

Persuasive Games and Mental Well-Being Improvement

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ABSTRACT

This paper describes research exploring the possible relationship between persuasive gamification and mental health improvement. I will first offer up definitions and examples of persuasive technologies and gamification to give the reader a better understanding of persuasive games. Next I will describe the process that a group of researchers went through to design a persuasive game with the purpose of improving the players' mental health. The results of a study conducted using this game will also be covered. These results show a possible correlation between playing the game and improvement in mental well-being.

Keywords

Persuasive games, mental health, gamification

1. INTRODUCTION

Many people around the world struggle with mental health issues. According to a 2018 report by SAMHSA (Substance Abuse and Mental Health Services Administration) [9] around 19.1 percent of US adults live with a form of mental illness. Many factors in our daily lives can affect our mental state. Work, school, our relationships with family and friends, and our physical health can all have affects on our mental well-being, positive or negative. It can also be difficult for those with these issues to seek treatment for a multitude of reasons. This crisis in mental health has led people to wonder whether a persuasive game could have a positive affect on a person's mental well-being. This paper will be looking into the work of a trio of researchers who studied and then developed a game to tackle this issue.

In Sections 3 and 4 of this paper, two studies by the previously mentioned trio of researchers will be discussed. Section 3 will focus on their qualitative study about how to adapt a persuasive game for mental health to different personalities, stressors, and attitudes. Section 4 will look at the game developed by the researchers called "Kindness is Contagious" and the study performed using it. Before either of those topics can be discussed, we must make sure we have an understanding of what persuasive games are and what they can offer in terms of behavioral changes.

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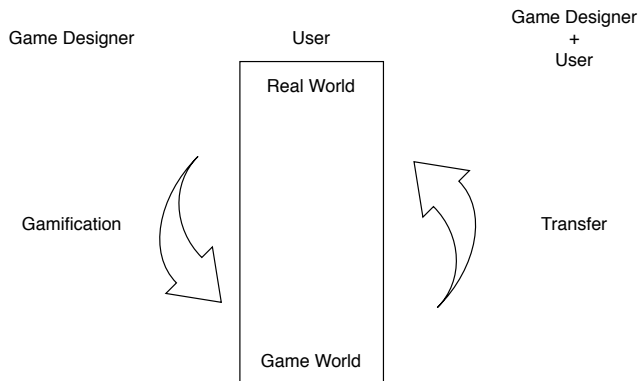


Figure 1: Persuasive Game Design Model (Recreated from [10])

2. BACKGROUND

Visch et al. [10] propose a model from which persuasive games can be derived, which can be seen in Figure 1. In this model, it is shown how elements from the real world are gamified by the game designer into the game world. The effects of participating in this game world are then transferred back to the user and cause them to undergo a change in their behavior based on how the game persuades them. This model is based on elements of persuasive technologies and offers up three central concepts of persuasive gaming: gamification, game worlds, and behavioral change design. Since behavioral change design will be discussed in tandem with persuasive technologies in this section, the three concepts we must have an understanding of if we want to understand persuasive games, in the context of this paper, are persuasive technology, gamification, and game worlds. Game worlds will be covered more in-depth once we begin discussing the persuasive game designed by Ciocarlan et al. [3]. This section will focus on improving our understanding of persuasive technologies and gamification as well as what those terms mean in the context of our later discussion.

2.1 Persuasive Technologies

B.J. Fogg [5] states that persuasive technologies are "any interactive computing system designed to change people's attitudes or behaviors." There are many websites or software programs that we use that can be considered persuasive technologies under this definition. Fogg [5] describes sites like Amazon.com as a persuasive technology because they try to influence a user to buy their products. Educa-

Table 1: Some Persuasive Technology Applications (Recreated from [5])

<i>Domain</i>	<i>Example application</i>	<i>Persuades users to</i>
Disease management	Bronki the bronchiasaurus game	Manage asthma
Personal finance	FinancialEngines.com	Create and adhere to retirement plan
Community involvement/activism	CapitolAdvantage.com	Get ordinary citizens involved in public affairs
Personal Relationships	Classmates.com	Reconnect former classmates
Personal management and improvement	MyGoals.com	Set goals and take the needed steps to achieve them

tional sites or programs intend to influence their users to learn and interact more with a certain subject. Table 1 describes more examples of potential persuasive technologies.

In terms of persuasion, the advantage that persuasive technologies have over more traditional types of persuasion methods (TV and print ads) is the interactivity provided to the user [5]. Persuasive technologies can change and adapt to better fit how the users respond to them, an interaction that did not usually exist with the former, more static, methods. Being interactive gives persuasive techniques a better chance to have an influence on those affected by them [5]. Since persuasive technologies are inherently interactive, these technologies have a better chance to leave an impact on their users.

Persuasive technologies also have a long-standing connection with health issues. Improving health was the main focus of many of the early persuasive technologies [5]. These technologies attempted to encourage their users to exercise more and avoid health risks such as smoking or drinking. While there are many examples of persuasive technologies that help with physical health issues, further work still needs to be done in the field of mental well-being [3].

2.2 Gamification

Deterding et al. [4] propose that gamification is “the use of video game elements to improve user experience and user engagement in non-game services and applications.” This means to take applications created with a non-gaming purpose and add game design elements to them to make them more enjoyable for the user. Based on the definitions of gamification and persuasive technologies described so far, Llagostera [7] argues that gamification can be seen as a type of persuasive technology. The elements introduced to systems through gamification can lead to behavioral changes in the users, persuading them to complete tasks they might otherwise not want to through the use of video game reward systems. Llagostera [7] also connects games to persuasive technology through tunneling, self-monitoring, surveillance, and conditioning; 4 of the 7 persuasive tools Fogg [5] states persuasive technologies can have. The category with the greatest connection to improving a user’s mental health and well-being is conditioning. Fogg [5] describes conditioning

Table 2: Stories depicting High and Low Extraversion (Recreated from [1])

EX Level	Story
High	Andy is a student who makes friends easily and often seeks excitement. He loves networking and socialising with numerous people and most of the times appears to radiate joy. Andy likes to keep busy all the time and often takes initiative.
Low	Martin is a student who is a bit harder to get to know, but he can be a very good friend. He enjoys spending time alone at home, where he usually reads books and listens to music. Martin likes to take things easy, and usually waits for others to lead the way when working together.

technology as a “computerized system that uses principles of operant conditioning to change behaviors.” Operant conditioning is also used in the persuasive game that will be discussed later in this paper.

3. ADAPTING TO PERSONALITY, STRESSORS, AND ATTITUDES

According to Ciocarlan et al. [1], because of peoples’ quickly changing needs and emotions and because of users’ subjective opinions, adaptation to personality, stressors, and attitudes is important for mental health focused technologies. This idea is the basis for their qualitative study into how to adapt persuasive games for mental health to personality, stressors, and attitudes. In this section I will be covering the study and its goals as well as the results of the study and what the results mean for the researchers’ later work on “Kindness is Contagious”.

3.1 Study

As Ciocarlan et al. [1] state

The aim of this study was to investigate the effect of personality, active stressors and attitudes on adapting interactions and challenges in persuasive game design.

In order to reach this goal, they created 6 focus groups, with 5-7 participants each, from a group of computer science students (25 men and 10 women) from the University of Aberdeen. The researchers then adapted 3 personality types (Conscientiousness, Emotional Stability, and Extraversion) into 6 fictional student stories, 2 of which are in Table 2, with one high or low level version of the aforementioned personality traits as well as stressor and attitude indicators. The focus groups were then asked to give challenges to these fictitious students where they had control over both the number and difficulty of the challenges. The participants were also asked to complete three other tasks which include anonymously writing down stressors for a fictional student, discussing the importance of certain user characteristics when tailoring the challenges provided by a persuasive game, and which personalization approaches should be considered for a persuasive game made for mental health improvement.

Table 3: Student stressors and impactors identified in the focus groups (Recreated from [1])

Stressors (S) and Impactors (I)	A1	A2	B1	B2	C1	C2	Total
Mental Demand (S)	4	4	2	5	5	10	30
Temporal Demand (S)	6	7	4	2	2	2	23
Isolation (S)	2	2	5	2	5	3	19
Societal Demand (S)	4	3	3	4	3	-	17
Frustration (S)	3	2	-	-	2	1	8
Diet (I)	3	6	6	1	4	4	24
Finance (I)	2	1	4	3	3	3	16
Sleep and Rest (I)	3	5	2	-	2	1	13
Environment (I)	1	1	4	4	-	1	11
Physical Activity (I)	1	3	1	1	3	2	11
Employment (I)	-	1	1	4	2	1	9
Academic Performance (I)	-	1	1	2	1	1	6

Table 4: User characteristics for effective personalization (Recreated from [1])

Characteristic	A1	A2	B1	B2	C1	C2
Personality	+		+	+		+
Motivation				+	+	
Emotions		+		+	+	+
Stress Level	+		+	+	+	+
Performance		+		+	+	+
Age	+	+	+(3)-(2)	-	-	+
Location	+	+			+	+
Culture	-	+		+(4)-(2)	-	-
Interest	+	+	+	+	+	+
Diet		+	+		+	
Physical Activity		+		+		+
Health Condition	+	+	+(1)-(4)		-	+

3.2 Results

There were four main questions that Ciocarlan et al. [1] wanted answered by this study. The first was what key stressors do students face in their daily lives? To answer this question, the researchers looked at the results of having their participants anonymously submit stressors and impactors for a fictional student. Stressors can be seen as any external condition that can cause stress to an individual. Impactors can have an influence over one’s wellbeing, potentially unrelated to their stressors. The results can be seen in Table 3. As can be seen in the table, the stressor that was mentioned the most by the participants was mental demand where the most indicated impactor was diet.

The second question that Ciocarlan et al. [1] wanted to consider was what do we need to know about students and their active stressors to effectively personalize persuasive games? This question is related to the results of the participants discussing which user characteristics to consider. The one characteristic that each group agreed had to be considered was the user’s interests. When developing a persuasive game, you want to make sure that your target audience is interested in completing the activities you have developed for them. All of the characteristics and group responses can be seen in Table 4. From this table we can tell that stress level, personality, emotions and performance were also considered highly important.

The results of participants giving challenges to the fictional students will be discussed next as they answer the third question proposed by Ciocarlan et al. [1]. The question they propose is how can game challenges be applied to different personalities, stressors, and attitudes? When the focus groups were asked to hand out sets of challenges to the

fictional students, the researchers learned that the fictional students with positive attitudes were given a higher number of difficult challenges despite their number of stressors and, typically, students with low levels of the three personality traits previously mentioned received easier challenges than those with high levels.

The final question that Ciocarlan et al. [1] wanted an answer to was which personalization approaches should be applied to a persuasive game for mental well-being improvement? The responses provided by the focus groups when they were asked to decide which personalization approaches were appropriate for a persuasive game meant to improve mental health give a potential answer. All of the groups agreed that real-time personalization would be very effective, especially for mental health improvement. Most groups also agreed that both explicit (questionnaires) and implicit methods for user profiling would be useful. One group, B2, argued that explicit methods could have the potential to change the user’s responses and therefore should be avoided if at all possible. For example, a questionnaire about one’s mental wellbeing may cause the person being questioned to do some self-reflecting, adding an extra influence to their answer and potentially hurting the integrity of the results.

4. "KINDNESS IS CONTAGIOUS"

Before discussing how “Kindness is Contagious” was made, one must first understand what it is. Ciocarlan et al. [3] describes “Kindness is Contagious” as an online persuasive agent meant to increase well-being by encouraging the user to engage in acts of kindness provided to them by the game. The game employs elements of Ciocarlan et al.’s previous research [1] as well as additional findings collected during the game’s design process [3].

The players log into a website and are given five activities each day. In the case of the study in which the game was used, these five activities were planned ahead of time for 7 days worth of activities. These relate to five categories of well-being: positivity, gratitude, generosity, friendliness, and self-kindness. 10 points are awarded to the players upon the completion of an activity. Persuasive messages are also given to the players each day. These messages use previously researched persuasive techniques to convince users to complete their activities. Players are also allowed to post anonymous messages to encourage fellow users to complete their activities. Figure 2 gives a simplified version of the “Kindness is Contagious” site layout.

Another important design element of “Kindness is Contagious” is how it will adapt to users. This process can be seen in Figure 3. When a user loads up the website for the first time they will be asked to register. After a user is done registering, a user model of their personality, preferences, attitude, and well-being will be created based of the responses they gave while registering. The user model is combined with the activity model to decide what activities and persuasive messages are most appropriate for the specific user. A user history is created that keeps track of which activities the user finished or ignored. This history is combined with feedback provided by the user to make adjustments to the previously mentioned user model. This new user model is once again combined with the activity model to provide new activities and persuasive messages to the user. Each time a user completes a set of activities or provides feedback, the site is able to more accurately adapt to their needs and

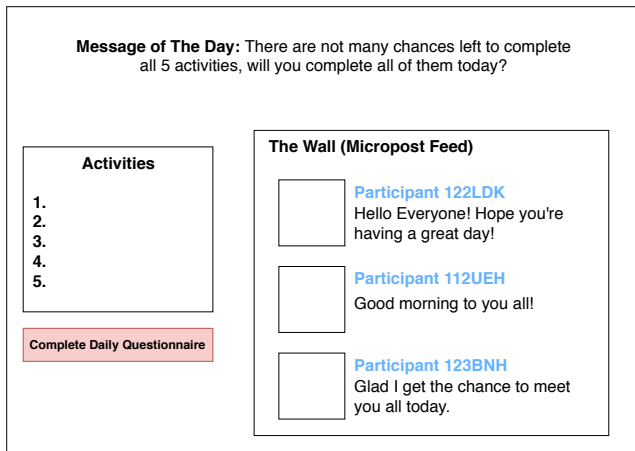


Figure 2: Simplified “Kindness is Contagious” Web-page (Recreated from [3])

Table 5: Persuasive Messages (REC = Reciprocity) (Taken from Table 3 [3])

Day	Message
5 (REC)	(Group A) If all participants complete 150 activities today, everyone will receive 50 extra points! (Group B) If you complete all 5 activities today, you will receive 50 extra points!

preferences each time. It should be noted that this model of adaptation for users of “Kindness is Contagious” was not implemented for the study as all activities and persuasive messages used in the study were planned ahead of time and all participants of the study received the same activities.

4.1 Study

After developing “Kindness is Contagious”, Ciocarlan et al. [3] conducted a study to test the effectiveness of their new game. They gathered 45 participants (28 males and 17 females) and split them into two separate groups, A and B. As previously mentioned, these groups received 5 activities and a persuasive message each day for 7 days. On days 4 and 5, the two groups were given different persuasive messages, with group A’s messages focusing on group goals while group B’s messages were focused more on self-monitoring and individual goals. An example of the different types of messages groups A and B received can be seen in Table 5.

Before the study began, the participants were given a pre-questionnaire with 3 different sections [3]. First the Subjective Happiness Scale [8], a set of 4 questions with a number range of responses from 1-7, was used to gauge the participant’s current mental well-being. Second they were asked about 10 activities and their willingness to complete them. These activities were based on the 5 categories of well-being that the game uses. The results of this section can be seen in Figure 4 labeled as the pre-intentions. To close out the questionnaire the participants were measured for their levels of friendliness, altruism, and gratitude. Their personalities were then assessed using the Ten Item Personality Measure (TIPI) scale [6]. The TIPI scale is a set of 10 questions relating to five personality traits: extraversion, agreeableness, conscientiousness, emotional stability, and openness to ex-

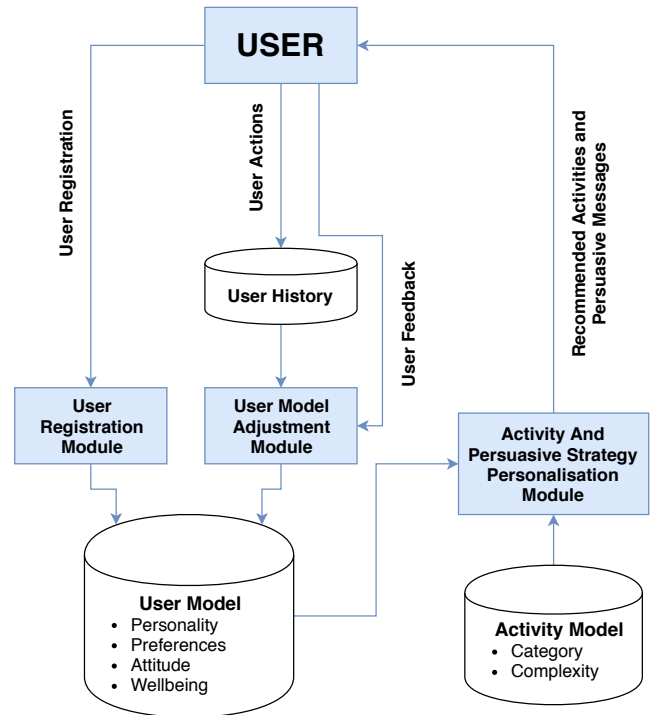


Figure 3: How “Kindness is Contagious” adapts to it’s users (Recreated from [2])

periences. There are two questions per each trait answered on a scale of 1-7.

A daily questionnaire was sent out to each participant at the end of each day of the study which allowed them to express how they felt about their activities for the day as well as their general happiness levels. Each participant also completed a post study questionnaire which asked why they were influenced to complete the tasks from the game and how willing they would be to continue to do such activities in the future.

4.2 Results

One goal of the study was to see how different personality types can affect how effective “Kindness is Contagious” is. Ciocarlan et al. [3] examined the relationship between the total number of activities completed by a participant and how agreeable, extroverted, and conscientious they are. For example, a high level of conscientiousness had a strong correlation with the number of activities completed seeming to suggest that people high in this personality trait need fewer reminders than others. Along with that positive correlation, Ciocarlan et al. [3] state that there is a negative correlation where people with high extraversion tended to complete fewer activities, especially those pertaining to the self-kindness category. The full set of correlations are in Table 6.

As previously mentioned, on Day 4 and Day 5 of the study, Ciocarlan et al. [3] gave groups A and B different persuasive messages with the goal of deciding which type of message was more effective. The mean and standard deviations for the number of activities completed by the two groups for Day 4 and Day 5 can be seen in Table 7. Overall, there was no significant difference in the amount of activities the two

Table 6: Personality Type and Activity Correlations (* = $p < 0.05$; ** = $p < 0.01$; * = $p < 0.001$;) (Recreated from [3])**

	Total Activities	Positivity	Generosity	Gratitude	Friendliness	Self-Kindness
Conscientiousness	0.712***	0.641***	0.563***	0.586***	0.600***	0.525***
Agreeableness	0.462***	0.385**	0.432**	0.434**	0.595***	0.98
Extraversion	-.288*	-.122	-.229	-.199	-.218	-.362*

Table 7: Group Comparison (Mean (SD)) (Recrated from [3])

	Group A	Group B
Activities completed on Day 4	3.64 (1.43)	3.91 (1.04)
Activities completed on Day 5	3.86 (1.73)	3.65 (1.61)



Figure 4: Behavioral Pre and Post Intentions [3]

groups completed over those two days.

Another goal of the study was to see if the game could influence those who played it to continue to perform such activities in their normal lives. According to Ciocarlan et al. [3], there was significant increase in intention compared to the results from the pre-questionnaire in every activity category, as can be seen in Figure 4.

One last goal for the study was to see if the game could have an impact on the well-being of the participants. Ciocarlan et al. [3] states that there was an increase between pre-questionnaire and post-questionnaire in the reported level of well-being of the participants, suggesting that “Kindness is Contagious” can have a positive impact on the mental health of those who play and engage with it. Reported post study well-being scores of the participants were, on average, 0.522 (on a scale of 1-7) higher than the reported scores taken during the pre-questionnaire.

5. CONCLUSIONS

The work covered in this paper suggests that persuasive games can have a positive affect on their players’ mental health when designed with mental health improvement in

mind. While the results of the “Kindness is Contagious” study are uplifting, more work must be done exploring this topic to know whether or not persuasive games could be a real tool for helping people who struggle with mental health issues. There could also be more work done in figuring out which game mechanics truly offer the greatest chance of improvement since the only mechanic covered in “Kindness is Contagious” is offering players points for completing activities. Another possible factor to consider would be the difference between a mobile app persuasive game and a web-based one. One advantage a mobile app might have over a browser-based game is the ability to send push notifications to the user. These notifications could send the persuasive messages of the game straight to the user, encouraging them to use the app instead of the user having to be motivated enough to navigate to the site first like in the case of “Kindness is Contagious”.

There are also concerns that can be raised about what the future might hold for these types of persuasive games. The ethics of using persuasion to specifically target one’s mental health state, even for positive purposes, are a gray area that needs to be considered if a mental health improvement game was ever released to a much wider audience.

Some of the methods used in the “Kindness is Contagious” study can also be examined further. For example, they use a questionnaire at the end of each day of the study. The concerns can be related back to what group B2 said during the qualitative study about how the self-reflection caused by an explicit user profiling method could cause the results from a daily questionnaire to be inaccurate [1]. Further research should be done to see what sort of effects different profiling methods could have on the results of a persuasive game adapted for mental health.

Another point that should be considered is the length of the study. While the improvement in both participant happiness and intention to complete more positive activities for their community is nice to see, with the study only being a week long it is hard to know if the short-term improvements provided by the game will stick with the participants. Will the participants still see the same improvement in happiness last if they played the game for a month? A year? Would they gain a better improvement the longer they play or would it stagnate/decrease? Are they still as willing to complete more positive, mental-health-focused activities as they were at the end of the study? A longer study using “Kindness is Contagious” or a different persuasive game with the same goal could answer these important questions and show us whether or not persuasive games designed to improve mental health have a real future.

Acknowledgments

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