

Gamification and Mobile Apps: Allies in Reducing Loneliness Among Young Adults

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INTRODUCTION

In 2016, no one expected that a mobile game could revolutionize how people engage with gaming. Suddenly, gamers were motivated to leave their homes, take long walks and interact with other players at meeting points with just one objective in common: to catch Pokémons. POKÉMON GO, the most played augmented reality and exergame in history,¹ encourages players to explore their local communities,² and increases the opportunities to establish new social networks within these spaces.^{3,4} Consequently, it promotes mental health benefits,⁵ as social engagement

- 1 Marquet, Oriol et al., “Examining Motivations to Play Pokémons GO and Their Influence on Perceived Outcomes and Physical Activity” in: *JMIR Serious Games* 5(4)e21 (2017), <https://doi.org/10.2196/games.8048>.
- 2 Adlakha, Deepti et al., “Pokémons GO or Pokémons Gone: How Can Cities Respond to Trends in Technology Linking People and Space?” in: *Cities Health* (2017), pp. 89-94, <https://doi.org/10.1080/23748834.2017.1358560>.
- 3 Wagner-Greene, Victoria R. et al., “Pokémons GO: Healthy or Harmful?” in: *American Journal of Public Health* 107(1) (2017), pp. 35-36. <https://doi.org/10.2105/AJPH.2016.303548>.
- 4 POKÉMON GO (Niantic, 2016: Niantic and Nintendo)
- 5 Tateno, Masaru et al., “New Game Software (Pokémons Go) May Help Youth With Severe Social Withdrawal, Hikikomori” in: *Psychiatry Res* 246 (2016), pp. 848-849. <https://doi.org/10.1016/j.psychres.2016.10.038>.

linked to gaming has been found to decrease perceived loneliness and depression.⁶ In a world where loneliness is at an all-time high,⁷ the POKÉMON GO phenomenon of 2016 revealed possible digital strategies to diminish the effects caused by loneliness.

Loneliness, emotional distress caused by the lack of meaningful social connections,⁸ affects people worldwide across all age groups. Although there has been much focus on the loneliness of elderly people, some studies have indicated that young adults are also a risk group. According to the UK's Office for National Statistics, young adults aged 16 to 24 years reported feeling lonely more often than those in older age groups.⁹ A survey conducted by CIGNA with over 10,000 U.S. participants also indicated that young adults have higher rates of loneliness than older adults.¹⁰ A possible explanation is that young people have greater aspirations for social success, like diverse social networks, popularity, and intimate social relations.¹¹ If these social expectations and goals are not met, young adults tend to experience loneliness.

POKÉMON GO is an example of how games can promote users' immersion, social interaction, and consequently well-being. Research on the benefits of using digital technologies for depression treatment, video games in particular, has

- 6 Steinfield, Charles/Ellison, Nicole B/Lampe, Cliff: "Social Capital, Self-esteem, and Use of Online Social Network Sites: A Longitudinal Analysis" in: *Journal of Applied Developmental Psychology* 29 (2008), pp. 434-445.
- 7 World Economic Forum: "The Global Risks Report 2019," 14th Edition, Geneva, (2019), http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf from 07.06.2022.
- 8 Rook, Karen S.: "Promoting Social Bonding: Strategies for Helping the Lonely and Socially Isolated" in: *Psychologist* 39 (1984), pp. 1389-1407.
- 9 Office for National Statistics: "Loneliness – What Characteristics and Circumstances Are Associated With Feeling Lonely?" (2018), <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/lonelinesswhatcharacteristicsandcircumstancesareassociatedwithfeelinglonely/2018-04-10#things-you-need-to-know-about-this-release> from 07.06.2022.
- 10 CIGNA. Global Health Service Company.: "U.S. Loneliness Index," in: Survey of 20.000 American Examining Behaviors Driving Loneliness in the United States (2018), https://www.multivu.com/players/English/8294451-cigna-us-loneliness-survey/docs/IndexReport_1524069371598-173525450.pdf from 07.06.2022.
- 11 Carstensen, L. Laura/Isaacowitz, Derek M/Charles, Susan Turk: "Taking Time Seriously. A Theory of Socioemotional Selectivity" in: *American Psychologist* 54(3) (1999), pp. 165-181, <https://doi.org/10.1037/0003-066X.54.3.165>.

shown the potential of these resources in mental health care settings.¹² These technologies can complement or help circumvent some of the obstacles often found in more conventional treatments for mental illnesses, such as Cognitive Behavioral Therapy (CBT), which faces challenges such as insufficient availability and accessibility to adequate treatment, logistic barriers, and stigma.¹³ For example, the digital game SPARX helps young people (12 to 19 years) with mild to moderate depression.¹⁴ This game is based on CBT methods aimed at coping with negative thoughts and feelings by helping the players to think in a more balanced way. Early tests with users showed reductions in levels of anxiety and depression symptoms.¹⁵

Drawing from this data, Bordini (first author) is developing the gamified social app NONELINESS in collaboration with the Affective & Cognitive Institute (ACI), a cross-faculty institution of Offenburg University. The app provides a safe and collaborative social network for university students, especially those experiencing periods of loneliness while adapting to a new environment with few meaningful friendships. In the context of this project, Bordini and the ACI team conducted studies that investigated the participants' perceptions concerning the design principles of the app's first prototypes. The concepts and relevant studies on gamification and mental health apps that have influenced the design and development of the NONELINESS project are presented in the next section.

GAMIFICATION AND MENTAL HEALTH

Gamification is a task-execution process based on the use of game elements (e.g., rewards, levels, objectives, etc.) in non-gaming settings (e.g., education, business,

12 Granic, Isabela/Lobel, Adam/Engels, Rutger C. M. E.: "The Benefits of Playing Video Games" in: American Psychologist 69 (1) (2014), pp. 66-78, <https://doi.org/10.1037/a0034857>.

13 Wolters, Lidewij H. et al.: "How Can Technology Enhance Cognitive Behavioral Therapy: The Case of Pediatric Obsessive-Compulsive Disorder" in: BMC Psychiatry 17, 226 (2017). <https://doi.org/10.1186/s12888-017-1377-0>.

14 SPARX (The University of Auckland, 2015).

15 Merry, Sally K. et al.: "The Effectiveness of SPARX, The Computerized Self-help Intervention for Adolescents Seeking Help for Depression: Randomized Controlled Non-inferiority Trial" in: British Medical Journal 344:e2598 (2012), <https://doi.org/10.1136/bmj.e25982012>.

health, etc.) to offer the same degree of involvement and motivation that players can normally experience in games.¹⁶

This strategy is an attempt to increase excitement and improve commitment regarding technology-mediated interventions for people with mental health issues. SUPERBETTER, for instance, is an application developed to help people afflicted with depression, anxiety, and post-traumatic stress disorder.^{17, 18} The app invites users to complete tasks to alleviate stress and promote relaxation (e.g., chug a glass of water, stretch their legs, etc.). A study showed that the depression levels of 31 participants who played SUPERBETTER for a month decreased significantly compared to the control group that did not play the game.¹⁹

Released in 2013, 7 CUPS OF TEA (7COT) is an example of how an online supportive app can engage users through gamification elements.²⁰ 7COT supports people who suffer from emotional problems by anonymously connecting them with active volunteer listeners through forums organized by topic (e.g., depression, anxiety, phobias, etc.) or private chat rooms. The service's gamification system is based both on "cheers" (e.g., points that can be given to helpful listeners) and on a progress bar that measures users' emotional level according to their social interactions. A preliminary study showed that users who received psychotherapy in the past marked the 7COT listeners' support to be just as helpful and genuine as a psychotherapist.^{21, 22}

16 Korn, Oliver: "Industrial Playgrounds: How Gamification Helps to Enrich Work for Elderly or Impaired Persons in Production" in: *Proceedings of the 4th ACM SIGCHI Symposium on Engineering Interactive Computing Systems* (EICS '12) (2012), pp. 313-316, <https://doi.org/10.1145/2305484.2305539>.

17 Chen, A.: "Health & Wellness: Digital Games Attempt to Treat Depression – Gamification Tools Gain Notice as a Novel Way To Address Mental Health Issues; Treating PTSD" in: *Wall Street Journal Europe* 25 (2014).

18 SUPERBETTER (SuperBetter, LLC, 2015).

19 Ibid.

20 7 CUPS OF TEA (The 7 Cups Foundation, 2013).

21 Baumel, Amit: "Online Emotional Support Delivered by Trained Volunteers: Users' Satisfaction and Their Perception of the Service Compared to Psychotherapy," in: *Journal of Mental Health* 24:5 (2015), pp. 313-320, <https://doi.org/10.3109/09638237.2015.1079308>.

22 Baumel, Amit/Correll, Christoph/Birnbaum, Michael: "Adaptation of a Peer Based Online Emotional Support Program as an Adjunct to Treatment for People with Schizophrenia-spectrum Disorders" in: *Internet Interventions* 4 (2016), <https://doi.org/10.1016/j.invent.2016.03.003>.

Although these approaches have yielded initial evidence to support gamification for mental health, empirical procedures are still in an early stage and larger studies are required—especially when it comes to effective methods for designing these applications. Fleming proposed four key approaches for maximizing the impact of E-therapies and serious games in mental health, both for design and research:²³ 1) explore user-centered approaches to address users' motivations and preferences for their mental health needs; 2) explore and report engagement, effectiveness, and provide sufficient detail regarding the dynamics used; 3) build skills required to develop engaging and effective games through intersectoral and international collaborations, since the acceptance level of a given system is diverse and go beyond many science-focused or clinical teams; and 4) ensure interventions maintain industry best practices through rapid testing and implementation.

These recommendations and others related to the development of high-efficacy mental health apps were taken into consideration in the process of creating the concept of the NONELINESS app, as we will see in the following section.

MENTAL HEALTH APPS

A report conducted in 2017 presented the statistics of mobile app downloads worldwide and a forecast for 2022.²⁴ The findings showed that in 2017, consumers downloaded 178.1 billion mobile apps to their devices. In 2022, this figure is projected to grow to 258.2 billion. Among these increasing numbers, mental health apps (MHapps) are self-management services to promote wellbeing, fitness, and better health habits. A 2015 World Health Organization survey of 15,000 MHapps revealed that 29% of them focus on mental health diagnosis, treatment, or support.²⁵ MHapps can be classified into six categories based on functionality: *self-management, cognition improvement, skills training, social support, symptom*

23 Fleming, Theresa M. et al.: "Maximizing the Impact of E-therapy and Serious Gaming: Time for a Paradigm Shift" in: *Front Psychiatry* 7:65 (2016), <https://doi.org/10.3389/fpsyg.2016.00065>.

24 Cheney, Sam/Thompson, Eric: "The 2017-2022 App Economy Forecast: 6 Billion Devices, \$157 Billion in Spend & More" in: *App Annie 2017-2022 Forecast* (2018), https://s3.amazonaws.com/files.appannie.com/reports/1805_Report_2022_Forecast_EN.pdf.

25 Anthes, Emily: "Mental Health: There's an App for That" in: *Nature* 532(7597), (2016), pp. 20-23.

*tracking, and passive data collection.*²⁶ These apps can be helpful as a way to engage people who may be unwilling or unable to attend face-to-face therapy, and they can also provide support in between sessions when used in conjunction with medication and/or in-person therapy.²⁷

Due to the lack of guides for the development of these resources, some authors have elaborated a set of recommendations for designing high-efficacy MHapps. Chandrashekhar proposed characteristics to overcome various challenges of MHapps:²⁸ inconsistencies in engagement and narrow focus on one disorder per app;²⁹ high patient engagement, which can be improved by using features such as real-time engagement, usage reminders, and gamified interactions;³⁰ simple user interface (UI) to reduce cognitive load by using features such as pictures rather than text, reduced sentence lengths and nonclinical language;³¹ and self-monitoring features to follow mood oscillations through periodically reporting thoughts, behaviors, and actions that can increase emotional self-awareness.³²

Based on approaches like the potential effects of gamification and recommendations for developing MHapps, the social mobile app NOLINESS adopted some of these principles for its development, mainly user-centered approaches, rapid testing and implementation, real-time engagement features, and simple UI, as they align more with the social and gamified app's proposal. The next section we will

- 26 National Institute of Mental Health: “Technology and the Future of Mental Health Treatment,” (2017) <https://www.nimh.nih.gov/health/topics/technology-and-the-future-of-mental-health-treatment/index.shtml> from 23.03.2022.
- 27 Yuan, Shupei et al.: “Keep Using My Health Apps: Discover Users Perception of Health and Fitness Apps with the UTAUT2 Model” in: *Telemed J E Health* 21:7 (2015), pp. 35-41. <https://doi.org/10.1089/tmj.2014.0148>.
- 28 Chandrashekhar, Pooja: “Do Mental Health Mobile Apps Work: Evidence and Recommendations for Designing High-efficacy Mental Health Mobile Apps” in: *mHealth* 4, 6 (2018), <https://doi.org/10.21037/mhealth.2018.03.02>.
- 29 Marley, Justin/Farooq, Saeed: “Mobile Telephone Apps in Mental Health Practice: Uses, Opportunities and Challenges” in: *BJPsych Bulletin* 39 (2015), pp. 288-90.
- 30 Bakker, David et al.: “Mental Health Smartphone Apps: Review and Evidence-based Recommendations for Future Developments” in: *JMIR Mental Health* 3(1) (2016), <https://doi.org/10.2196/mental.4984>.
- 31 Ibid.
- 32 Rickard, Nikki et al.: “Development of a Mobile Phone App to Support Self-Monitoring of Emotional Well-Being: A Mental Health Digital Innovation” in: *JMIR Mental Health* 3:e49 (2016). <https://doi.org/10.2196/mental.6202>.

present the app's concept and design strategies, as well as the evaluation processes with the target audience.

NONELINESS APP

The mobile and web app NONELINESS aims to reduce loneliness among university students by creating social opportunities through a gamified quest-based system in a secure and collaborative network of local users, both between students and the university staff. Users can organize meetings, make new friends based on commonalities, set up topic-specific discussion groups, or seek psychological support. The app does not charge users and they must be at least 18 years old.

The current app version (beta) is the result of research started in 2017 as a master's thesis project at the University of Campinas (UNICAMP) and then continued as doctoral research at Offenburg University.³³ Since then, the app has been developed in iterative cycles, whereby different prototypes and versions have been created (Fig. 1) in collaboration with undergraduate students at the university's Media faculty who acted as designers, and frontend and backend developers.

Figure 1: From left to right: versions 1 and 2 (2018-2020), and 3 (current) of the NONELINESS app, all showing the Chat function.

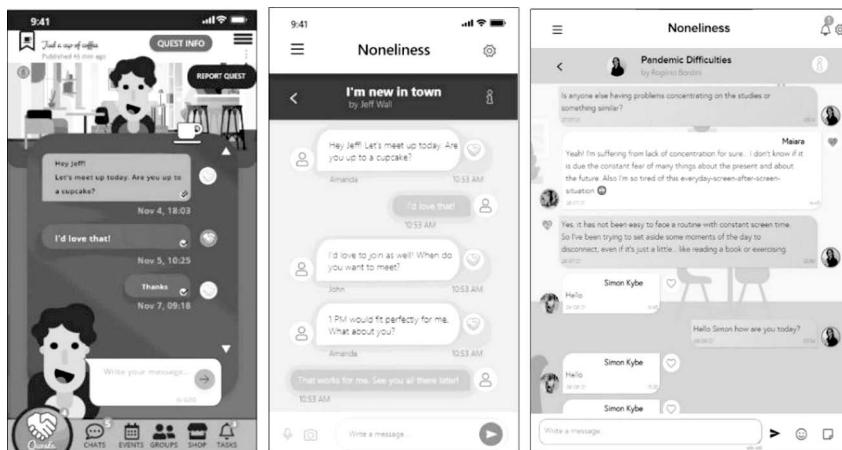


Image rights belong to the authors of the work.

33 Access to the NONELINESS app: <https://gratitude.affective-lab.org/> from 07.06.2022

Game elements were included following a set of recommendations on gamification in mental health to motivate users to assist people seeking help.³⁴ Therefore, the core features present in all app versions are:

Quests: as we commonly see in role-playing games and as adopted by the SUPERBETTER app, this option is based on solving a task for someone in the community who needs help, either material, emotional or educational. These Quests are posted in text form and the first user to solve one (via chat room interaction) receives a reward from its creator (e.g., a Gratitude Point (GP), a Shop item, or a real-world gift);

Chats: social interaction through public or private text messaging where GPs can be earned or donated by tapping a heart shaped button displayed next to each message (Fig. 1) to demonstrate appreciation;

Events: allow users to join a local event or invite others to a certain activity at a specified time (e.g., art exhibition, concert, meet up, etc.);

Gratitude Points: as similarly used by the 7COT, GPs are a score that shows empathy in the users' social interactions by assigning a point to a particular post in the chat. Unlike other social networks, these points are spendable and function as an in-app currency for purchasing new add-ons, which attributes another meaning in the way users "like" the platform's posts;

Level Progression: denotes the degree of experience that users have with the application. A user's level can be increased by gaining experience points through social interactions in the application (e.g., exchange of messages, solving Quests, etc.). This game-inspired feedback format was also adopted as a way of offering a sense of progress, personal growth, and greater engagement with the platform;

Shop: an option for purchasing items using GP, such as stickers for chats, picture frames, new chat backgrounds, and gifts to friends (no money is used).

These functionalities were designed according to studies on possible practices to reduce the rate of loneliness in universities, such as providing greater social opportunities for the integration of students (e.g., voluntary study groups, student

³⁴ Fleming, Theresa M.: "Serious Games and Gamification for Mental Health: Current Status and Promising Directions" in: *Frontiers in Psychiatry* 7 (2017), <https://doi.org/10.3389/fpsy.2016.00215>.

associations),³⁵ creating stronger bonds among international and local students,³⁶ raising awareness about on-campus psychological services, and strengthening connections with local health services and individuals.³⁷ These different functions were also strategically conceived to be flexibly used in different scenarios, so that both students and university staff could benefit from the platform.

Therefore, some possible uses could be: setting up support groups for students who are facing difficulties in academic life, offering freshmen orientation, raising awareness for psychological support (crisis lines, counselling centres, etc.), and sharing tips on good practices for mental health care. Online interactions can also facilitate and extend the support that the institution's psychologists provide to students who are seeking counselling, since the face-to-face services can be over-stretched and/or understaffed. These elements were also designed to enhance social cooperation, since these interaction mechanics were more beneficial to mental health purposes than mechanics that instigate social competition.³⁸

Three evaluations have been conducted with university students: a context study with UNICAMP students (Phase 1),³⁹ a focus group discussion and AB

35 Masi, Christopher M. et al.: "A Meta-analysis of Interventions to Reduce Loneliness" in: *Personal Soc Psychol Rev* 15(3) (2011), pp. 219-266. <https://doi.org/10.1177/1088868310377394>.

36 Sawir, Erlenawati et al.: "Loneliness and International Students: An Australian Study" in: *J Stud Int Educ.* 12. (2007) 148-180. <https://doi.org/10.1177/1028315307299699>.

37 QS Quacquarelli Symonds: "Mental Health in Higher Education: What Role Should Universities Play?," in: *QS*, (2019), https://www.qs.com/mental-health-higher-education-what-role-universities-play/?utm_source=website&utm_medium=blog&utm_campaign=Loneliness from 08.06.2022

38 Cheng, Vanessa Wan Sze: "Recommendations for Implementing Gamification for Mental Health and Wellbeing" in: *Frontiers in Psychology*, 11, (2020) 586379. <https://doi.org/10.3389/fpsyg.2020.586379>.

39 Bordini, Rogerio Augusto: "Design Process of an Application to Combat Loneliness in Young Depressives" in: *7th Meeting on PhD Design Research – UD18* (2018). Aveiro, Portugal.

testing between versions 1 and 2 (Phase 2);⁴⁰ and usability testing with version 3 (Phase 3) with students in Offenburg.⁴¹ The key results obtained so far are:

- (1) Both early app versions considered the adoption of 2D avatars as a way to protect the user's identity who would like to chat about sensitive personal issues, as this was a finding in the context study (Phase 1). However, in Phase 2 avatar usage was rejected by 74.07% of 33 respondents as they stated they could not trust an account without the owner's real photo;
- (2) All app versions were designed following guidelines on the importance of simple UIs for gamified and mental health systems. Participants in Phase 2 attested to preferring more minimalist and straightforward interfaces when comparing app version 2 to version 1 (Fig. 1), as the latter featured colorful and childlike elements;
- (3) Phase 3 focused on the app's usability and gamification issues. Version 3's interface (Fig. 1), navigation, and features presentation received positive scores. The Events feature was the participants' favourite option, as it can offer more opportunities for social exchange. Regarding the app's gamification, Level Progression and GP were the most favoured aspects. The Shop and Quests options were the least appreciated. Participants understood the purpose of those options but did not understand how to use them.

Since avatar usage was the most problematic aspect raised in the studies, we considered a semi-anonymous approach for the current version appealing to both individuals wishing to remain anonymous and individuals who do not mind sharing their photo and real name. To this end, users can create an account with a fictitious name to discuss personal matters privately with the university staff. For the functionalities that were not clear to the users (Shop and Quests), documentations and tutorials were implemented to facilitate user understanding.

40 Bordini, Rogerio Augusto. et al.: "Strangers in a Strange Land: Designing a Mobile Application to Combat Loneliness and Isolation Among Foreign University Students" in: *J. Technol. Behav. Sci.* (2020), <https://doi.org/10.1007/s41347-020-00171-6>.

41 Bordini, Rogerio Augusto/Korn, Oliver: "Noneliness: A Gamified Mobile App to Reduce Loneliness Among University Students" in: *Extended Abstracts of the 2021 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '21)*, (2021) 87-93. <https://doi.org/10.1145/3450337.3483480>.

In the first semester of 2022 a pilot randomized clinical trial (RCT) was conducted to test the new app settings and their efficacy. Offenburg University participants were divided into an experimental group to use NONELINESS (beta) to tackle loneliness, while the control group did not receive the intervention. Participants answered questionnaires about usability and their emotional states before, during, and after app use. Experimental group subjects had a reduction in their rates of loneliness, while control group members did not have the same effect. A new RCT is planned for the second half of 2022 at a German partner university with a larger sample.

CONCLUSION

The health risks of loneliness and social isolation in young adults are dangerous. Research shows that loneliness tends to be experienced more severely by young adults than by other age groups.⁴² Since these target groups also tend to have a strong connection with technological trends, online apps offer promising ways of making people more connected.⁴³ The use of gamification strategies in digital interventions is also a feasible approach to creating stronger engagement with the application. Although this research field still requires further investigation, there is evidence pointing to the positive effects of such approaches.⁴⁴

On the other hand, it must be emphasized that these technologies should not replace face-to-face social interactions. The isolation of the COVID-19 pandemic demonstrated how necessary human-social interaction is to an individual's well-being.⁴⁵ Digital technologies, however, can promote, facilitate, and create social opportunities that build more integrated communities. Mobile applications and other virtual environments can shorten the distances between individuals.

42 Office for National Statistics: "Loneliness – What Characteristics and Circumstances are Associated With Feeling Lonely?" (2018).

43 Steinfield, Charles/Ellison, Nicole/Lampe, Cliff: "Social Capital, Self-Esteem, and Use of Online Social Network Sites: A Longitudinal Analysis," pp. 434-445.

44 T. M. Fleming: "Serious Games and Gamification for Mental Health: Current Status and Promising Directions," p. 1.

45 Bu, Feifei/Steptoe, Andrew/Fancourt, Daisy: "Loneliness During a Strict Lockdown: Trajectories and Predictors During the COVID-19 Pandemic in 38,217 United Kingdom Adults" in: *Social Science & Medicine* (1982), 265, (2020) 113521. <https://doi.org/10.1016/j.socscimed.2020.113521>.

The NONELINESS app offers a democratic space to motivate the social integration of university community members through gamified elements. Although the app was initially evaluated in a small university setting, it is hoped that the design, gamification, and efficacy data of this research can inspire other institutions and designers to build gamified and technological solutions to strengthen social ties between members of these communities.

BIBLIOGRAPHY

Adlakha, Deepti/Marquet, Oriol/Hipp, J., Aaron/Tully, Mark, A.: “Pokémon GO or Pokémons Gone: How Can Cities Respond to Trends in Technology Linking People And Space?” in: *Cities Health* (2017), pp. 89-94, <https://doi.org/10.1080/23748834.2017.1358560>

Anthes, Emily: “Mental Health: There’s an App For That” in: *Nature* 532(7597), (2016), pp. 20-23.

Bakker, David/Kazantzis, Nikolaos/Rickwood, Debra/Rickard, Nikki: “Mental Health Smartphone Apps: Review and Evidence-Based Recommendations For Future Developments” in: *JMIR Mental Health* 3(1) (2016), <https://doi.org/10.2196/mental.4984>.

Baumel, Amit: “Online Emotional Support Delivered By Trained Volunteers: Users’ Satisfaction and Their Perception of the Service Compared To Psychotherapy” in: *Journal of Mental Health* 24:5 (2015), pp. 313-320, <https://doi.org/10.3109/09638237.2015.1079308>

Baumel, Amit/Correll, Christoph/Birnbaum, Michael: “Adaptation of a Peer Based Online Emotional Support Program As An Adjunct To Treatment For People With Schizophrenia-Spectrum Disorders,” in: *Internet Interventions* 4 (2016), <https://doi.org/10.1016/j.invent.2016.03.003>.

Bordini, Rogério, Augusto/Korn, Oliver: “Noneliness: A Gamified Mobile App to Reduce Loneliness Among University Students,” in: *Extended Abstracts of the 2021 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '21)*. Association for Computing Machinery, New York, NY, USA, (2021) 87-93. <https://doi.org/10.1145/3450337.3483480>

Bordini, Rogério. Augusto/Münscher, Johann-Christoph/Baumgartner, Kim-Anabell/Hagos, Sara/Hornig, Jennifer/ Gampe, Stefano/Yaman, Berkay/Korn, Oliver/Herzber, P.: “Strangers in a Strange Land: Designing a Mobile Application to Combat Loneliness and Isolation Among Foreign University Students” in: *J. Technol. Behav. Sci.* (2020), <https://doi.org/10.1007/s41347-020-00171-6>

Bordini, Rogério. Augusto: “Design Process of an Application to Combat Loneliness in Young Depressives,” in: *7th Meeting on PhD Design Research – UD18* (2018). Aveiro, Portugal.

Bu, Feifei/Steptoe, Andrew/Fancourt, Daisy: “Loneliness During a Strict Lockdown: Trajectories and Predictors During The COVID-19 Pandemic in 38,217 United Kingdom Adults” in: *Social Science & Medicine* (1982), 265, (2020) 113521. <https://doi.org/10.1016/j.socscimed.2020.113521>

Carstensen, Laura L./Isaacowitz, Derek M./Charles, Susan Turk: “Taking Time Seriously. A Theory of Socioemotional Selectivity,” in: *American Psychologist* 54(3) (1999), pp. 165-181, <https://doi.org/10.1037/0003-066X.54.3.165>

Chen, A.: “Health & Wellness: Digital Games Attempt To Treat Depression – Gamification Tools Gain Notice As A Novel Way To Address Mental Health Issues; Treating PTSD,” in: *Wall Street Journal Europe* 25 (2014).

Cheng, Vanessa, Wan, Sze: “Recommendations for Implementing Gamification for Mental Health and Wellbeing,” in: *Frontiers In Psychology*, 11, (2020) 586379. <https://doi.org/10.3389/fpsyg.2020.586379>

Chandrashekhar, Pooja: “Do Mental Health Mobile Apps Work: Evidence and Recommendations for Designing High-Efficacy Mental Health Mobile Apps,” in: *mHealth* 4, 6 (2018), <https://doi.org/10.21037/mhealth.2018.03.02>

Cheney, Sam/Thompson, Eric: “The 2017-2022 App Economy Forecast: 6 Billion Devices, \$157 Billion in Spend & More,” in: *App Annie 2017-2022 Forecast*, 2018, https://s3.amazonaws.com/files.appannie.com/reports/1805_Report_2022_Forecast_EN.pdf

CIGNA. Global Health Service Company.: “U.S. Loneliness Index,” in: *Survey of 20,000 American Examining Behaviors Driving Loneliness In The United States* (2018), https://www.multivu.com/players/English/8294451-cigna-us-loneliness-survey/docs/IndexReport_1524069371598-173525450.pdf

Fleming, Theresa M./Bavin, Lynda/Stasiak, Karolina/Hermansson-Webb, Eve/Merry, Sally N/Cheek, Colleen/Lucassen, Mathijs/Lau, Ho, Ming/Pollmuller, Britta/Hetrick, Sarah: “Serious Games and Gamification for Mental Health: Current Status and Promising Directions” in: *Frontiers in Psychiatry* 7 (2017), <https://doi.org/10.3389/fpsy.2016.00215>

Fleming, Theresa. M/deBeurs, Derek/Khazaal, Yasser/Gaggioli, Andrea/Riva, Giuseppe/Botella, Cristina/Baños, Rosa, M./Aschieri, Filippo/Bavin, Lynda, M./Kleiboer, Annet/Merry, Sally/Lau, Ho, Ming/Riper, Heleen.: “Maximizing The Impact of E-Therapy and Serious Gaming: Time For a Paradigm Shift” in: *Front Psychiatry* 7:65 (2016), <https://doi.org/10.3389/fpsy.2016.00065>.

Granic, Isabela/Lobel, Adam/Engels, Rutger C. M. E.: "The Benefits of Playing Video Games" in: *American Psychologist* 69(1) (2014), pp. 66-78, <https://doi.org/10.1037/a0034857>

Korn, Oliver: "Industrial Playgrounds: How Gamification Helps To Enrich Work For Elderly or Impaired Persons In Production" in: *Proceedings of The 4th ACM SIGCHI Symposium on Engineering Interactive Computing Systems* (EICS '12) (2012), pp. 313-316, <https://doi.org/10.1145/2305484.2305539>

Marley, Justin/Farooq, Saeed: "Mobile Telephone Apps In Mental Health Practice: Uses, Opportunities and Challenges," in: *BJPsych Bulletin* 39 (2015), pp. 288-90.

Marquet, Oriol/Alberico, Claudia/Adlakha, Deepti/Hipp, J. Aaron: "Examining Motivations to Play Pokémon GO and Their Influence on Perceived Outcomes and Physical Activity" in: *JMIR Serious Games* 5(4)e21 (2017), <https://doi.org/10.2196/games.8048>

Masi, C. Masi/Chen, His-Yuan/Hawley, Louise C./Cacioppo, John T.: "A Meta-Analysis Of Interventions To Reduce Loneliness" in: *Personal Soc Psychol Rev* 15(3) (2011), pp. 219-266.

Merry, Sally/Stasiak, Karolina/Sheperd, Matthew/Frampton Chris/Fleming, Theresa/Lucassen, Mathijs, F.,G.: "The Effectiveness of SPARX, The Computerized Self-Help Intervention For Adolescents Seeking Help For Depression: Randomized Controlled Non-Inferiority Trial," in: *British Medical Journal* 344:e2598 (2012), <https://doi.org/10.1136/bmj.e25982012>

National Institute of Mental Health.: *Technology and the Future of Mental Health Treatment*, 2017, <https://www.nimh.nih.gov/health/topics/technology-and-the-future-of-mental-health-treatment/index.shtml>

Office for National Statistics.: *Loneliness – What Characteristics And Circumstances Are Associated With Feeling Lonely?*, 2018, <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/lonelinesswhatarecharacteristicsandcircumstancesareassociatedwithfeelinglonely/2018-04-10#things-you-need-to-know-about-this-release>

QS Quacquarelli Symonds.: "Mental Health in Higher Education: What Role Should Universities Play?," in: *QS*, (2019) https://www.qs.com/mental-health-higher-education-what-role-universities-play/?utm_source=website&utm_medium=blog&utm_campaign=Loneliness

Rickard, Nikki/Arjmand, Hussain-Abdulah/Bakker, David/Seabrook, Elizabeth: "Development of a Mobile Phone App to Support Self-Monitoring of Emotional Well-Being: A Mental Health Digital Innovation" in: *JMIR Mental Health* 3:e49 (2016).

Rook, Karen, S.: "Promoting Social Bonding: Strategies For Helping The Lonely and Socially Isolated," in: *Psychologist* 39 (1984), pp. 1389-1407.

Sawir, Erlenawati/Marginson, Simon/Deumert, Ana/Nyland, Chris/Ramia, Gaby: "Loneliness and International Students: An Australian Study," in: *J Stud Int Educ.* 12. (2007) 148-180. <https://doi.org/10.1177/1028315307299699>.

Steinfield, Charles/Ellison, Nicole B./Lampe, Cliff: "Social Capital, Self-Esteem, and Use of Online Social Network Sites: A Longitudinal Analysis" in: *Journal of Applied Developmental Psychology* 29 (2008), pp. 434-445.

Tateno, Masaru/Skokauskas, Norbert/Kato, Takahiro, A./Teo, Alan, R./Guerrero, Anthony, P., S.: "New Game Software (Pokémon Go) May Help Youth With Severe Social Withdrawal, Hikikomori," in: *Psychiatry Res* 246 (2016), pp. 848-849.

Wagner-Greene, Victoria. R./Wotring, Amy J./Castor, Thomas/Kruger, Jessica/Mortemore, Sarah/Dake, Joseph, A.: "Pokémon GO: Healthy or Harmful?," in: *American Journal of Public Health* 107(1) (2017), pp. 35-36. <https://doi.org/10.2105/AJPH.2016.303548>

Wolters, Lidewij, H/op de Beek, Vivian/Weidle, Bernhard/Skokauskas, Norbert.: "How Can Technology Enhance Cognitive Behavioral Therapy: The Case of Pediatric Obsessive Compulsive Disorder" in: *BMC Psychiatry* 17, 226 (2017). <https://doi.org/10.1186/s12888-017-1377-0>

World Economic Forum.: *The Global Risks Report 2019*, 14th Edition, Geneva, 2019, http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf

Yuan, Shupei/Ma, Wenjuan/Kanthawala, Shaheen/Peng, Wei: "Keep Using My Health Apps: Discover Users Perception of Health and Fitness Apps with the UTAUT2 Model," in: *Telemed JE Health* 21:7 (2015), pp. 35-41.

LUDOGRAPHY

POKÉMON GO (Niantic, 2016: Niantic and Nintendo)
SPARX (The University of Auckland, 2015)

APPS

SUPERBETTER (SuperBetter, LLC, 2015)
7 CUPS OF TEA (The 7 Cups Foundation, 2013)

