

Landlords of the Digital World: How Territoriality and Social Identity Predict Playing Intensity in Location-based Games

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Abstract

Popular location-based games (LBGs) such as Pokémon GO have been downloaded hundreds of millions of times and have been shown to have a positive impact on mild exercise and social well-being of their players. Several currently popular LBGs introduce a gamified implementation of territorial conflict, where players are divided into teams that battle for the ownership of geographically distributed points of interest. We investigate how social factors and territoriality influence playing intensity in the context of Pokémon GO. Using reasoning from social identity theory, we propose a structural model connecting territoriality, sociality and playing intensity. To test the model, we analyze data collected from a global sample of Pokémon GO players (N=515). Our results show social self-efficacy, territorial self-efficacy and altruism to influence players' identification with their team. Team identification in turn predicts both in-game territorial control behavior and playing intensity.

1. Introduction

Location-based games (LBGs) have emerged as a consequence of technological developments in (1) smartphone technology; (2) satellite navigation; and (3) ubiquitous availability of the internet. What makes LBGs unique among other video games is that moving in them is tied to movement in the real world. Furthermore, players need to navigate to specific real world locations to access content in the game. This ties LBGs to geography [1] and exercise [2]. LBGs such as the popular Pokémon GO have multiplayer game mechanics, which influence player behavior [3, 4], and as the games are tied to geographical movement, understanding the effects of social playing on movement becomes relevant. According to Cho et al., social networks may explain up to 30% of human geographical mobility [5]. Due to such a strong influence, the aim of this study is to investigate whether and how territoriality

and sociality in LBGs are connected to playing intensity. Therefore we propose the following research question:

How do social factors and territoriality influence playing intensity in LBGs?

We use Pokémon GO as our study context due to its popularity and to provide a comparison to several other studies done in the same context [2]. Territorial conflict in the game revolves primarily around virtual geographically distributed points of interest (PoIs) called gyms. Early on the game, upon reaching level 5, players choose a team, and thereafter team change is possible only once a year. Gyms are owned by a specific team, until an opposing team takes them over. This leads players to disproportionately associate positive experiences to their own team members and negative to their opponents [4]. Before July 2017, players received a daily reward for holding up to 10 gyms. To reduce the positive rewards of permanent gym control, from summer 2017 onward, players have been only rewarded coins once an opposing team takes down their pokémon from gyms. Even after this change, some desire to control gyms persists in the game. This might be explained by the findings that LBG players use territory-linked game mechanics for self-presentation and manifestation of identity [6, 7]. Other studies have argued that territoriality may manifest as an obsessive, even primal, need to control and guard territory [8, 9]. In both these cases territoriality is inherently a social phenomenon due to conflict against other human players. In his definition for human territoriality, Julian Edney describes it to be composed of three parts: (1) defending an area; (2) reserving the area for the exclusive use of a perceived in-group; and (3) space-related intolerance [10]. This implies that territoriality is not only about conflict, but cooperation as well.

In the current study, we draw from previous work on location-based social networks [11], territoriality in locative media [8, 7] and the social identity approach (SIA) [12] to formulate a model explaining how territoriality and social identity are connected in LBGs,

and how they influence playing intensity. We test the model with data (N=515) collected from Pokémon GO players through Reddit. The rest of this study is structured as follows. In the theoretical background, we introduce SIA and a viewpoint on territoriality in locative media. We then theorize six hypotheses for our structural model, and proceed to describe the data collection and analysis methods and procedures before presenting the results. In the following discussion section we present our key findings, implications of our results and limitations. We conclude the study with suggestions for future work.

2. Theoretical Background

2.1. Social Identity Theory

As the overarching theoretical framework for our study, we refer to the social identity approach (SIA) from social psychology [13, 12]. SIA is built around the concept of identity, which is the collection of beliefs relating to defining characteristics about oneself in a given situation [14]. For this, the approach postulates that the self of an individual is constructed in a given situation using personal (i.e., the self as an individual) and social entities (i.e., the self as a group member) of identity [14]. The central postulate of the approach is the assumption that individuals strive for a positive self, therefore they use social comparisons between groups they feel they belong to (i.e., in-groups) and other groups (i.e., out-groups) to attain positive distinctiveness to other individuals and groups [14]. Whereby, individuals substantially favor the in-groups they identify with over out-groups. As a manifestation, this pattern can be observed with the willingness to associate in various situations with a specific group. For the purpose of our paper, we understand community identification as the identification of an individual with their team during the gameplay of Pokémon GO. Adopting the community identification scale of Mael and Ashforth [15], we define team identification as "a sense of belonging and identification with one's chosen team".

SIA has been used to explain outcomes in the context of video games with social communities, such as players' purchase behavior [16] and engagement with eSports [17]. A recent study observing static teams in two LBGs, Ingress and Pokémon GO, noticed that the use of game slang as well as friendships between players could be predicted using SIA [4]. When comparing location based social networks to other technically mediated networks such as online social media or digital platforms [18], the main difference is the inclusion of the spatial or geographical dimension [11]. Still,

even in traditional video games social interaction has been found to be a strong predictor of psychological engagement [19].

2.2. Human Territoriality

Human territoriality can be regarded as a primal behavior, as it is observed universally independent of culture and location [9]. It is a behavior shared with several other mammalian species, however, there is discussion on to what extent human and animal territoriality overlap [20]. Evolutionary psychology suggests territorial behavior, especially territory control, evolved as there was a survival benefit from controlling resourceful areas. From this perspective territoriality is linked to safety as well as resource control [10]. It can be argued that primal territorial control has not disappeared from our societies, rather it has transformed in manifestation along with industrialization and digitization [21, 20, 7]. As Pokémon GO and other LBGs augment the real world with a layer of digital PoIs that can be controlled and owned, this may evoke in players a dormant desire to control territory [9, 8]

For observing territoriality as a social phenomenon, one of the popular theories for understanding social identity in relation to location is the Spatial Self framework [22]. The framework connects online representation of an individual to their physical location. As such, the manifestation of the spatial self is connected to the game mechanics of LBGs [7]. Several LBGs do not in fact include game mechanics which allow competition over the control of territory [9]. For example, Ingress is heavily focused on territorial control whereas Harry Potter: Wizards Unite provide no opportunities for players to control territory. The playing location and the number of other players also impacts the manifestation of territoriality [8, 7]. Players tend to wish to seek certain in-game areas, and previous work has shown that these areas are connected to what the players perceive as their home turf [8]. LBGs also differ in the quality of controllable areas, and a body of work has been conducted in understanding the impact of the quality of PoIs in LBGs [1, 23, 24, 25]. Virtual PoIs connected to the real world can feel more meaningful to players than randomly generated PoIs [26], which can boost players' motivation to control them in LBGs.

Papangelis et al., [7] created an ad-hoc LBG with social and territorial game mechanics. They demonstrated that self-identity was deeply linked to territorial behaviour, and territorial manifestations were better received by players in case they conformed with the social norms of that particular area [7]. Other studies also reiterate that the players' motivation to

interact with location-based technologies tied to the perceived connected social networks [27]. This gives rise to the postulation that community identification in LBGs is connected to territorial playing. Subsequently, it is important to understand the antecedents of team identification in this context. This is the basis for the proposed model in this study.

3. Hypotheses and Research Model

Using reasoning from SIA, we chose team identification [15, 12] as a construct to describe players' social involvement within the game context. As antecedents for it, we measured two central social aspects from previous LBG literature: (1) altruism [3]; and (2) social self-efficacy; [28]. As measures of territoriality, we decided to look at players' perceived ability to influence territory, i.e. territorial self-efficacy [29], and the actual behavior of controlling territory in LBGs i.e. territorial control [30]. We adopted the neighborhood watch construct [30] and contextualized it to the territorial control mechanics of Pokémon GO. The construct covers five aspects of neighborhood watch, but in the context of Pokémon GO, they all describe territorial control, thus, we measured the items reflectively. Finally, as a meaningful measure for overall engagement, we chose playing intensity [31] as our dependent variable.

3.1. Scaffolding Community Identification

In the fictional narrative of Pokémon GO, the player assumes the role of a Pokémon trainer. Collaboration with other trainers is encouraged through several cooperative mechanics such as raids [32] and trading. Engagement with cooperative mechanics in LBGs has been shown to increase players' altruism [3]. However, it remains unclear whether altruism is an antecedent to engaging with cooperative mechanics and not the other way around. MacIntyre [33] defines altruism as "the motivation to increase another person's welfare". One way to understand why people behave altruistically is to draw from collectivism, that is, the postulation that the humans instinctively seek to benefit the welfare of their collective group more so than themselves [34]. Similarly, through SIA, we understand altruism to be behavior that supports the actions of the perceived in-group. From the evolutionary psychology perspective, altruism is needed for the survival of the species. In the context of LBGs, altruism has been shown to lead to increased we-intentions [3], which subsequently, has been found to strongly correlate with social identity in other studies (e.g. [35]). As such, altruism can lead to social bonding and identification

with associated player groups. Thus, we formulate the following hypothesis.

H1: Altruism increases team (community) identification

Jeong and Kim [36] define social self-efficacy as the ability to make friends and the willingness to participate in community events and activities. As LBGs are a mixture of online and offline play, both online and offline social self-efficacy are relevant [36]. LBGs contain several multiplayer game mechanics [37], which allow players' to manifest their identity (e.g. [4, 7]). Due to the communal nature of LBGs such as Pokémon GO [37], and self-efficacy being defined as willingness to participate in community events [36], it is reasonable to propose that in the context of LBGs, social self-efficacy could have a positive impact on team (community) identification. Therefore, we propose the following hypothesis.

H2: Social self-efficacy increases team (community) identification.

A few studies have proposed that LBGs harnesses the human territorial control instinct to engage players [9, 8]. We operationalize territorial self-efficacy as players' perceived ability to influence the game world (territory) through their actions [29]. In Pokémon GO the control over territory is team versus team conflict. Thus, players who have a high territorial self-efficacy are able to help out their team. Consequently, helping out team members can lead to receiving praise and respect from team members, which according to SIA, can be understood as a specific manifestation of in-group favoritism [14, 17]. These processes of helping others, being appreciated and engaging with team members are predicted to scaffold team identification. In fact, playing Pokémon GO has been shown to increase a sense of belonging in players [38]. Therefore, we hypothesize the following.

H3: Territorial self-efficacy increases team (community) identification.

3.2. Effects on Playing Intensity

Mael and Ashforth [15] demonstrated that community identification with alma mater organization was linked to increased alumni support. SIA suggests that social identity increases engagement and commitment within the perceived in-group [13, 12], and it has been demonstrated that an identification within a group can boost engagement in the context of

online multiplayer games [39]. A more recent study observing player identity in multiplayer online games found the desire for social/collaborative online gaming to lead to self-regulation deficiency and playing habits, which ultimately lead to gaming addiction [40]. For these reasons, team identification is likely to increase overall playing intensity and more specifically, playing for territorial control. Thus, we propose the following two hypotheses.

H4: Team (community) identification increases playing intensity.

H5: Team (community) identification increases territorial control.

As territorial control is a form of playing, it should have a positive impact on playing intensity. On the other hand, some players might intentionally avoid playing related to territoriality for reasons such as privacy concerns [41], not having strong enough pokémon or distaste of conflict. It is also possible that territorial control would in some instances take time off from other types of playing, or demotivate playing. However, in the case of Pokémon GO this does not seem to be the case. In fact, the Pokémon GO game mechanics related to territoriality blend in naturally with raiding [32] and capturing Pokémon, enabling players concerned about territorial control to play the rest of the Pokémon GO game while traveling from one PoI to the next. Having an impulse for territorial control should thus correlate with playing intensity.

Therefore, our final hypothesis is as follows.

H6: Territorial control increases playing intensity.

In addition to the proposed hypotheses, we test the impact of three control variables: (1) age; (2) gender; and (3) level in Pokémon GO, on team identification and playing intensity. Controlling for age is relevant as it is linked to situation in life, available time and many other aspects. A recent study also identified differences between age and gender in Pokémon GO [42], which also suggests that controlling for gender is important. The level in Pokémon GO is a rough in-game measure of how much time a player has spent on the game, and thus controlling for its effects is important.

4. Empirical Study

4.1. Survey preparation and data collection

The constructs for this study were derived from prior literature as such, or mildly adapted to the context of Pokémon GO. The exact survey items used and their

sources are available in Table 2 in the Appendix. We implemented the survey using an online professional survey tool called Webropol, which stores responses securely and in accordance to the GDPR legislation. After implementing the survey, we sent it to a small Pokémon GO player group (n=15) to get feedback on the understandability of the survey. At this stage we received a few comments about the items as well as noticed a few implementation errors. After adjusting our survey implementation based on the feedback we proceeded to the actual data collection.

As one of the key elements in our survey was human territoriality, we wanted to collect data from players in several countries to avoid a geographical bias. To this end, we contacted the moderators of the popular /r/pokemongo subreddit which has 2.5 million subscribers. The moderators assisted our project by pinning the survey to the frontpage of the subreddit for six days. The survey was available between June 24th-29th, 2020. We replied to all comments and upvoted them to further encourage commenting. In the end, the survey received 515 accepted responses.

The basic demographic data of respondents is displayed in Table 1. The majority of our respondents were male, and the largest age group was young adults. Almost half of all respondents lived in the USA. As the sole way of distributing the survey was via the /r/pokemongo subreddit with the exception of one time advertisement of the survey in a Finnish chat (it came to the authors' knowledge that the link to our Reddit survey post was shared in a local chat group), we believe the participant sample is fairly well representative of the /r/pokemongo subreddit users. While /r/pokemongo is the largest Pokémon GO themed subreddit, the survey distribution method introduced some self-selection bias to our data collection. However, we maintain based on the demographic data that our sample was fairly heterogeneous and could be used to test the proposed research model.

4.2. Validity and Reliability

Henson and Roberts [43] suggest that when construct survey items are taken largely from literature, scholars may proceed directly to confirmatory factor analysis. For this, we chose to use the partial least squares structural equation modelling (PLS-SEM) regression analysis. However, before this proceeding to analyze our results, the validity and reliability of the data need to be ensured. To this end, we followed the guidelines set by Fornell and Larcker [44]. First, we ensured that the loadings for each construct item are above the recommended threshold of 0.7. At this

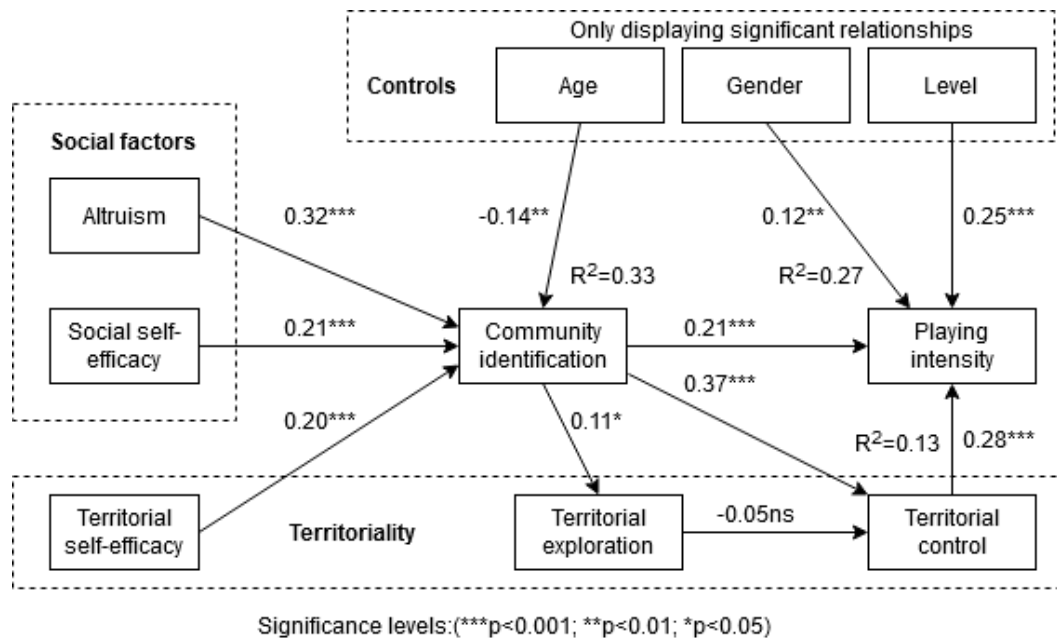


Figure 1. Proposed Research Model and Results

Table 1. Demographic information of respondents

Gender	
Male	66%
Female	31%
Non-binary	2%
Prefer not to tell	1%
Age	
18-25	48%
26-34	36%
35-44	10%
45-64	5%
Over 65	1%
Employment status	
Employed	52%
Student	32%
Unemployed	12%
Stay-at-home parent	1%
Other	1%
Country of Residence	
USA	43%
UK	12%
Finland	10%
Canada	6%
Germany	3%
Other	26%

stage two items of territorial control barely did not reach the threshold (TC2=0,677, TC4=0,688). Due to the similarity of these items and the others in the context of Pokémon GO, and three construct items remaining, we estimated the removal of them to not be a problem for our model. Second, we checked that the composite reliabilities of our construct are more than 0.8. Third, we ensured that the average variance

extracted (AVE) values of our constructs are above the threshold value of 0.5. Some of our construct items had to be dropped for not meeting the loading criteria of Fornell and Larcker [44], but otherwise our data passed the reliability and validity check. The values of this analysis are displayed in Table 2 in the Appendix.

For testing discriminant validity, we ran a comparison of the square roots values of the AVEs of each construct to all correlation between the construct itself and all other constructs. We saw that the square roots of the AVEs were greater than any of the correlations between the constructs. The results are shown in Table 3 in the Appendix. The inter-construct correlations were clearly lower than the square roots of the AVE's. Accordingly, we conclude that our data has sufficient validity and reliability for it to be used in PLS-SEM regression analysis.

4.3. Structural Model Results

Following the confirmation that our data filled the criteria for validity and reliability, we proceeded to evaluate the proposed structural model. The analysis was carried out using SmartPLS version 3.2.9. For the significance testing we ran a complete bootstrapping with 9100 sub-samples. The structural model results are displayed in Figure 1.

Altruism had a statistically significant effect on team identification (beta=0.32, p<0.001). Therefore, H1 was supported. The relationship between social

self-efficacy [36] and team identification also turned significant ($\beta=0.21$, $p<0.001$) supporting H2. With regards to H3, territorial self-efficacy also had a significant impact on team identification ($\beta=0.20$, $p<0.001$). Overall, our model explains 33% of the variance on team identification, and 31% without control variables. We then looked at the effects of team identification on playing intensity ($\beta=0.21$, $p<0.001$) and territorial control ($\beta=0.37$, $p<0.001$). Both had significant impact, confirming H4 and H5. Regarding our final hypothesis, territorial control had a strong significant impact on playing intensity ($\beta=0.28$, $p<0.001$). Overall the model explained 13% variance in territorial control and 27% variance on playing intensity. Without the control variables, the variance of playing intensity explained was 17%.

In addition, we had three control variables. Age had a significant negative impact on team identification ($\beta=-0.14$, $p<0.01$) but a non-significant influence on playing intensity. Gender had, surprisingly, positive impact on playing intensity ($\beta=0.12$, $p<0.01$) but no impact on identification. Finally, we looked at the effects of level in Pokémon GO on team identification (ns) and playing intensity ($\beta=0.25$, $p<0.001$). The positive significant impact of level on playing intensity is reasonable, as level can be regarded as a rough in-game measure of how much time a player has spent on the game. This effect could have been stronger if not Pokémon GO capping the level at 40, which active players reach fairly quickly.

5. Discussion

5.1. Key Findings

We found social personality to significantly impact team identification in Pokémon GO. Socially inclined players engage more with other players, and are thus, directed by the team-based game mechanics, more likely to identify with their team as a whole. This aligns with SIA and previous work on community identification [13, 12, 17].

The findings on territoriality revealed a connection between territorial behavior and social identity. Territorial self-efficacy had a strong influence on team identification, which subsequently led to increased territorial control in the context of Pokémon GO. This finding supports previous work on human territoriality in locative media [6, 8, 7] and provides further evidence for territoriality being highly related to inter-human relations and in-group favoritism [45, 10].

Territorial control in Pokémon GO led to increased playing intensity. The three dimensions of territorial

control that were included in the final structural model were watch, know and belong [30]. In order to obtain the knowledge necessary to fulfil these aspects of territorial control, players need to open the Pokémon GO application and click on gyms, which is essentially a form of playing the game. We also found that team identification predicted more strongly territorial control than overall playing intensity. These findings expand previous work on engagement with Pokémon GO and LBGs more generally [46, 47, 48].

Age had a negative impact on team identification, suggesting that as we get older, we are less capable of attaching ourselves to new communities. On the other hand, age had no correlation with playing intensity, which aligns with previous studies who have shown Pokémon GO to be a game enjoyed by all age groups [42].

Gender had a significant impact on playing intensity in that females were playing more compared to their male counterparts. This finding differs from a recent study which found no connection between gender and playing intensity [28]. The difference in our case might be explained by the data collection platform Reddit being male-dominant [49, 50] and therefore, women who gravitate there are likely intensive players. In fact, we notice that more of our women participants were also at level 40 in Pokémon GO (27%) compared to their male counterparts (24%). This disparity is not large, but might explain the finding that gender influenced playing intensity.

5.2. Theoretical Implications

Recent work has demonstrated how in locative media applications similar to Pokémon GO, territorial behavior and expression are linked to self-identity [7]. SIA postulates that individuals' identity is the result of both (1) self-identity; and (2) group identity [14]. Pokémon GO provides team vs team territorial control mechanics, which connects social identity to territorial conflict. With our model and results, we expand the recent work on territoriality in LBGs [7] by showing that territorial behavior is, in addition to self-identity, connected to players' social identity.

Previous work on engagement with Pokémon GO have used both quantitative [47, 51] and qualitative [46] approaches, but none of the studies accounted for territoriality to explain future use intention. Yet, some scholars have put forward the hypothesis that territoriality may play a crucial role in engagement with LBGs [9, 8]. Our results confirm this postulation as we found significant relationships between territoriality, team identification and our dependent variable, playing

intensity. Thus, we contribute to the previous work on engagement with locative media by providing evidence that a desire to control territory and identification with the players' team increase playing intensity [47, 51, 46].

While previous work has suggested Pokémon GO to increase social connectedness (e.g. [38]) this may be the result of a pre-existing social stance. Our findings indicate that altruistic and people high on social self-efficacy are in fact playing Pokémon GO more intensively. Riar et al., [3] suggest that engaging with cooperative game mechanics may increase altruistic behavior, which causally differs from our approach, as we used altruism as a pre-existing personality trait. An altruistic pre-disposition may increase community identification as per our results, but also be magnified by engagement with cooperative game mechanics [3]. We further argue that the human enemy, i.e. opposite team members and perceived out-groups, increase the saliency of altruism and territorial control [4], due to phenomena arising from team identification [17].

5.3. Practical Implications

Our findings suggest that LBGs invoke social and territorial dimensions in human behaviour. These differ from other multiplayer online games [40] in that social interaction occurs face-to-face in the real world and is tied to the players' physical location [8]. The way locative media applications such as Pokémon GO invoke territoriality is connected to the game mechanics, and this influenced the way we operationalized the "territorial self-efficacy" [36] and "territorial control" [30] constructs. Designers can increase player's playing intensity by not only including game mechanics which afford control and conflict over territory, but by making this conflict a social endeavour. From the currently existing LBGs, only Ingress and Pokémon GO have implemented this kind of a design. Some LBGs such as Orna include territorial control mechanics, but they lack the social aspect, and consequently, inter-group territorial conflict, which can be predicted to reinforce a divide into in-groups and out-groups [45]. In Orna, members of the same team can claim areas from each other. This offers an interesting opportunity for future comparison studies that build to understand the role of social and self identity in engagement with LBGs.

We believe the findings reflect to some extent human behavior also outside the immediate context of LBGs. As territoriality in the case game Pokémon GO and other similar games such as Ingress [37, 3] is team versus team conflict, actively participating in territorial conflict can lead to negative attitudes and prejudice towards

players in opposing teams [45, 4]. This has parallels to the polarization of our society into various cultural, ethnic and socioeconomic groups. This stratification of players' into social groups and in-group favoritism is natural human behavior according to SIA [14, 45]. As a remedy to real world polarization, Pokémon GO artificially divides players' into teams providing them a new social identity as members of their team that has nothing to do with their socioeconomic status. As players' identify with their team members, they may learn to get along with people who they would be unlikely to spend time without the game context. This phenomenon of acquiring a new identity is known as recategorization in the common in-group identity model [52]. If later on players find that their fellows have i.e. a political disposition that they strongly disagree with, they may be more willing to give them the benefit of doubt due to shared identity in the LBG context [52]. In this way, LBGs have the potential to alleviate some of the strain in society by bringing people from various backgrounds together to fight for a common cause.

5.4. Limitations

Among the limitations of this work is that our participants were self-selected. Data was collected through Reddit, which may have introduced some bias in our sample. One concern is that only highly active players would participate in the survey through Reddit. To test this, we looked at the reported levels of the players to see if they were exclusively at level 40. The median level was in fact between 35-39 (39%) followed by level 40 (25%) and 31-34 (22%). Comparing this to a recent study with data collected through Facebook where 55% of participants were at max level [28], we conclude that surveying only active players was not an issue in our study.

The data and the structural model provide a cross-sectional representation of the observed phenomena. This could be addressed by conducting longitudinal studies where the development and change in team identity and territoriality are observed. In addition, we only tested the model in the context of a single LBG, Pokémon GO. This could be addressed by conducting similar studies on multiple locative media applications to see which findings remain and are universal. Furthermore, studies linking social identity and territoriality to specific game mechanics and affordances could address this problem. Overall our findings fit well within the context of previous work on SIA, territoriality and LBGs (e.g. [47, 51, 9, 28, 8, 7]).

6. Conclusions and Future Work

Social identity plays a major role in engagement with locative media and video games [39], but also in engagement with popular franchises, brands and activities. Our study works towards connecting two bodies of previous research on: social identity [14, 13, 12, 16, 17] and territoriality [10, 8, 6] in the context of LBGs. A recent study by Papangelis et al., [7] showed that LBG players express territorial behaviour in accordance to the perceived norms and power structures in the given playing location. We continued this work further by connecting territorial expression to the team identification of players. While previous studies on the topic have mainly characterized territoriality as an individual characteristic [9, 8, 7], we demonstrate that territorial self-efficacy has a strong impact on players' identification which influences playing intensity. While not all locative media applications and LBGs contain affordances for territorial control and expression, our findings suggest that group -level territorial conflict can be highly engaging.

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Appendix

Table 2. Measurement items and loadings

Construct	Corresponding items	Loading
Territorial SE [29] CR: 0.938 AVE: 0.836	TSE1: My impact on what happens at gyms in Pokémon GO is high TSE2: I have a great deal of control over the gyms in my area. TSE3: I have a significant influence on who controls gyms in where I play.	0.910 0.919 0.913
Territorial contr. [30] CR: 0.836 AVE: 0.629	TC1: Watch: I keep an eye on my gyms daily. TC2: Recognize: I like to know who took down my gyms. TC3: Know: I know who are playing in the same area as I am and battling for the same gyms. TC4: Responsible: I feel responsible for protecting my gyms and making sure they belong to the right team. TC5: Belong: I feel that I have a home turf in the game where I belong.	0.778 removed 0.757 removed 0.838
Social SE [36] CR: 0.857 AVE: 0.667	SSE1: I can easily become friends with other Pokémon GO players. SSE2: I often participate in community activities such as legendary raids. SSE3: I love to meet unfamiliar people while playing Pokémon GO. SSE4: It is not important for me to meet other people while playing Pokémon GO. (reversed)	0.828 0.757 0.811 removed
Altruism [3] CR: 0.942 AVE: 0.802	ALT1: I like helping other Pokémon GO players. ALT2: It feels good to help other Pokémon GO players. ALT3: I enjoy helping my teammates in Pokémon GO. ALT4: I find it pleasurable to help my teammates in Pokémon GO.	0.873 0.899 0.918 0.892
Team identification [15] CR: 0.821 AVE: 0.605	CI1: When someone praises my Pokémon GO team, it feels like a personal compliment CI2: I feel I am a typical member of my Pokémon GO team. CI3: My Pokémon GO team's successes are my successes.	0.778 0.727 0.826
Playing intensity [31]	INT1: Playing Pokémon GO is part of my everyday activity. INT2: I feel out of touch when I haven't played Pokémon GO for a while INT3: I would be frustrated if I could not play Pokémon GO.	0.771 0.864 0.815

Table 3. The correlation matrix and square roots of AVEs

	altruism	team ident.	social SE	territorial contr.	territorial SE	play int.
altruism	0.895					
team ident.	0.473	0.788				
social SE	0.526	0.433	0.817			
territorial contr.	0.299	0.367	0.404	0.793		
territorial SE	0.230	0.342	0.292	0.653	0.914	
play int.	0.234	0.310	0.281	0.406	0.241	0.817