Flow and Pokémon GO: The Contribution of Game Level, Playing Alone, and Nostalgia to the Flow State

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Abstract

Purpose: Although there has been research examining the physical benefits of playing the mobile augmented reality exergame, Pokémon GO (released in July 2016), the mental health benefits have not been investigated. Therefore, to add to the body of knowledge concerning the mental health benefits of playing exergames in the new context of augmented-reality mobile games, this study investigated the positive and beneficial concept of flow and its association with playing Pokémon GO.

Design/Method/Approach: A quantitative survey of 202 adult players of Pokémon GO using two validated survey instruments, measuring flow and nostalgia, investigated the correlation between the beneficial state of flow, and playing Pokémon GO. Additionally, thematic analysis was used to analyse participant responses to optional, open-ended questions.

Findings: Significant predictors for 27% of variance in flow levels of Pokémon GO players were: game level achieved, playing alone, nostalgia for Pokémon from childhood, and playing with family. The themes identified by thematic analysis of participant comments concerned the beneficial effects they considered Pokémon GO was having on their social, mental, and physical well-being.

Key words: Flow; Pokémon GO; nostalgia; game design; exergame.

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Introduction

*Pokémon GO* is an augmented reality, mobile exergame, developed by the Californian software company Niantic, Inc. and released on July 6, 2016. It quickly became the most popular mobile game to date in the USA (Makuch, 2016) and had been downloaded over 100 million times worldwide by the end of July 2016 (Perez, 2016). In the USA, *Pokémon GO* overtook both *Tinder* and *Twitter* in terms of total users a week after its release date (Hern, 2016). This level of popularity was not sustained and by August 2016, *Pokémon GO* had lost one third of its daily players (Humphery-Jenner, 2016).

Wagner-Greene et al. (2017) noted that there have been few empirical studies of *Pokémon GO*. This is despite its initial popularity, the intense media interest in it as a popular culture phenomenon, the remaining player base, and that some short papers suggested its research potential (Baranowski, 2016). Some researchers have theorised outcomes that could be associated with the game, although these have not been tested (Tateno et al., 2016). Others have used the game as inspiration for related research, without actively investigating *Pokémon GO* (Pourmand et al., 2017).

The few empirical studies that have been conducted with *Pokémon GO* have focused either on the physical health benefits that players derive from playing, or on the personality traits of the players of the game, especially their motivations and influences for playing. Tabacchi et al. (2017) compared the personality traits of early-adopters of *Pokémon GO* with those who started playing later and how this influenced the type of play. Yang and Liu (2017) explored the factors which might explain *Pokémon GO* players’ motives for playing (exercise, fun, escapism, nostalgia, friendship, maintenance, relationship initiation, and achievement). Kaczmarek et al. (2017) found that a motivation for better health, along with the previously identified main motives for gaming of achievement, immersion, and socializing, influenced individuals to start playing *Pokémon GO*.

Studies that focused specifically on the physical health benefits associated with *Pokémon GO* returned mixed results, particularly in the short-term, regarding the game’s ability to affect change in physical activity. Barkley et al. (2017) found that playing *Pokémon GO* was associated with an increase in walking (self-reported), and a decrease in sedentary behaviour; a finding which complements the discovery of Wagner-Greene et al. (2017) that 31% of 662 participants had not met the recommended activity levels prior to playing, but 75% reached this level afterwards. Xian et al.’s (2017) pre-post observational study of 167 *Pokémon GO* players found that players took more steps each day after they started playing the game. Howe et al. (2016) also reported a significant increase in daily steps after participants installed and began playing *Pokémon GO*. However, over several weeks their number of daily steps returned to pre-installation game levels. Wong (2017) compared players’ frequencies and durations of staying outdoors, walking, and jogging with that of ex-players and found no significant difference in their overall or total physical activity levels.

Although it has been suggested that *Pokémon GO* might have mental as well as physical health benefits for its players (Baranowski, 2016; Saifi, 2016), research into the mental health benefits of playing the game is lacking. A review of the literature on exergames by Staiano and Calvert (2011) found that exergames have physical health benefits for their players, as well as mental health benefits due to increased social interaction, self-esteem, self-efficacy, positive mood, and motivation. To add to the body of knowledge concerning the mental health benefits of playing exergames in the new context of augmented-reality mobile games, this study investigated the positive and beneficial concept of flow and its association with playing *Pokémon GO*. This study has three aims:

1. To explore the extent to which the progression through *Pokémon GO*’s game levels is associated with increased flow.
2. To investigate the contribution that playing alone, playing with others, and nostalgia for *Pokémon* from childhood, contributes to the level of flow experienced.
3. To explore why players find *Pokémon GO* enjoyable, and to describe the ways in which they believe their well-being and social life is being impacted.
Literature Review

Flow and Video Games

Individuals enter the beneficial state of ‘flow’ when they perceive a balance between the challenges faced in their current situation, and their capabilities (Csikszentmihalyi, 1990). Research conducted with individuals experiencing flow in a variety of contexts has found that the state of flow is a highly enjoyable experience (Jackson et al., 1998), and associated with mental health benefits including positive emotional, motivational, and cognitive experiences (Fong et al., 2015; Jackson & Marsh, 1996). These benefits arise because when a person is in a state of flow, they concentrate so intently on their current activity that they are able to forget unpleasant thoughts and ignore distractions (Kiili & Lainema, 2008).

The original flow framework was developed by Csikszentmihalyi (1975) and contained nine key elements and dimensions: (i) A balance of an individual’s skill to meet a highly challenging task; (ii) a merge of action and awareness; (iii) clarity of the task’s goals; (iv) unambiguous feedback; (v) concentration; (vi) loss of self-consciousness; (vii) distorted sense of time; (viii) sense of control; and (ix) an overall autotelic experience (Csikszentmihalyi, 1990; Jackson & Marsh, 1996). It has been suggested that research into the complex processes contributing to the state of flow would enable a better understanding of how to use the state to increase productivity, life satisfaction, happiness, and improve well-being (Csikszentmihalyi, 1998). Research has often used video games as the context to investigate these beneficial effects.

Pokémon GO combines exercise and gaming, which could assist players of Pokémon GO to experience flow and the associated positive effects. The concept of flow has been applied in digital contexts including users of virtual environments (van Schaik et al., 2011) and, increasingly, to players of video games (Kaye, 2016; Keller et al., 2011; Limperos et al., 2011; Procci et al., 2012). Sherry (2004) noted that video games possess characteristics that help create and maintain flow because they contain the elements of the Csikszentmihalyi (1975) framework. For example, players of video games often report losing track of time as they play (Procci et al., 2012), and the defining feature of video games is their interactivity, which allows players a degree of control over the game’s world as well as feedback as they progress (Rigby & Ryan, 2011). Furthermore, studies have found evidence that playfulness helps to activate a state of flow (Ting-Jui & Chih-Chen, 2003), and video games primarily involve play (Crawford & Rutter, 2007).

To progress through exergames such as Pokémon GO, the player must engage in physical movement, and needs to be motivated by the challenges, competition, control, and curiosity stimulated by these games in order to continue playing (Laine & Suk, 2016). These motivators are considered to help achieve a state of flow (Hamari & Kovisto, 2014, Laine & Suk, 2016; Csikszentmihalyi, 1998). Research has confirmed that players of exergames can experience the flow state (Marston et al., 2016). Therefore, flow is an appropriate research variable in investigating Pokémon GO, particularly given the exergame and augmented-reality elements of the game. The game level achieved is also likely to have a positive association with flow due to the need for the skill and challenge of a task to be balanced for the flow state to occur (Fong et al. 2015; Keller et al. 2011). Players achieve higher game levels through more play and progression, which would indicate a balance between the skill of the player and the challenge of the game. Therefore, the first hypothesis (H1) is:

The higher the game level achieved by a player of Pokémon GO, the greater the level of flow reached.

Playing Alone and Playing with Others

Pokémon GO players are encouraged to cooperate with other players in order to learn more about the game. The objectives of the game are non-competitive and due to a lack of in-depth tutorials for the game (Concepcion, 2016), cooperation with others is likely to improve players’ skill and understanding of the game and is expected because Pokémon games have been
designed to encourage social interaction (Haiven, 2012). Research examining flow in cooperative gaming contexts found that effective group communication, knowledge of others’ skills, and effective team-working are factors that if present, can increase flow (Kaye, 2016). Furthermore, video game play is often considered to be a social activity and many games allow for talk and play with other players (Buckingham, 2006). Research into flow supports the idea that social flow (i.e. flow that is experienced in a group environment) is more enjoyable than flow that is experienced in isolation (Walker, 2010). Although Pokémon GO involves a social component, it is likely that increased flow levels will be associated with playing alone due to players becoming immersed in the game.

Immersion is an intense mental involvement often linked to players of video games (Calleja, 2011; Hjorth, 2011; Majorek & du Vall, 2016; Rigby & Ryan, 2011), and has been described as a feeling that an individual is entirely surrounded by a completely different reality (Murray, 1997). Flow has been described as a psychological state of immersion and the two concepts are closely linked. When players of video games become immersed in their games, they forget that the media lies between them and the game; they are present and emotionally experiencing the game as if it was happening in their conscious world (Rigby & Ryan, 2011). The player is so involved in the game that nothing else matters, and other thoughts or concerns are forgotten (Sekhavat & Zarei, 2017). Within video games, immersion often occurs as a consequence of the intense concentration that is necessary to attend to the challenges and activities in the game (Dovey & Kennedy, 2006), and has been found to occur in players of augmented reality games (Sekhavat & Zarei, 2017). Augmented reality differs from virtual reality in that the latter creates a new computer-generated world, while the former augments the real world with computer-generated resources (Laine & Suk, 2016; Majorek & du Vall, 2016). The only way to experience augmented reality is to interact with it, thus increasing its immersive capabilities (Majorek & du Vall, 2016). Cases of deep concentration have been associated with Pokémon GO players. For example, there have been reports of players in Bosnia wandering into mine fields (Pokémon Go: Bosnia players warned of minefields, 2016), or crashing their car while playing the game (Butler, 2016). Consequently, players who play with others may lack the concentration needed to experience flow and immersion. Therefore, the second hypothesis (H2) is:

Playing Pokémon GO alone allows players to experience higher levels of flow.

Nostalgia

The Pokémon franchise began in 1996 in Japan with a single product: a video game for the Nintendo Game-Boy hand-held console. The franchise quickly expanded worldwide with a cartoon series, multiple new titles in the video game series, and tie-in merchandise ranging from books to stationery and toys (Allison, 2003). The franchise, including both games and cartoons, places the participants in the role of a Pokémon ‘trainer’ who travels the Pokémon world collecting Pokémon (fantastic creatures) to care for and, to train to engage in gladiatorial-style battles with each other (Haiven, 2012).

Players of the original Pokémon games were encouraged to acquire knowledge about each Pokémon, including which type of ‘species’ they were (for example water, fire, or psychic), and what their weaknesses and strengths were, in order to win more battles. The amount of information associated with Pokémon has been described as ‘immensely detailed and quite incomprehensible to outsiders’, but was avidly learned by fans (Buckingham & Sefton-Green, 2003). The Pokémon franchise was originally targeted at children aged between four and 14 and was enormously popular from the time of its release in the USA in 1999 (Buckingham & Sefton-Green, 2003). Although its popularity declined after 2003, the Pokémon franchise has continued, and the audience remains sufficiently large to warrant the cartoon and video games continuing to be in production with regular releases of new titles.

Pokémon GO follows the original Pokémon formula: Players must collect Pokémon and train them to do battle, but in order to find and improve the skills of their Pokémon in Pokémon GO, players must walk in their real-world environment (Concepcion, 2016). Sometimes considerable distances must be covered to achieve success and this is the exergame component. Therefore,
*Pokémon GO* utilises elements from the original *Pokémon* franchise which many players will recall from their childhood.

Players of video games often feel nostalgic about games from their childhood that they had put time and effort into playing, understanding the patterns, and meeting the challenges they contained (Fenty, 2008). Nostalgia is understood to be a process of looking back to the past, and then trying to bring that past into the present (Taylor & Whalen, 2008), and involves a preference for objects or interests that were more common when consumers were younger (Holbrook & Schindler, 2003). When a video game series (or remake) moves to a new hardware platform, this often triggers nostalgia as players remember the fun they had with the original hardware and they want to re-live the experience (Taylor & Whalen, 2008). Many players of video games list older games in their top-ten favourite’s lists and feel nostalgic about the enjoyment they experienced when playing and being a part of their created worlds (Fenty, 2008), which is unsurprisingly given that nostalgic feelings are predominantly positive and may lead to psychological benefits such as positive self-esteem (Koetz & Tankersley, 2016).

For players, remembering the characters and the created worlds of video games they played in their youth is a way of activating nostalgia for that period of their lives (Taylor & Whalen, 2008). *Pokémon GO* appears to have stimulated nostalgia in its players. For example, *Pokémon* songs on the music streaming service Spotify reported a popularity spike in the days following the game’s release in the USA; the original *Pokémon* theme song increased its number of plays by 362% (Carpenter, 2016). Nostalgic feelings have been found to motivate consumers in the past to make purchases or engage in online communities (Koetz & Tankersley, 2016). Therefore, part of *Pokémon GO*’s popularity may be due to nostalgia, which may impact on flow. *Pokémon GO* players, who played or enjoyed *Pokémon* games as children, may experience a higher state of flow because they have a greater feeling of control in the game and clarity of the goals, and be more likely to concentrate closely due to their prior knowledge and familiarity. Furthermore, the current popularity of *Pokémon GO* may be related to the longevity of the *Pokémon* franchise. Therefore, the third hypothesis (H3) is:

Players of *Pokémon GO* with higher levels of nostalgia for *Pokémon* from their childhood will experience higher levels of flow.

**Summary of the Research Hypotheses**

It is hypothesised that as players progressed through the game levels in *Pokémon GO*, their level of skill, their awareness of progress, and their sense of competence would increase. Therefore, it would be expected that there would be a positive association between the level achieved in *Pokémon GO*, and the level of flow experienced. Furthermore, it is speculated that playing alone would result in players experiencing higher levels of focus on the game, a sense of removal from others, and an insensitivity to the passage of time, which would all be associated with higher levels of flow. This study also theorised that players with high levels of nostalgia for *Pokémon* from their childhood would experience higher levels of flow due to finding *Pokémon GO* to be a more rewarding experience, and having a greater feeling of control because of their prior knowledge about the game.

**Methodology**

**Data Collection**

To investigate flow levels in adult players of *Pokémon GO*, an online questionnaire was developed and distributed in September 2016, via SurveyMonkey. Ethics approval was provided by the university Research Ethics Committee for blinded for review (S/1234/xx). The survey originated in Australia, and recruitment methods used included: posts on personal Facebook accounts, announcements to students during lectures, personal contacts of the authors, and Facebook posts on *Pokémon GO* player forums.

**Participants**
A total of 214 participants completed the survey. Twelve participants were removed from the data set because they were under 18 years and this study was interested in the flow levels experienced by adult players of Pokémon GO. The final data set had 202 participants (124 female, 74 male, 4 did not indicate). The age of the participants ranged from 18 to 55 years (average 29.3 years, SD = 8.7). The majority of players indicated that they played mainly in Australia (86%). The median number of Pokémon collected was 104 (maximum 145), the median level achieved was level 22 (maximum 40), and the median distance travelled whilst playing the game was 110 kilometres.

**Measures**

Validated survey instruments were used to measure flow and nostalgia. The Flow State Scale-2 Short Form (FSS-2) (Martin & Jackson, 2008) has nine items and uses a seven-point scale ranging from ‘strongly disagree’ to ‘strongly agree’. The FSS-2 was selected due to its prior use to successfully measure the flow in cooperative and solo gaming contexts (Kaye, 2016), and the smaller number of items compared with other scales made it more accessible to participants. Items were adapted for this study by asking respondents specifically about Pokémon GO, for example: *I do things spontaneously and automatically without having to think when playing Pokémon GO.*

The second instrument used was the Nostalgia Scale (Shields and Wiggins, 2016), which is a four-item, seven-point scale which focuses on childhood nostalgia, with answers ranging from ‘strongly disagree’ to ‘strongly agree’. The Nostalgia Scale was adapted to contain items specific to Pokémon such as: *Pokémon features in happy memories of when I was younger.*

Players were also asked in the survey to provide information regarding: game level achieved in Pokémon GO, kilometres travelled collecting Pokémon, and the number of different Pokémon collected, which are statistics the game tracks. Further questions related to demographics (age, gender, work, and study status) and the number of hours per week played alone, with friends, with family, and with strangers. At the conclusion of the survey, players were given the opportunity to provide further comments regarding their opinions on: (a) the way in which Pokémon GO had impacted on their well-being; (b) on their social life; and (c) why they enjoyed playing Pokémon GO.

**Data Analysis**

Multiple regression was conducted using SPSS (version 24). A model was developed to examine the factors that would predict flow levels, including game level, nostalgia, playing alone, and playing with others. Additionally, participant responses to optional, open-ended questions were analysed using thematic analysis. Thematic analysis is a ‘method for identifying, analysing, and interpreting patterns of meaning within qualitative data’ (Clarke & Braun, 2017). Thematic analysis was selected because it is a flexible method and can be applied across a range of theoretical approaches and frameworks (Braun & Clarke, 2006), and was used to explore the player experience and to investigate the way in which playing Pokémon GO may enhance well-being.

**Results**

Results of multiple regression analysis showed that game level, playing alone and with others, and nostalgia explained 27.1% of the variance in flow levels ($R^2$ adjusted = .25, $F (6,195) = 12.11, p < .001$). Game level significantly predicted flow ($β = .25, p < .001$), as did playing alone ($β = .23, p = .002$), nostalgia ($β = .20, p = .002$), and playing with family ($β = .15, p = .024$). Playing with friends was not significantly correlated with flow ($β = -.13, p = .062$), nor was playing with strangers ($β = .09, p = .18$). Therefore, the three hypotheses were supported by the results.

Table 1 shows that, playing Pokémon GO is primarily a solitary activity. On a weekly basis, 57% of participants indicated that they spent more than six hours per week playing alone, whereas only 25% of participants spent more than six hours playing with friends. This percentage was further reduced for family play (18%), and play with strangers (6%).

**Table 1:**


**Table 2: Inductively Developed Thematic Categories**

<table>
<thead>
<tr>
<th>Category</th>
<th>Thematic Category</th>
<th>Key Terms</th>
<th>Characteristic Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. Please tell us how playing Pokémon GO has impacted on your well-being</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Well-being</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>Physical</td>
<td>Walk, exercise, outside, active, outdoors, lost kgs</td>
<td>I’m more active and can run long distances in shorter amounts of time</td>
</tr>
<tr>
<td>W2</td>
<td>Mental</td>
<td>Happy, joy, mental health, mood, depression, leaving house</td>
<td>Gives myself an objective when going outside which is helpful for my anxiety and depression.</td>
</tr>
<tr>
<td>Q2. Please tell us how playing Pokémon GO has impacted on your social life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>Extended social group</td>
<td>Made, new, people, strangers</td>
<td>Met some fantastic people from all walks of life</td>
</tr>
<tr>
<td>S2</td>
<td>Enhanced relationships</td>
<td>Friends, children, sons, partner,</td>
<td>It has encouraged me to spend more time with my partner and friends doing things together, rather than doing things separately but near each other</td>
</tr>
<tr>
<td>S3</td>
<td>No change</td>
<td>None, no, hasn’t, not</td>
<td>It hasn’t</td>
</tr>
<tr>
<td>Q3. Why do you enjoy playing Pokémon GO?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enjoyment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1</td>
<td>Achievement</td>
<td>Collect, collect em all, challenge,</td>
<td>Scratches my collector itch</td>
</tr>
<tr>
<td>E2</td>
<td>Nostalgia</td>
<td>Childhood, memories, nostalgia,</td>
<td>A new way to play my favourite childhood game</td>
</tr>
<tr>
<td>E3</td>
<td>Entertainment</td>
<td>Fun, escape, enjoy, exciting, motivation, happiness</td>
<td>It is fun and very engaging</td>
</tr>
</tbody>
</table>

**Discussion**

The results provide evidence that playing Pokémon GO is positively correlated with increased flow levels and so address Baranowski’s (2016) call for research into the health effects of Pokémon GO as well as addressing the lack of mental health focused research into playing Pokémon GO. This research has added to the existing body of knowledge concerning flow and...
video games (Kaye, 2016, Keller et al., 2011; Limperos et al., 2011; Procci et al., 2012). Game level was the strongest predictor of flow (H1) indicating that the game design and game mechanics used for Pokémon GO provide an appropriate balance between skill and challenge to allow for the flow state to occur in players, which follows findings by Fong et al. (2015) and Keller et al. (2011).

The second strongest predictor of flow was playing alone (H2) indicating that players did not require social interaction to experience a state of flow. This is contrary to the initial intention of the manufacturers who designed the game for collaboration between players (Haiven, 2012), but does align with Kaye (2016) who found that flow in a video game context was experienced to a greater extent by playing alone. The concentration and focus associated with playing alone provided a better context for producing a flow experience than playing with others. However, a surprising result, given the high level of concentration needed to achieve flow (Fang et al., 2013; Kiili & Lainema, 2008), was the significant positive association between flow levels and playing with family members. The mutual assistance between and within generations may increase the sense of control and clarity with regard to the task goals of the game for participants. Older participants commented on the benefits of playing with their children: ‘I play with my children. I also play by myself so I can tell them about my progress’ (Female, 35, part-time work, part-time study); ‘Shared experience with my children’ (Male, 45, full-time work); and ‘It creates an atmosphere where I can have fun with my grown-up children even when I am not with them’ (Female, 55, full-time work).

Whilst playing with strangers and friends was not significantly associated with flow, playing with others may have a beneficial impact on social well-being. Thematic analysis showed that players were expanding their social networks through meeting new people while playing Pokémon GO, and through joining online forums with other players as indicated by this comment: ‘In general, most strangers I met while playing the game had been extremely helpful and friendly, either the ones on the street or from the Facebook groups. Definitely positive feel to the experience dealing with other people’ (Male, 43, unemployed). Thematic analysis also demonstrated that players were deepening existing relationships, for example: ‘It is getting us outside with our children more. My kids think it’s great that we are doing it with them’ (Female, 40, full-time work). It should be noted that a third theme emerged: 31% of participants stated that playing Pokémon GO had not impacted on their social life (either positively or negatively).

Poke-walks, which are gatherings of people playing Pokémon GO together, were popular at the time of our study and, although 57% of participants stated that the largest group they had played in had fewer than 10 players, over 19% of participants reported playing Pokémon GO in groups with over 50 players. The following participant’s comment illustrates the variety of ways in which players spend time: ‘I walk along the beach each week with my mum, and I catch Pokémon, I occasionally play with my sister and her friends, and I’ve gone to a few Pokémon Go meet-ups before with hundreds of people all catching Pokémon’ (Female, 19, part-time work, part-time student). Whilst many participants described positive relationships arising from playing Pokémon GO with others, there were some who described the opposite effect: ‘I have become less social with friends and family because they don’t play Pokémon GO, but I am now more willing to socialise with people I don’t know who are playing the game at the same locations that I am’ (Male, 26, full-time work).

The third strongest predictor of flow was nostalgia for Pokémon from childhood (H3). Pokémon GO was launched 17 years after the release of the original Pokémon series. Children who engaged with the original series would now be aged between 21 and 31 years. The average age of participants in our study was 29.3 years (SD = 8.2) with an interquartile range of 23.7 - 34.9 years. Therefore, our sample is reflective of the age demographic for which a nostalgic connection is possible given the Pokémon franchise began in 1999. Additionally, results of a Pearson correlation indicated that age and nostalgia were significantly negatively correlated (r = -.60, p <.001), and so as expected, younger players tended to have higher levels of nostalgia compared with older players meaning that Pokémon was a favourable object of interest for the participants’ pasts thus following Holbrook and Schindler’s (2003) definition of nostalgia. Furthermore, Koetz and Tankersley (2016) found that nostalgia for an objective in an older
generation can make that object desired by a younger generation, which could help explain flow being experienced by players when playing with family members.

The significant correlation between nostalgia for Pokémon in childhood and flow levels in playing Pokémon GO is noteworthy. Players with a nostalgic connection to Pokémon from childhood are likely to have greater clarity about the aims of Pokémon GO; knowledge that will help them to progress in the game and to concentrate more closely on the game. Additionally, nostalgic feelings and affection for the Pokémon creatures would allow players to have a higher level of autotelic experience. This means that some players would be unconsciously motivated to search for, collect, and evolve particular Pokémon, in comparison with players who do not have a nostalgic connection.

Nostalgia was one of three themes identified as reasons why participants play Pokémon GO, and ten participants provided a specific reference to nostalgia for Pokémon from childhood. The following comment illustrates the degree of nostalgia felt by one participant: ‘Because Pokémon is life! Got to catch ’em all! I’ve been playing Pokémon every day of my life since February 26, 1996 the first day red and blue were released!’ (Female, 23, full-time student). The findings regarding nostalgia in Pokémon GO players thus support prior research regarding nostalgia’s impact on consumption and playing choices.

In terms of impact on well-being associated with playing Pokémon GO, two themes were observed: physical and mental. Distance walked playing the game can be imagined as a proxy for physical well-being, and whilst the number of kilometres walked was a self-report measure, participants could access the information from the game, which lends a level of precision to the measure. The median number of kilometres walked by participants was 110 kilometres. However, one third of participants indicated that they had walked more than 200 kilometres since they started playing the game. Furthermore, more than half of participants cited exercise and increased fitness as benefits of playing Pokémon GO, and three participants referred to weight loss of a specific number of kilograms (4kg, 8kg, and 9kg). These findings align with the findings reported by Barkley et al. (2017) regarding players reporting an increase in walking. As the current study was not longitudinal, it was beyond the scope to establish if this increase in physical activity was sustained, or followed the findings of other studies that players returned to pre-game levels of physical activity (Howe et al., 2016). The following participant comment provides an insight into the mechanisms which drive efficacy in exergames: ‘I do a lot more walking than I did before downloading the game, and I feel excited and enthusiastic about doing exercise now that I have the game, as opposed to feeling bored and consumed with thoughts about my body image when I exercised previously’ (Female, 19, part-time student, part-time work). The findings of this study concerning the physical benefits of playing Pokémon GO support others in that an increase in physical activity is present at least at the beginning of play indicating the game is of enough interest to players (likely due to nostalgia), to contribute to behavioural change concerning their physical activity.

The mental health benefits described by participants were mostly associated with the way in which playing Pokémon GO required individuals to break from usual patterns of remaining inside and alone. These two participant comments, which mention motivation, illustrate the specific way in which augmented reality-exergames can impact mental health: ‘I suffer from agoraphobia and severe depression. Playing this got me out of my house’ (Female, 26, unemployed); and ‘I struggle with depression. PoGo gives me a specific reason to leave the house on days I might not otherwise’ (Female, 25, part-time work). These mental health benefits support Staiano and Calvert (2011) findings that exergames can provide their players with mental, as well as physical health benefits, and therefore have the potential to improve players well-being in more than one way.

Conclusions

This study has added to the body of empirical research into Pokémon GO, and used the concept of flow to investigate the suggestion that taking part in the game has mental health benefits. Further understanding about the potential effects and benefits of playing exergames in the new context of augmented reality has also been provided. Twenty-seven per cent of the variance in the beneficial state of flow was explained by the regression model with significant
predictors of flow being game level, playing alone, and nostalgia for Pokémon from childhood. The game level achieved in Pokémon GO, which is likely reflective of the game design in terms of challenge and skill, was significantly associated with increased flow. Playing alone, rather than with friends or strangers, provided an environment significantly more likely to promote the flow state, but there was a significant positive association between flow levels and playing with family members. Finally, the sample consisted of a large number of participants that would be likely to have a nostalgic connection with the original Pokémon series. The significant correlation between nostalgia and flow levels suggests that nostalgia may play a part in the induction of the flow state while playing Pokémon GO. This connection between flow and nostalgia adds to the body of research into the flow state.

Although playing Pokémon GO with others (apart from family) did not significantly predict flow, participant comments illustrated the way in which Pokémon GO provided benefits to social well-being, including making new friends and initiating cross-generational activities. Players reported decreases in depression and anxiety, which they attributed to playing Pokémon GO, but further research is needed to explore this effect as well as the social well-being associated with playing exergames in groups. Future research, with more extensive questioning of players, will extend the initial indicators of the mental health benefits attributed to playing Pokémon GO identified in this study. More generally, further exploration of social well-being and exergames is also warranted.

Participant comments also gave an insight into the physical health benefits associated with playing Pokémon GO, which included increased fitness and weight loss. These comments, and the reported number of kilometres walked, also support the idea that Pokémon GO can lead to physical health benefits for its players. Given the mixed results of prior research into the physical health benefits of Pokémon GO, especially the long-term benefits, further research is needed. However, the initial increase in physically activity in players of Pokémon GO indicates that players are interested enough to play the exergame and thus, at least temporarily, increase their physical activity and change their behaviour. The findings also indicate that developing health apps and games based around long running, popular franchises is likely to have a nostalgic appeal for players, increase their flow state while playing the game, and their motivation to exercise.

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