

Gamification and policy compliance: Results from an online vignette experiment in the context of social distancing for public health security

Eetu Wallius
Gamification Group,
Tampere University
eetu.wallius@tuni.fi

Ana C.T. Klock
Gamification Group,
Tampere University
ana.tomeklock@tuni.fi

Juho Hamari
Gamification Group,
Tampere University
juho.hamari@tuni.fi

Abstract

The commonly applied strategies for promoting compliance with public health and safety policies can be inefficient and coercive, posing a need to examine novel motivational strategies to aid in this endeavor. Gamification, which aims to foster engagement and intrinsic motivation towards mundane activities and behaviors, is one of the vanguard design approaches among behavioral change support systems. Despite the increasing interest in gamification, the corpus lacks studies on its effects on policy compliance. Therefore, this study examines the relationships between gamification design types, gameful experience, and policy compliance in the social distancing context (during COVID-19) using a vignette-based online experiment (n=937). Based on the results, gameful experience mediates the positive relationships between achievement and progression-based, competitive, and immersive gamification and policy compliance, while social gamification is not associated with gameful experience. The results provide evidence of gamification's potential as a non-coercive method of helping people follow policies.

Keywords: Gamification, gameful experience, policy compliance, social distancing, COVID-19.

1. Introduction

Social contract theories posit that policies, rules, and regulations are needed to maintain a social order among individuals, while policy compliance is commonly considered to be a requisite for the secure and safe functioning of organizations and societies (Button, 2008; Drakopoulos & Theodossiou, 2016). Therefore, ensuring compliance behaviors is a major challenge across domains, whether related to large-scale global problems, such as climate change and pandemics, or on local scales, such as those related to harassment in working organizations. Policymakers have often chosen to enforce compliance by punishing individuals for violations or opted to promote it by providing information. For example, traffic surveillance and enforcement are

implemented to detect rule violations (such as speeding) to penalize the offenders, while awareness campaigns and training are conducted to provide information related to risks and safe behaviors (Tay, 2005). A recent instance of a disruptive event that posed novel challenges in relation to policy compliance, and touched everyone on a global scale is the COVID-19 pandemic, during which many countries implemented social distancing (i.e., keeping a physical distance between individuals in their day-to-day lives) policies to restrain the spread of the disease and keep individuals safe. While some governments imposed strict sanctions for individuals that did not comply with these policies, others settled for educating and providing recommendations to guide proper social distancing behavior (Six et al., 2021).

However, these commonly applied strategies for supporting policy compliance have their shortcomings. In many cases, extrinsic regulation based on punishment for non-compliance is inadequate in altering human behavior and can even backlash if the policies that are being enforced are incongruent with the values of an individual, as exemplified by the protests held against the COVID-19 restrictions (Mendoza, & Wielhouwer, 2015; Plümper et al., 2021). Moreover, merely providing information does not often effectively translate to behavioral change (Bandura, 1978). Due to the limitations of these approaches, which rely on extrinsic regulation and informing, there is a need to examine novel motivational strategies to aid in supporting policy compliance.

One of the vanguard behavioral change strategies is the class of behavioral change support systems, referring to information systems that aim to form, alter or reinforce behaviors or acts of compliance without being coercive or deceptive (Oinas-Kukkonen, 2013). Among behavioral change support systems, especially gamification has gained increasing attention among researchers and

practitioners during the last decade (Koivisto & Hamari, 2019). Gamification employs elements, such as narrative, avatars, leaderboards, and badges, that are commonly found in games in contexts outside of their normal use (Deterding et al., 2011). Implementing these gameful elements aims to provide a similar positive experience as games do - whether induced by competition, a sense of connectedness to others, personal achievement, or immersion, for example (Hamari, 2019; Högberg et al., 2019). By imbuing activities with a gameful experience, gamification typically aims to steer users towards desirable behaviors, serving a further utilitarian function, while the positive effects of gamification have been demonstrated in domains such as education (Dicheva et al., 2015), transportation (Klock et al., 2020), safety (Steinberger et al., 2017; Wallius et al., 2022) and environmental engagement (Douglas & Brauer, 2021; Fernandes-Galeote et al., 2021).

Despite the growing interest and promising results of gamification across domains, there are no prior studies examining how the experience provided by gamification affects policy compliance. To this end, by using social distancing as a case study, we conducted an online vignette survey to examine the relationships between gamification types, subjective gameful experience, and policy compliance.

2. Theory and hypotheses

2.1. Policy compliance

Compliance, referring to conformity with rules and policies of communities, and the factors that drive towards it have been explored in multiple domains. For example, a systematic review in the security domain revealed that, while no particular framework or theory seems to best predict compliance, variables related to “soft” emotional factors (e.g., normative beliefs) seem to have a greater influence than cerebral “hard” variables (e.g., perceptions about rewards or punishments) (Somme stad et al., 2014). In a similar vein, Herath & Rao (2009) found that compliance can be enhanced by both extrinsic (e.g., penalties) and intrinsic (e.g., perceived contribution, value) motivators, whereas Cialdini & Goldstein (2004) argue that the motivations to maintain a positive self-concept and form accurate descriptions of reality drive compliance behaviors.

Particularly, the role of social influence on compliance behaviors has been widely acknowledged. Motivation to preserve and form social relationships drives compliance, whereas some

of the factors that influence compliance behaviors include social pressure, social norms as well as unconscious social processes, such as behavioral mimicry (AlKabani et al., 2015; Cialdini & Goldstein, 2004; Herath & Rao, 2009). In a recent study, Bicchieri et al. (2022) argued that social proximity is crucial for preserving compliance, as it causes people to react not only to inappropriate behaviors and deviations from social norms that peers exhibit but also to appropriate behavior. In addition to social norms, individuals are inclined to behave in accordance with opinions, recommendations, and advice from authority figures, whose expertise and relative position in the social hierarchy affect compliance (Cialdini & Goldstein, 2004).

2.2. Gamification types

While gamification is a type of behavioral change support system design approach that aims to transform systems, activities, or services to become more game-like by using game elements in any non-game contexts, gamified systems are not unitary but comprise various designs that draw inspiration from games (Hamari, 2019; Oinas-Kukkonen, 2013; Treblmaier et al., 2018). In the extant corpus, the gamification types are commonly categorized into achievement and progression -based, social, and immersive designs (Koivisto & Hamari, 2019). Achievement and progression -based gamification elements include badges, points, and performance graphs that provide performance feedback, serving as goal metrics, while social gamification includes elements such as networking and teams that foster connectedness to others (Koivisto & Hamari, 2019). Also competition can be seen as a type of social gamification when competing with other users (Koivisto & Hamari, 2019). Finally, immersive gamification comprises elements such as narratives, role play, and characters that absorb the user into a gameful world.

What the various types of gamification designs have in common is that they are likely to invoke an experience in their users that is similar to that which is experienced when engaging in game-play (Högberg et al., 2019). This gameful experience is subjective and emerges from user interaction with an effective gameful system (Landers et al., 2018). Achievement and progression based gamification is likely to evoke a psychological state that is similar to gameplay by allowing the user to pursue goals while providing them with feedback that is gratifying, whereas social gamification induces a sense of connectedness to others which is also a common characteristic of the gameplay experience

(Yee, 2006; Ryan et al., 2006). Immersive gamification, on the other hand, aims to absorb the user into a game world, while competitive gamification features induce a sense of competitiveness, which are also considered to be at the core of gameplay experience (Yee, 2006; Ryan et al., 2006). In sum, we posit the following hypotheses regarding gamification designs and the gameful experience:

H1: Gamification (i.e., H1a: achievement and progression-based, H1b: social, H1c: competitive, H1d: immersive) is positively associated with gameful experience.

2.3. Policy compliance and gameful experience

Typically the goal of implementing gamification is not merely to provide a better (gameful) experience for users, but to also steer users towards a certain goal or beneficial behavior (Hamari, 2019; Huotari & Hamari, 2017; Högberg et al., 2019; Landers et al., 2018). In other words, gamification serves a further utilitarian function - commonly related to improving users' performance outcomes (Köse et al., 2019; Treiblmaier et al., 2018) - beyond attempting to make the experience more intrinsically gratifying. Therefore, gamification is a type of behavioral change system design that seeks to increase users' intrinsic motivation towards and during a task to help individuals act more productively towards their individual goals or those of a larger collective. The gameful experience is likely to satisfy the basic needs of relatedness, autonomy, and competence of intrinsic motivation, making the task that is being gamified such that individuals are willing to engage in it even in the absence of extrinsic rewards (Ryan et al., 2006). Due to compliance being influenced by a variety of factors related to intrinsic motivators, as described previously, we hypothesize the following:

H2: Gameful experience is positively associated with policy compliance.

Moreover, the central premise in the existing corpus of gamification research is that the effects of gamified design on behavior are mediated by the experiences gamification induces (Hamari, 2019; Landers et al., 2018; Huotari & Hamari, 2017). Therefore, we posit the following hypotheses regarding the relationships between gamification designs and policy compliance:

H3: Gameful experience fully mediates the positive relationship between gamification (i.e., H3a: achievement and progression-based, H3b: social, H3c: competitive, H3d: immersive) and policy compliance.

3. Materials and methods

This study was conducted as a vignette-based between-subject randomized online experiment, where the participants were presented with one out of four possible ways (achievement and progression, social, immersive, competition + one control version) of gamifying policy compliance concerning social distancing (i.e., maintaining a distance of more than 2 meters from other individuals) during a COVID-19 pandemic and asked to evaluate it in terms of gameful experience and policy compliance. The vignette survey method was chosen as it allows to standardize the stimulus that is presented to the respondents and enables the researchers to effectively manipulate the characteristics of a situation while still resembling real-life (Alexander & Becker, 1978).

3.1. Materials

We created four interactive user interfaces - Social Distancer versions - to represent different ways (i.e., achievement and progression, social, immersive, competition) to gamify social distancing behaviors using a mobile application. Additionally, we created one non-gamified control interface. All interfaces had a home screen with three functions (i.e., symptoms check, exposure check, gamification) including a button for navigating to the "gamification home screen". Moreover, all Social Distancers were based on the idea of tracking 'contacts', i.e., situations where the user comes within a two-meter distance of another user and using this information as the input for gamification. Each participant was presented with one of the interfaces, while the experience induced was fully based on these designs.

The first Social Distancer version (Figure 1) implements achievement and progression-based gamification features. It provides individual feedback and information on the users' social distancing behavior, allowing the user to set a personal goal of maximum daily contacts and showing a progress bar towards this goal. Additionally, this version displays the user statistics about their number of daily, weekly, and monthly contacts as well as about how their weekly and daily social distancing behavior compares to their average behavior. The user is

awarded virtual medals if they do not exceed their daily social distancing goal for seven, 15, or 30 consecutive days, and they can gain levels for the total number of contactless days.

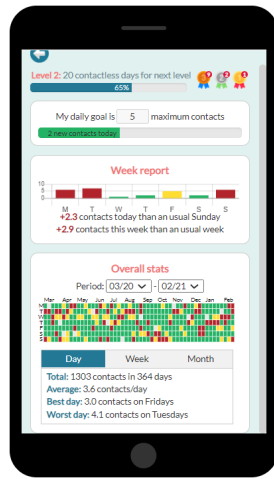


Figure 1. Achievement and progression-based social distancer version

The second Social Distancer version (Figure 2) is based on social gamification features. It allows the user to form a community (a virtual city) with their friends and provide social support to each other. Users can keep their city safe by sending each other support by clicking an icon below their friends' avatars while the application visualizes the city's status. Moreover, the social version of the Social Distancer displays the number of daily contacts of each user and the support the user has received.

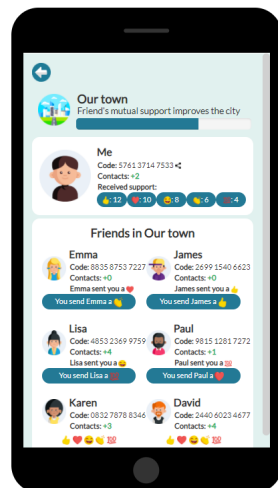


Figure 2. Social Social Distancer version

The third Social Distancer version uses competitive gamification (Figure 3). It allows the user to compete in social distancing with other users

by presenting a leaderboard of those who have the least contacts in the last day, week, and month. Additionally, this version displays a podium of those who had the least contacts in the previous days, weeks, and months and allows the user to access the podiums of the last days, weeks, and months.

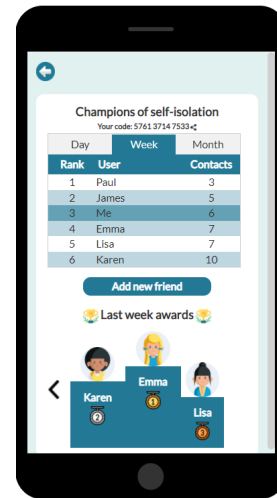


Figure 3. Competitive Social distancer version

The fourth Social Distancer version is based on immersive gamification, allowing the user to immerse themselves into a storyline by social distancing (Figure 4). This version displays an alternative journey of Frodo of the Lord of the Rings. Each day, the journey proceeds according to the user's social distancing behavior. The user sets a personal daily goal of maximum contacts. If the user does not exceed their daily contact goal, Frodo stays safe on his journey. However, if the user exceeds their daily goal, Frodo gets into trouble. It also allows the user to access the storylines from previous days.

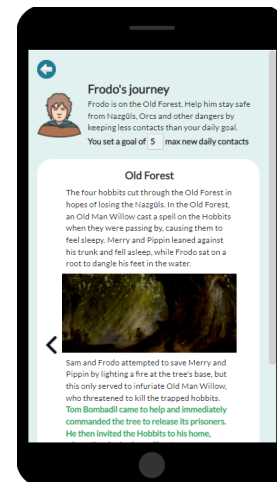


Figure 4. Immersive Social distancer version

The fifth version of the Social Distancer is a control version. It only displays the user their number of daily contacts without employing any gamification features.

To illustrate how the application would work during a pandemic, we produced five videos (one for each Social Distancer version) in which a person uses the application in everyday-life situations, including at home, at a bus stop, at work, and at a park. The videos included narration which explained how the application tracks contacts and how the user can interact with it (e.g., “The mobile application tracks your contacts with other users”, “Whenever you come within a two-meter distance of another user, a contact is registered.”) and on-screen texts which visualized the contacts that happened when the user came within a two-meter distance of others (Figure 5). All videos were identical, except for screen captures (Figure 6) and narration that displayed the interface of the respective application and explained how it works (e.g., “You can check your daily, monthly and weekly social distancing statistics”, “You can check your daily self-isolation ranking. The smaller the number of contacts, the higher the rank”). The videos were between 3 minutes 52 seconds and 3 minutes 54 seconds in length.



Figure 5. A contact is displayed on the video

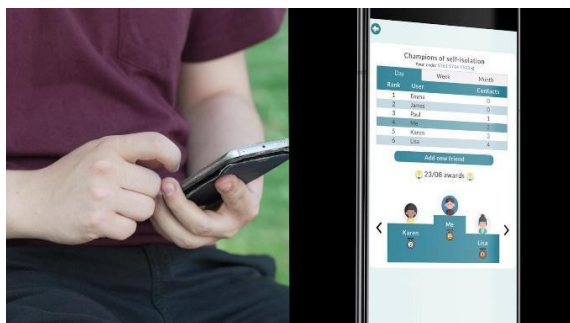


Figure 6. A person using Social Distancer on video

3.2. Measurement

To measure the gameful experience the participant would expect to have, we used a measurement adapted from Högberg et al. (2019). For the compliance measure, we used items adapted from Herath & Rao (2009). The measuring items of both constructs were adapted to fit the social distancing context by the authors of this study. Both psychometric measures were reflective, and the items for each construct and respective factor loadings are presented in the appendix.

3.3. Participants

We recruited the participants using the Prolific crowdsourcing platform and provided compensation for completing the study. We received a total of 937 valid responses. The participants represented 59 different nationalities, most predominant being British (incl. English, Welsh, Scottish) (205 respondents, 21.9 %), Polish (144 respondents, 15.4 %), South African (133, 14.2 %), Portuguese (88, 9.4 %) and Italian (63, 6.7 %). The participants' ages ranged between 18 and 78, being 30.0 on average (StDev=10.5, median=27). 508 of the participants identified as men, 429 women, 6 non-binary, 1 queer, and 2 preferred not to disclose. 391 participants were employed full-time, 276 students, 86 self-employed, 84 employed part-time, 67 unemployed, 17 homemakers, 7 retired, and 9 others (e.g., long term sick leave, student and working, disabled).

3.4. Procedure

The study was conducted as a vignette-based online survey where the participants were randomly assigned one version of the Social Distancer. First, the participants were informed about the purpose of the study and after having stated their informed consent, they were instructed to watch a video explaining how the application works during a pandemic and presented the corresponding interactive user interface. After having familiarized themselves with the application through the video and the user interface, the participants were asked to imagine themselves using the presented version of the application during the COVID-19 pandemic and to fill the survey with gameful experience and compliance items using a 7-point Likert scale (1 Strongly disagree - 7 Strongly Agree), followed by demographic information. The survey was conducted using the LimeSurvey tool. The data was analyzed using SmartPLS 3, where we used the path weighting

scheme with 1000 subsamples bootstrapping for assessing the paths, and the factor weighting scheme for reliability and validity measurements.

4. Results

4.1. Reliability and validity

Cronbach's alpha value was 0.977 for the gameful experience, and 0.910 for compliance, implying a good level of reliability (Nunnally, 1978). However, the high Cronbach's alpha values also suggest redundancy, meaning that the reflective measurements could be shortened without compromising reliability. Composite reliability was 0.979 for gameful experience and 0.943 for compliance, while the values for the average variance extracted were 0.582 and 0.847, meeting the convergent validity criteria (Fornell & Larcker, 1981).

We assessed discriminant validity using the Fornell-Larcker criterion and heterotrait-monotrait values. The Fornell-Larcker criterion which states that the square root of AVE of a construct should be higher than its correlation between other latent constructs was satisfied (Fornell & Larcker, 1981). The heterotrait-monotrait ratio of the reflective constructs was 0.769, satisfying the criteria which states that the values should be less than 0.9 (Teo et al., 2008). Moreover, we assessed discriminant validity by ensuring that all items had a higher loading to their respective construct than the other construct.

4.2. Path Analysis

To measure the relationships between gamification designs, gameful experience, and compliance, we created dummy variables for each gamification condition and the control condition,

while using the control condition as the reference in our analysis. Achievement & progression -based gamification ($\beta=0.150$, $p=0.000$), competitive gamification ($\beta=0.108$, $p=0.007$) and immersive gamification ($\beta=0.082$, $p=0.039$) were statistically significantly positively associated with gameful experience (Figure 7). However, no significant relationship was found between social gamification and gameful experience ($\beta=0.075$, $p=0.066$) at the $p<0.05$ level. Therefore, hypotheses H1a, H1c, and H1d were supported. While H1b was not supported, according to more liberal thresholds we found some evidence of the association between social gamification and gameful experience. Moreover, the gameful experience was statistically significantly associated with policy compliance ($\beta=0.736$, $p=0.000$), supporting Hypothesis H2.

In order to investigate whether the gameful experience indeed fully mediates the relationships between gamification and compliance, we also analyzed the direct relationships between gamification and policy compliance. We found statistically significant negative associations between social gamification ($\beta=-0.086$, $p=0.004$), competitive gamification ($\beta=-0.091$, $p=0.000$), and immersive gamification ($\beta=-0.135$, $p=0.000$), whereas achievement and progression -based gamification had no significant direct association with policy compliance. The null and negative direct associations were expected given the hypotheses regarding full mediation which also implies that the effect of gamification on compliance is explained by the heightened gameful experience. Additionally, we assessed the size of the mediated effect associations between gamification types and policy compliance as mediated by gameful experience. Achievement & progression -based gamification ($\beta=0.110$, $p=0.000$), competitive gamification ($\beta=0.079$, $p=0.007$) and immersive gamification ($\beta=0.060$, $p=0.042$) were statistically significantly indirectly associated with policy compliance (Table 1). Therefore, gameful

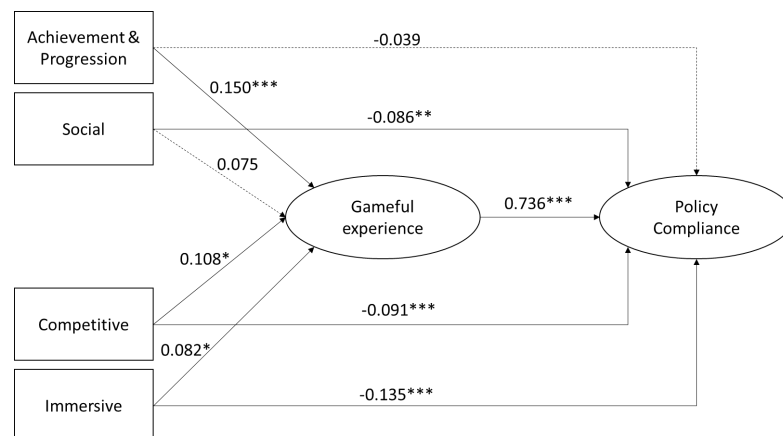


Figure 7. The path model (*= $p<0.05$, **= $p<0.005$, ***= $p<0.001$)

experience fully mediates the relationship between achievement and progression-based gamification, immersive gamification, competitive gamification, and policy compliance. Thus, hypothesis H3a was supported, H3b was not supported, while H3c and H3d were supported.

Table 1. Indirect associations between gamification and compliance

Path	β	95 % C.I.	p
Achievement & Progression gamification - gameful experience - policy compliance	0.110	[0.054, 0.164]	0.000
Social gamification - gameful experience - policy compliance	0.056	[-0.008, 0.113]	0.067
Competitive gamification - gameful experience - policy compliance	0.079	[0.020, 0.138]	0.007
Immersive gamification - gameful experience - policy compliance	0.062	[0.002, 0.117]	0.042

5. Discussion

We conducted an online vignette experiment to explore the relationships between different types of gamification (achievement and progression-based, social, competitive, and immersive), gameful experience, and policy compliance in the context of social distancing for public health. While there exist prior studies that examine the effects of gamification on adherence (De croon et al., 2021), to our knowledge the corpus lacks studies that have a specific focus on compliance towards policies, as well as examination of the association between gameful experience and compliance. Moreover, the corpus lacks studies comparing different types of gamification designs in the compliance context (De Croon et al., 2021). Therefore, our study provides a unique contribution to the corpus of research on gamification and behavior support systems.

As hypothesized, achievement and progression-based (H1a), competitive (H1c), and immersive (H1d) gamification were associated with the gameful experience. However, the association between social gamification and the gameful experience was non-significant (H1b) although some support for it was found. This is surprising as social

features are one of the prominent design types used in gamification and also one of the main motivational characteristics of games in general (Koivisto & Hamari, 2019; Yee, 2006). This non-significant relationship could be related to the context of this study. The social gamification design implemented in this study used features, such as common goals, social networking features, and cooperation, which aim to foster connectedness to others (Sailer et al., 2017). However, the goal of the design itself was to increase policy compliance during pandemics, which involves staying physically isolated from others and avoiding contacts in one's daily life. This juxtaposition regarding gamification features and the overall goals of gamification might have led to hindered experience stemming from interacting with the social gamification design.

The gameful experience was associated with policy compliance (H2) while mediating the positive associations between achievement and progression-based (H3a), competitive (H3c) and immersive (H3d) gamification, as hypothesized. The path between achievement and progression-based gamification and policy compliance was the strongest, suggesting that such design is the most efficient in promoting policy compliance through gameful experience. The direct associations between immersive, social, and competitive gamification and policy compliance were negative, implying that the aspects of gamification that do not serve towards the gameful experience might in fact worsen compliance. This might be due to the gamification designs requiring more effort to use than the control version, which can lead to diminished compliance if the interaction with the system does not induce a gameful experience in the user. Moreover, it might be possible that when a gamification design is not considered gameful, it can be perceived as a form of control and manipulation, leading to a backlash on compliance behaviors, providing another possible explanation (Landers et al., 2018; Martela et al., 2021).

5.1. Practical implications

Based on the results, we encourage policymakers to consider gamification as an alternative or complementary, non-coercive strategy for enhancing policy compliance, as the gameful experience which stems from using such systems is strongly associated with policy compliance. However, as with gamification in general, our results highlight the need to take the targeted behaviors and contextual factors into account while aligning the design with them. Moreover, our results emphasize the importance of the gameful experience when

enhancing policy compliance using gamification as in its absence, gamification can have even negative effects on compliance behaviors. As the gameful experience is subjective and dependent on individual differences, it is essential to take the user characteristics into account when using gamification to enhance compliance, making tailored gamification a viable option (Klock et al., 2020). Tailoring the gamification features also resonates with the broader corpus of health behavior support systems literature which sees personalization as an important facet of system design, while several design frameworks in the field also emphasize the participatory nature of the system design process (Kelders et al., 2016).

6. Limitations and future work

This work has some limitations. First, we explored the relationships between gameful experience and public health policy compliance by using social distancing policies as a case study which means that there might be problems in generalizing the results across contexts. For example, social gamification might have been perceived differently in this context as social isolation was a rudimentary part of compliance during the COVID-19 pandemic in many countries. Second, the study was conducted as an online vignette-based experiment and the actual behaviors and experiences might differ from those resulting from using actual gamification implementations in real-world contexts. Third, although the sample of our study was globally distributed, most respondents were Europeans, which might affect the results as the acceptance and effects of gamification can be partially culture-dependent.

We encourage future research to explore the relationships between gamification, the experiences it induces, and policy compliance in other contexts, such as transportation, sustainability, and occupational safety. Moreover, future research should explore the effects of gamification on policy compliance in real-world settings and in the long term to provide more evidence on the effects and eradicate the novelty effect that is often associated with gamification implementations (Koivisto & Hamari, 2014). Additional studies are also needed to investigate how individual characteristics (e.g., age, gender, motivational style, personality) affect the relationships between the gamification designs, experience derived from using gamification, and policy compliance.

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Appendices

Appendix 1. The reflective measurement

Construct	Item	Factor Loading		
				... give me a sense of knowing what I need to do to do better in social distancing 0.739
<i>Gameful experience</i>	Overall, the application would...			... make me feel deeply involved in social distancing 0.804
	... makes me feel that I need to complete things in relation to social distancing	0.726		... cause me to feel deeply engaged in social distancing 0.819
	... inspire me to maintain my standards of social distancing performance	0.818		... make my social distancing actions seem to come automatically 0.733
	... make me strive to take myself to the next level in social distancing	0.835		... get me fully emotionally involved in social distancing 0.767
	... motivate me to progress and get better at social distancing	0.845		... make social distancing feel playful 0.746
	... make me feel like I have clear goals for social distancing	0.756		... make social distancing feel like an adventure 0.772
	... give me the feeling that I need to reach social distancing goals	0.790		... give me a feeling that I want to know what comes next while engaging in social distancing 0.766
	... make me push my limits in social distancing	0.723		... give me a sense of discovery through social distancing 0.762
	... call for effort in order for me to be improve my social distancing behavior	0.778		... make social distancing appeal to my curiosity 0.792
	... motivate me to do things related to social distancing that feel demanding	0.752		... give me a sense of social support while social distancing 0.760
	... make me feel like I continuously need to improve in social distancing in order to do well	0.738		... give me a feeling of being connected to others while social distancing 0.703
	... make me work at a level close to what I am capable of in social distancing	0.816		... make me feel like I am socially involved with others while social distancing 0.733
	... inspire me to compete in social distancing	0.796		... give me a sense of having someone to share my social distancing endeavors with 0.714
	... involve me in social distancing by its competitive aspects	0.732		... make social distancing feel like it has a social aspect 0.745
	... make me want to be in first place	0.703		
	... makes victory feel important	0.755		
... make me feel guided in social distancing	0.753			
... give me a sense of being directed in my social distancing endeavors	0.701			
... make me feel like I am being pushed in the right direction in relation to social distancing	0.765			
				<i>Policy compliance</i>
				If I used this application...
				... I would be more likely to follow national and regional social distancing recommendations and restrictions. 0.929
				... it would be possible that I would comply more with national and regional social distancing recommendations and restrictions to protect myself and others from the pandemic. 0.916
				... I would be certain that I would follow national and regional social distancing recommendations and restrictions more. 0.917