

Push it real good: The effects of push notifications promoting gameful affordances on consumer engagement with a mobile app

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Abstract

Purpose: There is clear benefit in designing and sending notifications to users that persuade them to interact with an app and marketer goals. In this research, our purpose was to examine how including communicating different motivational affordances in notifications affects subsequent app use.

Design/Methodology/Approach: We designed three studies to address our purpose: (1) an online experiment to test how individuals perceived notifications, which contained social affordances, progression-based affordances, and a combination of social and progression affordances; (2) a survey to gain a deeper understanding of why certain notification characteristics were effective and to unearth factors that jointly affected notification effectiveness; and (3) an in-app field experiment to test if the findings from studies 1 and 2 held up in a ‘real world’ setting.

Findings: Our analysis revealed that progression incentives yielded the greatest increases in user behavior. Neither a social incentive, or combination of social and progression affordances was more effective than one progression affordance. This effect was heightened by consumers’ involvement with the focal brand.

Originality: This research extends knowledge on gamification to the domain of push notifications. In doing so, we have demonstrated the communicated affordances and wording of the push notifications organizations send affect user behavior. We further expand knowledge of the role of consumer involvement on push notification effectiveness while controlling for app usage patterns.

Research Implications: Our contribution extends knowledge about the use of motivational affordances to gamify push notifications in high-involvement contexts. This implies that greater attention should be paid to how the: length of push notifications, affordances communicated, and degree of consumers’ relationship with a focal brand (i.e., involvement) impact notification effectiveness. These findings set out new avenues to investigate the uses of gamification and services marketing in future research.

Practical Implications: We provide marketers with insights into the most effective ways to gamify, structure, and time the delivery of notifications. In high-involvement contexts where consumers decide whether to act on a gamified marketing affordance quickly, it pays to utilize push notifications that feature visible, immediate, and tangible rewards. Understanding consumers’ involvement with the brand allows marketers to turn notifications from a potential annoyance into a viable conduit for engagement.

Keywords: *Consumer behavior; Push notifications; Mobile applications; Motivational affordances; Gamification*

Introduction

Mobile applications (apps) are powerful platforms for building relationships with consumers (Kim et al., 2013). However, maintaining consistent user–app interaction is a considerable challenge. To promote consumers’ interaction, developers seek to provoke consumer behavior with push notifications (“notifications”) (Sahami Shirazi *et al.*, 2014). Notifications are brief, text-based messages that appear on device screens (Nations, 2019) with the intention of increasing the frequency and intensity of in-app behavior (Bidargaddi *et al.*, 2018). There are clear benefits in sending notifications that include appealing value propositions for users. As well as increasing in-app behavior, notifications are ‘manageable’ communication strategies, which distribute content that is within the control of app developers, rather than factors on the ‘pull side’ that are subject to random or situation-specific fluctuations (Kim and Song, 2020). Despite the organizational upside, some users perceive them negatively because notifications provide limited utility or practical value (Ström *et al.*, 2014). Indiscriminately sending impersonal notifications to users, therefore, can act as a barrier to app involvement and hinder the successful implementation of in-app monetization strategies.

There is an opportunity to apply gamification concepts to research on notification efficacy and personalization. To date, there is a lack of research investigating whether and/or how gamified notification characteristics affect user behavior. Most studies evaluating notification effectiveness have focused on user-based and/or environmental characteristics, such as the: timing and/or frequency of notification delivery (Mehrotra *et al.*, 2016; Morrison *et al.*, 2017; Okoshi *et al.*, 2018), user’s geolocation (Dale *et al.*, 2019), task a user was performing at the time of notification delivery (Mehrotra *et al.*, 2016; Okoshi *et al.*, 2018), and user demographics (Li *et al.*, 2008; Mehrotra *et al.*, 2016). Beyond contextual and situational factors

there is a lack of research exploring how the type of affordance communicated in a notification (i.e., aspects offered to users aimed at motivating specific behavior; Koivisto and Hamari, 2019) influences effectiveness.

We frame this study using Huotari and Hamari's (2017) services approach to gamification as a form of marketing fitting more broadly within service-dominant logic (e.g., Vargo and Lusch, 2008). From this perspective, notifications are organizational efforts to communicate value propositions to consumers — a key marketing function of high-involvement brands, such as Apple, Peloton, or Disney. The creation of value within in this approach occurs when users are persuaded to participate in a 'gameful experience' because of notifications. Existing research has found that in-app game elements can increase user behavior (e.g., Hamari *et al.*, 2014) when they 'afford' opportunities to satiate motivational needs (e.g., social competition, achievement etc.). We extend this work beyond the context of apps to explore whether and how the type of affordance[s] *communicated* in a notification influence users' propensity to open a mobile app and complete a designated task (i.e., notification effectiveness). Specifically, we develop present knowledge by testing the efficacy of progression (i.e., redeemable reward points), social (i.e., opportunities to interact with other users), or a combination of progression and social affordances on user responses to notifications (Zichermann and Cunningham, 2011). We selected spectator sport as a high-involvement research context and progression and social affordances because these affordances have received the greatest attention in prior studies of gamification and their effects on users in digital contexts (Koivisto and Hamari, 2019; Kunkel et al., 2021).

We conducted three studies. Study 1 is an online experiment that seeks to quantify the effectiveness of different affordances imbedded in notifications. Study 2 is a qualitative follow-

on that identifies situation-specific mechanisms that explain and contextualize the results of Study 1 as well as revealing that involvement potentially moderated the relationship between notification type and user response – independent of notification affordance. Study 3 is a field experiment including behavioral data from a sample of *real mobile app users* in partnership with a developer. Overall, the analyses suggest that, in the context of high-involvement services, progression-based affordances are more effective than social affordances (i.e., opportunities to interact with other users), or a combination of both. In addition, buttressing the findings from Study 2, users' involvement moderates' notification effectiveness. Our findings extend research on gamification and develop knowledge about the theoretical drivers of notification effectiveness (Hofacker *et al.*, 2016). As such our contribution offers valuable insights for practitioners seeking to improve service experiences and increase users' in-app behavior via notifications.

Review of Literature

Push Notifications

Mobile apps enable organizations to reach consumers more consistently and develop robust relationships (Kim *et al.*, 2013). Fostering relationships with customers is crucial as these connections encourage repeat patronage, loyalty, brand equity (Ryals and Knox, 2001), and value co-creation (Vargo and Lusch, 2008). Relationship building is especially important in high-involvement contexts, including: luxury goods (Phau *et al.*, 2014), games (Seo, 2013), and sport (Lee *et al.*, 2019). Yet, consistent app participation remains elusive, as many consumers do not sustain use over time (Bidargaddi *et al.*, 2018; Urban Airship, 2019). Therefore, app developers use notifications to prompt specific in-app behaviors (Alkhaldi *et al.*, 2016).

Table 1 presents an overview of extant research on notifications, which underpin three key points. First, notification effectiveness is influenced by user demographics, app usage frequency, and users' psychological traits (Li *et al.*, 2008; Mehrotra *et al.*, 2016; Morrison *et al.*, 2017; Okoshi *et al.*, 2018). Second, notification effectiveness is influenced by situational factors, such as message delivery time (Freyne *et al.*, 2017), and whether a moment is “interruptible” (Okoshi *et al.*, 2018). Third, most scholars focus on elements exogenous to the notification itself. While these studies generate actionable insights, there is a gap in knowledge about the content of a notification influences its subsequent effectiveness. The omission is inconsistent with the nascent trend towards personalization of marketing materials (e.g., Strycharz *et al.*, 2019). Some research finds that effectiveness can be enhanced by tailoring a message to individual users (Bidargaddi *et al.*, 2018) and delivering smaller chunks of information (Clor-Proell *et al.*, 2019).

From the studies presented in Table 1, only one explores how motivational affordances in notifications affect user behavior (Dale *et al.*, 2019). Dale *et al.* found that loyalty progression affordances have no effect on behavior speculating that the number of points offered was likely too small and suggesting that future research should address this limitation. Dale *et al.* (2019) did not compare multiple affordance categories or structures, which is important given the motivational differences inherent to various consumer segments (Bowles and Polania-Reyes, 2012). Therefore, we know very little about what effectively incentivizes app users to comply with a notification's requested behavior.

=====Insert Table 1=====

Conceptual Development: Message Characteristics and Effectiveness

Extending Huotari and Hamari (2017) to the domain of notifications, we conceptualize these communications as services that include value propositions, such as motivational affordances, that seek to persuade users to engage in a desired behavior. A challenge inherent in notification design is that consumers' receptivity to such material is subjective and depends on whether (i) the content is perceived to be useful and (ii) they are willing to act on the conveyed information (Dix *et al*, 2017). Accordingly, we define "notification effectiveness" as its content is successful in persuading users to open an app and complete a given task. The gamification literature contributes some insights in this regard from work conducted in the context of apps. Broadly, gamification refers to the use of positive, extrinsically, or intrinsically motivating affordances, that users deem to provide 'gameful' experiences by integrating services designed to increase user behavior and engagement (Huotari and Hamari, 2012; 2017). This can be accomplished using a range of mechanisms, including avatars, leader boards, performance graphs, badges, point systems, social interactions with other users, customized experiences, or products, etc. (Anderson *et al*, 2013; Jung *et al*, 2010). Gamified systems are powerful marketing techniques designed to "routine-ize" consumers' interactions with brands (Kim and Ahn, 2017) and increase consumers' loyalty to third-party brands (Kunkel *et al.*, 2021).

Despite the potential utility of promoting gamified elements like affordances in mobile notifications, it has not been a popular area of investigation. However, the sparse results are encouraging. For example, Dale *et al* (2019) show that using affordances to sustain user behavior in gamified environments is more effective than not using affordances. Yet, there is less focus on different types of affordances utilized in notifications, which represent short-form value propositions (cf. Huotari and Hamari, 2017). As promoting affordances is directly related to incentive design, we canvassed studies of consumer decision making to determine which

affordances were most pertinent to our research context (e.g., Bowles and Polania-Reyes, 2012; Strassburg *et al.*, 2009; Tang and Babich, 2014). In a survey of gamification literature, Koivisto and Hamari (2019) identified five categories of affordances (we show the most common form within each category in parentheses): “achievement / progression” (points, score, progression); “social” (social networking); “immersion” (avatar, character, virtual identity); “non-digital elements” (Real world/financial reward); and “miscellaneous” (Full game). Of these categories, progression and social affordances are applicable to various types of existing systems (Koivisto and Hamari, 2019) and more suitable to communicate via short form notifications than immersion, non-digital elements, and miscellaneous affordances. Consequently, existing research on affordances and human decision making was consistent with the gamification literature in that both domains coalesced around social and progression affordances.

Progression affordances

Progression affordances offer users the opportunity to satisfy needs in relation to achievement (Zichermann and Cunningham, 2011). Progression rewards are the most implemented affordances (Koivisto and Hamari, 2019). And, while external to a user’s self-image and sense of enjoyment (Ryan and Deci, 2000) progression rewards can be regarded as conceptually orthogonal to social affordances. These affordances are a useful motivational tool because they lie within developers’ sphere of influence (Zichermann and Cunningham, 2011) and are common in gamified environments to encourage desirable behaviors (Dale *et al.*, 2019; Jang *et al.*, 2018; Kunkel *et al.*, 2021). Offering points in return for desired behaviors increases users’ degree of performance in some settings (Mekler *et al.*, 2017); however, such rewards are more likely to be successful when congruent with the situational and contextual characteristics of the user group (cf. Deterding *et al.*, 2011). Drawing on this research, we expect that promoting

progression-based affordances through notifications increases notification effectiveness. This is reflected in Hypothesis 1.

Hypothesis 1: Notifications promoting a progression-based affordance are more effective than those that do not promote any kind of affordance.

Social affordances

Research in gamified contexts has assessed how socially oriented motivational affordances affect behavior (Cheong *et al.*, 2013; Downes-Le Guin *et al.*, 2012; Eickhoff *et al.*, 2012). Evidence suggests that social affordances promote users' interactions with others who share similar interests, such as fellow sport consumers, family members, or friends (Sailer *et al.*, 2017). Such work is predicated on the idea that individuals' use of games and gamified digital environments are motivated by a desire for enjoyment and fun, which are positive emotions that can be enhanced in the presence of like-minded individuals (Butcher *et al.*, 2017; Zichermann and Cunningham, 2011). Drawing on self-determination theory (Vansteenkiste *et al.*, 2004), researchers have found that gamified experiences satisfy humans' need for relatedness with others (for extensive reviews, see Antin and Churchill, 2011; Sailer *et al.*, 2014; 2017; Seaborn and Fels, 2015), and apps can be gamified to provide opportunities for social competition (Kunkel *et al.*, 2021; Mekler *et al.*, 2017; Seaborn and Fels, 2015). This approach builds on social comparison theory, in which Festinger (1954) argued that humans are driven to compare themselves with relevant others. Taken together, we expect that promoting social affordances in notifications increases the likelihood that a user opens the app and performs a requested behavior. This is reflected in Hypothesis 2.

Hypothesis 2: Notifications promoting a social affordance are more effective than those that do not promote an affordance.

Combining affordances

While individual affordances may increase the chances that a user will respond to a notification, multiple affordances may result in combinatorial effects (Zichermann and Cunningham, 2011). This amounts to a simple proposition – if telling users about one product benefit is good, is telling them about two product benefits better? After all, users may not be motivated to interact with an app *exclusively* for progression-based or social-based reasons. It is possible that some users seek a mix of social- and progression-based rewards. In that scenario, it would be prudent for developers to activate both reward mechanisms in notifications' text. Using multiple affordance types could also be more practical because app features and elements can frequently adopt characteristics of social- and progression-based actions. In mobile marketing specifically, Zichermann and Cunningham (2011; p. 79) described the engagement effects of imbedding social elements directly into mechanical features of a mobile environment: "...one of the most common needs is to combine game mechanics (a progression-based element of the app) with social interactions (a social-based element of the app). Moreover, socializing key game mechanics can make your experience more viral. Even if the mechanic is more achievement- or exploration-oriented, you have the option of increasing sociability to broaden its reach and cyclicity." Thus, positive effects may stem from both sources, and developers could activate both reward mechanisms simultaneously. This notion is supported by other researchers, as well. For example, Porter and Lawler (1968) speculate about a positive impact of combining progression and social affordances. Subsequent work by Gagné and Deci (2005) indicates that

combining affordances contributes to amplified user behavior. Integrating multiple affordances is shown to increase desired behavior in several decision-making contexts, such as reducing greenhouse emissions (Strassburg *et al.*, 2009), improving product safety standards (Tang and Barbich, 2014), and inducing specific behaviors (Bowles and Polania-Reyes, 2012). This leads to Hypotheses 3a and 3b:

Hypothesis 3a, b: Notifications promoting both progression and social affordances are more effective than notifications that a) do not promote any affordance; b) promote either a progression or a social affordance.

Study 1 Overview

The purpose of Study 1 was to test how individuals perceived notifications containing social affordances, progression-based affordances, and a combination of these affordances. We developed a survey in which participants were shown notifications and asked to rate the likelihood they would respond. Contextually, we located the study in relation to sport and entertainment, because it is a high-involvement industry – like technology, movies, or motorcycles – that is primed for consumer engagement (Lock and Funk, 2016; Lee *et al.*, 2019). Additionally, sport consumption is motivated by individual and social drivers (Armstrong, 2007), which align well with our exploration of progression and social affordances.

Study 1 Context and Participants

Study 1 data were collected via online surveys completed by Amazon MTurk workers. We used fantasy football within the National Football League (NFL) as a context due to the

popularity of fantasy football and the NFL's profile in North America (Pagels, 2018)¹. To ensure familiarity with the research context, we sampled participants from the United States only, and excluded MTurk workers if they: (i) were not an NFL fan, (ii) had not played fantasy football before, or (iii) had not used a fantasy football app in the past 12-months. Participants completed preliminary demographic questions and identified their level of football involvement on a scale from casual observer [1] to hardcore fanatic [7] (Kunkel et al., 2022).

Study 1 Process and Measures

We presented participants with a description of a fictitious fantasy sport app and, then, randomly presented respondents ($N = 147$) with one of the notifications displayed in Table 2. The control group received a notification containing only information about the app ($n = 40$). In contrast, the three treatment groups received notifications containing a: social affordance ($n = 36$); progression affordance ($n = 38$); or both progression and social affordance ($n = 33$). After participants were exposed to the notification, we asked them to rate the likelihood that they would respond using a 7-point, positively worded Likert scale item in the manner suggested by prior research (Alexandrov, 2010; Gardner *et al.*, 1998).

=====Insert Table 2=====

A series of ANOVA yielded no significant differences on the response likelihood outcome variable regarding level of fandom toward their favorite team, or the sport of football, gender, and age – which indicated a lack of sampling bias. We utilized Equation 1 to test our hypotheses.

$$(1) Y_i = \beta_0 + \alpha_i^{\varphi} + \mathbf{X}_n + \varepsilon_i$$

¹ Fantasy football is named as such because fans select their own rosters of athletes based on perceptions of how the athletes will perform. Then, fans' rosters are gauged against other fans' fantasy rosters based on the athletes' real-game performance.

In Equation 1, participants are indexed by i , Y_i is the user behavior of interest, β_0 is the intercept term, α_i^φ is the affordance treatment effect for condition φ , \mathbf{X} is a matrix of control variables, and ε_i is a disturbance term with $\mathcal{N}(\mu, \sigma^2)$. We used ordinary least squares (OLS) estimation with groupwise standard errors that are robust to heteroskedasticity. The model was estimated in two hierarchical stages, with the controls included in the first ‘block’ of covariates, and notification group indicators included in the second. This allowed us to assess (a) whether the notification type had any effect on response likelihood over and above the control variables, and (b) the individual effects of the notification types on response likelihood. A power analysis with G*Power 3.1 (Faul et al, 2009) indicated our sample exceeded the 119 respondents required to detect medium sized effects ($f^2 = 0.15$; Cohen, 1992) with a 95% confidence interval.

Study 1 Results

Results are presented in Table 3 and indicate that notification type was helpful in explaining respondents’ intention to respond to the notification above and beyond the control variables (R^2 Change = .051, $F(3,139) = 2.983$, $p = .033$). The results of Block 1 and Block 2 combined explain 21.52% of the variance; and the type of notifications resulted in a R^2 change of 5.1%. Thus, the control variables explained 16.42% of the variance and the notification type explained a further 5.1%. Table 3 also shows notifications containing progression affordances were more effective than a notification containing basic information. Specifically, respondents exposed to the progression notification indicated a significantly higher notification response likelihood when compared with the control group. Respondents exposed to a progression notification were associated with, on average, .45 more units of response propensity on a 7-point scale, *ceteris paribus*. This represented an increase of approximately 6.42% (.45/7), assuming linearity between groups. A series of two follow-on regressions compared the progression group

to (a) the social group and (b) the progression + social group, revealing consistently positive significant differences between groups' indicated response propensities. This means that, overall, progression affordances were most effective in persuading notification response.

=====Insert Table 3=====

=====Insert Table 4=====

Study 2 Overview

The results of Study 1 provided initial insights into the effectiveness of progression affordances in relation to other affordances. However, Study 1 did not investigate contextual mechanisms to explain participants' stated preferences. In mobile advertising, research has suggested that a single factor may not induce users to engage in a desired behavior; rather, the combination of situational and contextual factors was typically required for optimal in-app behavior (Freyne *et al.*, 2017; Li *et al.*, 2008; Mattke *et al.*, 2021; Mehrotra *et al.*, 2016; Morrison *et al.*, 2017; Okoshi *et al.*, 2018). Thus, the purpose of Study 2 was to explore why individuals reported their given preferences by unearthing relevant factors that may have influenced their choices. To that end, we developed a survey in which we presented one of the four notifications to respondents, then asked participants to provide qualitative feedback. The focus on qualitative responses sought to gain a deeper understanding of the effectiveness of certain notification characteristics and unearth factors that jointly affected notification effectiveness.

Study 2 Context and Participants

Following the same procedure as Study 1, we collected Study 2 data via online surveys completed by Amazon MTurk workers. Again, we used the NFL as a context, and screened

respondents following the approach in Study 1. A total of $N = 293$ passed the screening protocol and were included in the analysis.

Study 2 Process and Measures

The survey consisted of three steps (see Figure 1). In Step 1, we presented participants with a description of a fictitious fantasy sport app. We then presented the four notifications displayed in Table 2. In Step 2, we asked participants to select the notification to which they would be most likely to respond. An open-ended textbox directed respondents to provide explanations about why the value proposition communicated in the notification was or was not persuasive.

=====Insert Figure 1=====

Study 2 Results and Discussion

Buttressing Study 1 findings, the progression notification was selected most frequently (45.7%), followed by the progression and social notification (32.1%), information notification (15.4%), and social notification (6.8%). Participants' qualitative responses consisted of 9,785 words in total ($Min = 3$; $Max = 141$; $M = 33.22$; $SD = 23.89$). Two researchers conducted a manual thematic analysis following Neumann's (2003) three-round coding sequence. In the open coding sequence, the researchers examined the data for common concepts and phrases explaining why respondents preferred a specific message type. The researchers coded the data individually, then met and reviewed the entire coded set together to negotiate inconsistencies in the coding process until the team reached consensus (Creswell & Poth, 2016). This process ensured coders developed shared interpretations of the data before proceeding to the axial coding sequence, where we revised codes and grouped similar open codes into themes. In the selective coding sequence, the researchers identified quotes that reflected the final themes.

Our coding revealed themes explaining why participants preferred a specific type of notification. Table 5 provides an overview of five themes and a selection of representative quotes. Explaining why *'progression rewards'* were persuasive, participants stated that points represented a *'tangible reward'* with an immediate, *'visible impact'*. While there was a tangible reward to responding to the notification, some participants felt the progression notification was an attempt to *'buy'* their engagement. Participants indicated they would prefer an informational notification because it was simple and not a *'sales tactic'*. Conversely, participants who preferred other notifications mentioned how the affordances were effective in motivating them to respond to the notification. Participants who preferred the social notification indicated that they liked *'social rewards'*, such as the *'community'* aspect of the app. They enjoyed healthy *'competition'* but also stated the social notification reminds them they could *'lose'*, which in turn, created a drive for a more *'tangible reward'* than doing something because other fans would also do it. Participants who preferred the progression + social notification mentioned different ways in which the combination of rewards maximized incentives through collecting points while connecting with other people. However, the *'design'* of the message was perceived as too long—particularly when reading it on a locked phone screen—rendering it less likely that some participants would read, or engage with, such notifications. Overall, Study 2 shed light on why certain affordances are effective and highlighted that there is no *'one size fits all'* notification. However, in support of Study 1, the highest percentage of participants perceived the progression notification as the most effective affordance.

=====Insert Table 5=====

From our qualitative analysis, it emerged that participants were more likely to respond to notifications when they were *involved* in the activity to which it related². For example, a user would be more likely to follow-through on a notification if it asked them to act on content related to their favorite team. Involvement is a motivational state that was initially applied to work on advertising and communication (e.g., Zaichkowsky, 1986). This work conceptualized the construct as the degree to which consumers perceived adverts to be ‘relevant’ to their values, interests, and needs. More recently, the concept has been extended to investigate brand involvement, which represents the degree to which an individual perceives a company to be like them (Dholakia, 2001; Pratt, 1998). Being a person-level trait, involvement is individually determined and affects the degree to which users exercise autonomy in shaping their engagement with a brand. The involvement described in our findings reflects enduring involvement that is maintained over time requiring continued, latent emotional investment from the consumer (Pritchard and Negro, 2001). It represents a pertinent antecedent of behaviors that engage consumers with brands on a regular basis.

Rather than receiving all push notifications in the same way, then, users explained that their response likelihood was *moderated* by their involvement with the activity to which it pertained. Furthermore, the qualitative analysis indicated that the potential moderating role of involvement applied across different types of notification. Therefore, we developed Hypothesis 4 to test the degree to which involvement moderates notification effectiveness:

Hypothesis 4: Involvement positively moderates the relationship between affordance type and notification effectiveness.

² Context specific findings related to the specific game were discussed by participants but omitted from analyses to focus on generalizable moderators beyond the specific context.

Study 3 Overview

Study 3 extends findings from Study 1 and Study 2 with a field experiment. Study 1 revealed that characteristics of the message impacted effectiveness. Specifically, respondents preferred notifications featuring progression affordances relative to other types. Study 2 explored why consumers preferred certain affordances and indicated that consumers' involvement also influenced message effectiveness. The purpose of Study 3 is to test if these findings hold up in 'real world' settings. To facilitate this, we conducted a field experiment in collaboration with a mobile application developer. We identified developers that met several important criteria such as (1) a currently-in-use mobile app for sports consumers, (2) the use of engagement-specific app features, and (3) a mutual willingness and ability to conduct an experiment and provide us with the relevant data. In the end, the best match was a fantasy football app developer headquartered in Germany.

In partnership with the developer, we sent and tracked responses to 7,745 notifications distributed to 627 *active* app users (i.e., those who had the latest version of the app and had notifications enabled³) throughout a football (i.e., "soccer") season. Users were randomly assigned to one of the four notification conditions displayed in Table 2 and sent a single notification type throughout the study time frame. All users received notifications at the same interval (four hours prior to game times) to eliminate time-dependencies and other situational factors. The notification stem used in Study 1 was modified to read: "Hello! The next game between [Team A] and [Team B] starts in 4 hours...", where [Team A] and [Team B] were

³ We note that users received differing numbers of notifications over the course of the study, which was determined randomly. Some users joined the app after a few game days, some were with the app from the beginning of the season. Notifications were sent over a few months during the season, which equated to one or two notifications per week, depending on games. The intent was for users to get one notification per gameday over course of study time.

placeholders for actual teams playing in a match. Compliant with the European General Data Protection Regulations (GDPR), anonymized data were received from the app developer.

From a club perspective, the app built by our partner developer served as a tool to identify leads for ticket sales, entertain consumers with stories and videos, activate sponsorships, and gather feedback. From a consumer perspective, the app provided opportunities to follow a favorite team and be rewarded for their fandom. Gamification elements (e.g., individual ranking, team ranking, and badges) encouraged users to perform various in-app behaviors. The app presented users with four activities: (1) daily quizzes; (2) “checking in” while watching games; (3) predicting the results of upcoming games; and (4) making in-app purchases. Each week, users were eligible to earn prizes based on their level of activity. Screenshots depicting several app features appear in Figure 2.

Study 3 Context

The context for this study is a mobile app operating in European countries where football (i.e., soccer) is the most popular sport. This feature of Study 3 allowed us to generalize the findings from Studies 1 and 2 to another geographical context. There are key similarities between American football in the US and ‘soccer’ in Europe that make the two sports similar to one another. American football, and specifically the National Football League (NFL), is the most popular sport in North America by revenue (16 billion USD in 2019; Colleangelo, 2020) and between 37% and 43% of households – approximately 132 million individuals in North America – call American football their favorite sport to follow (Norman, 2018). In parallel, premiere-level soccer is the most popular sport in Europe, with the continent’s five most popular leagues set to make 15.1 billion Euros in revenue for 2020-2021. Between 30% and 50% of the continent

consumes soccer on television ‘at least several times a month’ (Ipsos, 2021). While consumers of American football and European soccer embody different cultures, consumption of professional team sport content serves similar psychological purposes, regardless of where sport is consumed. Research shows that the motives and outcomes of North American sport consumers can be generalized to other geographic contexts involving different professional sport teams and leagues (Neale and Funk, 2006). This is rooted in the observation that spectators watch sports in-person and via digital media for similar reasons (Trail and James, 2001; Wann et al., 2008). Thus, consumer behavior associated with these two sports is highly similar.

Study 3 Process, Measures, and Specifications

In Study 3, we (1) examined actual user behavior – i.e., whether a user completed the requested action or not, and (2) included additional controls at the message level and user level based on the qualitative feedback gleaned in Study 2. In this field study, notification content requested that users opened the app, predicted the result of a match, and ‘checked in’ when the match started.

We captured involvement using a single item following the guidelines of prior work (Alexandrov, 2010; Kunkel et al., 2022; Na, *et al*, 2019). We used this approach due to the practical nature of data collection, which required instrumentation that did not take too long or require a large cognitive load from participants (Gneezy and Imas, 2017). This process required the use of simplified data gathering techniques, such as using single-item measures of psychographic constructs, the use of representative proxies of psychometric constructs, and/or dichotomizing select constructs. The goal was to explain as much variance in a dependent variable using as simple a set of regressors as possible. As such, we faced an optimization problem whereby maximizing explained variance was constrained by model parsimony This

involved collaboration with the app developer to integrate a question asking users who signed up for the app to identify their level of football involvement on a scale from casual observer [1] to hardcore fanatic [7].

The sample reflected the high-involvement context of the study as it was skewed toward the highest level of involvement (Skewness = -1.42; i.e., a ‘highly skewed’ measure; Streiner, 2002). Among sports consumers and other fanatical brand communities, hardcore fanatics exhibit extreme attachment to their favorite brand, while other consumers do not (Hunt et al., 1999; Wann and Branscombe, 1990). These ‘superconsumers’ drive 30-70% of engagement and sales revenue (Yoon et al., 2014). Such users display consumption proclivities that are unique from typical consumers. Therefore, we operationalized involvement using an indicator for cases in which the user was a ‘fanatic’ (equal to 1 when *Involvement* = 7, zero otherwise). Our approach followed recommendations to compare respondents in the highest level of a skewed variable to all other levels of the variable (Streiner, 2002; MacCallum et al., 2002). In our sample, 42% of individuals reported *Involvement* = 7, which was a high concentration.

Last, we included age in both linear and quadratic forms based on research that has identified generational differences in sport consumption behaviors (Braunstein and Zhang, 2005). Based on this research, we suspected that the effect of each additional year of age on our outcome variable was not linear, but an inverted-U relationship instead. Thus, age has a positive effect until some point in one’s life stage (typically, mid-late 20s or early 30s), when career and family obligations inhibit sports consumption (Tapp and Clowes, 2002). After this inflection point, the effect of each additional year of age may be negative.

At the message level, we included an indexed message number (Msg Num) covariate that captured whether the notification was the [1st...nth] notification received by the user during the

study time frame. This control was included based on prior work suggesting that the volume of notifications sent to users can influence their propensity to engage (Bidargaddi, *et al.*, 2018; Morrison, *et al.*, 2017).

The complete equation used to produce estimates in Study 3 is given by:

$$\begin{aligned}
 (2) \ln\left(\frac{P_i}{1-P_i}\right) &= \beta_0 + \gamma_1 Age_i + \gamma_2 Age_i^2 + \gamma_3 Gender_i + \gamma_4 Msg.Number_i \\
 &+ \sum_{i=1}^4 \alpha_j Msg.Group_i + \alpha_1 Involvement_i \\
 &+ \sum_{i=1}^8 a_k (Msg.Group_i \times Involvement_i) + \varepsilon_i
 \end{aligned}$$

Where $\ln\left(\frac{P_i}{1-P_i}\right)$ is the natural logarithm of the odds that respondent i performed the requested behavior (i.e., the log-odds that $Y_i=1$). As the log-odds transformation of the dependent variable makes apparent, we recorded app users' behavior as a binary outcome and thus we estimate Equation (2) using a logistic specification. The coefficients of primary interest are those contained in the set a_k , which are the eight coefficients that corresponded to the four (message group) by two (high/low involvement) study design.

To assess the unique impact of these interaction effects, the analysis first (a) specified a partial model containing the control variables, then (b) specified a full model containing the controls plus the interaction effects, and finally (c) utilized a Log-Likelihood test of the null hypothesis that the partial model was equally as effective as the full model in predicting response likelihood. Because base-rates for mobile notification response and compliance can be as low as 2-4% (Accengage, 2018), the estimation of Equation (2) included a penalized maximum likelihood adjustment that reduced the estimation bias inherent in traditional maximum

likelihood estimation when events have a low base-rate of occurrence (Firth, 1993; Heinze and Schemper, 2002).

Study 3 Results

Summary statistics. Summary statistics and variance inflation factors (VIFs) are presented in Table 6. In the sample, about 4% of notifications sent to users elicited the requested response behaviors, which is approximately in line with industry standards (Accengage, 2018). The sample was heavily male (94%), and M_{age} of users was 30.5 ($SD = 10.3$). Each of the four message types comprised between 18%-32% of the sample, which is balanced given the heterogeneities in users' notification settings and app usage patterns. Users were randomly assigned to one of four groups as they signed up to the app (25% chance for each group). However, some users did not allow push notifications to be sent to their phone, resulting in group sizes that differed from the targeted distribution of 25%. Finally, 42% of the users in the sample were 'fanatic' consumers. The highest VIF was 1.8, and the mean was 1.39, which are below conservative thresholds (Allison, 1999). Therefore, we do not suspect multicollinearity to be an issue in these data.

=====Insert Table 6 & 7=====

Regression results. Table 7 presents the results of the hierarchical regressions. The partial model contained the controls and explained a portion of variance that was significantly different than zero – as evidenced by the model's Wald X^2 value.

Model 2 showed that fanatic sport consumers who were offered a Progression affordance were more likely to respond than fanatics sent the control notification – which contained no affordances ($OR = 9.32$; $z = 2.46$). However, Progression affordances were not equally effective

for non-fanatic users, as hypothesized. Model 3 showed that non-fanatic users sent a message containing a Progression affordance were 11% as likely to respond to the notification as non-fanatic users sent a notification with no affordance (OR = .107, $z = -2.46$). Models 2 and 3 also show that social affordances and both affordances together did not elicit engagement activity that was significantly different from the control group. We conducted a within-individual robustness check to ensure results were not driven by a few individuals. This check included dummy coding each individual user and including the 627 variables as individual fixed effects. Results did not meaningfully change, providing support that individual-level variables did not significantly impact our findings.

Discussion and Contributions

We investigated the efficacy of notifications promoting affordances users can access if they are persuaded to use an app. Collectively, our findings contribute to the body of work in mobile marketing (e.g., Ström *et al.*, 2014) by examining the effectiveness of motivational affordances imbedded in notifications as value propositions [not] persuading users to open a mobile app and perform a requested behavior.

There is a large body of research demonstrating the efficacy of gamified experiences that facilitate competition and achievement through progression-based rewards (Jang *et al.*, 2018; Mekler *et al.*, 2017; Zichermann and Cunningham, 2011). We designed *Hypothesis 1* to explore whether this observation translated to the effectiveness of notifications. Contributing to existing research (e.g., Jang *et al.*, 2018; Mekler *et al.*, 2017), we found notifications that included progression affordances – particularly those featuring visible, immediate, and tangible rewards – were more likely to persuade users to engage with an app (cf. Huotari and Hamari, 2017). The

importance of progression-based affordances was apparent in all three Studies, as evidenced by the positive and significant main effect in the ANOVA (Study 1) and the Full Model (Study 3). In Study 2, respondents explained that the notification clearly communicated the value proposition, which easily and consistently quantified the motivational affordance in consumers' minds. This finding demonstrated the transferability of work on gamification (e.g., Huotari and Hamari, 2017) to the domain of push notifications. It also contributed to gamification knowledge, demonstrating that notifications that convey progression-based affordances offer the most effective means of activating user response.

Regarding *Hypothesis 2*, notifications promoting a social reward were not significantly more effective in persuading users to interact with the app than notifications containing an informational message. Qualitative explanations provided in Study 2 explained that social rewards can be effective for some app users as they mentioned 'competition' and 'community'. These findings aligned with work concerning the positive impacts of social competition and community (e.g., Antin and Churchill, 2011). However, despite drawing on work related to game design elements that indicated the satisfaction of social needs positively influences behavior (see Sailer *et al.*, 2017), our results indicated that social affordances promoted via notifications did not increase the value proposition communicated to consumers. These findings were consistent in Study 3, which adopted a robust experimental design in a sample of real-world app users. These findings may be related to the high-involvement nature of sport, which is inherently social, or related to the characteristics of mobile notifications, as some users were reticent to interact with mobile devices in social settings. We therefore extend gamification knowledge to the context of notifications demonstrating that social affordances are not more effective than informational content in encouraging app use.

Our findings suggest a need for researchers to empirically and theoretically address the situational nature of social affordances in high-involvement brand settings. While these findings may be controversial in relation to existing work on game elements and design, they extend our knowledge into a novel distribution space (i.e., notifications). Given notifications operate in different ways to the in-app contexts explored in existing work (e.g., Sailer *et al.*, 2017) it is both novel and partly unsurprising given the brevity of the communication type and people's relationships with their devices. In this regard, the findings supported work on quick response (QR) codes effectiveness (Trivedi *et al.*, 2019). We have demonstrated in high-involvement contexts that time is of the essence and it pays to remove 'soft' incentives like social affordances (used in our research) or emotional appeals (used by Trivedi *et al.*, 2019) and instead just 'cut to the chase' using 'hard' appeals like points and objective information.

Existing knowledge in gamification has indicated that combining affordances in gamified apps increases their efficacy (Cheong *et al.*, 2013; Downes-Le Guin *et al.*, 2012; Eickhoff *et al.*, 2012; Sailer *et al.*, 2017; Zichermann and Cunningham, 2011). *Hypothesis 3a* and *3b* assessed whether this finding applied to notifications. We have contributed to understanding of notification efficacy showing that a value proposition including a combined progression + social affordance was not more effective in persuading users to engage with the app than an informational message or a message with one affordance. This finding was consistent in Study 1, which was exploratory, and Study 3, which constituted a more formal test. On balance, the combination of affordances could be nil as some perceived it positively, while others perceived it as too pushy, preferring simple messages that are not perceived as a sales tactic. Our finding extended Zichermann and Cunningham's (2011) insights to the context of notifications and highlighted that combining multiple affordances is not necessarily more efficient. Consequently,

we have contributed to the services approach to gamification (Huotari and Hamari, 2017) showing that combining affordances does not necessarily communicate greater value or motivate users to engage with the notification.

In addition to results related to our initial hypotheses, qualitative analyses in Study 2 and quantitative analyses of Study 3 revealed that involvement moderated notification effectiveness, supporting *Hypothesis 4*. Therefore, when notifications contain a value proposition (cf. Huotari and Hamari, 2017) that is personally relevant to an individual (e.g., Zaichkowsky, 1986; Dholokia, 2001) and aligned to their beliefs, it is more likely that the affordances offered will be acted upon. Study 1 isolated the use of progression affordances as a potential driving mechanism of notification effectiveness, and Study 2 contributed personal relevance as a booster of this effect, which was empirically confirmed in Study 3. This contribution extended prior work that has found consumers engage with pastimes congruent with activities in which they are highly involved, such as following their favorite sport teams (Lock *et al*, 2012) and playing video games (Seo, 2013). It also demonstrated that while the extension of motivational affordances into notifications has scope to offer meaningful value propositions to users, the brevity of the communication type and people's relationships with their devices impacted the effectiveness of social affordance, therefore extending existing gamification knowledge. Results further show the effectiveness is related to other interests of consumers that is beyond the control of the app developer. Overall, this research extends knowledge centered around communicating customized gamified value propositions to consumers (Huotari and Hamari, 2017).

Implications for Mobile Marketing

This study has implications for mobile developers and marketers of high-involvement products. First, progression rewards have a more positive influence on in-app behavior than

social rewards or the combination of both affordances. Rather than bundling multiple affordances when persuading users to complete in-app behaviors, practitioners should focus on messages that highlight tangible, visible affordances that are situationally and contextually relevant (cf. Deterding *et al.*, 2011). Furthermore, mobile marketers can increase the effectiveness of progression rewards by selectively sending them to highly involved consumers who opportunistically seek ways to maintain their connection to a brand.

Second, qualitative responses in Study 2 suggested that practitioners should design notifications to highlight the value of responding without being perceived as a *'sales tactic'* – neither in wording nor frequency as each additional message decreased efficiency by 5%. This finding aligns with research that has highlighted the importance of effectively managing notification volume and frequency on app use (Bidargaddi *et al.*, 2018; Morrison *et al.*, 2017) as too many messages can be perceived as redundant, annoying, un-useful, or bothersome than messages delivered in moderation (cf., Sahami Shirazi *et al.*, 2014). The moderating effect of involvement highlights the need to tailor messaging to the individual (Flaherty *et al.*, 2021). Although industry reports commonly espouse a link between sending higher volumes of notifications and reducing churn (Accengage, 2018), respondents explained that they would be less likely to comply when notifications are *'pushy'*, or if they felt that they *'were being sold to'*. The negative impact of higher numbers of notifications reinforced that excessive requests for purchase (or interaction, in the case of notifications) can have adverse effects on user engagement (Sahami Shirazi *et al.*, 2014). Thus, managers should expect a more nuanced relationship between notification volume and compliance.

Limitations and Future Work

Several limitations of our studies present avenues for future work. First, the app development process is dynamic, and the industry changes rapidly. During our research, some users signed up for the app before the involvement question was included in the sign-up process. While no differences were observed between Models 1 and 2 regarding the directionality and significance of variables, this discrepancy led to differences in the number of respondents included in Model 2. Users not allowing notifications led to different group sizes and our data did not include a panel structure because the app became non-operational once data analysis concluded for Study 3. Given app developers' desire to measure user behavior over time (Brodie *et al*, 2013), panel data would be especially helpful for examining individual differences longitudinally (Certo and Semadeni, 2006).

Second, many technology-mediated behaviors are relevant for app developers. In this research, we investigated a single behavior requiring low cognitive load. Future work should investigate the effects of notifications on cognitively demanding behavior, as cognitive load may influence consumer perceptions (Wentzel *et al*, 2010). Scholars could also explore how combinations of behaviors with varying degrees of cognitive load affect overall app use.

Third, the two categories of affordances examined herein were progression and social affordances, some of the most common game affordance types. While other categories exist, such as knowledge-based affordances that reward users for in-app behavior with exclusive content that affords individuals an advantage over other users, this in-app behavior was beyond the scope of studying notifications. Yet, future research may want to focus on gamified in-app notifications to examine the effectiveness of driving desired consumer behavior. Furthermore, results indicated broad social affordances were not more successful than information rewards.

However, there may be a potential to trigger the need for relatedness and the need for social competition through specifically worded notifications and affordances, providing opportunities for future research to investigate social affordances communicated via notifications at a more granular level. Relatedly, we operationalized progression affordances here using points, which have value for in-app purchases and rewards; however, future research may explore economic affordances using digital, crypto, or nominal currency that has purchasing power outside of the focal app ecosystem.

Last, we dichotomized the continuous variable measuring involvement because our high-involvement sport sample was skewed toward fanatic supporters. We followed methodological scholarship which stresses that a skewed variable can be a sound justification for dichotomizing a continuous variable (Streiner, 2002; MacCallum et al., 2002) in cases where continuous variables introduce ‘artificial’ variance where individuals naturally exist in two latent classes that are fundamentally different. Among sports consumers, it is observed that ‘die-hard fanatics’ exhibit extreme attachment to their favorite franchises, while other fans do not (Hunt et al., 1999; Wann and Branscombe, 1990). We observed this dichotomy in our own study because of the skewness of the involvement variable. This limitation presents opportunities to extend our findings to other contexts with samples displaying varying levels of involvement and investigating the slope of the possible curvilinear relationship. Other high-involvement contexts, such as participatory sport or entertainment may provide a rich field for future research projects. We also suggest examining ‘pull-based’ mobile communication strategies in which contact is initiated by the consumer via their mobile device (Atkinson, 2013), such as the use of quick response (QR) codes (eg., Trivedi et al., 2019) where the effectiveness of QR codes can differ by the type of appeal made to the consumer (emotional appeal vs. informational appeal) and by

product category (high-involvement product vs. low-involvement product). On the surface, the effectiveness of the progression affordance in sport is analogous to the finding that QR codes induce purchases for high-involvement products when an informational appeal is used. However, future research will need to confirm whether this surface-level consistency remains true in rigorous empirical settings.

Conclusion

In this research, we applied work on gamification to the domain of notification effectiveness. Using a three-study design, we found that social rewards promoted via notifications are no more effective than a basic informational message in engendering app usage. However, users are more likely to respond to notifications that offer point-based rewards, which represent a tangible reward with visible impact. Combining progression and social rewards did not have a positive impact on subsequent app interaction and consumers may perceive these messages as a marketing ploy. The effect of point-based rewards is moderated by consumers' involvement with the brand. Our findings have theoretical implications for research on gamified affordances as well as practical implications for marketers seeking to influence users' in-app behavior through notifications.

References

- Accengage. (2018). “The 2018 Push Notification and In-App Message Benchmark”. Accengage + Airship. Available at https://www.dropbox.com/s/t89hzlzi53jh8nk/Accengage-White-Paper_The-2018-Push-Notification-Benchmark.pdf?dl=0. (accessed 20 Oct 2019).
- Alexandrov, A. (2010). “Characteristics of single-item measures in Likert scale format”. *The Electronic Journal of Business Research Methods*, Vol. 8 No. 2, pp.1-12.
- Alkhaldi, G., Hamilton, F. L., Lau, R., Webster, R., Michie, S., and Murray, E. (2016). “The effectiveness of prompts to promote engagement with digital interventions: a systematic review”. *Journal of Medical Internet Research*, Vol. 18 No. 2, pp.1–14.
- Allison, P. D. (1999). *Multiple regression: a primer*. Pine Forge Press, Newberry Park, CA.
- Anderson, A., Huttenlocher, D., Kleinberg, J., and Leskovec, J. (2013, May). “Steering user behavior with badges”. In Proceedings of the 22nd international conference on World Wide Web (pp. 95–106). ACM.
- Antin, J., and Churchill, E. F. (2011, May). “Badges in social media: a social psychological perspective”. In CHI 2011 *Gamification Workshop Proceedings* (pp. 1–4). New York, NY: ACM.
- Armstrong, K. L. (2007). “Self, situations, and sport consumption: an exploratory study of symbolic interactionism”. *Journal of Sport Behavior*, Vol. 30 No. 2, pp. 111-129.
- Atkinson, L. (2013). “Smart shoppers? Using QR codes and ‘green’ smartphone apps to mobilize sustainable consumption in the retail environment”. *International Journal of Consumer Studies*, Vol. 37 No. 4, pp.387-393.

- Bidargaddi, N., Pituch, T., Maaieh, H., Short, C., and Strecher, V. (2018). "Predicting which type of push notification content motivates users to engage in a self-monitoring app". *Preventive Medicine Reports*, Vol. 11 No. 1, pp.267–273.
- Bowles, S., and Polania-Reyes, S. (2012). "Economic incentives and social preferences: substitutes or complements?" *Journal of Economic Literature*, Vol. 50 No. 2, pp.368-425.
- Braunstein, J. R., and Zhang, J. J. (2005). "Dimensions of athletic star power associated with Generation Y sports consumption". *International Journal of Sports Marketing and Sponsorship*, Vol. 6, No. 4, pp.37-62.
- Brodie, R. J., Ilic, A., Juric, B., and Hollebeek, L. (2013). "Consumer engagement in a virtual brand community: an exploratory analysis". *Journal of Business Research*, Vol. 66 No. 1, pp.105–114.
- Butcher, L., Tang, Y., and Phau, I. (2017). "Pawning n00bs: insights into perceptions of brand extensions of the video game industry". *Australasian Marketing Journal*, Vol. 25 No. 3, pp.215-224.
- Certo, S. T., and Semadeni, M. (2006). "Strategy research and panel data: evidence and implications". *Journal of Management*, Vol. 32 No. 3, pp.449–471.
- Cheong, C., Cheong, F., and Filippou, J. (2013, June). "Quick quiz: a gamified approach for enhancing learning". In *PACIS* (p. 206).
- Clor-Proell, S., Guggenmos, R. D., and Rennekamp, K. M. (2019). "Mobile devices and investment news apps: the effects of information release, push notification, and the fear of missing out". *The Accounting Review*. Vol. 95 No. 5, pp.95-115.

Colleangelo, M. (2019). “The NFL made roughly \$16 billion in revenue last year”. *USA Today*.

Available at <https://touchdownwire.usatoday.com/2019/07/15/nfl-revenue-owners-players-billions/>. (accessed 4 Jan 2021).

Creswell, J.W. and Poth, C.N., 2016. *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Dale, L. P., White, L., Mitchell, M., and Faulkner, G. (2019). “Smartphone app uses loyalty point incentives and push notifications to encourage influenza vaccine uptake”. *Vaccine*, Vol. 37 No. 32, pp.4594–4600.

Deterding, S., Dixon, D., Khaled, R., and Nacke, L. (2011). “From game design elements to gamefulness: defining gamification”. In *Proceedings of the 15th international academic MindTrek conference: envisioning future media environments*. ACM, 2011.

Dholakia, U. M. (2001). “A motivational process model of product involvement and consumer risk perception”. *European Journal of Marketing*, Vol. 35 No. 11, 1340-1360.

Dix, S., Phau, I., Jamieson, K., and Shimul, A. S. (2017). “Investigating the drivers of consumer acceptance and response of SMS advertising”. *Journal of Promotion Management*, Vol. 23 No. 1, pp.62-79.

Downes-Le Guin, T., Baker, R., Mechling, J., and Ruylea, E. (2012). “Myths and realities of respondent engagement in online surveys”. *International Journal of Market Research*, Vol. 54 No. 5, pp.1–21.

Eickhoff, C., Harris, C. G., de Vries, A. P., and Srinivasan, P. (2012). “Quality through flow and immersion: Gamifying crowdsourced relevance assessments”. In *Proceedings of the 35th international ACM SIGIR conference on research and development in information retrieval* (pp. 871–880). New York, USA: ACM. DOI: 10.1145/2348283.2348400.

- Festinger, L. (1954). "A theory of social comparison processes". *Human Relations*, Vol. 7 No. 1, pp.117–140.
- Fink, J. S., Trail, G. T., and Anderson, D. F. (2002). "An examination of team identification: which motives are most salient to its existence?". *International Sports Journal*, Vol 6, No. 2, pp. 195-207.
- Firth, D. (1993). "Bias reduction of maximum likelihood estimates". *Biometrika*, Vol. 80 No. 1, pp.27-38.
- Flaherty, S. J., McCarthy, M., Collins, A. M., McCafferty, C., and McAuliffe, F. M. (2021). "Exploring engagement with health apps: the emerging importance of situational involvement and individual characteristics". *European Journal of Marketing*, DOI 10.1108/EJM-06-2019-0531.
- Freyne, J., Yin, J., Brindal, E., Hendrie, G. A., Berkovsky, S., and Noakes, M. (2017). "Push notifications in diet apps: influencing engagement times and tasks". *International Journal of Human–Computer Interaction*. Vol. 33 No. 10, pp.833-845.
- Gagné, M., and Deci, E. L. (2005). "Self- determination theory and work motivation". *Journal of Organizational Behavior*, Vol. 26 No. 4, pp.331–362.
- Gardner, D. G., Cummings, L. L., Dunham, R. B., and Pierce, J. L. (1998). "Single-item versus multiple-item measurement scales: an empirical comparison". *Educational and Psychological Measurement*, Vol. 58 No. 6, pp.898-915.
- Gneezy, U., and Imas, A. (2017). "Lab in the field: measuring preferences in the wild. In *Handbook of Economic Field Experiments* ", Vol. 1, pp. 439-464. North-Holland.
- Hamari, J., Koivisto, J., and Sarsa, H. (2014, January). "Does gamification work? A literature review of empirical studies on gamification". In *HICSS*, pp.3025–3034.

- Heinze, G., and Schemper, M. (2002). “A solution to the problem of separation in logistic regression”. *Statistics in Medicine*, Vol. 21 No. 16, pp.2409-2419.
- Hofacker, C. F., De Ruyter, K., Lurie, N. H., Manchanda, P., and Donaldson, J. (2016). “Gamification and mobile marketing effectiveness”. *Journal of Interactive Marketing*, Vol. 34 No. 1, pp.25–36.
- Hunt, K. A., Bristol, T., and Bashaw, R. E. (1999). “A conceptual approach to classifying sports fans”. *Journal of Services Marketing*, Vol. 13 No. 6, pp. 439-452.
- Huotari, K., and Hamari, J. (2012, October). Defining gamification: a service marketing perspective. In *Proceeding of the 16th international academic MindTrek conference* (pp. 17-22).
- Huotari, K., and Hamari, J. (2017). “A definition for gamification: anchoring gamification in the service marketing literature”. *Electronic Markets*, Vol. 27 No. 1, pp.21–31.
- Ipsos. (2021). “Widespread opposition to Football’s Super League across Europe”, available at https://www.ipsos.com/sites/default/files/ct/news/documents/2021-04/Press%20Release_1.pdf (accessed 2 Jan 2022).
- Jang, S., Kitchen, P. J., and Kim, J. (2018). „The effects of gamified customer benefits and characteristics on behavioral engagement and purchase: evidence from mobile exercise application uses”. *Journal of Business Research*, Vol. 92 No. 1, pp.250–259.
- Jung, J. H., Schneider, C., and Valacich, J. (2010). “Enhancing the motivational affordance of information systems: the effects of real-time performance feedback and goal setting in group collaboration environments”. *Management Science*, Vol. 56 No. 4, pp.724–742.
- Kim, E., Lin, J. S., and Sung, Y (2013). “To app or not to app: engaging consumers via branded mobile apps”. *Journal of Interactive Advertising*, Vol. 13 No. 1, pp.53–65.

- Kim, H. J., and Song, H. (2020). “Effort justification for fun activities? The effect of location-based mobile coupons using games”. *Journal of Retailing and Consumer Services* Vol. 54, 102029.
- Kim, K., and Ahn, S. J. G. (2017). “Rewards that undermine customer loyalty? A motivational approach to loyalty programs”. *Psychology & Marketing*, 34, pp.842–852.
- Koivisto, J., and Hamari, J. (2019). “The rise of motivational information systems: a review of gamification research”. *International Journal of Information Management*, Vol. 45, No. 1, pp. 191–210.
- Kunkel, T., Lock, D., and Doyle, J. P. (2021). Gamifying the consumer experience via mobile applications: a longitudinal examination of the impact of gamified engagement on consumer loyalty and purchase behavior”. *Psychology & Marketing*. Vol. 38 No. 6 pp.948–964.
- Kunkel, T., Karg, A., & McDonald, H. (2022). The utility of a single item fandom measure for sport consumer segmentation and predicting behavior. *Sport Marketing Quarterly*. Vol. 31, pp.141–156
- Lee, M. A., Kunkel, T., Funk, D.C., McDonald, H., Karg, A. (2019). „Relationship quality management for sport consumers: antecedents and outcomes”. *European Sport Management Quarterly*. Vol. 20 No. 3, pp.364–384.
- Li, K. A., Sohn, T. Y., Huang, S., and Griswold, W. G. (2008, June). “Peopletones: a system for the detection and notification of buddy proximity on mobile phones”. In *Proceedings of the 6th international conference on Mobile systems, applications, and services* (pp. 160–173). ACM.

- Lock, D. J., and Funk, D. C. (2016). “The multiple in-group identity framework”. *Sport Management Review*, Vol. 19 No. 2, pp.85–96.
- Lock, D., Taylor, T., Funk, D. C., and Darcy, S. (2012). “Exploring the development of team identification”. *Journal of Sport Management*, Vol. 26 No. 4, pp.283–294.
- MacCallum, R. C., Zhang, S., Preacher, K. J., and Rucker, D. D. (2002). “On the practice of dichotomization of quantitative variables”. *Psychological methods*, Vol. 7, No. 1, pp. 19-27.
- Mattke, J., Maier, C., Reis, L., and Weitzel, T. (2021). „In-app advertising: a two-step qualitative comparative analysis to explain clicking behavior”. *European Journal of Marketing*, DOI 10.1108/EJM-03-2020-0210.
- Mehrotra, A., Pejovic, V., Vermeulen, J., Hendley, R., and Musolesi, M. (2016). “My phone and me: understanding people’s receptivity to mobile notifications”. In *Proceedings of the 34th SIGCHI Conference on Human Factors in Computing Systems*; May 07-12, 2016; San Jose, CA, USA, pp.1021–1032.
- Mekler, E. D., Brühlmann, F., Tuch, A. N., and Opwis, K. (2017). „Towards understanding the effects of individual gamification elements on intrinsic motivation and performance”. *Computers in Human Behavior*, Vol. 7, No. 1, pp.525–534.
- Morrison, L. G., Hargood, C., Pejovic, V., Geraghty, A. W., Lloyd, S., Goodman, N., and Yardley, L. (2017). “The effect of timing and frequency of push notifications on usage of a smartphone-based stress management intervention: an exploratory trial”. *PloS one*, Vol. 12 No. 1, e0169162. doi.org/10.1371/journal.pone.0169162.

- Na, S., Su, Y., and Kunkel, T. (2019). “Do not bet on your favourite football team: the influence of fan identity-based biases and sport context knowledge on game prediction accuracy”. *European Sport Management Quarterly*, Vol. 19 No. 3, pp.396–418.
- Nations, D. (2019). “What are push notifications? And how do I use them?” Lifewire. Available at <https://www.lifewire.com/what-is-push-notification-1994351>. (accessed 3 Nov 2019).
- Neale, L., and Funk, D. (2006). “Investigating motivation, attitudinal loyalty and attendance behaviour with fans of Australian football”. *International Journal of Sports Marketing and Sponsorship*, Vol. 7 No. 4, pp.12–22.
- Neumann, L. W. (2003). *Social research methods: qualitative and quantitative approaches* (5th ed.). Boston et al.: Allyn and Bacon.
- Norman, J. (2018). “Football Still American’s Favorite Sport to Watch”. *Gallup, Inc.* Available at <https://news.gallup.com/poll/224864/football-americans-favorite-sport-watch.aspx>. (accessed 23 Jan 2022).
- Okoshi, T., Tsubouchi, K., and Tokuda, H. (2018). “Real-world large-scale study on adaptive notification scheduling on smartphones”. *Pervasive and Mobile Computing*, Vol. 50 No. 1, pp.1–24.
- Pagels, J. (2018). “Competition between sports hurts TV ratings: how to shift league calendars to optimize viewership”. *Journal of Sports Analytics*, Vol. 4 No. 3, pp.193–199.
- Phau, I., Teah, M., Hanslin, K., and Rindell, A. (2014). “Consumer-brand relationships in step-down line extensions of luxury and designer brands”. *Journal of Fashion Marketing and Management*, Vol. 18 No. 2, pp.145-168.
- Porter, L. W., and Lawler, E. E. (1968). “What job attitudes tell about motivation”. *Harvard Business Review*, Vol. 46 No. 1, pp.118–126.

- Pratt, M. G. (1998). Central Questions in Organizational Identification. *Identity in Organizations*, 24(3), 171-207.
- Pritchard, M. P., and Negro, C. M. (2001). "Sport loyalty programs and their impact on fan relationships". *International Journal of Sports Marketing and Sponsorship*, Vol. 3 No. 3, pp.64–85.
- Ridinger, L., and Funk, D. C. (2006). "Looking at gender differences through the lens of sport spectators". *Sports Marketing Quarterly*, Vol. 15, No.3, pp. 155-166.
- Ryals, L., and Knox, S. (2001). "Cross-functional issues in the implementation of relationship marketing through customer relationship management". *European Management Journal*, Vol. 19 No. 5, pp.534-542.
- Ryan, R. M., and Deci, E. L. (2000). "Intrinsic and extrinsic motivations: classic definitions and new directions". *Contemporary Educational Psychology*, Vol. 25 No. 1, pp.54–67.
- Sahami Shirazi, A., Henze, N., Dingler, T., Pielot, M., Weber, D., and Schmidt, A. (2014, April). "Large-scale assessment of mobile notifications". In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 3055–3064). ACM.
- Sailer, M., Hense, J. U., Mayr, S. K., and Mandl, H. (2017). "How gamification motivates: an experimental study of the effects of specific game design elements on psychological need satisfaction". *Computers in Human Behavior*, Vol. 69 No. 1, pp.371–380.
- Sailer, M., Hense, J., Mandl, J., and Klevers, M. (2014). "Psychological perspectives on motivation through gamification". *Interaction Design and Architecture Journal*, Vol. 19, pp.28–37.
- Seaborn, K., and Fels, D. I. (2015). "Gamification in theory and action: a survey". *International Journal of Human-Computer Studies*, Vol. 74 No. 1, pp.14–31.

Seo, Y. (2013). "Electronic sports: a new marketing landscape of the experience economy".

Journal of Marketing Management, Vol. 29 No. 13-14, pp.1542–1560.

Strassburg, B., Turner, R. K., Fisher, B., Schaeffer, R., and Lovett, A. (2009). "Reducing emissions from deforestation—the "combined incentives" mechanism and empirical simulations". *Global Environmental Change*, Vol. 19 No. 2, pp.265-278.

Streiner, D. L. (2002). "Breaking up is hard to do: the heartbreak of dichotomizing continuous data." *The Canadian Journal of Psychiatry*, Vol. 47, No. 3, pp. 262-266.

Ström, R., Vendel, M., and Bredican, J. (2014). "Mobile marketing: a literature review on its value for consumers and retailers". *Journal of Retailing and Consumer Services*, Vol.21, No.6, pp. 1001-1012.

Strycharz, J., van Noort, G., Helberger, N., and Smit, E. (2019). "Contrasting perspectives—practitioner's viewpoint on personalised marketing communication". *European Journal of Marketing*, Vol. 53 No. 4, pp.635-660.

Tang, C. S., and Babich, V. (2014). "Using social and economic incentives to discourage Chinese suppliers from product adulteration". *Business Horizons*, Vol. 57 No. 4, pp.497-508.

Tapp, A., & Clowes, J. (2002). "From "carefree casuals" to "professional wanderers" – Segmentation possibilities for football supporters". *European Journal of Marketing*, Vol. 36 No. 11/12, pp.1248–1269.

Trail, G. T., and James, J. D. (2001). "The motivation scale for sport consumption: assessment of the scale's psychometric properties". *Journal of Sport Behavior*, Vol. 24 No. 1, pp.108–123.

- Trivedi, R., Teichert, T., and Hardeck, D. (2019). “Effectiveness of pull-based print advertising with QR codes: role of consumer involvement and advertisement appeal”. *European Journal of Marketing*, Vol. 54 No. 1, pp.145-167.
- Urban Airship (2019). “How push notifications impact sports and recreation app retention rates: Analysis of data from 63 million new app users reveal how push notification opt-in rates and frequency influence mobile app retention”. Available at <https://www.airship.com/resources/benchmark-report/how-push-notifications-impact-mobile-app-retention-rates/>. (accessed 20 Oct 2019).
- Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., and Deci, E. L. (2004). “Motivating learning, performance, and persistence: the synergistic effects of intrinsic goal contents and autonomy-supportive contexts”. *Journal of Personality and Social Psychology*, Vol. 87 No. 2, pp.246–260.
- Vargo, S. L., and Lusch, R. F. (2008). “Service-dominant logic: continuing the evolution”. *Journal of the Academy of Marketing Science*, Vol. 36 No. 1, pp.1–10.
- Wann, D. L., and Branscombe, N. R. (1990). “Die-hard and fair-weather fans: Effects of identification on BIRGing and CORFing tendencies”. *Journal of Sport and Social Issues*, Vol. 14, No.2, pp. 103-117.
- Wann, D. L., Grieve, F. G., Zapalac, R., and Pease, D. G. (2008). “Motivational profiles of sport fans of different sports”. *Sport Marketing Quarterly*, Vol. 17 No. 1, pp.6–19.
- Wentzel, D., Tomczak, T., Herrmann, A. (2010). “The moderating effect of manipulative intent and cognitive resources on the evaluation of narrative ads”. *Psychology & Marketing*. Vol. 27 No. 5, pp.510–530.

Yoon, E., Carlotti, S., & Moore, D. (2014). Make your best customers even better. *Harvard Business Review*, 92(3), 22-24.

Zaichkowsky, J. L. (1986). "Conceptualizing involvement". *Journal of Advertising*, Vol. 15 No. 2, pp.4-34.

Zichermann, G., and Cunningham, C. (2011). *Gamification by design: implementing game mechanics in web and mobile apps*. Boston, MA: O'Reilly Media, Inc.

Table 1. Push Notification Literature

Author	Type of notification	Focus of study	Discipline	Method	Analysis	Summary of findings
Bidargaddi, Pituch, Maaieh, Short, and Strecher (2018)	Tailored message: suggestion vs. insight	App usage frequency, Frequency*Message interaction	Medicine/health	18k notifications, 1,265 users	Econometric; logit (engage/not engage)	1. Suggestions improved the likelihood of interacting with app more than insights. 2. For high-frequency users, suggestions reduced the likelihood of interacting with the app. Insights worked better for this group.
Clor-Proell, Guggenmos, and Rennekamp (2019)	1. Grouping vs. ungrouping of content 2. Notifications vs. no notifications	I-FOMO; FOMO on investment news Study 1: validate scale; Study 2: test in model along with grouping and push)	Investing	Study 1: 301 MTurk workers to generate a 2-factor model of I-FOMO; Study 2: 178 MTurk workers to be non-professional investors	Study 1: EFA/CFA Study 2: 2 (grouped info, ungrouped info) by 2 (notif, no notif) design	1. Ungrouped information delivered in notifications generates more investment in the company. 2. High I-FOMO participants were more sensitive to the above relationship.
Dale, White, Mitchell, and Faulkner (2019)	1. Geolocation - within 200 meters of pharmacy	Income, employment, education, marital status, age, perceived barriers to “call to action”	Health and vaccinations	~29k Carrot Health app users	Series of descriptive analyses	1. Incentives + geotagged notifications = increased awareness of flu vaccine and increase in reported numbers of response to call to action (i.e., get a flu shot)

2. Set of incentives for completing tasks vs. no incentives

2. Loyalty point incentives may have been too small to compete with an easier alternative (take a quiz).
3. Incentives implied prolonged engagement with the app and/or lack of attrition.

<p>Freyne, Yin, Brindal, Hendrie, Berkovsky, Noakes (2017)</p>	<p>Notifications and self-monitoring tools vs. no notifications or tools</p>	<p>Time of day sent</p>	<p>Health/diet</p>	<p>75 users; 12,613 app usage sessions; ~45k notifications</p>	<p>ANOVA (notif' / no notif') of drop-out rate, app access rate</p>	<p>1. No difference in drop-out rate between those who received notifications and those who did not. 2. Those who received notifications accessed the app more than those who did not receive notifications.</p>
<p>Li, Sohn, Huang, and Griswold (2008)</p>	<p>Assigned notification sounds vs. group consensus assignment vs. individual choice</p>	<p>Gender, age</p>	<p>Friend apps</p>	<p>17 users (3 groups of friends)</p>	<p>User logs over 2 weeks + 4 interviews (683 notifications)</p>	<p>1. Personal choice in how a user receives notifications (sounds and vibrotactile) increases perceived usefulness and engagement.</p>
<p>Okoshi, Tsubouchi, and Tokuda (2018)</p>	<p>Notification delivered during breakpoint vs. notification delivered immediately as news happened</p>	<p>Descriptive results for age, gender, and occupation</p>	<p>General news</p>	<p>680k users, Yahoo Japan app (Android)</p>	<p>A/B test of user sample; access to breakpoint messaging vs.</p>	<p>1. Delaying notification delivery until users have down time ("interruptible</p>

immediate messaging moment") reduced response times by nearly half. 2. Delaying notification delivery until a breakpoint resulted in higher rates of continued engagement throughout the study period.

<p>Mehrotra, Pejovic, Vermeulen, Handley, and Musolesi (2016)</p>	<p>1. Priority (low v high)</p> <p>2. Task type (work, communication, travel, maintenance/ personal, leisure, idle, other)</p> <p>3. Ongoing task complexity (1–7 Likert)</p>	<p>Age, gender, Big 5 personality</p>	<p>All apps on phone</p>	<p>10,372 notifications, 474 survey responses, 20 users</p>	<p>In-situ monitoring of users' devices</p>	<p>1. Notifications were seen faster when the user was commuting vs. when they were idle, when their ongoing task was more complex, when sender was a frequent contact, and when priority was high.</p>
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<p>Morrison <i>et al.</i> (2017)</p>	<p>1. Delivery method</p> <p>2. Delivery frequency</p>	<p>Number of total logins to the app, login duration, gender, age, education</p>	<p>Public health; mental health</p>	<p>77 users, 2 weeks, 539 notifications</p>	<p>2 (intelligent delivery, pre-determined delivery times) by 2 (daily delivery, delivered once every 72 hours)</p>	<p>1. Intelligent delivery showed no significant advantage over non-intelligent delivery methods.</p> <p>2. Intelligent frequency and daily frequency performed better than</p>
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Current Study	Multiple incentives types imbedded in notifications.	Whether the user responds to various incentive types by engaging with the app.	Sports and Entertainment	148 survey respondents + 293 survey respondents + field study of ~8k notif. sent to ~700 users.	Multi-study; econometric predictive modelling of perceptions and behaviors.	occasional delivery. Points-based affordances are most effective at getting users to engage with the app – particularly for high-involvement ('fanatic') users.
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Table 1 Notes: k = thousands; FOMO = fear of missing out; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; ANOVA = analysis of variance; notif = notification.

Table 2: Message type

<i>Information</i>	<i>Social</i>	<i>Progression</i>	<i>Progression + Social</i>
Hello! The next game starts in 4 hours...			
...Predict the result and check in when the game starts.	...Predict the result and check in when the game starts to join other consumers.	...Predict the result and check in when the game starts to collect up to 90 points.	...Predict the result and check in when the game starts to join other consumers and collect up to 90 points.

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Table 3. Summary statistics, Study 1

Variable	Obs	Mean	Std. Dev.	Min	Max
Team Fandom	147	5.313	1.238	2	7
Football Fandom	147	5.388	1.236	2	7
Gender	146*	1.295	.457	1	2
Age	147	29.84	9.31	18	56
Message Groups					
Information	40	.272	.447	0	1
Social	36	.245	.431	0	1
Points	38	.259	.439	0	1
Both	33	.224	.419	0	1

* One participant indicated they were not comfortable sharing information related to their gender.

Table 4. Results Study 1

Respond	B	Robust SE	t
Block 1			
Team Fandom	0.272	0.122	2.22*
Football Fandom	0.220	0.120	1.84*
Gender	0.404	0.209	1.93*
Age	0.113	0.155	1.12
Block 2			
Information		<i>Omitted</i>	
Social	-0.129	0.319	-0.410
Points	0.450	0.263	1.71**
Both	-0.392	0.311	-1.260
Intercept	2.210	0.643	3.440

N = 147

F(6,139) = 7.09***

R-Sq. = .2152

R-Sq. Change = .051*

*p<.1, **p<.05, ***p<.01. SEs are clustered by Message Type and are robust to heteroskedasticity. Follow-on regressions leaving out the Social and Both message types revealed consistent results, with the Points coefficient remaining positive in direction and significant in magnitude.

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Table 5: Qualitative themes and representative quotes

Theme	Representative Quote
<i>Progression Rewards:</i> The first theme is concerned with receiving progression rewards that consist of tangible rewards that make a visible impact.	
<i>Tangible reward</i>	<ul style="list-style-type: none">• “Value always gives a good sale point. I’m more inclined to join in when I know the value of what I’m getting.”• “[Don't try to bandwagon me in to opening the app.] I want to know if I am getting something worthwhile like coins.”
<i>Visible impact</i>	<ul style="list-style-type: none">• “I think the ‘point’ incentive is better than any other. At least that is something that I will see show up, I won't really see the other consumers.”
<i>Social Rewards:</i> The second theme is concerned with social rewards of joining a community and competing against other.	
<i>Community</i>	<ul style="list-style-type: none">• “It’s a good reminder that you are joining other fans and are part of a group.”• “It wouldn't make me feel as if I'm the only person doing it.”
<i>Competition</i>	<ul style="list-style-type: none">• “I would be more likely to respond because I like competition and competing with other consumers makes it exciting.”• “There's a bit more pressure in predicting the score when you're reminded you compete with others, so I would likely not want to predict and be wrong”
<i>Sales Tactic:</i> The third theme is concerned with users not wanting to feel like the product.	
	<ul style="list-style-type: none">• “I weirdly feel taken advantage of because it feels like the messages that mention the points are pressuring me to feed my input into the app.”• “Don't try to bandwagon me in to opening the app. [I want to know if I am getting something worthwhile like coins.]”• “I like short messages that are not pressuring me too much, or sound like a marketing plea, that would get annoying very quickly.”• “The other messages sound like they have a hidden agenda, to inflate numbers or promote some points systems. Things I am generally not interested in.”
<i>Design:</i> The fourth theme is concerned with the design and useability of notifications.	

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- “I prefer notifications I can easily read in a glance and have the reminder. I’m less likely to read long, convoluted push notifications.”
- “I don’t like the extra space that message 4 would take up”

***Involvement:* The fifth theme is concerned with users’ involvement, which spans across all groups and moderates other themes.**

- “It really depends on how involved I am with the league.”
 - “I like football, but I love baseball. So I would respond to notifications more often if they were for the MLB.”
-

Table 6. Summary statistics and VIFs

Variable	N	Mean	SD	Min	Max	VIF
Respond to Msg	2,376	0.04	0.19	0	1	--
Gender = Male	2,057	0.94	0.24	0	1	1.1
Msg number	2,376	25.37	35.49	1	68	1.17
Age	1,894	30.46	10.30	5	73	1.09
Msg = Progression	2,376	0.187	0.39	0	1	1.81
Msg = Social	2,376	0.324	0.47	0	1	1.79
Msg = Both	2,376	0.279	0.45	0	1	1.77
Msg = Control	2,376	0.21	0.41	0	1	--
Fanatic	2,376	0.42	.49	0	1	1.01

Mean VIF = 1.39

Table 7: Penalized logistic regression results

	(Model 1) Partial Model: Controls	(Model 2) Full Model: Hi- Involvement Groups	(Model 3) Full Model: Lo- Involvement Groups
Female	16.9371*** (5.5395)	16.0062*** (5.6566)	16.0063*** (5.6551)
Message Number	1.0155*** (0.0033)	1.0150*** (0.0037)	1.0150*** (0.0037)
Age	2.9462*** (0.6283)	2.1637*** (0.5393)	2.1637*** (0.5382)
Age ²	0.9838*** (0.0034)	0.9886*** (0.0039)	0.9886*** (0.0039)
Progression		0.1797***	1.6760

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		(0.0989)	(1.1663)
Social		0.6249	1.5644
		(0.4609)	(0.9815)
Both		2.4621	2.4621
		(1.4046)	(1.4045)
Non-fanatic		0.0501***	
		(0.0331)	
Fanatic x Progression		9.3256***	
		(8.4860)	
Fanatic x Social		2.5033	
		(2.4101)	
Fanatic x Both			
Fanatic			19.9502***
			(13.1934)
Non-fanatic x Progression			0.1072**
			(0.0976)
Non- fanatic x Social			0.3995
			(0.3846)
Non- fanatic x Both			
Intercept	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)
N	1839	1839	1839
Wald X^2	105.750***	87.471***	105.709***
Penalized LL	-255.699	-238.030	-238.020
LR X^2		29.83***	29.83***

Coefficients presented as odds ratios

Message group-clustered standard errors are in parentheses

**** $p < .01$, ** $p < .05$, * $p < .1$*

For LR tests, Model 1 is nested in 2/3