon GO' character ^{*)} had thoughts and emotions."	.19	3.61	.90

Note. The items "When I was younger, I trusted (*Pokémon GO' character^{*)}" and "When I was younger, I Got sad when (*Pokémon GO' character^{*)} Got sad or made a mistake" were dropped because both crossloaded across two dimensions. Bold values within a column indicate items that are part of a specific dimension. The strength of the items is determined by the numeric value of the loading (in bold), which ranges from -1 to +1, with numbers closer to +/- 1 indicating a stronger loading on a given dimension. T

Summary of Findings

Participants' retrospective reports of PSRs with Pokémon characters yielded two dimensions: (a) attachment and friendship and (b) human-like needs. Participants with higher feelings of attachment and friendship were more likely to play Pokémon GO for nostalgic reasons, whereas participants who were older were more likely to play to improve their physical activity. Participants who were older and more motivated to play Pokémon GO to improve their physical activity reported playing Pokémon GO more frequently. By contrast, participants with stronger feelings of attachment and friendship with a favorite Pokémon GO character reported playing Pokémon GO less often.

Discussion

The purpose of this study was to describe how PSRs with Pokémon characters and the age of players impacted motivations to use Pokémon GO for nostalgia or physical activity, which in turn, was expected to increase the frequency of reported Pokémon GO app play. Our first RQ asked what factors constitute players' retrospective memories of PSRs with the Pokémon characters that were now embedded within Pokémon GO. The factor analysis of the items in the PSR measure yielded two dimensions—attachment and friendship and human-like needs—both of which were consistent with dimensions reported in previous studies (Aguiar, Richards, Bond, et al., 2018; Richards & Calvert, 2016, 2017). These findings provide further evidence for the ongoing importance of memorable experiences with characters as a facet of social relationships (Aguiar, Richards, Bond, et al., 2018). It also appears that if children breakup with previous favorite characters (see Aguiar, Richards, Bond, Putnam, & Calvert, 2018), they continue to recall close feelings for them years later, as indicated by the long-term emergence of the *attachment and friendship* dimension of PSRs with a formerly favorite Pokémon character. These imaginary characters are also remembered as having *human-like needs*, such as feeling hungry and sleepy, which means that these adults gave these characters animate qualities that are consistent with being alive (Calvert & Richards, 2014). Finally, the transmedia nature of PSRs is apparent, as these dimensions were reflected in adults' experiences in an augmented reality environment, which did not even exist when these adults first *met* the Pokémon GO characters during their childhood.

Our second RQ asked if PSRs and the age of Pokémon GO players predicted their motivations to play the mobile app for nostalgia reasons or to increase their physical activity levels. Players with higher feelings of attachment and friendship with Pokémon characters were more likely to play Pokémon GO for nostalgia motivations, and PSRs for nostalgia motivations were stronger

for younger than older Pokémon GO players. The positive relationship between PSRs and feelings of nostalgia is consistent with previous literature (Wulf & Rieger, 2017) and suggests that the inclusion of favorite media characters with which players' experience feelings of attachment and friendship influences how games are perceived. Stronger PSRs with characters were unrelated to motivations for physical activity, but an interest in physical activity was a motive for older participants.

Our final question asked if the motivations to play Pokémon GO were linked to reported app play. Those who reported stronger PSRs with a prior favorite Pokémon character when they were a child actually reported *less* app play. Thus, the indirect route of playing the exergame to be in contact with a favorite character via a PSR was not an effective way to increase frequency of play. One possible reason for the negative relation between childhood PSRs with Pokémon characters and reported app play may be that the characters commonly listed by our participants as favorites were rarely in the game. Two of the most frequently reported favorite Pokémon GO characters, Pikachu and Charmander, were classified as *special* Pokémon GO characters, falling even beyond the *very rare* range in terms of ease of capture and frequency of appearance (Higgins, 2016). When this study was conducted, capturing characters like Pikachu and Charmander required an achievement of high Pokémon GO player levels, which involved walking to numerous Pokéstops in which players encountered evolving low-level characters, harvesting eggs, and fighting in gyms (Higgins, 2016). Since players with popular favorites like Pikachu and Charmander could not interact with these *special* characters frequently if at all due to the game design (Higgins, 2016), they likely could not reactivate past PSRs with these characters or may have felt discouraged that they could not find those favorite characters, which may have disrupted their actual app play.

Older participants, by contrast, who had expressed greater motivation to play Pokémon GO in order to increase their physical activity levels, did report more app play. Thus, the direct route of playing Pokémon GO to increase physical activity was an effective motivation. This finding is consistent with previous literature examining the link between motivation to increase physical activity and actual initiation of, and participation in, that physical activity or exercise (Kilpatrick et al., 2005).

Our findings also suggested that players of different ages were playing Pokémon GO for different reasons. Specifically, younger participants with stronger PSRs played for nostalgia and older participants played to increase their levels of physical activity. Given the game design, it was possible for the motivations of those who wanted to play for physical activity to be met. However, those who had a particular favorite Pokémon character who was difficult to find may have had their motivations undermined. The implication is that exergame designers could improve play frequency and the associated physical activity of younger adult players by including game features needed

for sustained Pokémon GO app play, specifically easier access to their favorite Pokémon characters. Because Pokémon GO's inclusion of augmented reality technology provides the potential for enhanced parasocial experiences with favorite characters (Koroleva et al., 2016), the rare appearance of popular favorite characters presents a missed opportunity for app play for younger players, who reported stronger feelings of attachment and friendship and nostalgic motivations. Pokémon GO remains extremely popular (Barrett, 2018), so making these changes are clearly an option and an opportunity.

One limitation of this study was that a survey was used as the data collection technique, which included participants' self-reports of Pokémon GO app play frequency. To gain a more thorough understanding of how reported motivations and PSRs impact physical fitness, future studies could directly measure duration of time spent playing Pokémon GO and physiological changes related to participants' physical activity via motion detection trackers embedded in smart phones. Future research could also explore the long-term effectiveness of exergame play, the impact of different schedules to engage in exergames based on work and school demands, and include the questions about the social realism dimension of PSRs with Pokémon characters.

Conclusion

Pokémon GO players report about their favorite Pokémon character from the past yielded two factors: *attachment and friendship* and *human-like needs*, which are consistent with prior reports about children's PSRs with media characters (Aguiar, Richards, Bond, Brunick, & Calvert, 2018; Richards & Calvert, 2016, 2017). Different motivations for Pokémon GO app play occurred in this study, with nostalgic as the reason for younger adults' play and to improve physical activity for older adults' play. Nostalgia was unrelated and stronger feelings of attachment and friendship (i.e., PSRs) with a favorite character was negatively related to reported levels of Pokémon GO app play. The infrequent appearance of childhood favorite Pokémon characters in the new Pokémon GO app is a potential reason for this negative outcome. The motivation for increased physical activity, by contrast, did yield higher levels of reported Pokémon GO app play. Overall, the findings suggest the importance of considering a players' age and motivations for play when designing augmented reality exergames like Pokémon GO, which could potentially extend the physical activity and health-related outcome benefits that were found for older adults to younger adults as well.


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