

Development of a serious game as a method to support youth work: A case study

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Abstract. Youth social workers are looking for new ways to use digital technology in their daily work with adolescents. The current research focuses on serious games (SGs) in the social and healthcare sector. The objective was to identify the key phases in the design and development of SGs for such purpose. The case study consisted of the development of a visual novel, *Game of My Life*, aiming to support the life management skills of adolescents that can be used as an effective discussion tool for professionals and patients in nursing and youth work. The game was developed in three phases using iterative methods and in cooperation with different stakeholders. The results support our existing knowledge of SG development and suggests that SG development consists of analysing, development, testing and validation phases, in which all the multi-disciplinary teamwork is in focus. Providing guidance and a protocol on how to use the SG for both end users and their supporters is considered important.

Keywords: Serious Game, Health Game, Visual Novel, Youth Work.

1 Introduction

The main goal of the current study is to identify the key phases of the design and development of serious games (SGs) in the social and healthcare sectors. Many definitions of SGs exist, but it is commonly stated that the term refers to the use of games and game technology for other purposes than just entertainment [1,2,3].

Serious games in healthcare may be one strategy for coping with the increasing challenges of ageing populations and chronic diseases [4]. Health games can be a method for maintaining and developing the health capability of different age groups [5].

The research goal of identifying the key phases has been met with the help of the following question in this case study: How do we develop a SG in the social and healthcare sector that aims at enhancing the life management skills of young people?

The means of the case study were applied according to Myers ([6], p. 73), who asserted that case studies offer fruitful approaches for learning how to act or what is to be built, because of their special nature of showing that the theory can be applied and that the subject matter has a meaning in life. The use of case studies is a well-known approach that aims to understand the process taking place in defined settings, and it often combines several data collection methods such as observation, interviews, archives and

questionnaires [7]. The approach is reasonable due to the nature of the current study as aiming to answer a research question in a limited context while also considering an environment larger than the current context (see also [8], p. 344). Multiple case studies help researchers understand the differences and similarities between cases [9,10].

This paper presents the phases of development of a serious game, *Game of My Life*, as a multiple case study and is organised into four major sections: first, the introduction here presented; second, a review of related work on serious games; third, a description of the design and development of the game; and finally, the discussion and conclusion.

2 Related Work

This chapter presents previous literature related to the current study. First, youth work and serious games in healthcare and the social sector are explained, followed by a discussion of games supporting youth mental health. Finally, the visual novel concept is introduced.

Young people are living in the transition phase from childhood and dependence to adulthood and independence. That world can be challenging and complex [11]. According to Curtis [12], adolescence is a separate and often complex phase in the developmental lifecycle of a human being. This complexity arises from the several developmental tasks that young people must process [12]. Adolescence most commonly spans from age 10 to age 18, but it can also span from the ages of nine to 26 [12].

Social and emotional skills have been seen as a key asset and resource for young people's positive development. They contribute to a youth's health, education and social and economic prosperity. Therefore, it is important to support these skills during childhood and adolescence [13]. A focus on building social and emotional capabilities can have a greater long-term impact than a focus on seeking to reduce the 'symptoms' of poor outcomes for young people [11]. McNeil et al. [11] defined a consistent core set of social and emotional capabilities for young people, grouped into seven interlinked clusters: Communication, Confidence and Agency, Planning and Problem Solving, Relationship and Leadership, Creativity, Resilience and Determination and Managing Feelings (see Fig. 1).

Young people's social and emotional capabilities can be supported by many services. Support focuses on the process of personal and social development [11]. Youth work is one of those services. Youth work is organized very differently in different countries in Europe, and there is no common definition or understanding of what youth work is [14]. In Finland, youth work refers to the development of age-specific activities: it is the creation of activities for young people, who engage in the process on a voluntary basis. Here, youth work creates spaces for young people to co-operate and have fun with their peer group. In youth work, there is also an educational perspective that aims at promoting youth participation within both the youth work itself and the whole society in general [15].

The Warwick-Edinburgh mental well-being scale (WEMWBS) consists of the key elements of mental well-being: positive emotions like optimism, joy and relaxation; good relationships with others; and positive psychological functioning like energy,

clear thinking, self-acceptance, autonomy and resilience [16]. This scale can be used in measuring the impact of actions aimed to influence young people's capabilities (see Fig. 1).

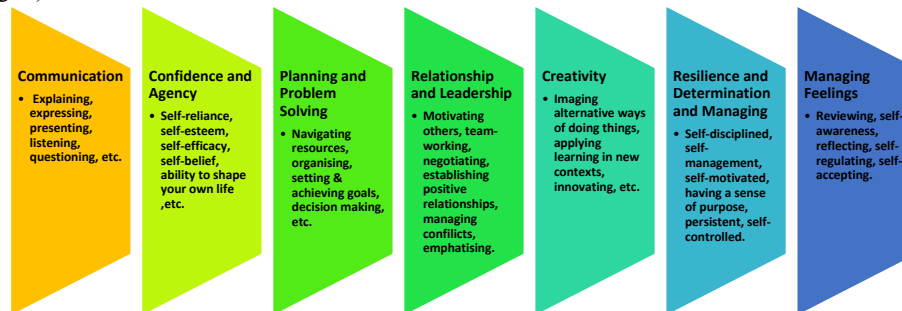


Fig. 1. Clusters of young people's capabilities [11].

Games can work as motivators and help to change players' behaviour [17,18]. Research on player motivation attempts to establish the psychological needs that games satisfy and how different games fulfil these needs, which provides information about versatile experiences within games [19].

Similar development processes have been used by many serious game developers in the health sector: all include a strong research and analysis phase and consider the involvement of different stakeholders to be essential. An iterative development process is used, with user-group testing and an evaluation phase at the close of the game development process [20, 21, 22].

Supporting players' motivation and enhancing behaviour change are key points in health game design [19]. It is essential to use game elements like surprise and simulation to engage players and enable immersion [23]. In addition, the development of a health game requires a multidisciplinary team successfully working together [5]. Merry et al. [24] state that professional knowledge is an essential part of the development process. Iterative design emphasises playtesting and prototyping, which allow players to be part of the game design [25]. Brox, Fernandez-Luque and Tollefsen [26] suggest that it is important to define both the target group and the main objective and design a game accordingly, to use sound game design principles and design elements to enhance learning and persuasion, to collaborate with health professionals and to involve patients. It is also essential to include an assessment of serious games' usefulness and effectiveness in the development process [27].

Computerised therapies have been seen as effective in easing depression and anxiety symptoms in adults, adolescents and children [28,29]. Fleming et al. [30] state that serious games suggest potential benefits for psychological and behavioural changes. An example is a PC game called *SPARX*, developed in New Zealand for the treatment of mildly depressed adolescents and used as a stand-alone self-help intervention. It was developed using cognitive behavioural therapy (CBT) and learning theory. It included youth and other stakeholders in its game design phase [31,32].

Knowles and Hawke [33] have studied *SPARX*. In their study, they state that young people have a strong need to be able to control how they access services or get help for

their mental issues. The researchers map the model of design elements that can be used as tools in serious game design. This model supports players' sense of autonomy, competence and relatedness, key points that have been found to mediate motivation in the change process [33].

A visual novel is a narrative-based digital medium that players can guide by making decisions, thus altering outcomes. It is more like a role-playing game than a simulation and consists of a soundscape, static graphics or animations, immersive storytelling and interactive decision-making moments that allow the player to decide how the visual novel progresses. The pace of the game's progress is slow. The genre is dependent on narrative and dialogue. An engaging video game narrative enables a personal experience for the players. [34-36.]

3 Case Study: The *Game of My Life (GoML)*

This chapter presents the development of the *GoML* in three phases, starting with reasoning out the game, continuing with its implementation and concept, then ending with a description of the phases of content creation and the testing and evaluation of the game.

Pre-phase: Analyzing and Creating the Concept

The need for the game was expressed by youth psychiatry experts who wanted new tools for approaching their young (16–19 years old) clients. The main objective was to create a game that could be used as a tool in conversations between experts and clients regarding life management issues. The focus was in building the capabilities (see Fig. 1) and enhancing the life management skills of young people.

The game development process began with a search of existing, similar games on the market. This was followed by the preliminary requirements analysis that, with help of health professionals, defined the target group and the main objective of the serious game being developed. The next step was testing and reporting on the most significant similar products and involving end users to find the most problematic aspects that needed to be covered in the game.

The existing *SPARX* game was tested in youth psychiatric outpatient clinics, hospitals and vocational colleges with clients of Social Welfare Officers. We used this research to gather basic knowledge of experiences of serious games for our development process. The participants described soundscape as an important part of the game and wanted to have more events and more appealing graphics and colours. According to the participants, a serious game should be fascinating in terms of graphics, soundscape, character and storytelling. The serious message was seen as good if incorporated into the fascinating world of the game. It was also important for the player to be able to truly influence the events in the game and face the consequences of their choices.

The next step was to gather more information about the life management skills of adolescents from their own point of view, particularly regarding problems related to mental health and substance abuse. This was done by a qualitative study with six young persons who participated in individual, semi-structured theme interviews. The purpose of the study was to describe the life management skills of young persons and their hopes

and expectations regarding a game that would support their life management. The results showed that the young people had difficulty understanding the term *life management skills* but found it easier to understand when it was referred to as “managing your everyday life.” They described difficulties in managing stress and economic situations. Some of them described heavy drinking as a problem. The participants hoped that the developed game would provide information on substance abuse as well as on the use of time and money.

After understanding user needs, our focus moved to user–computer interaction and game concept design. It was decided that *GoML* should be a network game, playable in a prototype phase on the most-used browsers and Android devices. After a literature search, the visual novel was selected as the game genre. The narrative of the original visual novel had three characters (two males, one female), all with three different storylines relating to their school, home and free time. Each of these had stories related to some of the clusters of young people’s capabilities (Fig. 1). To get a feeling of interactive decision making, decision paths were planned according to the storylines, with players guiding the narrative by choosing from multiple options. It was agreed that, in order to provide additional information regarding life management issues, there would be external links at the end of each storyline.

Restrictions due to budget, resources and timing meant that the result was a visual novel without a soundscape, with the maximum gameplay time for each storyline limited to 15 minutes. These features created the game concept for this first phase of *GoML*. The three phases of game development from 2012 to 2018 are presented next.

Phase 1: Starting from Stories

The development of *GoML* began after with finding an appropriate art style and writing the first storyline. The team, consisting of three game development students, developed the first demo version during 2012.

The game design began with an idea session between the team, a nursing lecturer and her students. The nursing students brought valuable information about end-users needs to the process. The ideas were also presented throughout the project to several stakeholders, including youth psychiatry experts and game development professionals. The game design document covered the main idea for the whole game, but it was decided that only the “Home” level of one character could be included in the demo version. The design of the visual novel also included the story writing. The art style was kept simple; it was cartoonish and used light colours that would bring a positive atmosphere to the game. Since the game mechanics were simple and used a Web browser platform, the production was carried out using Adobe Flash. This allowed for quite rapid programming, and the executables were easily available online.

The development process was iterative. This enabled quick prototypes to test the ideas so that the game could be presented to different stakeholders. After testing and feedback, the development continued further. In several iterative steps, the demo of *GoML* was presented to youth psychiatry experts and tested by experts and patients; it was also evaluated by an external professional.

Phase 2: The Second Version as an Interactive Book

The second phase of the *GoML* development started in 2014 with a new game development team. The extended project team also included a nursing student and two senior

lecturers. The new multidisciplinary team began by analysing the developed demo version and gathering the testing and evaluation results. Based on these, the major lines of development were decided upon and prioritised. The available time and budget were set as limitations.

A book-like graphical user interface was added to the beginning of the game, allowing the player to choose a character from three options and to operate in all three story-lines (levels): school, home and free time. It was decided that the main themes of the game would be relationships, intoxicating substances, economic skills, mental health and daily life activities.

The aim of the game was to evoke new thoughts and ways of thinking concerning daily life decision-making and problem-solving situations. The players would face the consequences of the choices they made during the game. At the end of each level, the player would be able to find additional information through external links related to the themes of the story.

The programming and tools used remained the same, but there was a major change to the graphics in this second phase. In addition, the stories in *GoML* took on a new, more realistic approach with a twist of darker shades: all the characters had problematic backgrounds.

The second version of *GoML* was tested in several ways. It had already been under constant testing through its availability on the website: at the end of the game, there was a request to fill in a feedback form. This brought only very general comments about the game.

In the first qualitative study, nine young persons who were clients in a specialized youth work office (aged 18–22 years) were interviewed after playing *GoML*. According to the results, the interviewees recognised different themes in *GoML* and openly began to describe how they would act in similar situations. *GoML* provoked discussion about very difficult areas of life management such as a lack of sleep, problems at school and problems with substance abuse. The study also showed that young people, as players, tended to make decisions in the game to see what might happen, often even making the opposite decisions from what they would do in life. The interviewees brought up the need for more choices in the game that were not as obvious as the current ones. The study thus showed that *GoML* works as a discussion tool for professionals and young persons in youth work; communication is easier when the discussion concerns a third party such as a game character.

In the second qualitative study, three Social Welfare Officers from a vocational college and high school were interviewed after they used *GoML* in their work with youths. According to these results, playing the game should be done before coming to an appointment with a Social Welfare Officer because of the limited time of the meeting. The game could also be used in small groups. Participants pointed out that professionals should know the content and progress of the game when using it in their work. They considered the themes (use of time and money, substance use, decision making, social relationships and stress management) of *GoML* appropriate and suggested adding housing as a new theme. The game evoked new discussion topics between the adults and young persons, gave thematic frames for discussions and concretized abstract themes

in life management issues. *GoML* was considered a fresh, new tool for the Social Welfare Officers' work that strengthens the relationship between the young person and the adult.

The mental health professionals who participated in the development process were provided with a protocol on how to use *GoML* as a discussion tool in their work with young people.

Phase 3: Interactive Storytelling via a Mobile Game

For the ongoing phase, as young people are using more mobile devices, the focus has been on mobile, story-driven content. To begin, the most popular, entertainment focused, narrative-intensive games was studied as references. A new game development team was set up with a game producer, two graphics designers and one programmer. As well, the stories were written by young people themselves and modified into game stories by a professional game designer. The game outlook and stories promote positive mental well-being. This is the new focus in the game, with, of course, the initial goal of helping young people with life management issues continuing (see *Fig. 1*). Concerning the content development, new positive mental health characteristics were added to the game.

GoML's impact will be evaluated using the WEMWBS in three pilot groups of youth workers and young people. There are pre- and post-measurements for young people. This WEMWBS scale is suitable because it enables measurement of the impact of actions aimed to influence young people's capabilities. The aim of the measurements is to get knowledge of the mental well-being of young people participating in the *GoML* test setting.

4 Discussion and Conclusion

The use of game-based methods to support mental health is increasing, and as [28–30] stated, there are potential benefits for patients in this area. Nevertheless, we did not find existing games targeting social work, especially regarding the life management skills of young people.

The clusters of young people's capabilities [11] as presented in *Fig. 1* were the background for the game's narrative. The objective in this case study was to identify the key phases in the design and development of SGs; the conclusions are illustrated in *Fig. 2*. We suggest that the development process begins with development of familiarity with the subject area. This analysis phase includes brief research on the topic and existing or previous games [31] as well as defining the target group and aim of the game. Also, the supporting specialists in this area have to be included in the process, supporting the earlier research [5, 24–26]. The theoretical foundation (if there is one) has to be set, and the restrictions of time and budget have to be considered. After establishing the game genre, the initial concept for the game is ready.

The practical game production phase can start when the overall graphical and technical issues are set: What is the development environment? What is the look and feel of the game? Is there a strong narrative, and how it is implemented in the game? Throughout the development, the theoretical background and aim of the game has to be

taken into account. Iterative development enables testing the game during the production phase.

Profound testing and measurement of the impact of the game will enable the validation of the SG. It is important to be able to provide guidance and a protocol on how to use the SG for both end users and their supporters (social workers) and pointing out this in the process is a new approach compared to previous studies [20-22, 25-27, 32].

Iterative development makes it possible to learn from previous phases and improve the game in every iteration. However, as SGs are developed with limited budget and compared with entertainment games, it is challenging to fulfil especially youth needs. In practice, it seems that development of SGs need more mature processes and supporting tools that are easily available. Testing and evaluation bring valuable information, as mentioned by previous research [27], and in the ongoing phase, the validation of *GoML* is a very important task. Using WEMWBS [16] will enable measurement of the state of the mental well-being of the participants. The suggested process model (Fig 2.) has similarities with Design Science Research framework's relevance, design and rigor cycles [37].

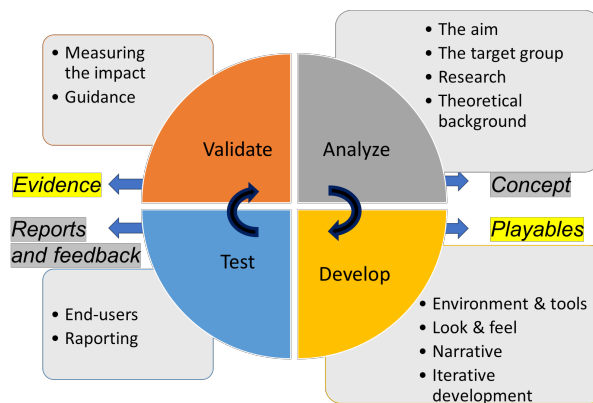


Fig. 2. Key phases in the design and development of SGs.

The development of SGs in the social and healthcare sector requires a profound understanding of the game's topic and players, which can be gained through multidisciplinary teams. In this case study, the developed *Game of My Life* (2nd) can be used in nursing or youth work as a discussion tool to inspire thoughts and provoke conversations between professionals and young people. Future work will include the development of the 3rd version of *GoML* for mobile devices and its validation.

References

1. Djaouti, D., Alvarez, J., Jessel, J.-P. & Rampnoux O. Origins of Serious Games. Serious Games and Edutainment Applications. Springer-Verlag London Limited (2011).

2. Susi, T., Johannesson, M. & Backlund, P. Serious Games: An Overview. Technical Report HS-IKI-TR-07-001 (2007). Retrieved 1 March, 2019, from <https://www.diva-portal.org/smash/get/diva2:2416/FULLTEXT01.pdf>
3. Zyda, M. From visual simulation to virtual reality to games. *IEEE Computer* 38(9), 25–32 (2005).
4. Arnab, S., Dunwell, I. & Debattista, K. *Serious Games for Healthcare: Applications and Implications*. IGI Global (2013).
5. Kempainen, J., Korhonen, T. & Ravelin, T. Developing Health Games Requires Multidisciplinary Expertise. *Finnish Journal of eHealth and eWelfare*, 6(4), 200–205. (2014).
6. Myers, M. D. *Qualitative Research in Business and Management*. Ch. 7. Case study research, pp. 73-91. SAGE (2013).
7. Eisenhardt, K.M. Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), 532-550 (1989).
8. Gerring, J. What is a case study and what is it good for? *The American Political Science Review*, 98(2), 341-354 (2004).
9. Yin, R. K. *Case study research: Design and methods* (3rd ed.). Thousand Oaks, Calif.: Sage Publications (2003).
10. Baxter, P., & Jack, S. Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, 13(4), 544-559(2008).
11. McNeil, B., Rich, J., Reeder, N. Framework of outcomes for young people. Department for Education, The Young Foundation, London, UK. (2012). Available at <http://eprints.lse.ac.uk/51085/>
12. Curtis, Alexa C. Defining adolescence. *Journal of Adolescent and Family Health*: Vol. 7: Iss. 2, Article 2 (2015). Available at: <https://scholar.utc.edu/jafh/vol7/iss2/2>
13. Clarke, A.M., Morreale, S., Field, C-A, Hussein, Y.& Barry, M. What works in enhancing social and emotional skills development during childhood and adolescence? A report produced by the World Health Organization Collaboration Centre for Health Promotion Research, National University of Ireland Galway (2015).
14. Schild, H., Vanhee, J. & Williamson, H. Youth work – An incomprehensible subject? Introductory reflections on youth work. In *Thinking Seriously about Youth Work. And how to prepare people to do it*. Ed. Hanjo Schild, Nuala Connolly, Francine Labadie, Jan Vanhee and Howard Williamson. Youth Knowledge#20. Council of Europe and European Commission. 7 – 13 (2017).
15. Kiilakoski, T. Saying, doing, relating – Reflecting on youth work praxis in Finland. In *Thinking Seriously about Youth Work. And how to prepare people to do it*. Ed. Hanjo et al. Youth Knowledge#20. Council of Europe and European Commission. 53-62 (2017).
16. Putz, R., O'Hara, K., Taggart, F. and Steward-Brown, S. Measuring the impact of your work on mental wellbeing. Using WEMWBS to measure the impact of your work on mental wellbeing: A practice-based user guide. *Feeling good and doing well in Coventry Wellbeing Project* (2012).
17. Baranowski, T., Buday, R., Thompson, D., Lyons, E.J., Shirong, Lu A. & Baranowski, J. Developing Games for Health Behavior Change: Getting Started. *Games for Health Journal: Research, Development, and Clinical Applications*, 2(4), 183–190 (2013).
18. Ryan, R.M., Rigby, S. & Przybylski, A. The Motivational Pull of Video Games: A Self-Determination Theory Approach. *Motivation and Emotion* 30(4), 344–360 (2006).
19. Rigby, S. & Ryan, R.M. *Glued to Games. How Video Games Draw Us In and Hold Us Spellbound*. ABC-Clio, LLC (2011).
20. Braad, E.P., Folkerts, J. & Jonker, N. Attributing Design Decisions in the Evaluation of Game-Based Health Interventions in Schouten et al. (Eds.) *Games for Health. Proceedings*

- of the 3rd European Conference on Gaming and Playful Interaction in Health Care. Springer Fachmedien, 61-74 (2013).
21. Friess R., Kolas N. & Knoch J. Game Design of a Health Game for Supporting the Compliance of Adolescents with Diabetes in Schouten et al. (Eds.) *Games for Health 2014. Proceedings of the 4th Conference on Gaming and Playful Interaction in Healthcare*. Springer Fachmedien, 37-47 (2014).
 22. Deen, M., Heynen, E.J.E., Schouten, B.A.M., van der Helm, P.G.H.P. & Korebrits, A.M. Games 4 Therapy Project: Let's Talk! In Schouten et al. (Eds.) *Games for Health 2014. Proceedings of the 4th Conference on Gaming and Playful Interaction in Healthcare*. Springer Fachmedien (2014).
 23. Adams, E. *Fundamentals of Game Design* (3rd edition). Pearson Education, Inc (2013).
 24. Merry, S., Stasiak, K, Shepherd, M., Frampton, C., Fleming, T. & Lucassen, M. The effectiveness of SPARX, a Computerised Self-Help Intervention for Adolescents Seeking Help for Depression: Randomised Controlled Non-Inferiority Trial. *BMJ*, 344(2598), 1–16 (2012).
 25. Salen, K. & Zimmerman, E. *Rules of Play: Game Design Fundamentals*. Massachusetts Institute of Technology (2004).
 26. Brox, E., Fernandez-Luque, L. & Tøllefsen, T. Healthy Gaming: Video Game Design to Promote Health. *Applied Clinical Information*, 2(2), 128–142 (2011).
 27. Graafland, M., Dankbaar, M., Mert, A., Lagro, J., De Wit-Zuurendonk, L., Schuit, S., Schaafstal, A. & Schijven, M. Viewpoint How to Systematically Assess Serious Games Applied to HealthCare. *JMIR Serious Games*, 2(11), 1–8. (2014).
 28. Cascar, A.L, Christensen, H. Review of internet-based prevention and treatment programs for anxiety and depression in children and adolescents. *Med J Aust*, 192 (11 Suppl): S12 (2010).
 29. Richards, D., Richardson, T. Computer-based psychological treatments for depression: A systematic review and meta-analysis. *Clinical Psychology Review*, Volume 32, Issue 4, 329-342. <https://doi.org/10.1016/j.cpr.2012.02.004>. (2012).
 30. Fleming, T.M., Bavin, L., Stasiak, K., Hermansson-Webb, E., Merry, S.N., Cheek, C., Lucassen, M., Lau, H.M., Pollmuller, B. and Hetrick, S. Serious Games and Gamification for Mental Health: Current Status and Promising Directions. *Front. Psychiatry* 7:215. (2017).
 31. SPARX Fact Sheet. Retrieved 7 July, 2018, from <https://www.fmhs.auckland.ac.nz/assets/fmhs/faculty/ABOUT/newsandevents/docs/SPARX%20Fact%20sheet.pdf>
 32. Cheek, C., Fleming, T., Lucassen, M. F., Bridgman, H., Stasiak, K., Shepherd, M., & Orpin, P. Integrating Health Behavior Theory and Design Elements in Serious Games. *JMIR Mental Health*, 2(2), e11 (2015). <http://doi.org/10.2196/mental.4133>
 33. Knowles, S., Hawke, K. Integrating Health Behavior Theory and Design Elements in Serious Games. *JMIR Ment Health*. Apr-Jun; 2(2): e11 (2015).
 34. Cavallaro, D. *Anime and the Visual Novel: Narrative Structure, Design and Play at the Crossroads of Animation and Computer Games*. McFarland & Company Inc (2010).
 35. Lu, B. Hikikomori: The Need to Belong and the Activation of Narrative Collective-Assimilation through Visual Novels. *Journal of Interpersonal Relations, Intergroup Relations and Identity*, 7, 50–61 (2014).
 36. Lu, A.S., Baranowski, T., Thompson, D. & Buday, R. Story Immersion of Videogames for Youth Health Promotion: A Review of Literature. *Games Health Journal*, 1(3), 199–204 (2012).
 37. Hevner, A., & Chatterjee, S. *Design research in information systems: theory and practice*. (Vol. 22). Springer Science & Business Media. (2010).