The effect of a mediated environment on the outcome of a facilitated tabletop game

H. N. aan het Rot

A mixed-methods research to study the effect of a mediated environment on player experience and the result of the game Cue Kitchen, that aims to increase awareness about the invisible symptoms of Parkinson's Disease in the social environment of people with Parkinson's

TU Delft

The effect of a mediated environment on the outcome of a facilitated tabletop game

by

H. N. aan het Rot

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Student number:	4147499	
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Thesis committee:	Prof. dr. ir. A. Verbraeck,	TU Delft, chair
	Dr. L. J. Kortmann,	TU Delft, first supervisor
	Dr. G. de Vries,	TU Delft, second supervisor
	Ir. M. Kooreman,	Stichting MaySways

TU Delft

MaySways

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Preface

The report you are about to read is both the final piece of my graduation project and the result of a combination of circumstances in a rather bizarre time. Initially, I would research how the serious card game *Cue Kitchen* could improve the lives of people with Parkinson's Disease (PD), by creating awareness about the invisible symptoms of PD. Unfortunately, due to the Covid-19 pandemic, it was not possible to carry out my graduation proposal, as players could not physically meet each other. From this situation arose a new and interesting research problem: what happens to the outcome of a game when a 'tabletop game' cannot be played in a physical environment? Both despite and thanks to the Covid-19 pandemic, I managed to finish my thesis with an inventive and interesting topic.

This report should be a first step towards filling in a relevant knowledge gap from a scientific perspective about playing tabletop games in a mediated environment instead of a physical one. In addition, I hope my research provides the MaySways Foundation insights for the further development of Cue Kitchen. Finally, as the 'magnus opus' of my study life, this report will be the last step to obtain my master's degree in Complex Systems Engineering and Management at Delft University of Technology.

There is nothing left for me but to thank everyone who made my graduation possible. Thanks to all the participants, with and without PD, for playing the game and their patience and enthusiasm. In many cases, it was a privilege to be part of your conversations and to have the opportunity to learn about Parkinson's. Also, a special thanks to the MaySways Foundation and the Dutch Parkinson Foundation for allowing me to use their channels to find my participants. I would also like to mention the designers of the game, besides myself: Diederik de Planque, Celine Jansen (all compliments for her illustrations), Jeffrel Hermias and Shridhar Kulkarni. We did a fantastic job!

I would like to express great gratitude to my graduation committee. In the first place, thank you Rens Kortmann for our weekly meetings, be it in a physical or mediated environment. I enjoyed our conversations and appreciated your constructive, positive, and useful feedback. Also, thanks to Alexander Verbraeck and Gerdien de Vries for taking the time to read my work and sharing your critical view to bring my work to a higher level. And thanks to May Kooreman and Birgit de Bruin of the MaySways Foundation, for your fresh perspective and reminding me of the impact that my project has for people with PD and their social environment

Finally, I would like to thank my family and friends. Thanks to my parents for their support and their patience. Thanks for being there for me all these years, especially during the darker times, and for everything we have talked about (e.g., Presentia Realis). Thanks to all the friends and family for their interest and allowing me to share both my enthusiasm and frustration. And, last but not least, thanks to my girlfriend Anne Jolijn. I've made it, because of you. Thank you for motivating me, believing in me, and standing by my side. For walking an 'ommetje' with me and staying up (too) late to proofread my work. And above all for all the good times we experienced together last year. Graduating during a pandemic did not get us down!

Harmen aan het Rot
Delft, 4 January 2021

Summary

During the coronavirus disease pandemic in 2020, it was not possible to play a facilitated tabletop game in a physical environment. The use of digital tools like Teams, Zoom or FaceTime, could enable a mediated environment for players to play a facilitated serious tabletop game. However, facilitated tabletop games are usually played in a physical environment (Hofstede et al., 2010). This begs the question: Are these games still effective when played and facilitated in a mediated environment?

Facilitated tabletop games, like board games, card games or role-playing games, can be a useful method for analysing and designing complex socio-technical systems. For example, multi-actor decision-making can be supported by a facilitated tabletop game to create an experimental setting for stakeholders to 'play around' with different policies and technologies (Mayer, 2009). Games can also be used to persuade or educate people, by creating awareness about complexities in those systems.

An example of a facilitated tabletop game is *Cue Kitchen*, created by students from TU Delft including the author of this study and in collaboration with the MaySways foundation. *Cue Kitchen* is a game to create awareness in the social environment of persons with Parkinson's Disease about their invisible symptoms. Because of measures preventing the spread of the coronavirus disease (COVID-19) in 2020, it was not possible to test the game as planned, with the test subjects being physical present around the playing table. Therefore, other ways had to be found to play and test the game without physical presence, which led to this study.

The research question answered in this study is: *What is the effect of playing Cue Kitchen in a mediated environment on the outcome of the game compared to a physical environment?*

The first step in answering the research question was to conduct a literature review about the relation between the playing environment and the outcome of a serious tabletop game. Although this relation has not been described in literature, it is possible to create insight in this relation to combine different ideas emerging from the literature.

First, the outcome of a facilitated tabletop game is twofold: the extent to which the goal(s) of a game has been achieved (the result of the game) and player experience (Michael and Chen, 2006; Sawyer, 2007; Ritterfeld et al., 2009).

Second, the choice of playing a game in a mediated environment is part of the game session design. The design of the session can, just as facilitation, affect the quality of the session and therefore jeopardize the outcome of the game (Magerkurth et al., 2004; Hofstede et al., 2010). Furthermore, a mediated environment can influence the exchange of emotions, which could affect the player experience. However, the literature also suggests a possibility to create a sense of presence using a mediated environment(Bourdon, 2020; Mantovani and Riva, 1999).

Finally, During the coronavirus disease (COVID-19) pandemic in 2020, the term 'Zoom fatigue' was introduced to indicate tiredness when using video conferencing software like Zoom(Wiederhold, 2020). Although no reviewed results have been published so far, grey literature such as traditional media and lifestyle websites are observing an increased level of tiredness when video calling (Morris, 2020).

This research used a mixed-methods research methodology, combining both quantitative and qualitative data. The qualitative data (observations during the game sessions) explain the quantitative data (measured outcome: player experience and result of the game).

The participants in this study were persons with Parkinson's Disease and persons in their social network, like family, friends, colleagues or healthcare providers.

Player experience has been measured, using 12 variables from the Game Experience Questionnaire (GEQ) by IJsselsteijn et al. (2013), with 67 questions in three different modules. Each variables is an average, composed of 3 to 6 (unique) questions, that has been answered using a five points Likert scale ('Totally agree' to 'Totally disagree').

The result of the game, in terms of achieving the goal, was measured using five questions in the questionnaire. The goal of the game is to increase awareness about the invisible symptoms of Parkinson's Disease (PD) and to enable the player with PD to start a conversation about his personal invisible symptoms, to improve understanding in his social environment.

Qualitative data have been collected to study how a playing environment affects a game session and consist of extensive game session reports focusing on 1) how the quality of the game was affected by the player environment, 2) how the playing environment affected the game play and 3) how the playing environment affected the debriefing.

To make a mediated environment possible, the playing table was filmed using a smartphone and a construction made of kitchen stairs, some books, rope, tape and a book shelf. The players can see the playing field of the game, including the playing cards, on their screen using a video connection. By giving the facilitator directions of their desired actions, they could participate in the game play.

A total of 11 playing sessions have been organized of which 3 in a physical environment and 8 in a mediated environment. A total of 49 test subjects participated in the game *Cue Kitchen*. This has resulted in 44 completed questionnaires and extensive observation reports, of which 13 from players in a physical environment and 31 from players in a mediated environment.

The most interesting result is that participants in a mediated environment were significantly more tired than in a physical session. Some observations showed a relation between the quality of the session (e.g. connection issues, audibility and visibility) and people showing symptoms of fatigue. Also, during some physical sessions it was noticeable that non-active players (i.e. it was not their turn) were able to 'tune out' for a moment. The possibility of being able to have a moment without concentration, could contribute to the players being a little more energetic at the end of the game.

Another surprising result in the experiment, is that no significant differences have been found between the outcome of a game in a physical and mediated environment. This is unexpected, because factors like reduced non-verbal communication or the inability to convey emotions in a mediated environment could have an effect on the outcome of the game. Instead, some observations show that mediated presence caused players to be more comfortable and show emotions, as the screen was acting as a 'safe barrier'.

This study also shows that the sense of presence in a mediated environment is not significantly different than in a physical environment. This is not inconsistent with literature, a feeling of presence could be established without a physical presence Bourdon (2020); IJsselsteijn and Harper (2001); Mantovani and Riva (1999). Furthermore, in this experiment no significant difference has been measured between the result variables, in terms of achieving the goal, between both playing environments.

The last important finding in this study, is that the difference between a physical and mediated environment is not a day-and-night contrast. Not all physical sessions went better than the mediated sessions: Some mediated sessions went worse, but other sessions went better than physical sessions. The reason for this is threefold. First of all, the outcome of a game is highly dependent on the quality of the individual session. The dependence on digital communication technology increases the likelihood that something will go wrong in a mediated session, but this is not always the case. Second, the facilitation of the game is not unequivocally better or worse in either a physical or mediated session, both environments have advantages and disadvantages. Finally, mediated sessions are sometimes not fully mediated. In a number of cases in this experiment, two people were in the same room, which clearly affected the game session. The interaction between the two 'physical players' increased (i.e. it is easy to interact with each other), while the interaction with and between the two 'mediated players' reduced, due to noise on the connection.

In conclusion, the results in this study show that players in a mediated environment were significantly more tired than in a mediated environment. The observations in the game session reports show that some players in a mediated environment became more tired during the debriefing. This was especially the case when problems occurred with the video and audio connection. Players showed signs of tiredness when earlier in the game some connection issues needed to be resolved, causing the game to start later or interrupting the session.

Apart from tiredness, the playing environment of the game session does not have as much effect on both player experience and the result of the game as expected. The game *Cue Kitchen* is equally successful in both a mediated and physical environment. Also, no differences have been found between the two environments on almost all variables measuring player experience. However, this does not mean that the playing environment has no effect at all. The qualitative results show that the dependence on digital communication technique plays a decisive role with regard to the quality of an individual game session and can 'make or break' a session.

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Introduction

During the coronavirus disease pandemic in 2020, it was not possible to play a facilitated tabletop game in a physical environment. The use of digital tools like Teams, Zoom or FaceTime, could enable a mediated environment for players to play a facilitated serious tabletop game. However, facilitated tabletop games are usually played in a physical environment Hofstede et al. (2010). This begs the question: Are these games still effective when played and facilitated in a mediated environment?

Facilitated tabletop games, such as board games, card games or role-playing games, can be a useful method for analysing and designing complex socio-technical systems. For example, multi-actor decision-making can be supported by a facilitated tabletop game to create an experimental environment for stakeholders to 'play around' with different policies and technologies (Mayer, 2009). Games can also be used to persuade or educate people, by creating awareness about complexities in socio-technical systems.

A game for complex systems analysis and design often models a social, multi-actor system, just as a computer simulation can resemble a technical system. Therefore, many games for complex systems have a similar architecture as the social system in the real world: several players interact at the same time and in the same physical environment (Hofstede et al., 2010). Tabletop games are well suited for being an representation of a social system: players can sit around a table, look at each other and understand each other's actions even without verbal communication (Magerkurth et al., 2004).

An example of a facilitated tabletop game is *Cue Kitchen*, created by students from TU Delft including the author of this study and in collaboration with the MaySways foundation. Cue Kitchen is a game to create awareness in the social environment of persons with Parkinson's Disease about their invisible symptoms. Because of measures preventing the spread of the coronavirus disease (COVID-19) in 2020, it was not possible to test the game as planned, with the test subjects being physical present around the playing table. Therefore, other ways had to be found to play and test the game without physical presence, which led to this study.

1.1. Games for complex systems analysis and design

Complex systems are systems with many stakeholders, all with their own interest and with many interactions between them (Ridolfi et al., 2012). In many cases, complex systems consist of technical aspects and challenges (Enserink et al., 2010). Terminology similar to complex systems are multi-actor and socio-technical systems, both indicating the characteristics of a complex system as mentioned before. Examples of complex systems are the energy supply system or the public transportation system.

A useful method for analysing and designing complex systems with many stakeholders are games (Lukosch et al., 2018). For example, in multi-actor decision making, games can provide a simulated environment, where stakeholders can 'play' with a complex system and see the outcome of their actions. Mayer (2009) described games for complex systems as "experimental environments (…) where players learn by taking actions and by experiencing their effects through feedback mechanisms that are deliberately built into and around the game". There are different types of games, dependent on the purposes that it serves, for instance persuasive games, games for learning and games that create awareness. Also, there are many different game designs, for example a solo player video game, a

multi-player, competitive board game or a cooperative role-playing game.

1.1.1. Facilitated tabletop games

Klabbers (2009) stated that games can be models of existing social systems, with certain rules of correspondence in mind. Tabletop games are well suited for being such an 'image' of a system: players sit around a table, look at each other to interpret impersonations and gestures which allows them to understand each other's actions, even without verbal communication (Lukosch et al., 2018; Magerkurth et al., 2004). Different actors are together when playing the game, which creates a social cohesion where they share emotions, but also confront each other about the decisions made during the game. Tabletop games for complex systems usually require a game master or facilitator. He is responsible for briefing the players before the game, but also for directing the game by making the game reactive to players' decisions using storytelling techniques (Tychsen et al., 2005). The facilitator also plays an important role in the debriefing of the game (Kriz, 2010). The debriefing "enables players to reflect on what has happened during game play, what they have learned, and how to translate these lessons to the real system" (Lukosch et al., 2018, p.288). The game play is the course of the game, including players' actions, decisions, behaviour and interactions.

This master thesis focuses on facilitated tabletop games for complex systems, played by stakeholders or other persons involved in that complex system. A (facilitated) tabletop game is ideally suited to recreate the social structures in the real world system (Klabbers, 2009), opposed to digital models and computer simulations. Therefore, these games have a similar architecture as the social system in the real world it represents: several players interact at the same time and in the same physical environment (Hofstede et al., 2010). According to this approach, games for complex systems are usually played in a physical environment, at a physical table.

1.1.2. Awareness games

There are many types of games for complex systems where the choice of a particular type depends on the purpose of the game (Harteveld, 2011). The purpose to implement games in a social system can be to raise the level of awareness, to practice skills or to produce knowledge in order to stimulate change in that sytsem (Klabbers, 2006). For example, when there is need for attitude change towards renewable energy, persuasive games can be a suitable choice. When players need to practice certain skills or extent their knowledge in order to increase efficiency, training or educational games can be used. When the goal is to create better understanding about (a part of) a complex system for example the importance of reducing CO2 emissions, an awareness game can be a good option.

Awareness games are characterized by creating an environment where players experience the importance of a complex issue, are triggered to seek knowledge about it and learn that they lack some necessary skills (Hofstede et al., 2010). By playing an awareness game, players will get more elaborate understanding of the real-world system. Dependent on the issue, the player can also recognize his own role. Harteveld (2011) discusses multiple examples of awareness games. For instance, the game Budget Hero was designed to create awareness about the difficult dilemmas that the federal USA government faces, when allocating the federal budget (Rejeski, 2009). In this game the player experienced the role of decision maker and had to make trade-offs in the allocation of the federal budget.

Another awareness game was FloodSim, with the aim to raise awareness among UK citizens about flood policy, government spending and citizen involvement (PlayGen, 2008). In this game the player had to make decisions about investments in flood safety. The reason for this game were floods in 2007, which costed the UK insurance industry around £ 3 billion.

1.1.3. Cue Kitchen

Cue Kitchen is another example of an awareness game. This facilitated tabletop game was created in 2019 by students of TU Delft, including the author of this study, in collaboration with the MaySways foundation. Cue Kitchen aims to create awareness in the social environment of people with Parkinson's Disease (PD) about the invisible symptoms and the importance of so-called cues. The game also aims to initiate the conversation between someone PD and its social environment about these symptoms and how they could help the person with PD by using cues. The game focuses on the people around the person with Parkinson's Disease such as family, friends, colleagues, employers, or healthcare providers.

In this cooperative tabletop card game with 4 players, the (in-game) goal is to run a successful

service in a professional kitchen by using ingredient cards to cook dishes. While playing, each player has an invisible symptom, something that limits the player in its play. Other need to guess this symptom and by providing the right cue, players can help each other to overcome this symptom. While the game is fun to play, the player can experience what it is to have an invisible symptom and needing a cue from others, which relates to Parkinson's Disease. After playing the game, during the debriefing, the players reflect on this. With the help of the facilitator, the players relate their experience in the game to the invisible symptoms of Parkinson's Disease as well as the importance of cues that can help people with PD. More explanation about the game can be found in section 3.5.2.

Cue Kitchens is not a typical game for complex systems. Usually, complex systems can be recognized by the presence of technical aspects and challenges (Enserink et al., 2010). With Parkinson's Disease, no technical aspects are involved. However, there are characterises of Cue Kitchen that resemble a complex system with stakeholders and many interactions between them (Ridolfi et al., 2012). In a social system of someone with PD, multiple actors are involved: the person with PD itself and different people in his social environment, including close relatives (partner, children, or parents) but also more distant acquaintances and colleagues. Even though no technical aspect is present in this system, the complicated nature of a neurological disorder like Parkinson's Disease shows similarities with the complicated nature of a technical system. In both cases it is hard to understand the bigger picture of the system, it is difficult to recognize all interactions and it is impossible to predict the outcome as it progresses over time with different outcomes in different situation/persons.

The game Cue Kitchen in itself also has elements that are typical for games for complex systems: cooperation, the purpose of learning and creating awareness. The game meets the definition of Mayer (2009): "an experimental, rule-based, interactive environment, where players learn by taking actions and by experiencing their effects through feedback mechanisms that are deliberately built into and around the game". In other words, when conducting an experiment with Cue Kitchen, the conclusions and lessons learned can also be applied to other facilitated tabletop games for complex systems.

1.2. Playing Cue Kitchen in times of the coronavirus pandemic

During the coronavirus disease pandemic in 2020, measures like working from home and keeping 1.5 meter apart, made it hard to organize physical activities. Going to a restaurant, visiting the cinema, or getting a haircut were not possible anymore. Activities like visiting friends and family, meetings with colleagues or following lectures, that previously took place in physical form, suddenly took place in an alternative, online environment. Digital tools like Skype, Facetime or Zoom can help us by providing communication and interaction. By using these tools, people can sense some form of social presence, especially during the difficult times of the corona crisis, when people want to be together.

Some of these alternative forms were already established, such as conference calling instead of a physical meeting. But for other activities, an online form is less obvious, such as attending a workshop or playing a board game. The strength of these activities often lies in the physical interaction between people. The same applies for playing a facilitated tabletop game for complex systems, especially when role playing, a playing board or playing cards are involved.

1.2.1. Playing a facilitated tabletop game in a mediated environment

Also without the circumstances of the corona crisis, there are many situations conceivable where you want to be able to play a facilitated tabletop game for complex systems without being physical present. In multi-national businesses it is sometimes not possible for colleagues from different countries or locations (e.g. an oil platform) to be present at the same location. The costs of bringing these people together may not outweigh the benefit of playing the serious game. In healthcare, some patients are not able to leave their home due to an illness because the risk for their health could be compromised. In these cases the risk is not worth the benefit with respect to the possible benefit that a game can bring. A way to make this work, is to use digital tools and create a mediated environment where people can interact, communicate and play the facilitated tabletop game.

However, facilitated tabletop games are usually played in a physical environment, not only because it is a physical game, but also it is intended to reflect reality (see Hofstede et al. (2010), Klabbers (2009), Lukosch et al. (2018)). Also, when playing a tabletop game, players sit around a table and look at each other to interpret impersonations and gestures (Magerkurth et al., 2004). This allows them to understand each other's actions even without verbal communication.

The questions that now arise are: How can a facilitated tabletop be played in a mediated environment? Is this game still as effective as if it was played and facilitated in a mediated environment? And what are the differences with playing in a physical environment?

1.2.2. Cue Kitchen: a game about the invisible symptoms of Parkinson's disease

These questions also arose during the spring of 2020, when discussing further development for the game Cue Kitchen. The game had already been tested on a small scale, but as follow-up on the design of the game, the MaySways foundation wanted to continue the development of *Cue Kitchen* by testing the game on a larger scale. Because of the measures preventing the spread of the coronavirus disease in 2020, it was more difficult to test the game as planned with physical test subjects. Therefore, an alternative way to play the game had to be created, without players physically present and using a mediated environment. However, this begs the questions as mentioned above, whether Cue Kitchen would be just as effective in a mediated environment as it would be in a physical environment. This led to the research problem in this study, about the effect of playing Cue Kitchen in a mediated environment versus a physical environment.

1.3. Knowledge gap and research question

Facilitated tabletop games are designed for a physical environment with players together at a physical table and are usually played accordingly (see Hofstede et al. (2010), Klabbers (2009), Lukosch et al. (2018)). Therefore, academic research into facilitated tabletop games does not focus on the effect of playing such a game in a mediated environment. And although some studies do mention the effect of playing a game in a mediated environment, these were about computer games and not about facilitated tabletop games (e.g. Bachen et al. (2016), Harteveld (2011) or Nicovich (2010)). It is not known how a mediated environment affects the game play and debriefing of a facilitated tabletop game, to what extent this has an effect on the desired outcome of the game compared to a physical environment (see section 1.1).

However, as discussed in section 1.2, there are circumstances such as the coronavirus pandemic, in which it is not possible to play a physical game in a physical environment. And although some games can easily be turned into a fully digital version (i.e. with the whole game play digitized), other facilitated tabletop games cannot be easily digitized, without redesigning the whole game. Therefore, it is important to study how a facilitated tabletop games can be played in a mediated environment, without fully digitizing the game play, and how this affect the outcome of the game.

Current academic research does not provide enough insight into how a mediated environment affects (the outcome of) playing a facilitated tabletop game. To fill this knowledge gap the following research question has been formulated, from which six sub questions were derived:

Research question

What is the effect of playing Cue Kitchen in a mediated environment on the outcome of the game compared to a physical environment?

This research question can be specified using seven sub questions:

1. How can the relation between a playing environment and outcome of a facilitated tabletop game be described and measured?
2. What effects can be expected from playing a facilitated tabletop game in a mediated environment, based on theory?
3. How does the playing environment affect the game session (i.e. game play and debriefing) of Cue Kitchen?
4. What is effect of the playing environment on the outcome of Cue Kitchen?
5. What is the effect of players' characteristics (e.g. players with or without Parkinson's Disease) on the outcome of Cue Kitchen
6. How can the observations (sub question 3) explain the measured outcomes (sub question 4 and 5) of the game Cue Kitchen?

The first two sub questions focus on what is known in and can be derived from literature between a playing environment and outcome of a facilitated tabletop game, in order to give this study a solid scientific basis. The third sub question will focus on how a mediated environment affects the game session of *Cue Kitchen*: what can be observed in the game play and debriefing that relates to a mediated or physical environment? The fourth sub question addresses the effect of the playing environment on the outcome of *Cue Kitchen*. In other words, is the intended outcome of *Cue Kitchen* in a mediated environment still as good as it is in a physical environment? Or is there a difference? The fifth sub question focus on the role of player characteristics, for example age, education or experience with board games, in the outcome *Cue Kitchen*. Considering the target audience of the game (i.e. people with Parkinson's Disease and their social environment) the influence of Parkinson's Disease will also be measured. The reason to consider player characteristics as independent variables is twofold. It differentiates the effect of a playing environment for players with different characteristics and also provides insight for which players *Cue Kitchen* is most suitable. In the last sub question, the previous sub questions come together: it addresses how the observations during the game session can explain the measured results with respect to the outcome of the game.

1.4. Research approach and methodology

This section discusses the research approach that will be used in this study. First, the research approach will be introduced and discussed. Then the choice of methods will be discussed. This section ends with a research flow diagram to illustrate the structure of this research

1.4.1. Mixed-methods research: combining quantitative and qualitative research

The research questions as stated in section 1.4 are not answered by using either a purely qualitative or quantitative perspective. The way a playing environment affects the game play and debriefing of *Cue Kitchen* (sub question 3) can be observed and described in a qualitative way. On the other hand, the outcome of the game can be measured in a quantitative way (sub question 4 and 5). The research questions in this study need an approach that fits the insights provided by both the qualitative and quantitative research into a workable solution together. (Johnson and Onwuegbuzie, 2004). In this case, as stated in question 6, the qualitative answer on the third question serves as explanation for the quantitative answers on the fourth and fifth sub question.

A mixed-methods research methodology can be used to combine these two perspectives. Johnson and Onwuegbuzie (2004) define mixed-methods research as "the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (p.17). By using mixed-methods research, the researcher is not limited or constrained by the characteristics of typical quantitative or qualitative research. This could be a focus on deduction, confirmation and prediction from a quantitative perspective or a focus on discovery, exploration and induction from a qualitative perspective. Instead, it offers the opportunity to collect, analyse and integrate both quantitative and qualitative data in a single study for research problems where one type of data source may be insufficient to answer the research question (Creswell et al., 2003; Creswell and Plano Clark, 2011).

1.4.2. Advantages and disadvantages of mixed-methods research

The most important reason to use a mixed-methods research approach is to answer research questions that cannot be answered by a quantitative or qualitative approaches alone (Creswell and Plano Clark, 2011). According to Johnson and Onwuegbuzie (2004) "words, pictures and narrative can be used to add meaning to numbers and numbers can be used to add precision to words, pictures, and narrative"(p. 21).

Mixed-methods research can utilize the strengths of both approaches, while it offsets the weakness of using a pure qualitative or quantitative approach (Creswell and Plano Clark, 2011). For example, in quantitative research it can be hard to include a specific context of all test subjects and their voices are not directly heard. The combination with qualitative research can counteract this (potential) weakness. On the other hand, in qualitative research the bias can influence the results and it is difficult to generalize findings because the data set is relatively small. Quantitative research can make up for these weaknesses.

Other reasons for using mixed-method research is that it has more data sources available than a

pure qualitative or quantitative study. It is a practical approach in which also multiple worldviews can be used, rather than a single paradigm that is associated with certain qualitative or quantitative research (Creswell and Plano Clark, 2011).

An important disadvantage of mixed-methods research is the complexity of the methodology. It can be difficult for a single researcher to carry out both methods: he needs to learn about multiple methods in both the quantitative and qualitative perspective and also mix these methods in a right and understandable way (Johnson and Onwuegbuzie, 2004). This leads also to the second disadvantage: the use to time and resources (Creswell and Plano Clark, 2011). Because a mixed-methods is quite complex, it consumes a lot of time, especially when data are collected sequentially (i.e. in different phases). Qualitative and qualitative data both need their own platform and storage (e.g. interview recordings or software for data analysis), which can be expensive. Finally, another disadvantage of mixed-methods research, according to Creswell and Plano Clark (2011) is that it can be hard for other researchers to comprehend, especially those who are used to work within either a qualitative or a quantitative paradigm. Therefore, it is important to clearly explain all steps in the methodology: which distinctive methods are used and how the results from both approaches are being mixed (i.e. integrated).

1.4.3. Methods and data collection

The core of this study consists of an experiment where test groups will play *Cue Kitchen* in either a physical or mediated environment. These experiments will be used to collect both qualitative and quantitative data. The game play will be observed, using video recordings of the test sessions. After the game session, the players will be asked to complete a questionnaire about their experience and the outcome of the game, in order to collect quantitative data. A detailed mixed-methods design as well as a design for the experiment used this in study will be discussed in chapter 3.

1.5. Structure of the report and Research flow diagram

Directly after this introduction, chapter 2 presents the literature review. This will answer sub questions 1 and 2 about the relation between a playing environment and the outcome of a facilitated tabletop game and what can be expected from the effect of a mediated environment. The conceptual model resulting from the literature review serves as input for chapter 3, in which the methodology and design for a valid experiment will be presented. Then, in chapter 4 the quantitative results will be presented, answering sub questions 4 and 5 about the measured effect of players' characteristics (e.g. players with or without Parkinson's Disease) on the outcome of Cue Kitchen. Chapter 5 will present the qualitative results, in order to answer sub question 3 about how the effect of the playing environment was noticeable in this experiment. The qualitative and quantitative results will then be mixed in chapter 6, answering sub questions 6 about how the observations can explain the measured outcomes of Cue Kitchen.

In chapter 7, the results as presented in chapters 4, 5 and 6 will be discussed. Finally, in chapter 8, the conclusions of this study will be presented, which answers the main research question about the effect of playing Cue Kitchen in a mediated environment on the outcome of the game compared to a physical environment. These last two chapters elaborate on how the conclusions from this study can be applied to the use of facilitated tabletop games in general.

The research flow diagram in figure 1.1 provides an overview of the structure of this study, the steps that have been carried out and the corresponding chapters in this report. The structure in this study is based on a concurrent mixed-methods approach and consists of four phases.

During phase 1, participants have been selected and literature has been reviewed, which is an input for the experimental design. After this, during the data collection phase, 11 session of Cue Kitchen have been played. This resulted in quantitative results from the questionnaire and qualitative results from observations during the game sessions. During the third phase, the quantitative results will be analysed using the appropriate statistical test and data visualizations. At the same time, the observations from the game sessions will be summarized. The third step in the data analysis phase, is to integrate the qualitative and quantitative data. The results from phase three will be interpreted in phase four and related to the findings in the literature review. In the last step, the conclusions of this study will be formulated. Also, some shortcomings will be identified in a reflection, and recommendations will be made.

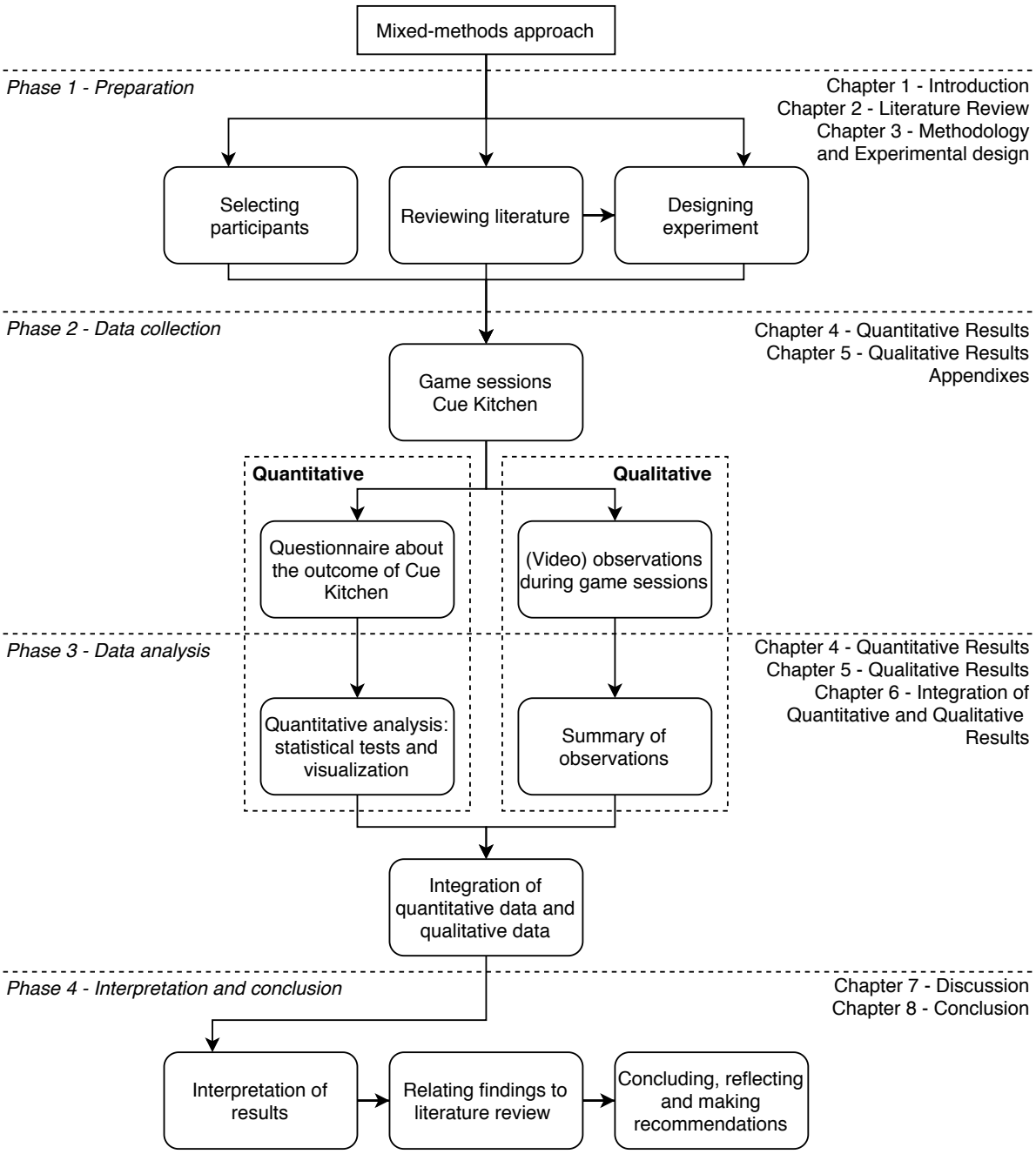


Figure 1.1: Research Flow Diagram

2

Literature review

In this chapter, the relation between the playing environment and the outcome of a game for complex systems will be discussed based on literature. First, section 2.1 addresses the meaning and definition an outcome of a game. Following this definition, the impact of playing in a mediated environment on the player experience is discussed in section 2.2. Section 2.3 reviews the role of game design, and specifically game session design. Section, 2.4 focuses on tiredness when using video conferencing software like Zoom. Finally, section 2.5 draws a conclusion from the different elements in this literature review. It also presents a conceptual model that captures the relation between game session design and the outcome of game. This conceptual will be used as input for the methodology.

2.1. The outcome of a game

This section discusses the outcome of a game for complex systems analysis and design, first, in section 2.1.1 in terms of its purpose and then, in section 2.1.2 in terms of player experience.

2.1.1. The purpose of a game

The general purpose of a game used for the analysis and design of complex systems is to contribute to the analysis and design of the complex system (see Lukosch et al. (2018)). However, this purpose can be more specified depending on the type of game, for example educating, simulating, persuading (i.e. to change behaviour), or creating awareness. For example, based on the definition of Mayer (2009), players have to learn something by taking actions and experience the effect of those actions.

A game has a specific purpose, related to the subject of the game (Greenblat, 1988). Duke (1980) stated that purpose of a game is built around the message to be communicated and the means of conveying it. Lukosch et al. (2018) related the game's purpose to "the goals the game needs to achieve". They gave some realized examples like (1) "influence the situational awareness of players for interdependent planning tasks" and (2) "support the strategic decisions around the extension of the port area in Rotterdam with the Maasvlakte 2".

When evaluating the outcome of the game, it is important to determine if and in which extent the goals of the game are achieved. Does the game have its desired result? For the previous discussed examples (by Lukosch et al. (2018)), this can be (1) the extent to which player's situational awareness has improved or (2) the extent to which the decision process has become more efficient. A game would have a successful outcome if it has resulted in fulfilling its desired goal(s). In that sense, the outcome of a game for complex systems can be defined as the extent in which the goal(s) of the game has been achieved or, in short, the result of the game.

The exact way the outcome of a game can be measured is dependent on the type and specific goal of game. Mayer et al. (2014) presented a general quasi-experimental design, that shows a generic way of how the outcome of a game can be measured in an experimental context (see figure 2.1). In this framework, there is a flow from observation 1, through observation 2, the in-game observations and observation 3 towards observation 4. Observations 1 and 4 take place in a real world context, whereas observation 2, the in-game observations and observation 3 take place in a game situation (see Kriz (2003) and Peters et al. (1998)). Although this framework is created for Game Based Learning (GBL)

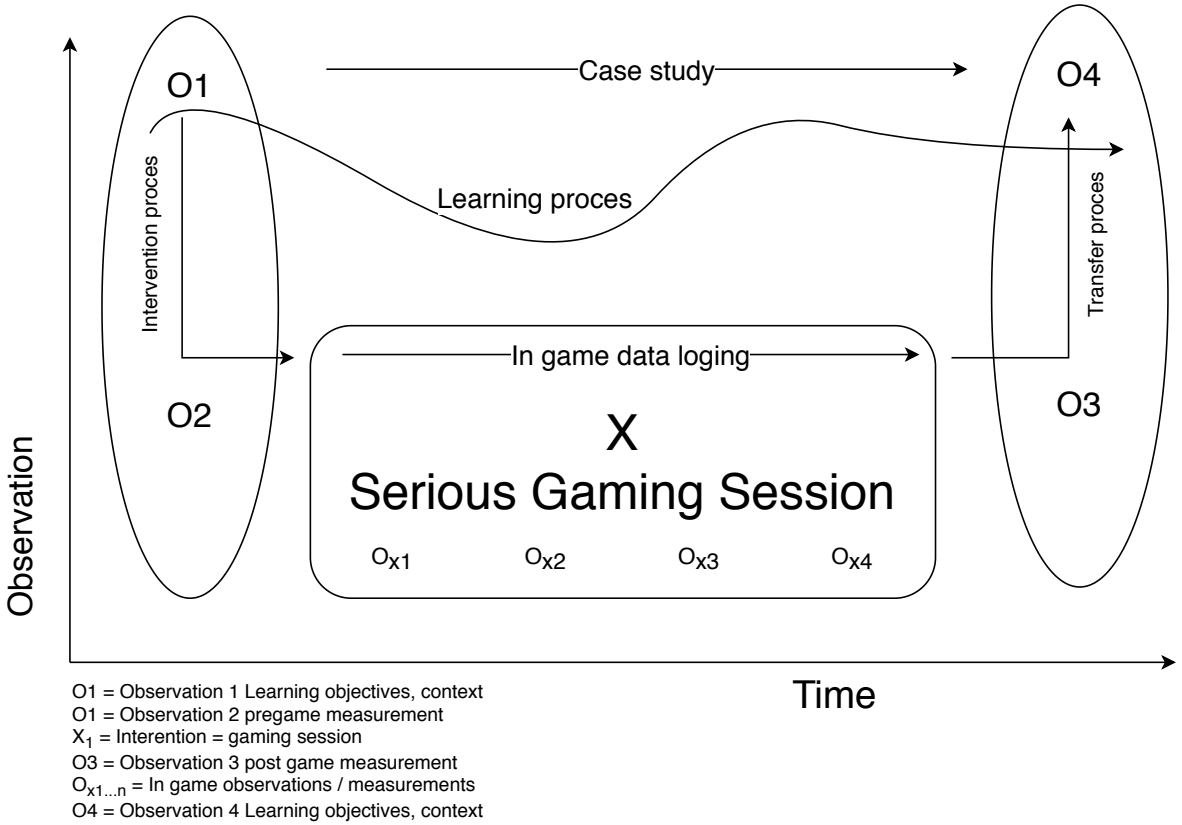


Figure 2.1: Generic quasi-experimental design for game based learning and serious games, based on (Mayer et al., 2014)

and serious games, it could also be applied to games with other purposes than learning, as long as the outcome is related to a change between the pregame and post-game situation.

2.1.2. Player experience

Another way to approach the outcome (or purpose) of a game is to review literature about serious gaming. In academic research, this term is often associated with video or digital games (e.g. Connolly et al. (2012), Bachen et al. (2016), Zyda (2005)). However, in the field of (non-digital) games for complex systems analysis and design, the term serious game is also used, albeit in a more limited extend (see Bekebrede (2010), Hofstede et al. (2010), Mayer (2009), Mayer et al. (2014)).

Indeed there are shared principles with 'serious' tabletop games, as Sawyer (2007) stated: "The general use of games and game technologies for purposes beyond entertainment is collectively referred to as serious games". Game designers Michael and Chen (2006) described a serious game as "games whose first purpose was not mere entertainment." This becomes clear when decomposing an example of a serious game: simulation gaming. The purpose can be found both in the meaning of a 'game' and 'simulation'. A simulation game is entertaining (from a game perspective) but also serves a serious purpose related to the real world environment (i.e. simulating a certain phenomenon). Therefore, apart from the extent in which the goal(s) of a game has been met, the entertaining part is also a purpose of the game.

The entertaining purpose of a game must be seen from a players' perspective. After all, the players are experiencing the game as entertaining (Ritterfeld et al., 2009). This relates to the principle of play, as described by Huizinga (1949): "Play is a free activity standing quite consciously outside 'ordinary' life as being 'not serious,' but at the same time absorbing the player intensely and utterly"(p. 13) A game being 'free' grasps the notion of the player experience as purpose of playing (a game): there is no practical task that needs to be fulfilled; the player is not forced to play by another person, nor by himself. The player experience when playing is in itself the reason why people play.

Player experience can be considered as an outcome of the game, besides achieving a certain goal, but is at the same time influencing the result of the game. If the player experience is not satisfiable (e.g.

the game is not enjoyable), the game may fail to motivate its participants (Hofstede et al., 2010). This can result in a failure of the game, with regard to achieving its goals, because of lack of involvement of its participants.

Player experience will be considered as the outcome of the game from a player's perspective, although this does not mean that players have no interest in the serious goal. IJsselsteijn et al. (2013) created a questionnaire to measure the player experience, in terms of seven components: Immersion, Flow, Competence, Positive and Negative Affect, Tension, and Challenge. These components are quite similar to constructs related to in-game experience as presented by Mayer et al. (2014): game play (effort, dominance, influence, power) and game experience (flow, immersion). Mayer et al. (2014) considered also presence within the game experience construct. IJsselsteijn et al. (2013) even created a special module about social presence that "investigates psychological and behavioural involvement of the player with other social entities, be they virtual (i.e., in-game characters), mediated (e.g., others playing online), or co-located" (p. 3).

2.2. Player experience in a mediated environment: sense of presence

As discussed above, presence is a part of a player's experience. Therefore, it is important to understand what happens when a game is played without players being physically present. Is it possible to experience presence without it being physical? There is little research about the role of presence in tabletop games. However, in digital gaming, (social) presence is seen as an important part of the player experience (Hudson and Cairns, 2014). Just like in physical games, the sense of being present at the same time, having the same (virtual) playground and being able to interact with other (real) players, is one of the main reasons people like to play digital multi-player games. Hudson and Cairns also mentioned the Game Experience Questionnaire by IJsselsteijn et al. and the importance to study the complex nature of social presence in digital games.

2.2.1. What is presence?

The exact meaning of presence can be considered vague and hard to grasp, but is at the same time related to our very own existence and perception of reality. Mantovani and Riva (1999) stated that presence is closely linked to ontology: the study of being. Presence can be defined in a narrow and absolute way. Schloerb (1995) defined presence as something physical: "[Presence] designates the existence of an object in some particular region of space and time. For example, this text (in some form) is physically present in front of you now" (p. 68). However, according to Mantovani and Riva "the meaning of presence depends on the concept we have of reality and that different ontological positions generate different definitions of presence" (p. 541). They argue that presence should not be defined as something physical but propose an alternative conception of presence as a social construction. In other words, (social) presence is a social construct, as part of reality, including relationships between actors and their surroundings.

The way Mantovani and Riva described presence, creates more possibilities to see presence than only in physical form. In other words, to have a sense of presence, despite physical absence. Bourdon (2020) referred to this phenomenon as mediated presence. Other authors are using similar terms such as virtual (co)presence or telepresence. The difference between these terms is mainly a different emphasis of context: 'tele' as in presence at or over a distance; virtual as in presence using software; mediated as in by using a medium. These terms all have the similar notion of presence that is not physical; using a (digital) tool to make the communication and interconnection possible to experience presence over a distance. Through immersive, interactive and perceptually realistic media, people can have a similar experience of social presence to those in non-mediated environments (IJsselsteijn and Harper, 2001).

2.2.2. The role of technology and levels of embodiment

Technology plays an important role in creating and enabling mediated presence via embodiment (Waterworth and Waterworth, 2014). Through different levels of embodiment, a person can experience presence as if he is physical present. This becomes possible by using low-tech communication technologies like telephone, e-mail or even conventional post, but also by using emerging technologies like virtual reality and computer-brain interaction (see Bourdon (2020) and Waterworth and Waterworth

(2014)). The interaction between disembodied ‘users’, like conveying messages, thoughts or feelings, can vary from hearing and seeing to feeling in physical and mental sense. Of course, the technology or a combination of different technologies determine to what extend the experience of mediate presence is possible. Further literature research is necessary to find and identify a structured classification about different technologies or mechanisms.

2.3. Game session design

The choice of playing a facilitated tabletop game in a mediated environment is related to game session design. This section will first discuss game session design in the context of a game design process, followed by the effect of game session design on the outcome of a game.

2.3.1. Game session design in a game design process

Multiple guidelines and recommendations for game design have been developed over time. Duke (1975) introduced 9 steps of game design for complex systems; he described the process as an incremental way where the game designer starts with identifying specifications for the game, including requirements as well as the purpose of the game (1). After that, the game designer has to conduct a system analysis (2) in order to identify components that will be part of the game (3) and combining these with game mechanics in a matrix (4). Then, the game designer describes these combinations (5), elaborates on the specific game techniques that will be used (6), and builds the game (7). Finally, the game will be evaluated in relation to the specifications from step one (8) and the game is tested and used in the field (9).

A practical approach to the game design process has been introduced by Peters and Van de Westelaken (2014), but is quite similar to the game design process as presented by Duke. They present a game design process of four phases with a total of ten steps. Phase 1 focuses on the design specifications and the second phase consists of a system analysis to identify the components of the system. During phase 3, system components that needs to be in the game are selected, after which these components are combined with game elements. Then the game designer chooses a game format and develops a conceptual design of the game. The fourth phase describes the construction and testing of the game. This phase also contains an elaboration on how the game can be transferred to the client (i.e. the problem owner that has ordered to develop the game) and needs to be prepared for optimal.

Lukosch et al. (2018) introduced a Combined Toolbox of Game Design for Complex System based on a combination of the process presented by Duke and Peters and Van de Westelaken. They introduced an “iterative process of (1) analysing the (elements of the) real system; (2) defining the overall aim of the game, (3) deciding which elements of reality underpin the real-world problem, as well as the aim of the game; (4) defining how these elements should be represented within the game; (5) defining how the player can use and act upon these elements within the game; (6) testing and redefining the game design; (7) designing a game session including debriefing and additional research instruments, in order to provide rich feedback both to the players as well as the researchers”(p. 288).

Duke (1975) did not mention session design as part of the game design process, although step 9 includes a notion of the practical use of the game, which the game session design could also be a part of. Peters and Van de Westelaken (2014) elaborated in step 10 about practical use, indicating a form of session design. For example, an overview of the setup of the room and necessary resources should be provided to the client, as well as an overview of all necessary forms and resources. Only Lukosch et al. (2018) clearly mentioned the need for designing a game session as part of a game design process. However, they do not elaborates on this subject.

2.3.2. Effect of game session design on the outcome of the game

The literature about the game design process does not elaborate much about the specific role of game session design. However, this does not mean that there is no influence of game session design on the outcome of the game. Hofstede et al. (2010) identified seven possible sources of failure for game sessions. Although game session design is not one of them, it can be connected to design, facilitation, and emotions.

As discussed in the previous section, game session design can be seen as a part of the game design process. Hofstede described a wrong design as a mistake in the representation of reality in the game (i.e. the game is too simple or complex), which leads to the game being not enjoyable, or

failure to achieve the goal of the game. Although game session design is not mentioned in this study specifically, it could cause the game not being played as intended and therefore cause the game to fail.

Regarding facilitation as source of failure, Hofstede stated that "a well-designed game can be jeopardized by inadequate facilitation" (2010, p. 873). The design of the session is, just as facilitation, important during the game run and can therefore also jeopardize the outcome of the game. For example, failing technical resources, could influence the flow and duration of the game. In this report, the effects of session design on the play of the game, during the game run, are referred to as *events during the game sessions*.

Finally, choices in the game session design can affect the players' ability to share emotions in the right way. For example, the choice to play in a mediated environment means that the exchange of emotions, including facial expressions and posture, takes place over a mediated connection (e.g. using a screen, voice connection or text) instead of a physical connection. This can change the interpretation of these emotions and therefore the player experience. This also relates to the key characteristics of tabletop games where players sit around a table and can see each other, allowing them to understand each other's actions, even without verbal communication (Magerkurth et al., 2004).

2.4. 'Zoom' fatigue

From literature there is no clear indication of what the effect of a mediated environment will be on the outcome of a facilitated tabletop game. However, due to the coronavirus disease (COVID-19) pandemic in 2020, online conference meetings became the new way of working. For example, the platform Zoom expanded from 10 million daily participants in 2019 to 300 million in 2020 (Reuters, 2020). A new term followed, 'Zoom fatigue', indicating tiredness when using video conferencing software like Zoom. In an editorial in *Cyberpsychology, behaviour and social networking*, Wiederhold (2020) stated that "aside from mechanical malfunctions and networks struggling to handle increased traffic, people are now beginning to recognize a new phenomenon: tiredness, anxiety, or worry resulting from overusing virtual videoconferencing platforms" (p. 437).

Although no reviewed comparative studies about this phenomenon have been published so far, grey literature such as newspapers stated that an increased level of tiredness when video calling (Morris, 2020). One hypothesis on the cause of 'Zoom fatigue' comes from Jeremy Bailenson, professor and director of Stanford University's Virtual Human Interaction Lab. He states that technology can interrupt our finely tuned human interaction methods. A study in 2014 found that delays effects during speech communication over telephone systems changes the perception on the personality of the conversation partner (Schoenenberg et al., 2014). A large studies has been set up by Jeremy Bailenson to investigate the psychological effect of video conferencing (Hijink, 2020).

2.5. Conclusion of the literature review

The aim of this literature was to answer research sub questions (1) *How can the relation between a playing environment and outcome of a facilitated tabletop game be described and measured?* and (2) *What effects can be expected from playing a facilitated tabletop game in a mediated environment based on theory?*.

Based on literature, there seems to be no straightforward answer to describe the relation between the outcome of a facilitated tabletop game and the playing environment; this specific relationship has not been described anywhere. However, based on insights in this literature review, it is possible to conceptualize this relation.

Although it is possible to create a sense of presence using a mediated environment, the choice to play a facilitated tabletop game in a mediated environment could affect the outcome of the game. This outcome is twofold: the extent to which the goal(s) of a game has been achieved, or just the result of the game, and player experience. The player experience can affect the result of the game: a negative player experience can lead to failure of the game in terms of achieving the goals of the game.

The choice of playing a game in a mediated environment is part of the game session design. Just as session facilitation, the session design can cause events during the game session, for example a failing video connection or issues with audibility. This can affect the game session and therefore also jeopardize the player experience of the game. Also playing in a mediated environment could influence the exchange of emotions. This could affect the player experience, for example the sense of presence, or the result of the game. These relationships have been made visual in a conceptual model in figure

2.2, as a layer over the quasi-experimental design by Mayer et al. (2014). The conceptual component *Game sesion design* relates to the game session *X*, while this affects the conceptual component *Events during the game session*, based on the in-game observations and measurements. Player experience is affected by the game session design directly (e.g. problems with conveying emotions) and by the events during the game play. The *Result of the game* is affected by all of the conceptual components mentioned before.

With regard to expected results of a mediated environment compared to a physical environment, players in a mediated environment could become more tired. However, this relationship has not yet been proven in a peer-reviewed comparative study and is largely based on so-called 'gray' literature. Furthermore, according to the literature, it could be that the experiment succeeds in creating a sense of presence in mediated environment, similar to a sense of presence in a physical environment. However, it is not entirely clear what the effect might be on the outcome of the game, other than that the player experience in a mediated session can be worse compared to a physical session, because less emotions can be conveyed.

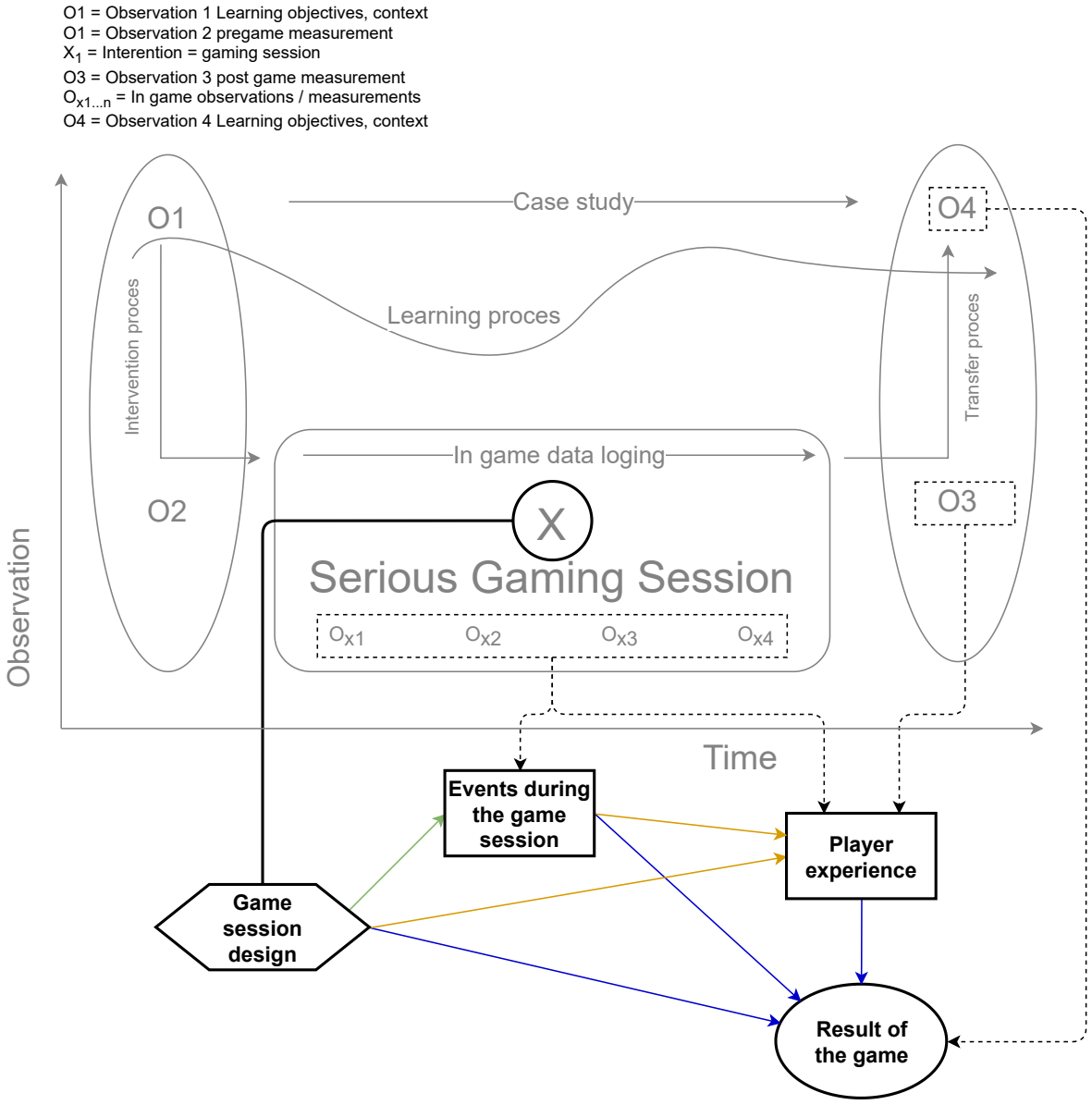


Figure 2.2: Conceptual model, original figure based on the quasi-experiemntal design by Mayer et al. (2014)

3

Methodology and Experimental Design

This chapter will discuss the methods used in this study, as well as the experimental design. First, in section 3.1 the choice for an explanatory mixed-methods design will be explained. Then, in sections 3.2 and 3.3, is described which quantitative and qualitative data were collected, respectively. Section 3.4 discusses how both methods have been integrated. Finally, in section 3.5, the experimental design will be be described, including a brief explanation of the game, adaptations for this study and the design of the game session, in particular how a mediated environment was created.

3.1. Explanatory mixed-methods research with a concurrent parallel design

This study followed a mixed-methods research approach, because it can answer the research question from both a qualitative and a quantitative perspective (see section 1.4). When following a mixed-method research approach, many designs can be used. In this section the choice for an explanatory mixed-methods research with a concurrent parallel design will be discussed.

3.1.1. Different designs for a mixed-methods approach

According to Johnson and Onwuegbuzie (2004), there are two questions that need to be answered by choosing a good mixed-method design with a combined quantitative and qualitative approach: 1) is one of the two approaches more important (i.e. dominant, with more weight) than the other and 2) are both approaches conducted concurrently or sequentially. Based on these questions, Johnson and Onwuegbuzie (2004) have identified 9 different mixed-method designs, but unfortunately they did not elaborate on these designs.

In order to choose a suited design for this study, a more substantive context was needed for the different types of designs. Creswell and Plano Clark (2011) did give more context using 6 mixed-method designs: convergent, explanatory, exploratory, embedded, transformative and multiphase. Borrego et al. summarizes the most important designs in table 3.1. The notation in this table is based on Morse (1991), where a qualitative (”qual”) or quantitative (”quan”) approach in capital letters is used for higher priority or weight than the approach in lower case letters. An arrow stands for sequential, while a plus means concurrent use of both methods.

In a triangulation or convergent design, there is need to collect both quantitative and qualitative data as they both provide a partial and equally important view of the problem. In an explanatory design, quantitative results are explained using qualitative data. An exploratory study aims to discover if a qualitative insight can be generalized using qualitative data. In an embedded design a qualitative insight is needed before quantitative data can be collected or vice versa. A transformative design focuses on a desired change, from where around the qualitative and quantitative research is built. Finally, a multiphase design is basically a project with multiple designs as mentioned before, but in separate phases.

Table 3.1: Mixed-method design types, based on Borrego et al. (2009)

Design Type	Timing of quan and qual phases	Relative weighting of quan and qual components	Mixing - when quan and qual phases are integrated	Notation
Triangulation	Concurrent	Equal	During interpretation or analysis	QUAN + QUAL
Embedded	Concurrent or Sequential	Unequal	One is embedded within the other	QUAN(qual) or QUAL(quan)
Explanatory	Sequential, quan then qual	Usually quan is given priority	Phase 1 informs phase 2	QUAN ->qual
Exploratory	Sequential, qual then quan	Usually qual is given priority	Phase 1 informs phase 2	QUAL ->quan

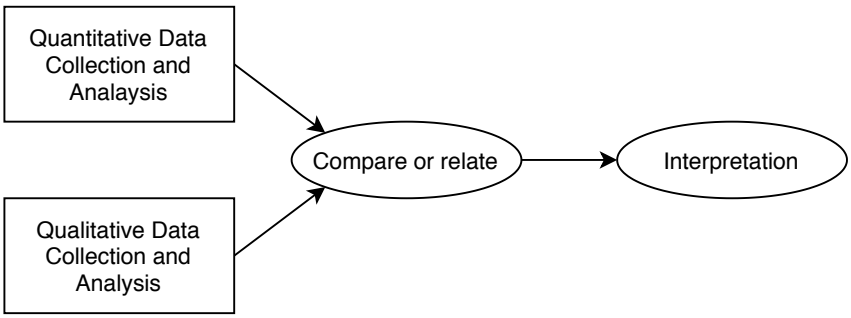
3.1.2. Explanatory approach with parallel design

This study focused on a potential relation between observations during the game session and the outcome of the game. The game session can influence the player experience and result of the game (i.e. achieving the goal of Cue Kitchen, see chapter 2). The question that needed to be answered, was how the qualitative observations of the game sessions can explain the quantitative outcome of the game (see section 1.3 sub question 6). Therefore, an explanatory design seemed to be suitable for this study.

However, an explanatory design has two sequential phases for the quantitative and qualitative design. Furthermore, the qualitative research questions are based on the qualitative data (Creswell and Plano Clark, 2011). This was not suitable for this study, because the quantitative and qualitative data had to be collected concurrently, due to time and practical reasons. Also, the quantitative and qualitative research questions have been formulated based on the research problem, the literature and the knowledge gap (see section 1.3).

Therefore, this study followed the steps of a convergent parallel design (see figure 3.2) but the philosophy and approach of an explanatory design. The risk of choosing this practical approach, is that there could be no relevant quantitative findings and therefore nothing for the qualitative findings to explain.

Table 3.2: Convergent parallel design for a mixed-methods approach, based on Creswell and Plano Clark (2011)



3.2. Quantitative data collection

This section explains quantitative data collected in this study. First, section 3.2.1 describes the player characteristics. Then, section 3.2.3 explains the variables measuring player experience and section 3.2.4 describes the variables measuring result of the game. Section 3.2.2 explains how social desired behaviour will be measured. Finally, section 3.2.5 gives a visual overview of the quantitative data collection.

In order to answer the quantitative part of the research question (see sub question 4 and 5, section 1.3), the outcome of the game as well as player characteristics needed to be measured. To determine the specific variables that needed to be measured, the conceptual model resulting from the literature

review (see section 2.5) needed to be operationalized. This means that conceptual components have been made measurable. Figure 3.1 shows the conceptual model with player characteristics as added component, including the (expected) relations between the components. The conceptual components *Game session design*, *Player experience*, *Result of the game*, and *Player characteristics* are quantitative. The component *Events during the game session* is qualitative (see 3.3)

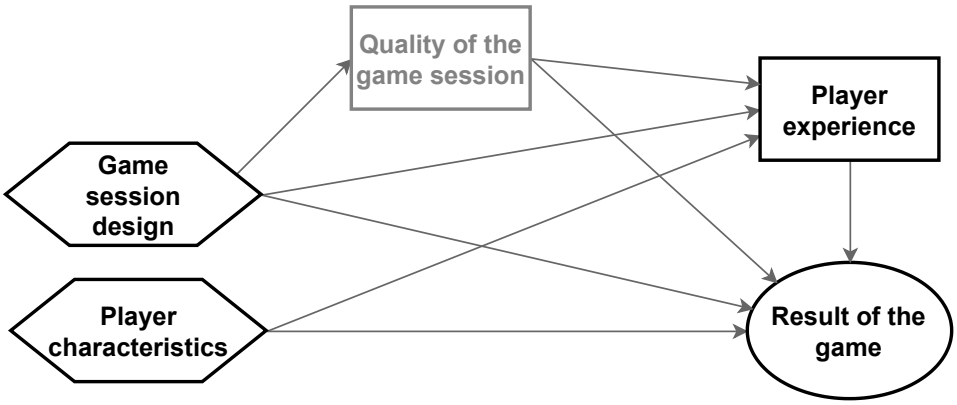


Figure 3.1: Conceptual model, including player characteristics

3.2.1. Measuring player characteristics

In order to answer sub question 5 about the effect of player characteristics, some basic player characteristics have been measured: age, level of education and gender. Also, four other player characteristic variables have been measured: players' attitude towards board games, experience with board games and frequency of playing board games (i.e. for fun) and their experience with mediated communication like Skype, Facetime or Zoom. Although these factors are not derived from literature, it is conceivable that these can influence the player experience and the result of the game. After all, it is likely that players with a lot of affinity with board games have a better and faster understanding of the game. This will affect their experience and possibly the result of the game.

3.2.2. Measuring socially desirable behaviour of the participants

When conducting an experiment followed by a questionnaire, there is a risk of socially desirable behaviour of the participants, especially when they enjoyed their participation. They might try to answer questions in the questionnaire based on what they think will help the researchers. The participants can pretend to be more positive than they really are or downplay any negative feelings they have. In the case of this experiment, in which the researcher is also the facilitator of the game, the risk of socially desirable behavior is even more present, since the participants get to know the researcher and have 'a face' connected to the questions in the questionnaire.

To determine if and to which extent the participants answer questions in a socially desirable way, a control question was added to the questionnaire. Participants needed to indicate to which extent they gained an increased respect for researchers involved in research about Parkinson's Disease after playing the game, using a Likert scale (5 steps, totally agree to totally disagree). A neutral or negative response would indicate that there is no socially desirable behaviour, since the game and debriefing should not increase respect for researchers involved in research about Parkinson's Disease. A positive response indicated some form of socially desirable behaviour, because this was probably not resulting from the game and debriefing but merely from interaction with the facilitator.

When the answers indicate that people show a lot of socially desirable behaviour, the results from the questionnaire could tend to be more positive than they would be without socially desirable behaviour. Unfortunately, it is hard to control for this phenomenon in a questionnaire beforehand. Also, the answers of participants who show socially desirable behavior are not excluded from the data set afterwards, because their answers are not invalid necessarily. After all, it cannot be determined to what extent the answers actually deviate from the real opinion of the player. However, when interpreting the results, the measurement of social desirable behaviour can be used to determine the validity of the data and possibly be used for recommendations

It should be noted here that social desirable behaviour can only be measured to a certain extent. Although playing Cue Kitchen should not directly lead to more respect for researchers working on Parkinson's disease, people may feel that more research should be done as a result of the game. In this regard, the measured result cannot be seen as fully convincing evidence that people do or do not exhibit socially desirable behavior.

3.2.3. Measuring player experience

Player experience is measured, using the Game Experience Questionnaire (GEQ) by IJsselsteijn et al. (2013) that measures game experience with 67 questions in three different modules: the Core Module, the Social Presence Module and the Post-game Module. These modules consists of 14 variables in total. Each variable is an average, composed of 3 to 6 (unique) questions. The questions are formulated as a statement (e.g. 'I thought it was fun'). Participants answer by choosing one answer on a 5 points Likert scale (totally disagree, disagree, neutral, agree or totally agree).

In this study, *Player experience* is divided into three sub components: In-game experience, Sense of presence and Post game experience. Below, these sub components are explained, including the variables that have been measured. See appendix D for an overview of the specific questions, including which variable they belong to.

In-game experience

The first sub component addresses what the player experienced while playing the game. IJsselsteijn et al. (2013) have identified seven variables of in-game experience in the Core Module of the GEQ:

- Competence
- Sensory and Imaginative Immersion
- Flow
- Tension/Annoyance
- Challenge
- Negative affect
- Positive affect.

In this study the questions related to Competence and Challenge have been excluded from the questionnaire, because it can be ambiguous if these questions relate to playing the game or, in case of a mediated playing environment, using the digital communication technology. This also limits the number of questions in this study, which benefits the user-friendliness of the questionnaire for participants. In addition, fewer variables (and therefore fewer statistical tests) will reduce the chance of finding false-positive results in terms of significance. The revised Core Module of the GEQ consists of 23 questions.

Sense of presence

To measure the sub component sense of presence, the Social Presence Module of the GEQ has been used. The main goal is to measure how the player experiences the presence of other players. In this study, where players in a mediated environment are not in each others physical presence, it is important to study psychological and behavioural involvement of the player with other players. This sub component consists of three variables:

- Behavioural Involvement
- Psychological Involvement – Empathy
- Psychological Involvement – Negative Feelings.

Post-game experience

The sub component post-game experience has been measured using the Post Game Experience Module of the GEQ. It assesses how players felt after they had stopped playing, in contrast to the core module which is based on the experience during the game. The four variables that construct this sub component are:

- Positive experience
- Negative experience
- Tiredness
- Returning to Reality

3.2.4. Measuring result of the game

The result of the game, in which extent the goal of the game is achieved, was measured using five questions in the questionnaire (see appendix D). The goal of the game is to increase awareness about the invisible symptoms of Parkinson's Disease and to enable the players to start a conversation about the personal invisible symptoms of the relative, acquaintance or friend so they have an improved understanding of his personal situation.

To measure awareness, the players have been asked if they have an gained an improved understanding about invisible symptoms, the concept of cues, and Parkinson's Disease in general. In the case of a person with Parkinson, his expectation about an improved understanding among his fellow players has been measured.

The result of the game in terms of a personal conversation about the players' personal situation has been measured by two variables. The first variable measured whether the game has indeed enabled the players to start a personal and relevant conversation about the personal symptoms of the person with Parkinson's, and in that way has increased understanding in the social environment about the personal situation of the person with Parkinson's Disease. The second variables measured to what extent the players expect that this conversation has ensured that the person with Parkinson's can be helped better in the future.

The player with Parkinson's Disease will be asked if:

1. he expects his fellow players to have an improved understanding of:
   (a) having an invisible symptom
   (b) the concept of cues
   (c) Parkinson's Disease (in general)
2. the game helped him to start a conversation about his own symptoms and cues
3. he expects that his fellow players can help him better in the future

The players in the social environment of a person with Parkinson's Disease will be asked if:

1. they have an improved understanding of
   (a) what it is to have an invisible symptom
   (b) the concept of cues
   (c) Parkinson's Disease
2. they have an improved understanding for the specific situation of the person with Parkinson's Disease that they know
3. they expect that, in the future, they can help the person with Parkinson's Disease that they know better

3.2.5. Overview of quantitative data collection

This section has explained how the quantitative components in the conceptual model will be measured. An overview of the operationalized conceptual model, including all quantitative components and variables, is shown in Figure 3.2.

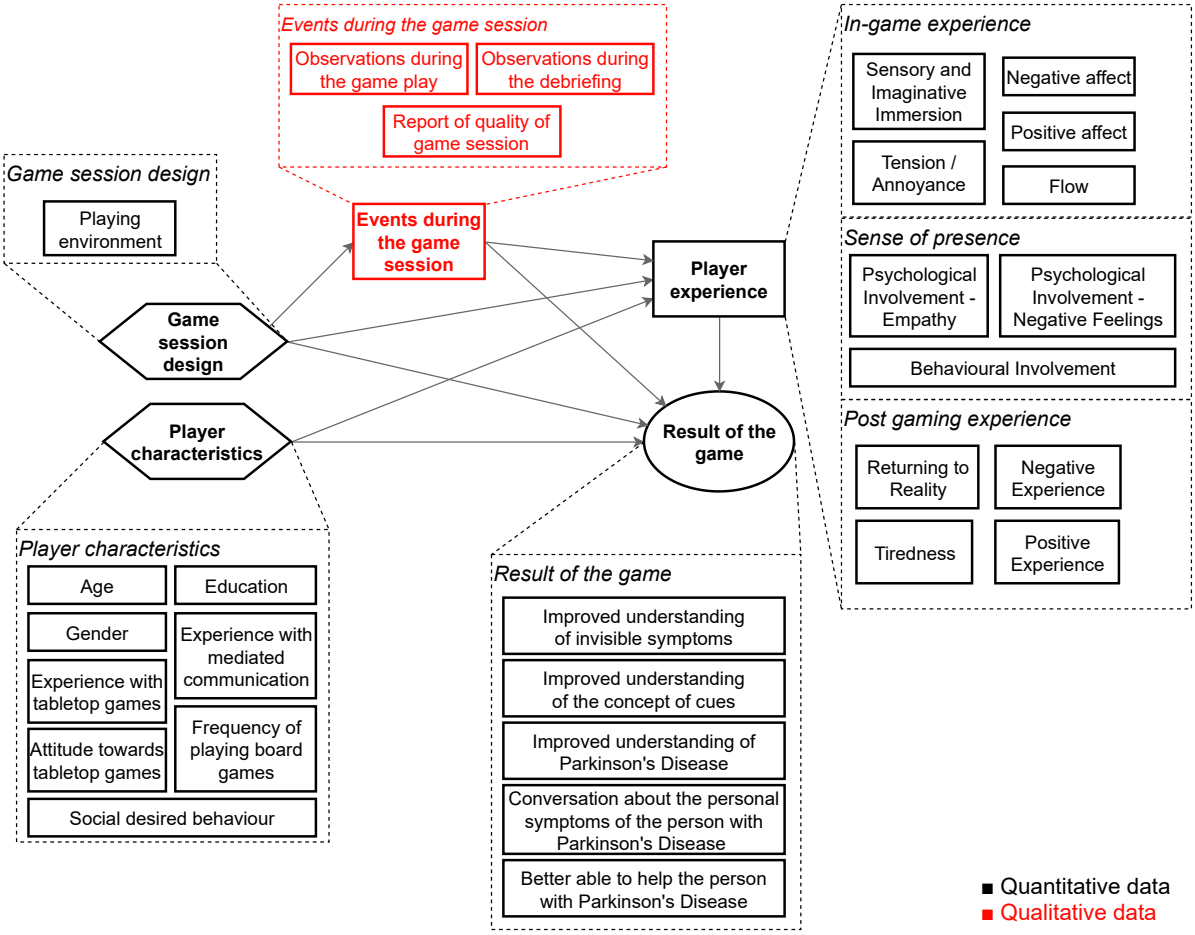


Figure 3.2: Operationalized conceptual model - Overview of quantitative and qualitative data

3.3. Qualitative data collection

In order to answer sub questions 3 and 5 about how a playing environment affects the game session, in-game observation have been made (see the qualitative component *Events during the game session* in Figure 3.1). Most of the sessions have been recorded (with informed consent of the players) to make it possible to re-watch the session and to describe the events in the session as specific as possible. In some cases, the session was not recorded, but notes were taken during the game sessions.

These observations of each session are reported in a game session report, containing the following qualitative elements:

- Description of the player group
- Report of quality of game session, mainly focused on the performance of technology used for the mediated environment, but also on preparation of the players and facilitator and other factors that influenced the game play
- Report of the game play, focused on how the game was played
- Report of the debriefing, focused on how the debriefing went
- Feedback in the questionnaire, although this is not really an in-game observation. Players had the option to provide feedback in the questionnaire
- Conclusion and additional comments (i.e. observations that are not related to any of the elements before)

See figure 3.2 to see the conceptual component *Events during the game session* operationalized using the different reports as mentioned above. The qualitative results are summarized and analysed in chapter 5. See appendix G for the game session reports, with the qualitative elements as presented above.

3.4. Integration of quantitative and qualitative data

The qualitative results are integrated in two different ways. First, the qualitative and quantitative data will be integrated per session. The game session reports contain the individual qualitative results of each session (player characteristics, player experience and results of the game). The conclusion of each game session gives a short elaboration on how the observations in that session can explain the individual results. The second integration will be done on an aggregated level, focusing on how the summarized and analyzed qualitative data can explain the general results found in the quantitative data.

3.5. Experimental design

In this section, the experimental design and game setup will be described. First, in section 3.5.1, the selection of participants will be explained. Then, in section 3.5.2, the game of Cue Kitchen will be briefly discussed. In section 3.5.3 the adaptation of the game will be explained, followed by the experiment procedure in section 3.5.4. Finally, in section 3.5.5 the setup of Cue Kitchen in a mediated environment will be explained.

3.5.1. Participants

Potential participants have been approached through the network of MaySways foundation and through a call on the Facebook page of the Dutch Parkinson's Association. The target group consists of persons with Parkinson's Disease (PD) and people in their social network like family, friends, colleagues, or healthcare providers. A game can be played by players from the social environment and with the person with PD either playing along or observing. Ideally, the person with Parkinson's is present during the session, in order to explain what invisible symptoms of Parkinson's Disease he experiences in his personal life and how others can support him.

Because the experiment is conducted with human test subjects, an application has been made to the Human Research Ethics Committee of the faculty Technology, Policy and Management of the TU Delft. This includes a checklist and data management plan. Before test subjects play the game, they have to give informed consent in an online questionnaire, using *Qualtrics* software for online questionnaires. The checklist, data management plan, and informed consent form are attached in Appendix A.

3.5.2. Explanation and background of Cue Kitchen

In 2019, a student team created the serious game Cue Kitchen, commissioned by the MaySways foundation during the TU Delft course *Game Design Project*. The MaySways foundation, based in Aerdenhout, the Netherlands, is committed to create awareness of invisible symptoms in Parkinson's Disease. MaySways is committed to creating empathy and understanding in the outside world by artfully expressing the invisible thought and emotional world of the patient MaySways (2018).

Cue Kitchen focuses on the people around someone with Parkinson's Disease (PD) such as family, friends, colleagues, employers, or healthcare providers. The aim of this game is to create awareness in the social environment of people with PD about the invisible symptoms and the importance of so-called cues. The game also aims to initiate the conversation between the person with PD and his social environment about their symptoms and how others can help him with these symptoms by using cues.

Cue Kitchen is a cooperative tabletop card game with 4 players, where the (in-game) goal is to run a successful service in a professional kitchen by using ingredient cards to cook dishes. Each player is a different chef and has its own speciality, while together they are responsible for cooking dishes and score as many points as possible. However, each player also has an 'invisible symptom' that limits his game play. For example, he is not able to begin his turn. However, if a certain cue is used, it can help the player overcome its symptom. For example, if another players reminds him of his turn. The other players also have to guess and discover this symptom and cue to score additional points.

The game is played two times in a row. The first time it is played without symptoms, to get used

to the rules, game play and, in case of a mediated environment, the game setup. The second time, the players are used to the rules and processes, and the invisible symptoms and cues are introduced. This affects the game play, especially when it takes a long time before invisible symptoms and cues are discovered.

During the debriefing, the players reflect on the game, using the 'debriefing guide' with questions, talking points and information about invisible symptoms of Parkinson's Disease. The players relate their experiences in the game to the invisible symptoms of Parkinson's Disease as well as the importance of cues that can help a person with PD. Ideally, this starts a personal conversation. The facilitator guides and moderates the conversation.

See appendix B and appendix C for the manual and debriefing guide, both in Dutch.

Video tutorials are available for playing Cue Kitchen in a physical environment, (`https://youtu.be/Q6GPjVKXB2U`) or a mediated environment (`https://youtu.be/ZCLeGoxAelk`).

3.5.3. Adapting Cue Kitchen for a mediated environment

In order to make the Cue Kitchen suitable for playing in a mediated environment, the game play has been slightly adapted, without changing the basic principles and goals of the game. In the first place, the die has been removed from the game play, including invisible symptoms like 'you are unable to roll the die'. In the second place, other invisible symptoms involving a physical action have been removed, like giving cards to other players.

Table 3.3: Invisible symptoms and cues in a mediated environment

Player	Invisble symptom	Cue
1	You get angry when someone else cooks a dish.	Another player reminds you that you earn the points together.
2	You can't cook.	Another player tells you which ingredients you can use to make a dish.
3	You can't start your turn.	Another player reminds you that it is your turn.
4	You forget to use your special ability.	Another player tells you what your special ability is.

Finally, to increase the flow of the game, the invisible symptoms were chosen beforehand, instead of picked at random. In this way, the facilitator has had the symptoms an cues prepared to send them in a personal message (i.e. in the chat) to the players. Table 3.3 contains the four invisible symptoms in the mediated session.

3.5.4. Experiment procedure

The procedure consisted of a preparation phase, the game session itself and the evaluation phase. This section explains the details of the procedure for each phase .

Preparation phase

1. When a potential participant with Parkinson's Disease (PD) was found, information about the game was provided, so that the participant knew what was expected from him and his relatives. Also, information about the purpose and method of the study was provided.
2. The participant with PD selected three or four players in his social environment, depending on if he wanted to play himself. The facilitator received their contact information.
3. The facilitator sent a 'date picker' in order to select a date and time for the session. In the same e-mail, the facilitator sent information about the purpose of the study.
4. After the date had been selected, the players were asked to fill in an online informed consent form, using the *Qualtrics* platform. This form informed the participants about the use of personal data in the study and asked for their permission (see appendix A).
5. Finally, information about the game session was sent, including an invitation link for the digital session in case of a mediated session. Also, a video tutorial explaining the game has been shared (except the first session).

Game session

1. Each session started about 15 minutes earlier, in order to welcome the players, setting up the game and, in case of a mediated session, helping the players to access the mediated environment.
2. The game was played two times, the first time without invisible symptoms and the second time with invisible symptoms. Each game took about 30 minutes to complete.
3. The debriefing started with a reflection on the game, and more specifically with the invisible symptoms of the players. After that, it was related to Parkinson's Disease (PD) in general and the specific symptoms of the player with PD.

Evaluation phase

1. One to three days after the game session, the players were sent an e-mail, with a link to a questionnaire on the *Qualtrics* platform. It takes about 10 to 15 minutes to complete this questionnaire. See appendix E for the questionnaire in Dutch. A translation can be found in appendix D.
2. After one to two weeks, players who did not complete the questionnaire were reminded to complete it.

3.5.5. Game setup in a mediated environment

In a mediated session, all players can see the playing field of the game on their screen, including the playing cards (see figure 3.4). By giving the facilitator directions of their desired actions, they could participate in the game play. In order to achieve this, the software of Big Blue Button has been used (see figure 3.3). This is an open source web conferencing software, similar to Zoom. Players needed a laptop, computer (with webcam) or tablet, with a Google Chrome browser. The version of Big Blue Button used in this study, has been specially set up by TU Delft for educational purposes.

To make a mediated environment possible, no professional tools have been used, but only day-to-day objects, that is available to everyone. The playing table was filmed using a smartphone and a construction made of kitchen stairs, some books, rope, tape and a book shelf. Figures 3.5, 3.6, 3.7 and 3.8 give an impression of the setup of the mediated session.

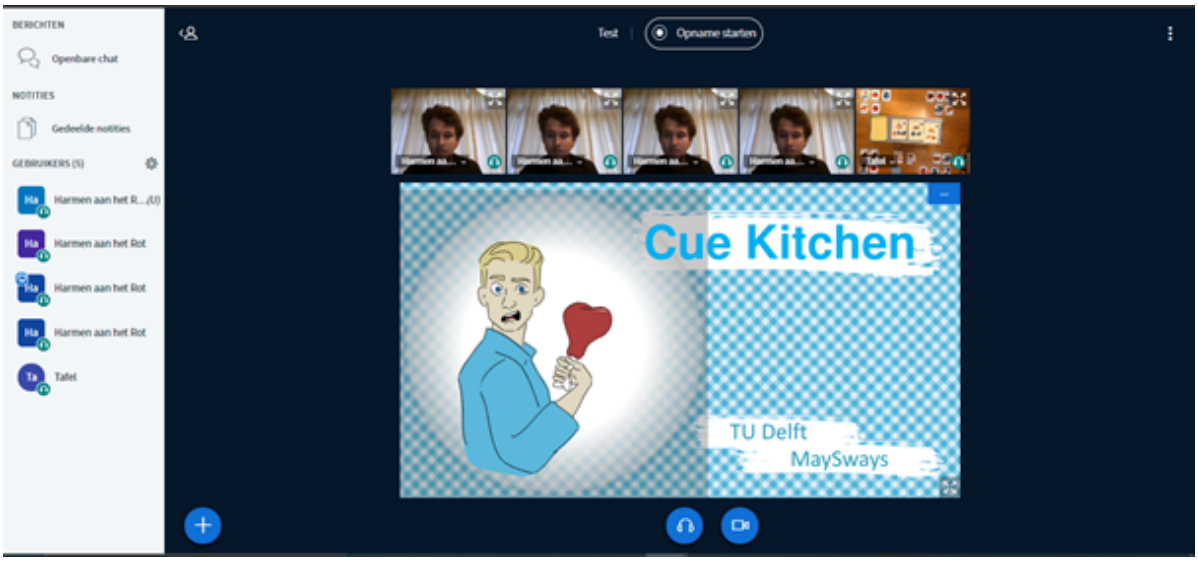


Figure 3.3: Screenshot of the Big Blue Button Environment

Figure 3.4: Screenshot of the playing table

Figure 3.5: Setup overview photo (1)

Figure 3.6: Setup overview photo (2)

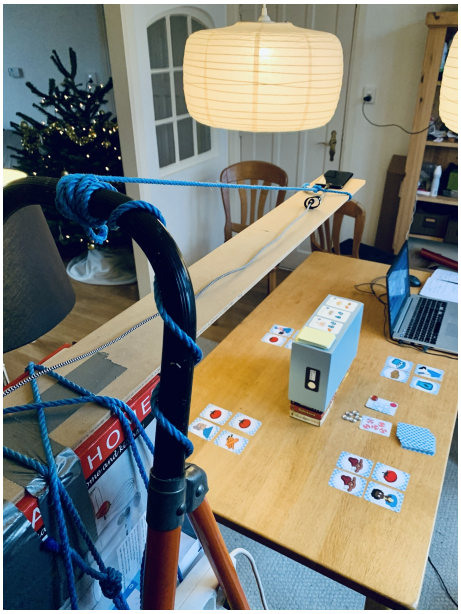


Figure 3.7: Table recording unit (1)

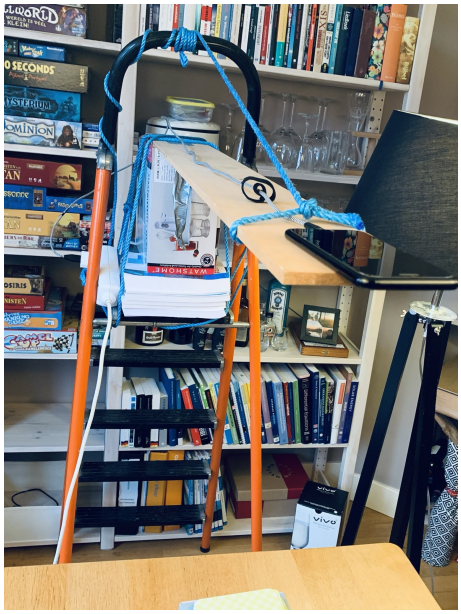


Figure 3.8: Table recording unit (2)

4

Quantitative Results

In this chapter, the quantitative results will be presented, resulting from the online questionnaire participants have completed on the *Qualtrics* platform, after the having played Cue Kitchen. First, in section 4.1 an overview of the participants and their backgrounds will be presented. Then, section 4.2 presents the outcome of Cue Kitchen in terms of the Player Experience, after which section 4.3 describes the outcome of Cue Kitchen in terms of achieving the goals. Finally, the quantitative results will be summarized in section 4.4. Appendix F presents the results of the statistical tests that have been performed in this study.

4.1. Participants

A total of 11 game sessions were organized and carried out, of which 8 in a mediated environment and 3 in a physical environment. The reason for the difference between both environments is that only 3 groups were of a single household. The rest of the groups consisted out of more household and because of the measures with regard Coronavirus disease pandemic, it was not possible to do this sessions in a physical environment.

A total of 49 participants have played the game. Table 4.1 shows an overview of the number of participants and completed questionnaires. In a one game session with four healthcare professionals, there was no participant with Parkinson's Disease present. 13 questionnaires were completed by participants who played in a physical environment and 31 by participants who played in a mediated environment.

Table 4.1: Number of participants

	Physical environment		Mediated environment		Total
	Parkinson's	*Social env.*	*Parkinson's*	*Social env.*	
Participants	3	12	7	27	49
Players	2	10	6	26	44
Observers	1	2	1	1	5
Completed questionnaires	3	10	7	24	44

As shown in table 4.1, 4 participants where not a player in the game themselves. In two game sessions the person with Parkinson's disease and one and two persons in his social environment were observing the game play. Resulting from the cooperative character of Cue Kitchen, these players were participating in game discussions (e.g. about the game tactics and guessing symptoms). Furthermore, these participants played an important role during the debriefing.. Therefore these observers have been treated as if they were players themselves and also asked to complete a questionnaire.

Unfortunately, 5 participants, all from the social environment, did not complete the questionnaire, 2 of which played in a physical environment and 3 played in a mediated environment. While it is regrettable that less data were collected as a result, it is not likely that this has an important effect on the data analysis, because the ratio between participants in both environments is similar to the ratio

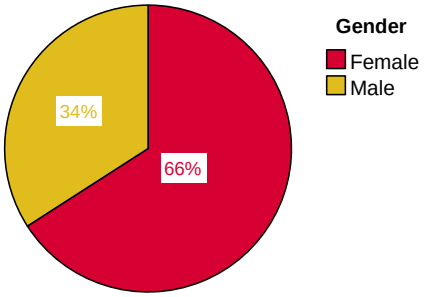


Figure 4.1: Gender distribution

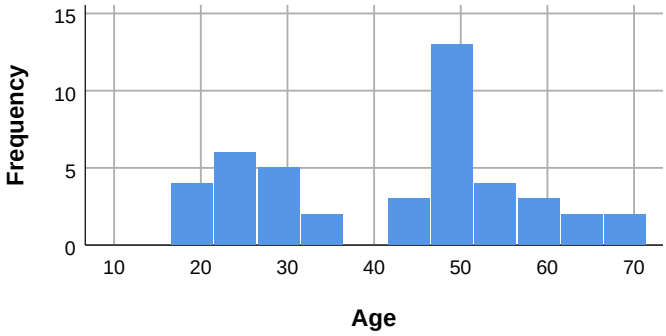


Figure 4.2: Age distribution

of completed questionnaires in the both environments, respectively 0.44 and 0.42. This ratio is not more skewed because of the missing questionnaires. The completed questionnaires did not have any missing values.

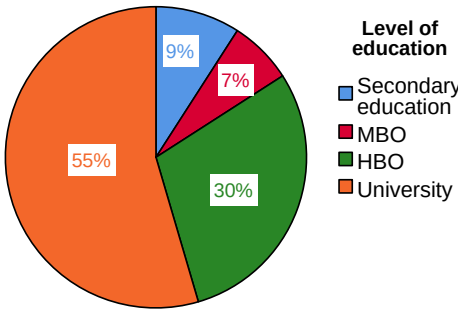


Figure 4.3: Level of education

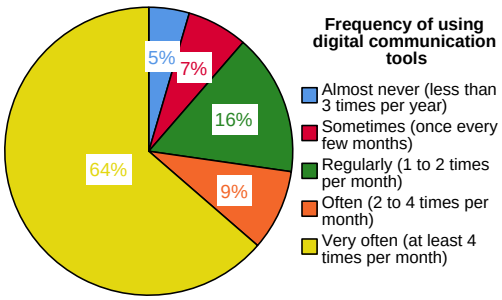


Figure 4.4: Experience with digital communication tools

4.1.1. Player characteristics

A large majority of the participants were women (see figure 4.1). An explanation for this can be found in test session 3 with a group of 7 female friends and test session 11 with a group of 4 friends, a total of a quarter of the number of participants. The rest of the groups were mixed in gender. Only 1 of the outcome variables, *Negative Feelings*, showed a significant, low positive correlation (r=0.352, p=0.019) with gender (see Appendix F, table F.1) were female is coded as '1' and male as '2'.[1] The variable *Negative Feelings* measures a negative psychological involvement as part of the Social Presence Module. This results indicates that male participants experience more negative feelings *towards other players*, like jealousy, revenge and malicious delight. Also, the mood of the male players are more dependent on the mood of the other players. The rest of the outcome variables showed no significant correlation with gender.

In the age distribution in the group with participants, it is clearly visible that the game was mainly played with people aged 20 to 35 and 50 to 60 years old (see figure 4.2). An explanation for this is that many sessions were played with people with Parkinson's disease, their partner, friends (often peers) or children. Cue Kitchen focuses in particular on people where the invisible symptoms are developing. The age at which a person is diagnosed with Parkinson's is often between 50 and 65 years(van Laar, 2012), and their children, if any, are between 15 and 35 years old. Only 1 of the outcome variables, *Behaviour Involvement*, showed a significant, low negative correlation (r=-0.410, p=0.06) with Age (see table F.1 in Appendix F). *Behaviour Involvement* is measured as part of the Social Presence Module. It

[1] In the statistical tests that determine the correlations between variables in this study, a Spearman's rank correlation has been used. This is a non-parametric measure of rank correlation and can be used if one or both of the variables are not continuous but ordinal. This is the case for measuring all player experience variables and result variables, since for all these variables a Likert scale is used

measures the extent to which a player felt connected to the other players, with his own behaviour and actions influencing other players' and vice versa. This result indicates that younger participants were slightly more behavioural involved with the other players than older players. The rest of the outcome variables showed no significant correlations with Age.

It stands out in figure 4.3 that most participants in this study are all highly educated (i.e. University or HBO (Higher Vocational Education)). Figure 4.4 shows the experience of participants with digital communication tools, such as Zoom, Skype or FaceTime, in terms of the frequency they use these tools. A vast majority of the participants (73%) use more than 2 times a month. No significant correlations were found between the level of education or the experience with digital communication tools and the outcome variables (see table F.1 in Appendix F).

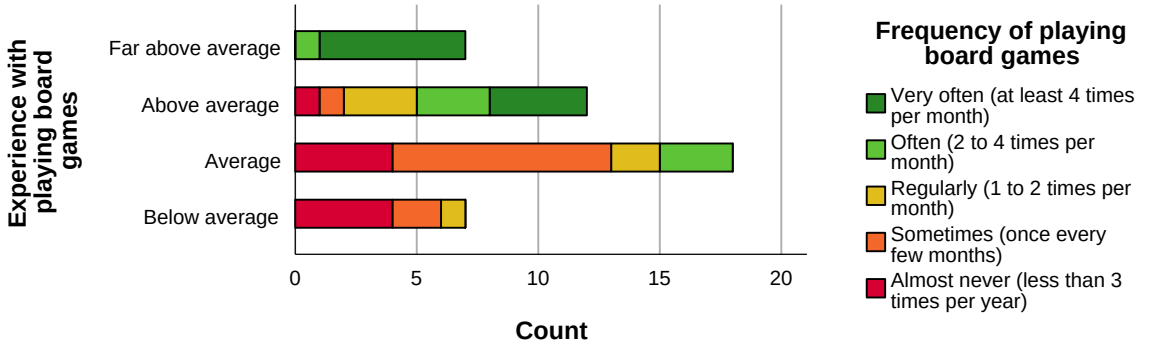


Figure 4.5: Player's experience with board games

Most participants consider themselves an average player of (regular) board games in terms of experience (see figure 4.5). Half of the average players, play once every few months a board game, the other half plays it about equally more or less often. The participants that consider themselves far above an average experienced player, play board more than 4 times per month. Only a small portion of the participants play board games on a regular basis (1 or 2 times per month). Nobody considers themselves a far below average player of board games in terms of experience. More than three quarters of the participants indicate that they (really) enjoy playing board games.

Between the the three input variables experience with playing board games, frequency of playing board games and opinion on playing board games, some moderate correlations have been found (see Appendix F, table F.2). This is not a surprising result, because these variables are similar, measuring affinity with board games. However, it is worth noticing that not a single participant considers himself having a *far below average* experience. Moreover, most players who *almost never* play a board game, still consider themselves having an *average* or even *above average* experience.

Between variables measuring affinity with board (experience with, frequency of and opinion on playing board games) and the age of the players significant, low negative correlations has been found (with r-values -0.359, -0.359, -0.306 and p-values 0.017, 0.017, 0.043). Between the experience of playing board games and gender a significant, low negative relation has been found with r=0.318 and p=0.036. These results indicates that younger participants show a little more affinity with board games than older players. Also, male players consider themselves a little more experienced than female players.

4.1.2. Socially desired behaviour

By means of a question about increasing respect for researchers involved in research into Parkinson's disease, the extent to which the players provide socially desirable answers was measured. It should be noted that more than half (57%) of the participants indicated that they received more respect through the game session. A third indicated that they were neutral and a small number disagreed with this statement. This means that it is possible that most players showed some socially desirable behaviour.

To interpret socially desirable behaviour even better, it was examined whether the outcome variables show correlations with this particular question. Five outcome variables, all measuring Player Experience, show significant low correlations with the variable measuring social desired behaviour (see table

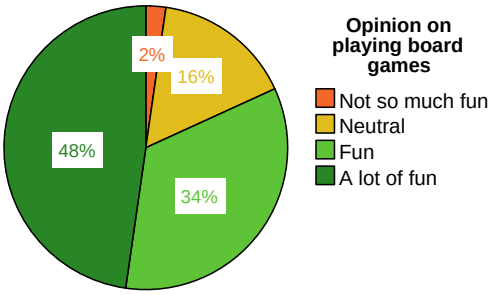


Figure 4.6: Player's opinion on board games

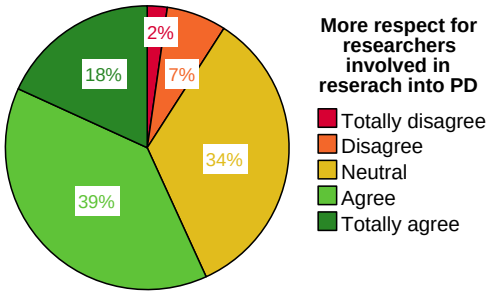


Figure 4.7: Socially desired behaviour

Table 4.2: Correlations between Social Desirable Behaviour and output variables (abridged version of table F.3 in Appendix F

		Social Desirable Behaviour
Sensory and Imaginative Immersion	Cor. Coefficient	0.405
	Sig. (2-tailed)	0.006
Flow	Cor. Coefficient	0.390
	Sig. (2-tailed)	0.009
Tension / Annoyance	Cor. Coefficient	-0.357
	Sig. (2-tailed)	0.017
Positive affect	Cor. Coefficient	0.369
	Sig. (2-tailed)	0.014
Negative Experience	Cor. Coefficient	-0.307
	Sig. (2-tailed)	0.043

4.2). No significant correlations have been found between the other output variables and the variable measuring social desired behaviour(see table F.3 in Appendix F). These results indicate that although based on this question some socially desirable behaviour can be expected, it can be assumed that it didn't have important affect the other answers of the players, since correlations were absent or low. Furthermore and more important, there were no correlations with the questions measuring the result of the game. In other words, participants who show possible socially desirable behaviour according to the control question, did not appreciate or rate the result of the game better than participants who did not show this behaviour.

4.2. Player Experience

The Game Experience Questionnaire (GEQ) (IJsselsteijn et al., 2013) consist of three parts: the Core Module, the Social Presence Module and the Post-game Module (see chapter 3 section 3.2.3). This subdivision will also be used in this section in order to display the results in an orderly manner.

An overview of the scores on the Player Experience variables from the Core Module, Social Presence Module and Post-game Module can be found in figure 4.8, figure 4.9 and figure 4.10, respectively. It is noticeable that the median of Tension/Annoyance, Negative effect, Negative experience and Returning to reality are all below 1, which relates to answers 'Totally disagree' (coded as 0) and 'Disagree' (coded as 1). This means that most players did (almost) not experience any tension or annoyance, negative affect during the game or negative experience after the game and had no problem with returning back to reality. Also noticeable is the relatively large range of the variables Flow, Behavioural involvement and Tiredness. This indicates that some players experienced a flow, were involved with other players or were tired, while other players did experience these components vice versa.

Many of the Player Variable variables are significantly correlated to each other (see table F.9 in Appendix F. Negative affect has a significant correlations to 9 of 11 other variables, among which two moderate. Positive Affect and Empathy are also heavily correlated to other variables with both 8 correlations. Positive affect has a strong correlation to Sensory and Imaginative Immersion (r=0.754,

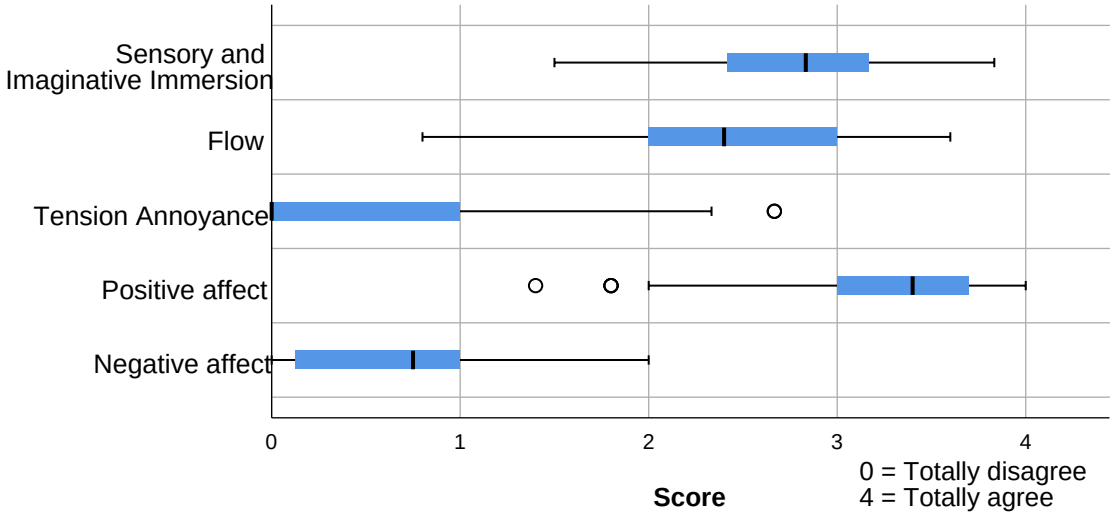


Figure 4.8: Player experience - Core Module

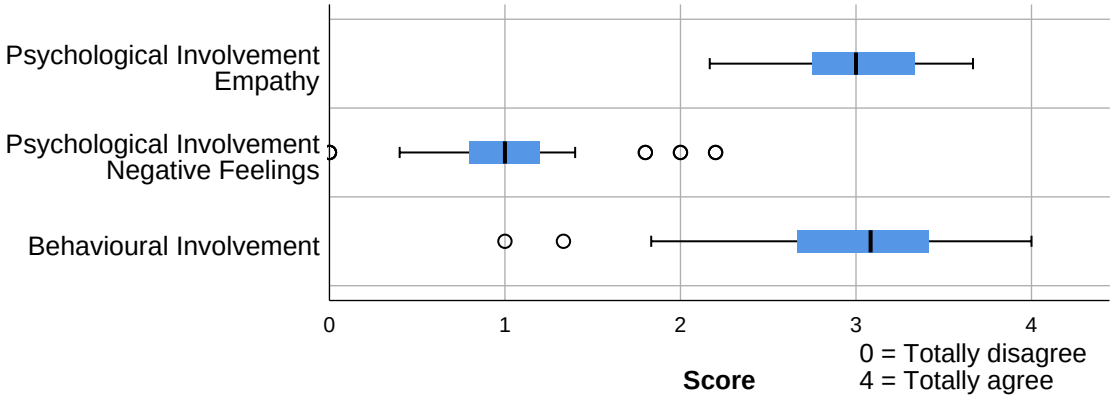


Figure 4.9: Player experience - Social Presence Module

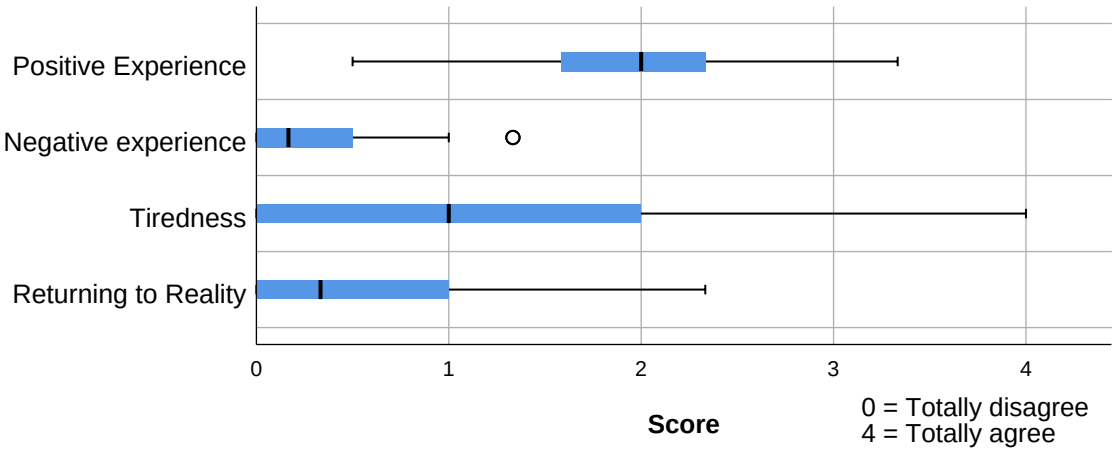


Figure 4.10: Player experience - Post-game Module

p=0.000). This means that players who feel more immersed in the game, also have a more positive experience during the game play. Only the variables Negative Feelings and Tiredness are less related to the other variables with only three significant low correlations. These results indicates that partic-

ipants have experienced most of the different components of player experience in a similar way. In other words, the extent to which a player has experienced the game is similar for most components.

4.2.1. The effect of the playing environment on player experience

In most cases almost no clear difference has been measured between both environments (See figure F.1 in Appendix F for the boxplots of the scores of the Player Experience variables in both the physical as the mediated environment). However, the variable *Tiredness* is a clear exception. In figure 4.11 the difference of the experience of tiredness between both environments is clearly visible. In a physical environment all players disagreed or totally disagreed with the statements 'I felt exhausted' and 'I felt weary". However, in a mediated environment, participants responded in a wider range, including totally agreeing wit this statement. This result indicates that participants in a mediated environment are more tired after having played the game or, technically more correct, disagree less with being tired. A statistical test show, indeed, a significant difference between the (ranked) score of *Tiredness* in a physical and mediated environment (U-value = 91.5, p=0.003). [2]

As expected from figure F.1 in Appendix F, the other variables do not show any significant differences in the (ranked) scores between a physical and mediated environment (see tables F.11 and F.12 in Appendix F). These results indicate that, apart from tiredness, the playing environment does not affect the player experience in a significant way, not even the components from the Social Presence Module. So, interesting enough, the feeling of presence without the other players physically present is not significantly different than playing in a physical setting.

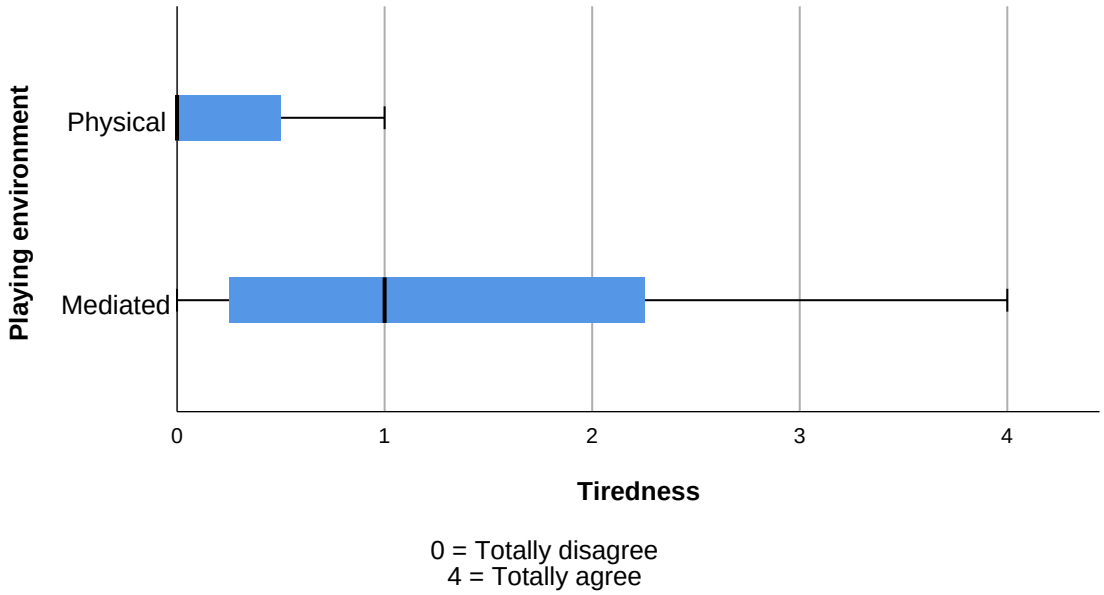


Figure 4.11: Tiredness in a physical and mediated environment

4.2.2. The effect of Parkinson's Disease on player experience variables

In most cases almost no difference has been measured between both perspectives (See figure F.2 in Appendix F for the boxplots of the scores of the Player Experience variables of both the Parkinson's Disease (PD) and Social Environment's perspective). Almost every variable in both groups has a wide range, but in most cases the interquartile range (IQR) from both groups are overlapping. This indicates that players from both groups have responded similar to the questions. The wide range especially

[2] In the statistical tests determining differences between variables in this study (i.e. a mediated vs. a physical environment or players with or without Parkinson's Disease) a Mann-Whitney test has been used. This non-parametric test is an alternative for a independent samples t-test. A Mann-Whitney test is is suitable for small and non normally distributed outcome variables in small samples. In this study only 10 participants had Parkinson's Disease and only 13 played in a physical environment. Furthermore, a Mann-Whitney test is suitable for analyzing variables that are not continuous but ordinal. This is the case for measuring all player experience variables and result variables, since for all these variables a Likert scale is used

applies to the variable Tiredness, which can be explained by the difference in playing environment (see previous sub section).

However, the IQR of the variable Returning to Reality does not overlap (see 4.12. The score of participants with PD is clearly higher than participants from the social environment. Statistical test confirm a significant difference between the (ranked) score of Returning to Reality from a Parkinson's and social environment's perspective, respectively, with an U-value of 73.5 and a p-value of 0.003. This could indicate that participants with PD struggled more with returning back to reality after the game was played, than participants without PD. It should be noted that apart from one outlier (with Parkinson's Disease) all participants disagreed with the statements 'I felt disoriented', 'I found it hard to get back to reality' and 'I had a sense that I had returned from a journey'. In other words, the difference between both perspectives is particularly the extent to which they disagree.

The other Player Experience variables do not show any significant differences in the (ranked) scores between both perspectives (see tables F.13 and F.14 in Appendix F). These results indicate that participants with Parkinson's Disease do not have a significantly different player experience than participants without Parkinson's Disease. However, it should be noted that the sub groups are small, which increases the chance of a difference not being detected (Type II Error).

Finally, the playing environment is not a significant factor when determining the difference between players with or without Parkinson (see figures F.18 to F.27 in appendix F. Also the players' perspective is not a significant factor when determining the difference between a physical and mediated environment.

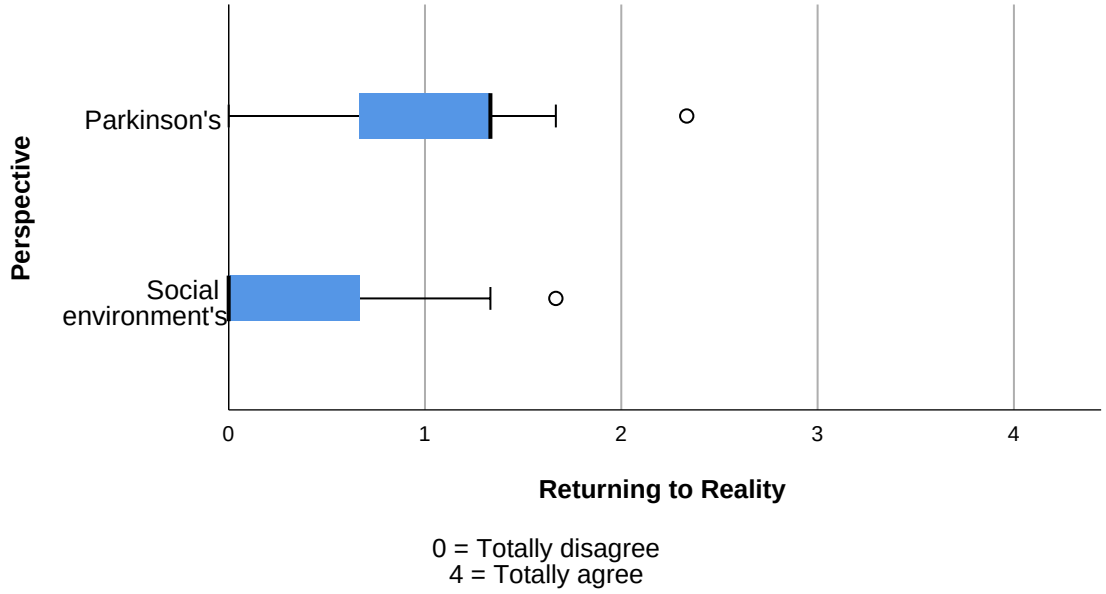


Figure 4.12: Returning to Reality with a Parkinson's perspective and Social environment's perspective

4.3. Achieving the goal of Cue Kitchen

Figure 4.13 shows the overall result of playing Cue Kitchen in terms of achieving the goal of the game: that is creating awareness of the invisible symptoms, cues and Parkinson's Disease (PD) and enable the player with PD to start a conversation about his own symptoms and cues.

Most participants (77%) indicate that they have more understanding of invisible symptoms and cues. Just over half of the participants also expect an improved understanding of Parkinson's Disease. More than a third of the players indicated that the game helped to start a conversation about the individual symptoms and cue of the person with Parkinson's Disease involved in the session. However, this variable has a slightly different interpretation for individuals with and without Parkinson's disease (see section 4.3.2). A majority also indicates that they expect the participant with Parkinson's Disease can be better helped in the future. For all variables the mode and median is 'Agree'.

Most of the output variables measuring the extent to which the goal of Cue Kitchen is achieved have low to moderate correlations between themselves (see table F.4 in Appendix F, also for the test

results).

All result variables (in terms of achieving the goal of the game) are correlated with Sensory and Imaginative Immersion and Negative Experience (see table F.10 in Appendix F). All correlations are low, except between three moderate correlations between an improved understanding of Parkinson's Disease and Empathy(r=0.516, p=0.000), Positive affect(r=0.521, p=0.000) and Sensory and Imaginative Immersion (r=0.598, p=0.000). This means that participants who are more immersed in the game, have a more positive in-game experience and/or experience more empathy during the game (are expect to) have an improved understanding of Parkinson's Disease.

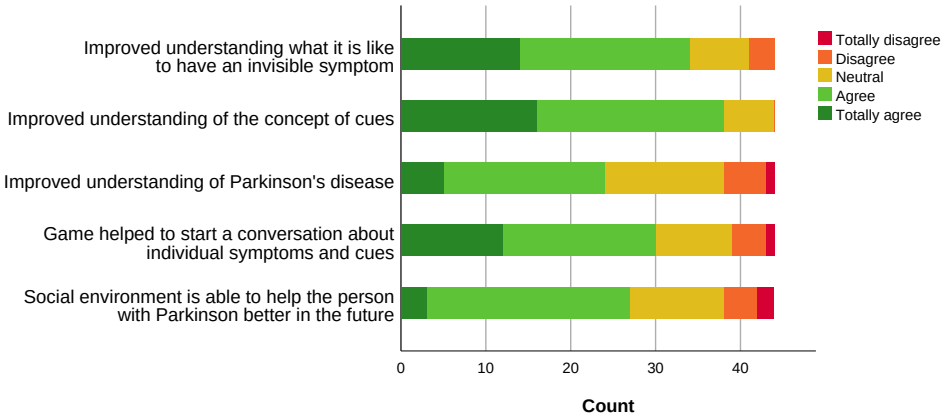


Figure 4.13: Achieving the goal of Cue Kitchen

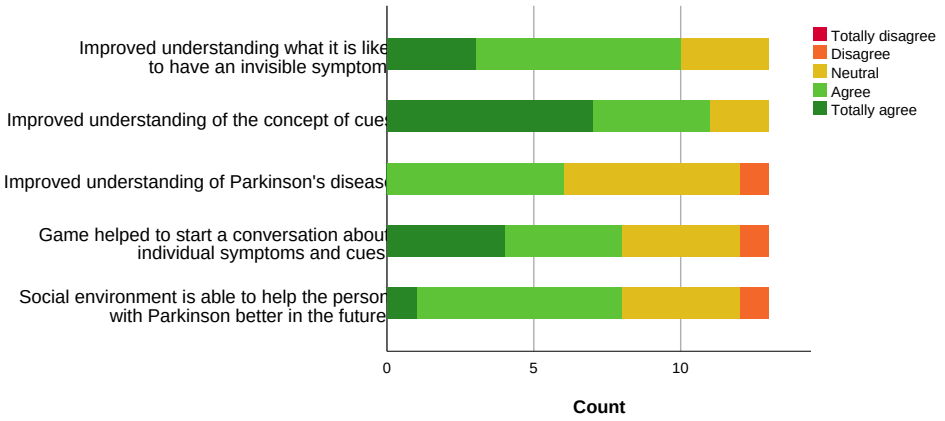


Figure 4.14: Achieving the goal of Cue Kitchen - Physical Environment

4.3.1. The effect of the Playing Environment on result variables

Figures 4.14 and 4.15 show the result of playing Cue Kitchen in a physical and mediated environment, respectively. In a physical environment, the mode and median is 'Totally agree' for an improved understanding of the concept of cues in a physical environment. For an improved understanding of Parkinson's disease, the modes are 'Neutral' and 'Agree' and the median is 'Neutral'. In all other cases, for both a physical and mediated environment, the mode and median is 'Agree'.

With the exception of the variable *Improved understanding of Parkinson's Disease*, all variables in a physical or mediated environment show a similar distribution between the answer options. This distribution also resembles the general distribution (figure 4.13). It is noticeable that in a mediated environment the answers are slightly more often negative (orange and red), so at first view a session in a mediated environment is less successful than a physical session. An exception is *Improved Understanding of Parkinson's Disease*: it appears that less awareness has been created in a physical environment of participants than in a mediated environment.

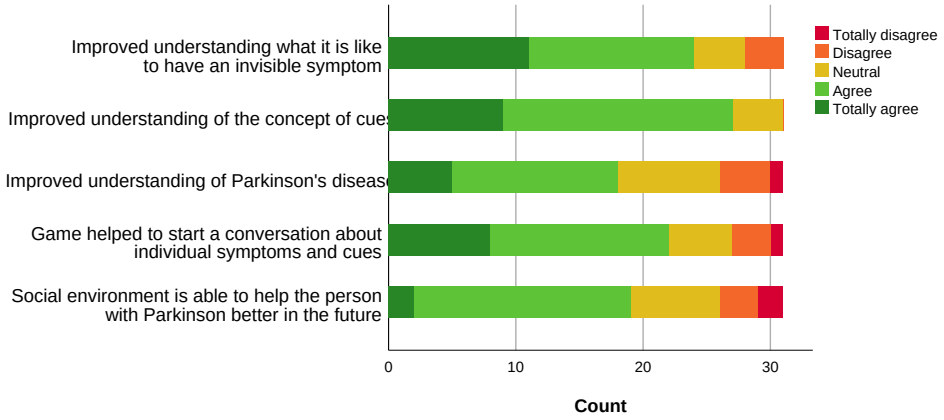


Figure 4.15: Achieving the goal of Cue Kitchen - Mediated environment

However, there is no significant difference between the (rank) scores for the result of the Cue Kitchen (i.e. achieving the goal) in a physical and mediated environment (see tables F.5 and F.6 in Appendix F). So, these results indicate that the playing environment does not play a (significant) role the result of Cue Kitchen in terms of achieving the goal.

4.3.2. The effect of Parkinson's Disease on result variables

Figures 4.16 and 4.17 show the result of playing Cue Kitchen from a perspective of a person with Parkinson's Disease and of the social environment of this person, respectively. Note that the statements for both groups are similar and should measure the same goal (e.g. more increasing awareness of invisible symptoms or starting the conversation of Parkinson's disease) but are not exactly the same.

For all variables both the mode and median is 'Agree', except for an expected improved understanding of invisible symptoms (mode also 'Totally agree') and the starting-a-conversation variable (mode is 'Totally agree', median is between 'Totally agree and Agree') from a Parkinson's perspective. For the social environment the mode for an improved understanding of cues is both 'Totally agree' and 'Agree'.

Participants with a social environment's perspective tend to be more positive ('Totally agree)' about having an improved understanding than participants with a Parkinson's perspective, although still quite positive, expect them to have. Participants with Parkinson's Disease (PD) seem to be more positive about being able the conversation about their own symptoms and cues because of the game, than the social environment has an improved understanding about those symptoms. For the other variables, the distribution between the different possibilities seems about the same.

This is also confirmed by statistical tests. The only significant difference between the (ranked) scores from both perspectives, is about starting the conversation (U-value=98.5, p=0.038). The other variables had no significant difference between the (rank) scores from a PD and a social environment's perspective, (see tables F.7 and F.8 in Appendix F).

This result indicates that the perspective of the participant does not play a (significant) role in assessing whether the game creates awareness about Parkinson's disease, the invisible symptoms and cues. In fact, the expectations of the participant with PD are similar to what the social environments indicates about having an improved understanding about these aspects of PD. However, this is not the case regarding the individual situation of the person with PD. Participants with PD are more positive about the game helping him to start a conversation about the symptoms, than participants with a social environment's perspective have an improved understanding after that conversation. Note that these questions are not as similar as the other output variables. More elaboration about this, can be found in the discussion in chapter 7.

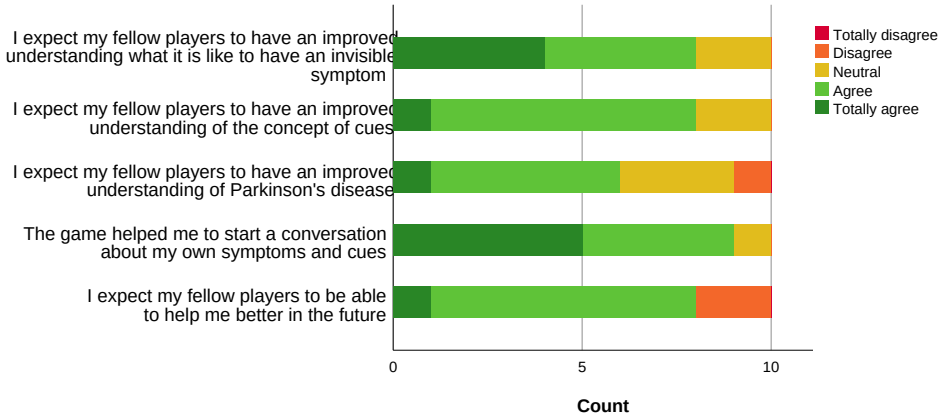


Figure 4.16: Achieving the goal of Cue Kitchen - Parkinson's disease perspective

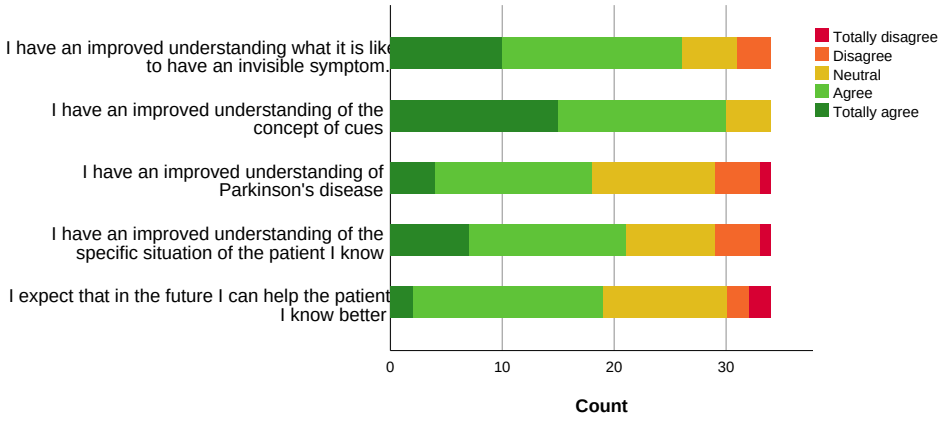


Figure 4.17: Achieving the goal of Cue Kitchen - Social environment

4.4. Summary of quantitative results

This sections provides as summary of the quantitative results in this study. In section 4.4.1 the general outcome of the experiment will be presented. Section 4.4.2 summarizes the quantitative results with regard to player characteristics after which section 4.4.3 will present the quantitative results that relates to Parkinson's Disease. Finally, in section 4.4.4 the quantitative results with respect to the player environment will be summarized.

4.4.1. General outcome of playing Cue Kitchen

More than 77% of the participants indicated that the game provides a better understanding of invisible symptoms and more than 86% of the participants responded having more understanding of the concept of Cues cues. Only 55% of the participants were positive about having an improved understanding of Parkinson's Disease(PD). Overall, most players felt positively affected while playing the game, with a score of 3.2 on 4 and indicated that they felt immersed in the game, with a score of 2.8 on 4. On the other hand, they felt no negative affect (0.7 on 4) or any tension and annoyance (0.6 on 4) during the game.

Half (57%) of the participants indicated that they received more respect for researchers involved in research into Parkinson's Disease because of the game session. A third indicated that they were neutral and a small number disagreed with this statement. Five outcome variables, all measuring Player Experience, show significant low correlations with the variable measuring social desired behaviour.

The number of participants in the different groups (playing environment and player's perspective) were not evenly distributed. Only 13 questionnaires have been completed by participants in a physical environment compared to 31 questionnaires by participants in a mediated environment. And only 10 questionnaires have been completed by participants with Parkinson's Disease compared to 34 partici-

pants from the social environment. The statistical tests in this study, take into account that the groups are not evenly distributed (i.e. a Spearman's rank correlation and a Mann-Whitney test). However, the low number of quantitative data can lead to significant relationships not being found (Type II error). The discussion in chapter 7 will elaborate and reflect on this.

4.4.2. The effect of player characteristics

There is are significant relation between the effect of Cue Kitchen and the affinity people have with playing board games in general. People who play games often have a better understanding of invisible symptoms and Parkinson's Disease after playing Cue Kitchen. And people who like to play board games better, have a better understanding of the concept of cues. People who have a strong affinity with board games did not exhibit socially desirable behaviour.

Other than a significant negative correlation between 'Age' and 'Behavioural Involvement', no correlations have been found between age and the outcome variables. Significant negative relationships have been found between age and all three variables measuring affinity with board games. The only relation between 'Gender' and the outcome of the game is with 'Negative Feelings'. No significant correlations were found between the level of education or the experience with digital communication tools and the outcome variables.

4.4.3. The effect of Parkinson's Disease

There are almost no significant differences found between players with or without Parkinson's disease. 9 out of 10 participants with PD indicated that the game enabled them to start that conversation and 8 of them expected that their social environment is able to help them better in the future. On the other hand, only 62% of the social environment has better understanding about the individual situation of the person with PD and 56% expect to be able to help the participant with PD better in the future. The player experience is almost equal for players with and without Parkinson's Disease, with the exception of Returning to Reality. People with Parkinson's had significantly more trouble getting back to reality.

4.4.4. The effect of the playing environment

Almost none of the outcome variables showed a significant difference between the outcome of a game in a physical or mediated environment. No significant differences have been found in the variables measuring the Sense of Presence (from the Social Presence Module). Also no difference between the result variables, in terms of achieving the goal, has been measured. The only factor significantly affected by playing in a mediated environment is tiredness: people in a mediated environment were more tired than in a physical environment. Furthermore, many significant relations between player experience and the result of the game.

There has also been a significant correlation between tiredness and people who often play board games. The reason for this is probably that this player characteristic is not balanced between mediated and physical participants: in the physical group they play board games significantly less often than in the mediated group.

5

Qualitative Results

In this chapter, the qualitative results will be presented, based on the observations of the game sessions. The observations were done during the game session or afterwards, using a video recording. The observations can be found in detail in the game session reports in Appendix G.

First, in section 5.1, the effect of player characteristics will be discussed. Section 5.2 presents the observations in a physical environment, after which in section 5.3 the observations in a mediated environment will be described. The last section 5.4 focuses on the observations in relation to playing with a person with Parkinson's Disease. Finally, the qualitative results will be summarized in section 5.5.

5.1. The effect of player characteristics

To answer research sub question 5 about the effect of player characteristics, this section describes how the effect of player characteristics (e.g. age, level of education) was visible in the observations. See section 5.4 for the observations in relation to playing with a person with Parkinson's Disease. In most sessions, the age of the players did not have a visible effect on the game sessions, although some younger players seemed to understand the game better than some older players. During one session, it was difficult to communicate with a player with a relative high age. However, this had more to do with her experience with board games and having a hearing problem. These factors could possibly be related to age. However, the observations were too incidental and inconsistent to draw conclusions from.

Some observations showed that the participants with a higher level of education were better at understanding the game, in most cases this effect was not noticeable. During the debriefing, no effect of the level of education was noticeable.

In some sessions, it was clearly noticeable which players had more affinity with playing board games. These players were more immersed in the game and expressed positive feedback about the game. In many cases it was clear that these players in particular wanted to succeed in the game, causing them to be more emphatic when something went well or to be annoyed when it didn't go well. Furthermore, players who often play and enjoy board games seemed to better understand the 'serious goal' of the game. They expressed a better understanding of what it is like to have an invisible symptom and of the concept of cues.

> "I wouldn't mind playing this game just for fun. It was really much more amusing than I expected." - Player 10B

5.2. Observations in a physical environment

In order to answer research sub question 3 about the effect of the player environment, this section describes how the effect of a physical environment was visible in the observations. First, some general remarks about the sessions will be presented in section 5.2.1. Then, section 5.2.2 focuses on the effect of a physical environment on the game play. Finally, 5.2.3 focuses on effect of a physical environment on the debriefing.

5.2.1. General remarks

In a physical environment, the players are physically in each other's present with the playing card physically before them on the table. Three sessions took place in a physical environment, of which two were facilitated through a video connection and one was facilitated physically on location. The biggest advantage of playing in a physical environment is that the game can be played during a social gathering, which is often the intention of games (see Chapter 2). Players are able to enjoy being together, which includes having a drink or snack. In this environment, players are able to have small conversations and laughter about matters not directly related to the game. The quality of sessions is not dependent on digital technology.

> "Nice game, beautifully designed and a fun way to learn more about Parkinson's disease." - Player 3B

In most physical sessions, the game contributed to a personal conversation about the individual symptoms of Parkinson's Disease. Many players expressed positive reactions about debriefing. Especially during physical sessions with the facilitation through a video connection, the conversations were quite intimate.

5.2.2. During the game play

In a physical environment, players are able to have fast interactions. During these sessions, many one-on-one interactions between players and interrupting each other have been observed. However, depending on the playing group, this does not mean these sessions were chaotic. Instead, the possibility of having quick conversation with another player without bothering other players, prevented unnecessary and chaotic group conversations. When someone is stepping up to take the lead and moderate the group discussion, the discussion about things as strategy is even more streamlined.

> "I thought it was a fun game, we had a lot of fun together! And the goal of having a good conversation with each other afterwards certainly succeeded!" - Player 4B

When playing in a physical environment, it is possible for players to 'tune out' for a moment without everyone noticing, especially when it is not their turn.

One group did not sit at a kitchen table, but at a low coffee table. This meant that not all players were equally close to the game and had the cards within reach. This was not ideal for the involvement of the players who were a bit further away.

The role of the facilitator during a physical session is focused on explaining the game, helping with the setup and first steps, and introducing the invisible symptoms and cues. In between, during most of the game play, the facilitator can sit back and just answers questions if necessary. When the facilitator is physically present, he becomes involved in the game play. The advantage of this, is that the facilitator can feel when his advice is needed and when not.

5.2.3. During the debriefing

When the facilitator was present through a video connection and not physically present, the players did seem to feel feel more private in their environment, as if the facilitator was not really or 'less' present there. During these two sessions the players had an intimate conversation about their specific situation. When the facilitator was physically present, the conversation during the debriefing was not as intimate as it was in the other two cases. Furthermore, during these sessions the player with Parkinson's Disease or its relative takes on the role of debriefer in a natural way. The advantage of this, is that a participant is more of an expert on the personal situation of the person with PD than the facilitator. He knows what is relevant and what is not, causing the conversation to become more personal.

> "For me, the discussion afterwards was very valuable, when we discussed with our friend how she really experiences Parkinson's" - Player 3D

Being physically present as facilitator contributes to the social connection between the facilitator and the players, but at the same time the players silently expect the facilitator to moderate the debriefing by taking the lead and asking questions. The debriefing requires a personal conversation, in which also sensitive questions can be answered. However, during the physical session with the facilitator present, it was sometimes uncomfortable for the facilitator to keep asking about certain sensitive and personal topics.

5.3. Observations in a mediated environment

In order to answer research sub question 3 about the effect of the player environment, this section describes how the effect of a mediated environment was visible during the game sessions. First, some general remarks about the mediated sessions will be presented in section 5.3.1. Section 5.3.2 focuses on the effect of a mediated environment on the game play and 5.3.3 describes the effect on the debriefing.

5.3.1. General Remarks

7 of the 11 session were in a mediated environment, meaning the players did see the game and (most of) the other players on the screen of their laptop in the mediated environment of Big Blue Button.

Playing a physical game using a mediated environment went very well. Almost all players expressed their enthusiasm about the game, even without the cards being physically in their hands. Compared with the physical sessions, the mediated ones were not more or less successful. Many players declared that the game helped them to have a better understanding about the invisible symptoms of Parkinson's Disease and expressed their appreciation about the personal conversation during the debriefing.

> ”Personally, I really liked the game and it was thought out very well. It's great that others can gain more insight into Parkinson's.” - Player 5A
>
> “Nice that it has not become a digital game, because the physical aspect makes the experience bigger and it also increases my involvement. Compliments.” - Player 9B

Playing in a mediated environment means a dependence on digital communication technology and associated technology (Wi-Fi, webbrowsers, microphones, etc.). In some cases, the software and hardware being used caused significant problems. This is not always preventable for the facilitator, because it also depends on the technology on the other side of the connection. For example, in some cases players had a bad Wi-Fi connection and in other cases a laptop was over-secured by the company it belonged to.

Most technical issues could be resolved. For example, Big Blue Button has the flexible option to call in by phone. Using this option did quickly resolve some problems with the microphone. However, in most cases when coming across a technical issue, this resulted in a long delay (up to 40 minutes) before the game could start. Solving the problems during the first session took so long, that the game could only be played once instead of two times. Although all players remained patient until a problem was fixed, a noticeable consequence of this delay was that players became tired and lost concentration later on in the game.

5.3.2. During the game play

All players could see the playing table on their screen, and were able to read the playing cards. By giving the facilitator directions of their desired actions, they could participate in the game play. Some people indicated that, contrary to their expectations, they felt immersed in the mediated game play.

> ”I did not expect that playing a physical game in a digital would have worked so well. I enjoyed it way more than I expected. After a couple of rounds I was fully immersed in the game.” - Player 2B

Only when technology was not working well, the quality of the game play was compromised. In some cases, the image of the playing table froze or was significantly delayed. In another case, one of the players had to monitor the session on her phone, which made the cards no longer readable for her.

When playing in a mediated environment, only one person (player or facilitator) can speak at a time. Especially in groups discussions, some interactions got lost in the mediated environment, when two persons were speaking at the same time. However, an advantage is that the game can be played in a really structured way, when everybody is listening to each other. If this is not the case, this can lead to more chaos, where some players are not heard and therefore less involved in the game.

The design of the mediated environment plays an important role. In two cases, two players sat next to each other: one time on the same screen and one time on two different screens. This was not a success. When two people were physically in each other's presence, it caused noise on the video connection due to their interaction with each other. This was not only distracting for the other players,

but also caused their input to not be heard. It was noticeable that the other two players were less involved in the game.

Players had to be really focused on their screen in order to follow the game play, so it was not possible to stare away for a while. Some players indicated afterwards that this was quite intense. It was noticeable that participating in the game play cost the players more energy, which caused them to lose some concentration and become tired during the debriefing.

A mediated environment also limits your flexibility. You cannot easily adapt to a special situation, for example a hearing problem of one of the players.

> "Maybe you can use a mic next time to be more audible." - Player 8B

An advantage of a mediated environment is that you are able to communicate personally with a single player using the chat.

5.3.3. During the debriefing

The effect of mediated environment, where people should not speak at the same time, ensures that the most debriefings are calm and substantive, and all players could tell their story and ask questions.

> "First, it is very good that attention is paid to the invisible symptoms of Parkinson's. I found the post-game debriefing more relevant than the game itself. For me, the distribution could have been slightly better: slightly less play, a little longer afterwards." - Player 10B

During two sessions, one of the players was not visible during the debriefing. This made it more difficult for the facilitator to involve this person in the conversation. It is not possible to see from his expression how he reacted to what was discussed. This also applies to other players, who had a less interaction with players who were not visible. The same applies for a participant who was watching the session on another screen without the webcam directly above it. It is difficult to see if this person can follow the conversation well enough or is just distracted by other things. A noticeable result was less interaction between the 'normal' visible players and this person.

When playing in a mediated environment, the role of facilitator is more present: in this environment he is equal to the other players, quite literally, 'on the screen'. They see the facilitator as the moderator, who has to guide the players in their conversation, and therefore it is not natural for another player to take on the role of debriefer. The players expect from the facilitator to take the lead, ask questions and let everyone have their say. A facilitator should be able to do this. However, a long and intense session, preceded by technical issues, can also cause loss of concentration with the facilitator.

In many cases, the mediated environment did not seem to affect the exchange of emotions. However, the screen in a mediated session can sometimes form a 'barrier' between the facilitator and the players. This can both be an advantage and a disadvantage. In some cases, a player did show emotions, which could be because the screen created some distance between himself and others. Furthermore, in one session, one of the players criticized the facilitator. In this case, the screen acted as a safe barrier, allowing the facilitator to handle criticism from a player a little better. However, the mediated environment and the impersonal interaction may also have been the cause of the negative experience for this player. The fact that the session could be recorded caused extra stress for this player, something that would not have been necessary in a physical environment.

5.4. Playing with people with Parkinson's Disease

In almost all sessions, the players were quit enthusiastic about the game. Many players with Parkinson's Disease (PD) recognized some of their own symptoms in the invisible symptoms in the game. A lot of players indicated that they learned a lot about the invisible symptoms of PD. One of the players with PD, found the theme of Cue Kitchen well chosen.

> "I learned a lot and now have a good and nuanced picture of what the various symptoms of someone with Parkinson's might be" - Player 8D (Social Environment)

> "Cooking is a good topic for the game, because that's one of the things that I'm less able to do now because I've become more chaotic. Step-by-step recipes will help me keep cooking." - Player 2A (Parkinson's perspective)

It was noticeable that there are differences between the individual participants with Parkinson's. Some players had slow movements or were slow in their interactions with other players and the facilitator. On the other hand, other players had quick and random movements and seemed chaotic in their interaction with others. And others had no visible symptoms of Parkinson's disease during the sessions.

In two sessions, the sessions were not as successful as others. During the very first session, a player with Parkinson's indicated that it was precisely because of her Parkinson's that she found it difficult to participate in the group discussions during the game. This first session was of very poor quality and the session did not go as intended. Because of technical issues it took a long time to start the game which could only be played one time. The player with PD indicated that in her opinion, because of the chaotic game session the message of the game did not came through. Some players did indicate that if the game were simpler and less chaotic, it could be an added value in raising awareness of the invisible symptoms of PD.

> "Good setup, but the feeling remains that my fellow players have not learned to understand me better through the game. The debriefing can make up for a lot, but mental flexibility is not one of the stronger sides of people with Parkinson's." - Player 1A (Parkinson's perspective)

In another session, the player with Parkinson's Disease, was not enthusiastic about the short period leading up to the game, the game itself and the debriefing. She had trouble understanding the game, while also having a hearing problem. Furthermore, it was also difficult to get her input during the debriefing, in which she did not participated with full devotion. It is not clear if this was because of PD, it could also be because of her hearing problem or just because of her expectations not being met, that the result of the game was not good.

An important observation while playing the sessions with players with Parkinson's, is that they are the expert on their own symptoms. The person with PD plays a role in the debriefing that should not be underestimated, where he can explain more about his own situation and answer questions from other players. During the last session, no person with PD was present. This session lacked the opportunity for a personal conversation and the lessons in the game could not be tailored to a real and unique situation.

> "It was a good eye opener for my daughters" - Player 5A (Parkinson's perspective)
>
> "It became clear to us that we know the person with Parkinson's very well and that we also understand her "invisible" social limitations." - Player 9C (Social Environment)

Finally, many players had a close relationship with the person with Parkinson's and felt that they already knew them well. Therefore, in most cases the players indicated that the game was helpful, albeit they were already doing a good job helping the person with PD. In some but not all cases, this was confirmed by the player with PD. In some cases, the participants specifically indicated that it was helpful for them.

5.5. Summary of qualitative results

This section summarizes the main findings from the qualitative data as presented in this chapter and in appendix G. Section 5.5.1 starts with some general remarks, after which section 5.5.2 summarize the qualitative results about the effect of player characteristics. Then section 5.5.3 presents the main qualitative results about the playing with Parkinson's Disease. Finally, section 5.5.4 will present the qualitative results with regard to the effect of the playing environment.

5.5.1. General remarks

Almost all players indicated that they had a good time and thought it was a great game. Many players appreciated the debriefing in particular. They indicated that the game can create more awareness about Parkinson's Disease (PD), and that they had a better understanding about invisible symptoms and cues. In most cases the players indicated that they were already doing a good job helping the person with PD, sometimes confirmed by the player with PD. In other cases, the participants specifically indicated that the game was helpful for them. Ideally, the players ask each other questions during the debriefing

and share experiences without the intervention of the debriefer. The more the debriefer had to initiate the conversation, the less personal the debriefing was.

In most cases, the person with PD appreciated the idea of the game. Many recognized, their own symptoms in the invisible symptoms in the game, in one way or another. However, in some cases this recognition was lacking, mainly because of a poor quality of the game session. In most cases the person with Parkinson's was able explain more about his own situation and answer questions from other players. During the last session, no player with Parkinson's was present and the session lacked the opportunity for a personal conversation about individual symptoms.

5.5.2. The effect of player characteristics

It was noticeable which players had more affinity with board games and which players did not. Many players with a strong affinity for board games understood the principles behind the game and were keen to get a good score. In many cases, these players became more immersed in the game.

In general, age did not play a visible role in sessions. However, in a couple of sessions younger players seemed to understand the game better than some older players, albeit in other sessions this effect was not visible. Some other factors, possibly related to age, seemed to have an effect on the quality of the game play, such as hearing or visual problems or difficulties with modern technology. Some observations showed that the participants with a higher level of education were better at understanding the game, however in other cases this effect was not noticeable. During the debriefing no effect of the level of education was noticeable.

5.5.3. The effect of Parkinson's Disease

First of all, differences between the individual participants with Parkinson's Disease (PD) were noticeable. Some had slow movements or were slow in their interactions with others. Other participants with PD had quick and random movements (i.e. the tremor was visible) and seemed chaotic in their interaction with others. And others had no visible symptoms of Parkinson's disease during the sessions.

In general, however, the symptoms of PD did not have any visible effect on the quality and outcome of the game or debriefing. However, during the first session the player with PD indicated that it was precisely because of her Parkinson's that she found it difficult to participate in the group discussion during the game. This session had a very poor quality (many connection issues and no video tutorial beforehand) which caused the session not going as intended. During another session, the person with PD was not enthusiastic about the game, however it was not clear if this had any relationship with PD.

5.5.4. The effect of the playing environment

The observations related to the playing environment were not unambiguous and consistent. Some mediated sessions went very well with only a few problems, resulting in enthusiasm among the players. However, some other mediated sessions had a lot of problems, taking a long time to be remedied. Most players in a physical environment were showing more social interactions with each other than players in a mediated session. On the other hand, mediated presence could sometimes cause players to be more comfortable and show more emotions.

In a physical environment, players were able to have many fast, one-on-one interactions while interrupting each other. This does not necessarily mean that these sessions were more chaotic. Instead, a physical player was able to have a quick conversation with another player, without bothering other players. During some physical sessions it was noticeable that non-active players (i.e. it was not his turn) were able to 'tune out' for a moment. The opposite was true for players in a mediated environment. Mediated players had to stay focused on their screen to follow the game play. Some of these players indicated that this was quite intense.

Participants in a mediated environment seemed to be more tired than in a physical session. In many cases, concentration decreased during the second game as well as during the debriefing. In some of these sessions, there were connection issues that needed to be restored, causing the game to start later or to interrupt the session. However, these observations were incidental and not consistent over all sessions. In some cases, the players seemed to be more concentrated after a short break, whether or not this was caused by a technical problem.

In physical sessions, the facilitator has a supportive role and adjusts his interference in the game as needed. When the facilitator is physically present, it can also create an uncomfortable situation. However, during two physical sessions with the facilitator present through a video connection, an inti-

mate atmosphere was created in which the conversation became more personal. During the mediated sessions, the role of the facilitator was much greater, because he controlled the playing table and acted as a moderator during the debriefing. On the other hand, an advantage of a mediated environment is that everyone takes turns speaking and allowing each other to speak.

During some mediated sessions, several people were behind the same screen or behind another screen in the same room. In these sessions, the interaction between the 'physical players' increased, causing significant noise on the line. As a result, comments from the other players were missed more often and the interactions with and between these players were reduced.

6

Integration of Quantitative and Qualitative Results

This chapter will integrate the results and analysis of both the quantitative and qualitative data, using an explanatory approach. According to sub question 6 (see section 1.3) this chapter will focus on how the observations can explain the measured outcomes of the game Cue Kitchen. First, in section 6.1, the results will be integrated per individual session. Then, in section 6.2 the results will be integrated on a aggregated level, meaning only consistent observations and general results will be mixed.

6.1. Integration on an individual level

This section mixes the relevant results, both quantitative and qualitative per individual game sessions, to create a better understanding in the relation between the qualitative and quantitative data. For each session it will be indicated how the observations can explain the measured outcome (player experience and result). If relevant, it will also be indicated if the observations are inconsistent with the measured outcome. For detailed reports of the game sessions, see appendix G.

Session 1 - Mediated environment

Positive affect (during game) and positive experience (after game) were low, while negative affect, negative feelings, and Negative Experience were all higher than the overall average. This is consistent with the observations in the game session, which were also not really positive.

The game was also not really successful, especially from a Parkinson's perspective . The feedback in the questionnaire reflects a disappointment from the player with a Parkinson's Disease PD. Although she appreciated the debriefing, the negative feeling during the game dominates her feeling.

In general, both the negative measurements and the observations reflect a rather unsuccessful game session, which can be explained by the fact that this was the very first official session.

Session 2 - Mediated environment

The measurements reflect a pronounced experience during the game: positive affect was very high, while the negative variables were very low. However, Positive Experience (after the game) was quite low. There is no clear explanation for this, except that the session lasted longer than expected and one of the players had to delay another social meeting. The Psychological Involvement variables are relatively, which could be explained by the observation that there was not so much interaction.

Both from a Parkinson's perspective as from the Social Environment's perspective measurements this session seemed to be a fairly successful game, in line with what the players said about this during the debriefing. Yet the measurements also show that players said they are close to the person with Parkinson's and therefore able to help her properly already.

Finally, social desired behaviour was measured as quite high. This is consistent with their behaviour, especially at the end of the debriefing, when they showed interest in the facilitator's education, and in feedback in the questionnaire.

Session 3 - Mediated environment
The relaxed nature of the session is reflected in the measurement results. Neither the quantitative data as the observations showed that they were tired in some way. In addition, it should be noticed that almost no Flow was experienced during the session. An explanation for this could be the fact that a drink was regularly taken or snacks were passed on, in other words the focus was not totally in the game. It can also be noted that the social presence variables (Empathy, Negative Feelings and Behavioural Involvement) are lower than the average, despite the fact that people are physically present together. This cannot be explained from the observations.

The social environment finds the game more successful than the one with the Parkinson's perspective. From the observations, there is no clear explanation for this difference. On the other hand, the positive responses from the social environment match what they write in the feedback about the game; they particularly appreciated the conversation afterwards.

Session 4 - Mediated environment
The social presence variables Empathy and Behavioural Involvement are quite high. This is fully consistent with the observation that the players had almost no discussions or disagreements, and really played the game cooperatively. This can also be seen in a very low score on Tension / Annoyance.

The person with a Parkinson's perspective was particularly positive about how a personal conversation was started. This is explained by the observation that it was very successful to initiate the conversation and that it became very personal. The social circle seems particularly enthusiastic about being able to better understand the concept of cues, probably because the discussion regularly focused on how best to help the person with Parkinson's.

Session 5 - Mediated environment
Although this mediated game lasted for a relatively short time, the players still found it tiring. This is clearly reflected in the measurements. A reason for this could be found in the observations that the game play did not go according to plan. It is noticeable that two of the three social presence variables are well below the average. This could be due to the fact that two people were behind the same screen, and visual connection with another player was lost, causing a reduced feeling of social presence.

The player with PD was very positive and enthusiastic about the game. This was also clear in the observations, in which he specifically expressed his enthusiasm about the game.

Session 6 - Mediated environment
In the player experience of this group, it is especially noticeable that the players had absolutely no trouble returning to reality. This could be due to the fact that the game was played in the morning, and the players were able to engage in other activities quite soon after playing the game, something that also emerged during the observations (e.g. home delivery was ordered by one of the players). It also noticeable that this group is also more tired than average despite the time of day. This score can be explained by the observations: the difficulties with the technique, the extra time required to explain the game, reduced interaction and the length of the session.

It was successful to initiate the conversation about the individual symptoms, which is clearly reflected in the scores of both the player with a Parkinson's perspective and the social environment.

Session 7 - Mediated environment
After this session, more negative feelings have been measured. This could be related to the observation players were irritated about not guessing a cue. Players became less tired according to the quantitative results. The players did not show any signs of fatigue during the session.

Both the player with PD and the social environment are moderately positive about the outcome of the game. This relates to the observation that the personal conversation was not easy. During the debriefing, the facilitator had to give information about invisible symptoms and cues related PD. The individual situation of the person with Parkinson's was only slightly discussed.

Session 8 - Mediated environment
The problems during game play were not very clear in the measured player experience. However, if a difference is made between the player with PD and the other players, it is clear that the player with PD has experienced the game much more negatively. Mostly she has experienced more Tension /

Annoyance in the game, so she was more annoyed and frustrated. This is completely consistent with the observations made during the game, that she didn't look very happy. She also experienced almost no Flow, which can be explained by the observation that she became little involved in the common decisions in the game and therefore did not stay in the flow of the game.

According to the observations, the player with the Parkinson's perspective did not find the outcome of the game very successful. However, the quantitative data indicate a successful outcome from the social environment's perspective. This can be explained by the observations, where did express their appreciation of the game

Session 9 - Mediated environment

The high score on Positive Affect and low score on Negative Affect can be well indicated by the pleasant time the players had together. Behavioural Involvement scores lower than the overall average. The reason for this can be found in the observation that two players were less involved because there was a lot of noise on the line.

The observation that the players know each other well, is clearly reflected in the assessment of the effect by the social environment, where three of the five variables score negatively. Interestingly enough, the person with Parkinson's was positive about the (expected) effect of the game.

Session 10 - Mediated environment

The high score on Sensory and Imaginative Immersion can be explained by the observed immersion in the game during the game play. The higher score on Tiredness corresponds to what the players themselves said about this and what was observed: the players lost concentration during the debriefing. A high score of Negative Feelings can well be explained by the passionate discussions about the strategy to be pursued, which could cause the players to irritate each other.

The players are very positive about the effect of the game. There was a problem with the connection with the observers, just when they were about to talk about the individual symptoms of the person with PD. This may have contributed to the fact that the score for starting a conversation about the individual symptoms is slightly lower than the overall average when it comes to the Parkinson's perspective. In the Social Environment's perspective this effect is not visible.

Session 11 - Mediated environment

The relatively high score on a large part of the variables can be attributed to their positive feeling during the game. The Social Presence variables Empathy and Behavioural Involvement score high, which can be explained by the extent to which the players worked together to achieve the goal, while paying close attention to each other's symptoms and cues.

Players indicated during the debriefing that they had learned a lot. This can be seen in the high scores for improved understanding about invisible symptoms, cues and Parkinson's Disease in general.

6.2. Integration on an aggregated level

This section mixes the quantitative and qualitative results on a higher, aggregated level. This means that it focuses on how quantitative results in general can be explained by consistent observations. This section also mentions some interesting qualitative results, that can not be explained by the observations. Also some consistent observations without a general qualitative result will be mentioned.

6.2.1. General outcome of Cue Kitchen

In general, players liked to play Cue Kitchen. Most players felt positively affected while playing the game and felt no negative affect or any tension and annoyance during the game. These quantitative results are supported by the qualitative results: Almost all players indicated that they had a good time and thought it was a great game.

In general, the better the quality of the game, the better the experience of the players. A smooth debriefing, on the other hand, led to a better achievement of the goals. The more the debriefer has to initiate the conversation, the less successful the game is in terms of achieving the goal of Cue Kitchen.

6.2.2. Player characteristics

While some observations showed that the participants who have had a higher educations were better at understanding the game, there was no significant difference between players with a lower or higher education level in variable measuring the player experience or achievement of the goal.

6.2.3. Playing environment

Players in a physical environment are significant less tired than players in a mediated environment, which is consistent with the qualitative data. The observations show indeed that players in a mediated environment became more tired during the debriefing. This was especially the case when problems occurred with the video and audio-connection. In many cases when players showed signs of tiredness, earlier in the game some connection issues needed to be resolved, causing the game to start later or interrupting the session.

During some mediated sessions, many thing went wrong and the quality of the session was very low. In the qualitative data it is clear that a low quality of the session leads to the game play or debriefing not going as intended. However, no significant results have been demonstrated in the difference between achieving the goal of Cue Kitchen in a mediated environment or a physical environment.

6.2.4. Playing with Parkinson's Disease

The qualitative data show a significant difference between the Player Experience variable 'Returning to Reality'. In other words, players with Parkinson's Disease (PD) have more trouble getting back to reality and are feeling more disoriented after playing the game, than players without PD. This relation can not be explained by qualitative data.

7

Discussion

In this chapter the results as presented in chapter 4 will be discussed and interpreted. First, section 7.1 discusses the key findings of the experiment with Cue Kitchen. Section 7.2 interprets the effect of different player characteristic, including Parkinson's Disease. Then, section 7.3 discusses the effect of a mediated environment and compares this with findings in literature. After that, in section 7.4, important nuances of the difference between physical and mediated environment will be discussed. In section 7.5 the methodologies used in this research will be discussed. Then, section 7.6 reflects on this research and point out a number of possible shortcomings. Finally, section 7.7 gives a personal reflection on this master thesis project.

7.1. Key findings

In this research, 11 playing sessions have been conducted, 3 in a physical environment and 8 in a mediated environment. A total of 49 test subjects participated in the game Cue Kitchen, resulting in 44 completed questionnaires and extensive observation reports.

More than 77% of the participants indicated that the game provides a better understanding of invisible symptoms and cues. Just over half of the participants were positive about having an improved understanding of Parkinson's Disease. Therefore, Cue Kitchen can be a successful method for raising awareness about the invisible symptoms and cues of Parkinson's Disease, but the game is a little less suitable for creating an understanding about Parkinson's disease in general. In almost all sessions, the players had a conversation about the individual situation of the person with Parkinson's, what symptoms, both visible and invisible, they experience, how this changed over time and what other can do to help them. Nine out of ten participants with PD indicated that the game enabled them to start that conversation and eight of them expected that their social environment is able to help them better in the future. However, this does not necessarily mean that the social environment has better understanding about the individual situation of the person with PD (only 62%) or that they expect to be able to help the participant with PD better in the future (see section 7.2.3 for further elaboration).

The results show that players liked to play Cue Kitchen. Most players felt positively affected while playing the game, with a score of 3.2 on 4 and indicated that they felt immersed in the game, with a score of 2.8 on 4. On the other hand, they felt no negative affect (0.7 on 4) or any tension and annoyance (0.6 on 4) during the game. These quantitative results are supported by the qualitative results: Almost all players indicated that they had a good time and thought it was a great game.

In almost all cases, the observations of the session explain the outcome variables, or at least deviations from the mean results, of that individual session. An important finding is that the extent to which a game play and debriefing runs smoothly is particularly important to explain the score on player experience and result of the game for individual sessions. The better the game went (i.e. the players played the game as intended, without ambiguities and interruptions), the better the experience of the players was. A smooth debriefing, on the other hand, led to a better achievement of the goals. The most successful scenario is when the conversation between the players starts, in which the players ask each other questions and share experiences without the intervention of the debriefer. The more the debriefer has to initiate the conversation, the less successful the game is.

7.2. The effect of player characteristics

Based on the results, it is possible to evaluate and discuss who Cue Kitchen is most suitable for. This subsection will discuss the three most important findings: people who have an affinity with playing board games, players of all ages and players with and without Parkinson's disease

7.2.1. Affinity with board games

There is a relationship between the effect of Cue Kitchen and the affinity people have with playing board games in general. Based on these results, people who play games often have a better understanding of invisible symptoms and Parkinson's in general after playing Cue Kitchen. And people who like to play board games better, have a better understanding of the concept of cues. It is important to note that people who have a strong affinity with board games, did not show significantly more socially desirable behaviour according to the control question posed in the questionnaire.

This relationship can be explained by the qualitative data, in two ways. First, many players with a strong affinity for board games understood the principles behind the game and were keen to get a good score. The obstructive effect of the symptoms was greater and people were more eager to guess the correct cue. Second, players with a strong affinity for board games became more involved in the game, which is also confirmed by a significant relationship between the players' opinion about board games (i.e. how much they like to play board games) and Sensory and Imaginative Immersion (i.e. the extent of which they are able to immerse in the game). The fact that the players allowed themselves to be more immersed in the game, ensures that they have a better experience of what it is like to have an invisible symptom.

7.2.2. Both younger and older players

Based on the results, age should not be a decisive factor when determining the ideal target group for this game. However, age could play an indirect role in determining the target group. There appears to be only one significant correlation between age and the output variables: a negative relationship with Behavioural Involvement. This can be explained from the same interpretation of the effect of affinity with board games (see previous section). A significant negative relationship has been found between age and the three variables that measure affinity with board games. Young people are, due to their affinity with board games, slightly more able to be immersed and involved in the game.

The qualitative data show that some unmeasured factors, possibly be related to age, have a greater effect on the game session than the age of the players itself. Examples are a hearing or visual problem or difficulties with modern technology. However, the observations were to incidental and inconsistent to draw conclusions from this. When determining the target group, it should be noted that many persons with Parkinson's disease are at least 50 years old. So, when the game is played with their friends, the age of the target audience is higher.

7.2.3. Players with and without Parkinson

First of all, the qualitative results show many differences between the individual participants with Parkinson's. For example, some players had slowness of movements or were slow in their interactions with other players and the facilitator. On the other hand, other players had fast and random movements and appeared chaotic in their interaction with others. And others had no visible symptoms of Parkinson's disease during the sessions. This is consistent with what is known about Parkinson's disease, where symptoms may vary between patients, between periods (for example, after treatment), and as the disease progresses (NHS, 2019).

During one session the player with Parkinson's indicated that it was precisely because of her Parkinson's that she found it difficult to participate in the group discussion during the game. It should be noted that this was the first session with a very poor quality which caused the session not going as intended. A number of players with Parkinson's disease in the mediated sessions could experience problems when picking up cards or pass a die to another player. This would have become visible in a physical session. In general, however, the symptoms of Parkinson's Disease did not have any visible effect on the quality and outcome of the game or debriefing.

Quantitatively, there is almost no difference between players with or without Parkinson's disease regarding the outcome of the game. However, the players with Parkinson's responded quit positive about the game helping them to start a conversation about their own symptoms and cues. They ex-

pected their social environment to help them better in the future, while about half the players from their social environment indicated that they did not have more understanding about the personal situation of the player with Parkinson's, or help them better in the future. This can be explained by the qualitative data. In many cases the social environment was considered quite close to the person with Parkinson's Disease and knew about invisible symptoms. When the social environment is close they probably think that they are doing a good job helping the player with PD. It is however very noteworthy that the player with Parkinson's is hoping this could improve after having played Cue Kitchen, while the social environment's does not believe that this going to happen.

Based on the results, the player experience is almost equal for players with and without Parkinson's Disease, with the exception of Returning to Reality. People with Parkinson's had significantly more trouble getting back to reality and are feeling a bit disoriented than their social environment, although it should be noted that they still scored very low on these variables. It is not entirely clear what this could be related to, nor can it be explained by the observations.

Finally, an important finding about playing with a person with Parkinson's, is that they are the expert on their own symptoms. In most cases, this player recognizes the idea behind the game and the invisible symptoms in the game, although there also been have some cases in which recognition was lacking, mainly because of a poor quality of the game session. The person with Parkinson's plays a role that should not be underestimated in the debriefing, where he can explain more about his own situation and answer questions from other players. When no player with Parkinson's is present, the session lacks the opportunity for a personal conversation and the lessons in the game cannot be tailored to a real and unique situation.

7.2.4. Social desired behaviour

Over half of the participants indicated that they received more respect for researchers involved in research into Parkinson's Disease because of the game session. This could indicate that a majority of the players showed some form of social desired behaviour, since this is not an effect what the game is supposed to have. The reason for this, could be that the people liked the facilitator, and wanted to please him with a positive answer.

> "Sympathetic facilitation." - Player 2C in the questionnaire (score 4 out of 4 on social desired behaviour)

If the control question really measures socially desirable behaviour, it can be expected that people with more socially desirable behaviour also give more positive responses. However, the result variables measuring the effect of Cue Kitchen were not significantly related to the question measuring social desired behaviour. This means that participants who showed possible socially desirable behaviour according to the control question, did not appreciate or rate the result of the game better than participants who did not show this behaviour. 5 out of 12 player experience variables (*Sensory and Imaginative Immersion*, *Flow*, *Tension / Annoyance*, *postive affect*, and *Negative experience*) showed low correlations with the question measuring social desired behaviour. This means that the score on these variables may be slightly more positive than the real experience of the participants. Apart from these variables, the result from the control question does not give a reason to question the validity of the outcome variables.

An important and critical note that has to be made, is that the control question cannot determine to what extent the answers actually deviate from the real opinion of the player. And although playing Cue Kitchen should not directly lead to more respect for researchers working with Parkinson's Disease, participants may find research into Parkinson's more important because of the game, and therefore also feel that the researchers deserve more respect. In this regard, the results cannot be seen as fully convincing evidence that people do or do not exhibit socially desirable behavior.

7.3. The differences between a physical and mediated environment

The most interesting result is that participants in a mediated environment were significantly more tired than in a physical session. The concentration decreased during the second game and also during the debriefing. In many cases when fatigue was higher than average, connection issues needed to be restored, causing the game to start later or to interrupt the session. Although because of these reasons

some sessions were markedly longer, no significant correlation was found between session duration and tiredness.

The result that mediated sessions causes more tiredness is not yet supported by scientific literature. However recent 'grey' literature, such news paper articles, show that a mediated setting, such as an online meeting, is indeed more tiresome than a physical meeting and causing so-called 'Zoom Fatigue' (Morris, 2020; Wiederhold, 2020). No reviewed literature has been found about an explanation for this. Some observations showed a relation between the quality of the session (e.g. connection issues, audibility and visibility) and people showing symptoms of fatigue. Also, during some physical sessions it was noticeable that non-active players (i.e. it was not their turn) were able to 'tune out' for a moment. The possibility of being able to have a moment without concentration, could contribute to the players being a little more energetic at the end of the game. However, these observations were incidental and not consistent over all sessions. Therefore, the results in this study cannot give a definitive explanation about the cause of tiredness. In any case, it can be concluded that there is a causal relationship between the playing environment and tiredness.

Tiredness has also a significant correlation with the frequency of playing board games. The reason for this is probably that this player characteristic is not balanced between mediated and physical participants: in the physical group they play board games significantly less often than in the mediated group. From the literature it can be assumed that the correlation found between tiredness and environment is a causal relationship. Moreover, it is unlikely that people playing games often will tire more quickly compared to people playing games less often. Therefore, it is believed that the correlation between Tiredness and the frequency with which participants play a board game is not a relevant causal relationship.

When playing *Cue Kitchen* with players with Parkinson's Disease (PD) in a mediated environment, it is important to take into account that a mediated environment can cause people to be more tired. PD causes areas in the brain to work and communicate with each other less efficiently (van Laar, 2012). This means that a person with Parkinson's is less able to cope with some complex functions. It reduces the time that a person with Parkinson's can concentrate and they can tire more quickly. This should be taken into account when playing *Cue Kitchen*, even though this study does not statistical prove a difference between Tiredness between a physical environment and mediated environment for only participants with a Parkinson's perspective. This could be attributed to the low number of participants with Parkinson's who played in a physical environment.

A surprising result in the experiment, is that no significant differences have been found between the outcome of a game in a physical and mediated environment. This is unexpected, because facilitated tabletop games are usually played in a physical environment, not only because it is a physical game, but it also is intended to reflect reality (see Hofstede et al. (2010), Klabbers (2009), Lukosch et al. (2018)). It could be expected that factors like reduced non-verbal communication or the inability to convey emotions in a mediated environment could have an effect on the outcome of the game (Magerkurth et al., 2004). It could change the player experience and with it also the extent to which the goal of the game is achieved. However, in this study, this effect is not visible. On the contrary, some qualitative observations show that mediated presence could sometimes cause players to be more comfortable and show emotions. This is probably because of a physical barrier (the screen) between themselves and another players.

This study also shows that the sense of presence in a mediated environment is not significantly different than in a physical environment. This is not inconsistent with literature, because while presence could be defined as something physical ((Schloerb, 1995)), the literature also suggested that a feeling of presence could be established without a physical presence (Bourdon, 2020; IJsselsteijn and Harper, 2001; Mantovani and Riva, 1999). In this study, no significant difference has been found, which supports the second statement. Furthermore, the playing environment does not seem to play an important role in the desired result. In this experiment no significant difference between the result variables, in terms of achieving the goal, has been measured. Given these results, the game is equally successful in both a mediated and physical environment.

This study shows many relations between player experience and the result of the game. This is consistent with literature, which suggests a relation between player experience and the result of the game (Hofstede et al., 2010). This study shows that the extent to which players were able to immerse themselves in the game and felt positively influenced during the game, plays a role in achieving the goal. A negative relationship has also been found between a negative experience (after the game)

and the extent to which goals have been achieved. However, the playing environment does not play a significant role in this.

Finally, it should be noted that the quality of the session of the game, and in particular the performance of the digital communication technique, contains the most important explanation to explain individual qualitative results. If players were poorly audible due to a bad connection, the game started later due to technical problems. For example, during the first session the game was played only once instead of twice, which was reflected in the individual quantitative results. In a mediated, the quality of the session is much more dependent on digital technology and therefore plays a major role in the outcome of the game. This difference is particularly noticeable, because there is a lot of difference in the facilitation of mediated sessions where everything went well or not very well. This corresponds to with literature stating that inadequate quality of the session (or facilitation) can jeopardize the outcome of the game (Hofstede et al., 2010).

7.4. Nuances in differences between physical and mediated environment

An important finding in this study, is that the difference between a physical and mediated environment is not a day-and-night contrast. It is not the case that the physical sessions generally went better than the mediated sessions. Some mediated sessions went worse, but other sessions went better than physical sessions. This also becomes clear in the quantitative results, where no significant differences were established in the outcome variables except for Tiredness. This would conclude that we cannot draw a clear dividing line between the performance of a physical and mediated session. Below three reasons for this will be discussed.

First of all, the outcome and player experience is highly dependent on the quality of the individual session. A mediated session can go very well with only a few problems, resulting in a successful session. But if things go wrong and it takes a long time for a problem to be remedied, the outcome is visibly less good, as can be seen from the (individual) quantitative results. In mediated sessions, the dependence on digital communication technology increases the likelihood that something will go wrong, resulting in fatigue and a less positive experience, as shown in the observations. Backup options can play an important role in this, as they can lead to more flexibility and resilience. The faster a problem can be solved, the better it is for the course of the sessions. On the other hand, in some cases the players seemed to be more concentrated after a break, whether or not caused by a technical problem.

Second, the facilitation of the game is not unequivocally better or worse in either a physical and mediated session. Facilitation plays an important role in the success of a game session, both during game play and during debriefing. In a physical session, the facilitator plays a supportive role and can easily adjust his interference in the game as needed. During the debriefing, he can actively moderate and start the conversation, but can also hold back a bit once the conversation has started. However, the physical presence of the facilitator can also create an uncomfortable situation, because the players play the game and do the debriefing under the 'watchful eye' of the facilitator. During a mediated session of a facilitated board game, the role of the facilitator is much greater. When controlling the gaming table, there is a risk of failure if the facilitator makes mistakes. The facilitator in the debriefing must also be more active in guiding the conversation. On the other hand, a mediated environment makes the facilitator's role as a mediator easier, because everyone takes turns speaking and allows each other to speak. A mediated environment also provides a 'safe barrier' so that it can be easier for the players to adopt a vulnerable position. Especially during a physical session (so the players play the game in a physical environment) with the facilitator present through a video connection, an intimate atmosphere can be created in which the conversation becomes more personal.

Finally, mediated sessions are sometimes not fully mediated. In a number of cases in this experiment, several people were behind the same screen or behind another screen in the same room. So these people were physically present together, but the other players were present in a mediated way. This is clearly reflected in the behaviour of the players. The interaction between the 'physical players' increases because they can communicate back and forth faster and can easily interrupt each other. Moreover, it was easier to have a conversation between themselves, about the game or irrelevant topics. This caused significant noise on the line, causing comments from the mediated players to be missed more often. This actually reduced the interaction with and between the 'mediated players'. In summary, mediated sessions in which part of the players are physically in each other's presence is

counterproductive.

7.5. Discussion of the methodologies used in this study

A mixed-method research methodology was a very suitable for studying the effect of a playing environment on the outcome of a facilitated tabletop game. By using a mixed-method approach in this study, the different research sub questions were answered by using a suitable methodology. Measuring the outcome of the game, that is the player experience and the result in terms of achieving the goal, required a quantitative perspective while the question how a mediated environment affects a game session can be answered in a qualitative way by observing and reporting what happens during the sessions. When integrating both perspectives, the observations were very useful for explaining the quantitative results of individual sessions, especially the importance of quality of the session. On an aggregated level, the qualitative data were important to explain significant results, like the relation between the playing environment and tiredness or between affinity with board games and the result of the game. Also for explaining the absence of significant relations the integration of both perspectives provided important insights. For example, the presence of Parkinson's disease was occasionally visible, but did not play a decisive role in the game sessions.

In section 1.4 advantages and disadvantages of this approach are explained. For example, mixed-methods research can utilize the strengths of both approaches while it offset the weakness of using a pure qualitative or quantitative approach (Creswell and Plano Clark, 2011). Another advantage of this approach is that more data sources are available than a qualitative or quantitative study. A disadvantage of mixed-methods research is the complexity of the methodology. A researcher has learn about multiple methods in both the quantitative and qualitative perspective and mix these methods in a right and understandable way (Johnson and Onwuegbuzie, 2004). Also, because a mixed-methods is quite complex, it can consumes a lot of time(Creswell and Plano Clark, 2011).

In this study the advantages were noticeable. In this study, the availability of qualitative data was quite low, because of the coronavirus pandemic and a very specific target group (people with Parkinson's Disease and their environment). 44 participants completed the questionnaire, from only 13 played in a physical playing environment. This can lead to significant relationships not being found (Type II error). At the same time, many statistical tests have been performed, increasing the chance of finding false significant results (Type I error). However, because the conclusions do not only depend on the statistical results, but are explained by the qualitative data, the conclusions are more reliable than if it were only a qualitative study. On the other hand, if only a qualitative approach was used, the results would be difficult to generalize. Because the conclusions are a based on a mix of qualitative and quantitative data, it is more suited to generalize the findings in this study.

The disadvantages were also present in this study. The complexity of both having a questionnaire and also recording and reporting qualitative data, caused the data collection phase to quite complicated and the analysis phase to be longer than anticipated. In the analysis of the qualitative data, it was important to use the correct statistical tests and to visualize the results in a clear way. At the same time, the qualitative data had to be both reported extensively and summarized clearly. After these steps, both also had to be integrated before the results could be discussed.

In the end, the use of both qualitative data and quantitative data can ensure the creation of an rich picture of the effect of the game environment. However, the intensity and time consumption of using a mixed-methods approach should not be underestimated.

7.6. Shortcomings in this study

This section reflects on some choices that have been made in this study and discusses a couple weaknesses in this study.

In the first place, the test setup of this study has been quite austere. It has been decided to create a 'minimum viable' mediated presence with hardware and software that are easily available and without professional tools. Although many players responded positively to the way the mediated environment has been designed, some testing sessions might have gone better with the use of more professional tools. For example, a better image quality, connection reliability or user-friendliness could have resulted in a different player experience or game result.

Secondly, in this study, 44 participants completed the questionnaire, of which only 13 played in a physical environment and 10 Parkinson's Disease. This are small groups to find reliable, significant results. It is difficult to measure a clear difference between a physical and mediated session, especially because the quality of an individual game session plays an important role and is very different per session. Furthermore, this increases the chance of a type II error. Moreover, the number of participants were unevenly distributed between the different groups (i.e. playing environment and players' perspective). Even though the non-parametric statistical tests have taken this into account, evenly distributed groups and the use of parametric tests would have given the results more statistical power.

Thirdly, when answering the questions, participants have been asked for their own assessment estimation or expectation of the effect of the game instead of measuring the real effect with a pre- and post-measurement. Also, this study does not measure any long-term effects of the game, for example by measuring the effects after six months or a year.

In the fourth place, the questions in the Game Experience Questionnaire are answered by means of a Likert scale. The different variables are calculated by averaging 2 to 6 questions from the GEQ. A Likert scale is also used for measuring the effect of Cue Kitchen. Strictly speaking, it is not right to just take the averages of a Likert scale or compare answers different groups. Participants can approach the different options such as "totally disagree", "neutral" and "agree" in different ways, with one choosing an extreme option only exceptionally while the other prefers to stay around the middle. Also, the distances between the different options are not necessarily the same, the Likert scale is ordinal and no interval. However, because it is hard to measure player experience or the result of the game in another way, given the time and resources in this study, a Likert scale can provide useful insights, especially when qualitative data are used to explain the quantitative data.

Finally, many statistically significant tests were performed in this study, which increases the risk of a type I error. However, it should be noted that this research naturally focuses on the relevance of significant relationships and differences, because of the mixed-method approach, in which the qualitative data were used as an explanation of the quantitative data. An example of a significant relationship for which no relevant explanation has been found, is the one between PD and the player variable Returning to Reality.

7.7. Personal reflection

In the first place, I had a lot of fun during this master thesis project. I especially enjoyed the inspiration from my first supervisor Rens Kortmann. I was not afraid to ask for his opinion and his regular feedback has helped me very well, especially in formulating the right research questions, choosing a suitable method and performing the right analyzes.

In the second place, I learned a lot during the project. For example, I got better at guiding the game sessions and I felt more and more at ease during a debriefing, for example. I noticed that I should not play a role of facilitator in this, but rather be myself and be able to ask the right questions based on my own interests. Working with a minimum viable setup for the mediated sessions made it exciting and had some teething problems in the beginning, but got better each time. Ultimately, the setup worked well.

Thirdly, looking back, I have underestimated the effect of the corona crisis. Searching and finding participants in particular was difficult and did not really get off the ground. I think people had other things on their mind or just wanted nothing on their mind during the summer holidays. That made the middle part of the study mentally difficult. Once things got underway, things got better mentally, but gathering data took much longer than planned.

Fourthly, I have found myself often too optimistic. The first part, figuring out exactly what to research and how, was much more difficult than I thought. And although my method was suitable for this research, the analysis took much longer than I expected. With today's knowledge I would have liked to be more realistic in my planning and communication.

Last but not least, it was a privilege to be present, physically and mediated, in the conversations that the participants had with each other. These were often intimate and really about something important. It was nice to see that the game and my research made a very concrete contribution to people's lives. This often gave me the motivation to continue when finding participants was difficult or the analysis of results took longer than I would have liked. Finally, I learned a lot about Parkinson's Disease, something I did not expect when I started graduation for Complex System Engineering and Management.

8

Conclusion

This chapter draws conclusions and answers the research question *What is the effect of playing* Cue Kitchen *in a mediated environment on the outcome of the game compared to a physical environment.* The main conclusion that answer the research question can be found in section 8.3.

First, section 8.1 elaborates on the theory about playing environments and the outcome of facilitated tabletop games. Then, section 8.2 focuses on the general outcome of the experiment and elaborates on the effect of different player characteristics. In section 8.3 the conclusions about the effect of a mediated environment on playing *Cue Kitchen* will be presented (Sub questions 3, 4 and 6). Section 8.4 draws conclusions about playing the game with people with and without Parkinson's disease, also addressing sub question 5. Finally, in section 8.5 recommendations are made for improving Cue Kitchen, for playing a facilitated table-top game in a mediated environment and for further research.

8.1. The relation between a playing environment and the outcome of facilitated tabletop games

This section answers research sub questions 1 and 2 about how the relation between a playing environment and outcome of a facilitated tabletop game can be measured and what can be expected from these results.

The relation between the playing environment and the outcome of a serious tabletop game has not been described in literature or what effect it could have. However it is possible to create insight in this relation to combine different ideas emerging from the literature.

The outcome of a facilitated tabletop game is twofold: the extent to which the goal(s) of a game has been achieved (the result of the game) and player experience. The player experience can affect the result of the game: a negative player experience can lead to failure of the game in terms of its result.

The choice of playing a game in a mediated environment is part of the game session design. This can influence the outcome of the game. The design of the session can, just as facilitation, affect the quality of the session and therefore also jeopardize the outcome of the game. Furthermore, the choice of playing in a mediated environment could influence the exchange of emotions, which could affect the player experience. However, the literature also suggests that it is possible to create a sense of presence using a mediated environment. This mediated or social presence in a mediated environment is then similar to physical presence in a physical environment.

As stated before, there is no clear indication of what the effect of a mediated environment will be on the outcome of the game. However, during the coronavirus disease (COVID-19) pandemic in 2020, the term 'Zoom fatigue' was introduced to indicate tiredness when using video conferencing software like Zoom. Although no reviewed results have been published so far, grey literature such as traditional media and lifestyle websites are observing an increased level of tiredness when video calling. Large studies have been set up to investigate the psychological effect of video conferencing.

8.2. The outcome of Cue Kitchen

This section presents the general outcome of the experiment and elaborates on the effect of different player characteristics, answering research sub question 5 about the effect of the player characteristics on the outcome of Cue Kitchen.

Cue Kitchen can be a successful method for raising awareness about the invisible symptoms of Parkinson's disease in the social environment of people with Parkinson's. The game is a little less suitable to create understanding about Parkinson's Disease in general. In almost all cases, the game enabled participants with PD to start a conversation about their individual situation, invisible symptoms and cues. However, the social environment is not convinced that they have a better understanding about the situation of the player they know (see also section 8.4).

In general, players had positives feelings when playing Cue Kitchen. Most players felt positively affected and immersed in the game. On the other hand, they felt no negative affect or any tension and annoyance during the game. Almost all players indicated that they had a good time and thought it was a great game.

The quality of the game play and debriefing is particularly important to explain the score on player experience and result of the game for individual sessions. A good game play is leading to a better player experience. A smooth debriefing leads to a better achievement of the goals, especially when the players ask each other questions and share experiences without the intervention of the debriefer. The more the debriefer has to initiate the conversation, the less successful the game is.

Cue Kitchen is better suited for players who have more affinity with playing board games. Players who often play and enjoy board games have gained a better understanding of what it is like to have an invisible symptom, the concept of cues, and Parkinson's disease in general after playing. These players are better able to empathize with other players in the game. The game is suitable for players of various age, gender and education level.

8.3. Playing *Cue Kitchen* in a mediated environment

In this section the conclusions about the effect of a mediated environment on playing *Cue Kitchen* are presented. This will answer research sub questions (3) *How are the effects of the playing environment noticeable*), (4) *What is effect of the playing environment on the outcome of Cue Kitchen?*, (6) *How can the observations explain the measured outcome?*. and (7) *How can the conclusions from this study be applied to the use of facilitated tabletop games for complex systems in general*.

8.3.1. Main conclusion about the effect of a mediated environment

Based on the results in this experiment, the playing environment of the game session does not have much effect on both player experience and the result of the game. The game *Cue Kitchen* is equally successful in both a mediated and physical environment. Also, no differences have been found between the two environments on almost all variables measuring player experience. However, players in a physical environment indicated to be less tired than in a mediated environment. The observations show indeed that players in a mediated environment became more tired during the debriefing. This was especially the case when problems occurred with the video and audio-connection. In many cases when players showed signs of tiredness, earlier in the game some connection issues needed to be resolved, causing the game to start later or interrupting the session.

These results contradicts what literature states about presence only existing in a physical setting. Instead, it confirms what the literature suggests about mediated presence, that it is possible to create a sense of presence without actually being present. The social presence module results are not significantly different between both environments. The fact that tiredness is greater in a mediated environment can be expected from the (grey) literature about 'Zoom Fatigue' (see Section 8.1).

8.3.2. The quality of game session in a mediated environment

The quality of a session plays an important role in explaining the results of the sessions when it comes to achieving the goal of Cue Kitchen. Although no significant quantitative differences were found between the two environments, differences are noticeable in the observations and the individual quantitative results of different sessions. The main reason for these difference were issues with the quality of the game session like problems with the audio or video connection. In these cases, the game play had to

begin later or was even interrupted. For these sessions, the scores on variable measuring the result of the game were lower than other sessions. Although mediated presence did seem to affect the quality of the game play and the quality affected the outcome of the game, no significant difference have been found.

8.3.3. Ambiguity in the difference between a physical and mediated environment

An important conclusion of this experiment is that there are no unambiguous differences between a physical or mediated environment. There are three reasons for this.

First, a mediated session has more dependence on digital communication technology, which means an increased risk of problems in the quality of the game session. However, this does not necessarily have to be the case. During some mediated sessions, many thing went wrong and the quality of the session was very low. In other mediated sessions everything went well and the outcome was just as good, and in some cases even better, as with physical sessions.

The second reason is that during a number of sessions there was not fully physical or mediated environment. For example, in two of the three physical sessions, the facilitator was actually present through a video connection. And in a number of mediated sessions, there were two players behind the same screen or behind different screens in the same room. So, these players experienced each other as physical present and therefore had more interaction together. However, the other two players were mediated present, and because the many interactions of the first two players caused a lot of noise on the video connection, they were less involved in the game.

Finally, there are advantages and disadvantages in both environments that could have an effect on the outcome of the game in both directions. In a physical environment there is more interaction during the game play, but the physical presence of the facilitator can cause an uncomfortable situation. In a mediated environment it is more difficult to play the game together because comments from the player are regularly lost due to noise on the connection when two players are speaking at the same time. The advantage of a mediated debriefing is that it is much more structured, everyone can share their story and ask questions. An interesting finding is that during a physical session with the facilitator present through a video connection, an intimate atmosphere is created in which the conversation becomes more personal.

8.4. Playing *Cue Kitchen* with or without Parkinson's disease

This section elaborates on how a game is affected when playing with people with Parkinson's Disease and answers an important part of research sub questions 5 about the effect of Parkinson's Disease on the outcome of *Cue Kitchen*.

The variety of symptoms of PD, which it is known for, were noticeable in some game sessions. Some players had slowness of movements or were slow in their interactions with other players and the facilitator. On the other hand, some other players had fast and random movements and appeared chaotic in their interaction with others. And others showed no visible symptoms of PD during the sessions. In almost all cases, these symptoms did not affect the game play.

The player experience is almost equal for players with and without PD, with the exception of Returning to Reality. While players with Parkinson's have little trouble getting back to reality and don't feel disoriented, this is significantly more than their social environment. It is not entirely clear what this could be related to, nor can it be explained by qualitative data as this is what happens after the session.

A person with PD can explain more about his own situation and answer questions from other players. Nine out of the ten participants with Parkinson's indicated that the game enabled them well or very well to initiate a conversation about their own invisible symptoms and cues. Eight participants expected that their social environment is able to help them better in the future. However, this does not necessarily mean that the social environment has a better understanding about the individual situation of the person with Parkinson's (only 62%) or that they expect to be able to help them better in the future (only 55%). This can be explained from the qualitative results: many players had a close relationship with the person with Parkinson's and felt they already knew them well, although it is remarkable that the hope of the person with PD does not reflect the expectations of their social environments.

8.5. Recommendations

This section discusses three types of recommendations: for the MaySways foundation for further development of Cue Kitchen, for game designers and facilitators who want to facilitate a board game in a mediated environment, and for future research.

8.5.1. Recommendations for the MaySways foundation

The MaySways foundation can use *Cue Kitchen* as a successful method for creating awareness about the invisible symptoms of Parkinson's Disease (PD) in the social environment of someone with PD. It can be recommended to produce the game, organize facilitated game sessions and maybe even distribute the game to interested parties who can play the game without facilitation.

In general, the participants enjoyed the game while it also has positive results with regard to creating awareness. The game enables the player with PD to start a personal conversation about his personal situation, although this does not necessarily mean that the social environment has an improved understanding, since the participants indicate that they already know the situation of the person with PD very well. In order to know to what extent *Cue Kitchen* improves the life of people with Parkinson's, MaySways should study the effect long term including multiple pre- and post-game measurements, instead of the estimated effect by persons themselves as has been done in this study. This could also include measuring the long-term effect of Cue Kitchen, for example after half a year.

Also, different disciplines should be consulted in the further development of this game. For example, a medical (neurological) discipline needs to assess the medical accuracy in and relevance of this game. A game designer (e.g. a complex systems engineer like myself) for improving the game design. Or a behavioural scientist with a psychological perspective to study the relation between the social environment and the person with PD and the effect of the game on the behaviour of the social environment.

During this study all game sessions have been facilitated. Facilitation and moderation is necessary in a mediated environment, because the moderator needs to manage the game table during the game play (i.e. moving the cards around). In a physical environment, the facilitator has only a supportive role, answering players' questions about the game play and Parkinson's Disease. Therefore, it should be possible to play the game without facilitation in a physical environment, since the players can use the video-tutorial, manual and debriefing guide. Another possibility to make facilitation unnecessary is to digitize the game, using online software like Tabletopia, (`https://tabletopia.com/`). However, it is not clear if the game is still as effective without facilitation or in a fully digital form. MaySways could test the effectiveness (and player experience) of these possibilities using the questionnaire used in this project.

Although it is possible to play *Cue Kitchen* in a mediated environment, it should be taken into account this causes the players to be more tired. This is an important factor for people with PD, who can have difficulties concentrating and are tired faster. On the other hand, when people with PD have trouble with a chaotic social setting with people talking over each other, a mediated presence can be a good solution, since a discussion needs more structure. Depending on the individual situation and preferences of the player with PD, the facilitator can choose whether the game session can take place in a mediated environment or not. Based on the findings in this study, it can be advised that people with Parkinson's Disease do not necessarily have to play the game, but can also observe. If he likes to play board games, it can be encouraged to play along, but if not, being an observer and participating in the debriefing works very well.

Two aspects in the game can be improved. First, the debriefing should be improved to ensure a smooth debriefing. The debriefing guide or facilitator can provide some necessary information and directions, but is better to 'seduce' the players in taking the initiative. For example, talking points can be handed out on question cards. Also, the facilitator should act as moderator and sometimes it is not bad when there is a silence. Secondly, a number of people found the dark skin colour in combination with the function of the fourth role in the game, the 'jack of all trades' or le Garçon de Cuisine, inappropriate. While it is by no means intended to be offensive, it should be adjusted, for example by swapping the image of two role cards.

Finally, although the game can be considered as a successful way to create awareness, MaySways could compare the effect of this game with possible other ways of creating awareness of the invisible symptoms of Parkinson's Disease. Of course, these ways do exclude each other and can even com-

plement each other well. For example, an informative video can contribute to the debriefing, or the game can be a good addition to a workshop.

8.5.2. Recommendations for game designers and facilitators

Although I expect that playing a facilitated tabletop game in a physical environment will remain to be the standard, game designers and facilitators do not have to be afraid to play such a game in a facilitated environment. Especially, after reading the following recommendations:

- A mediated environment should be fully mediated, which means that all interaction between the players should be mediated. So avoid multiple people behind the same screen or in the same room, because then the interaction with the other (solo) players will be less.
- Mediated facilitation can be an advantage, especially during the debriefing. It brings a structure and calmness to a debriefing. Try to start the conversation by asking questions but encourage other players to take the lead, for example by asking questions to each other. Avoid setting off a monologue and become a ‘presenter’ when everybody stays quiet because it is hard to get out of this role.
- Also in a physical environment, a remote facilitator can be an advantage. The fact that you are not physically present can create a more intimate atmosphere for the players. Encourage one of the players to take the lead in the debriefing.
- You are dependent on the technique, which determines the quality of the session and thus the effect. Therefore, choose and test your setup well. Also take into account what can happen on the participants’ side, such as bad Wi-Fi connection, wrong browser, empty batteries, et cetera. Prepare backup options for when problems occur, because flexibility is key.
- Tiredness is a major factor, especially when it takes a long time before the game begins due to technical issues. Stay patient yourself because it reflects also on the players. Breaks work well, so encourage people to grab a drink or take a bathroom break. This also is true for the facilitator, do not underestimate that you can become tired yourself

8.5.3. Recommendations for future research

This study is a first step towards filling in a scientific knowledge gap about playing tabletop games in a mediated environment instead of a physical one. Since facilitated tabletop games are intended to be played in a physical setting, the effect of a mediated environment on the outcome of a facilitated tabletop game has not been studied before. And although ’Zoom fatigue’ is mentioned in ’gray’ literature and currently studied on large scale, this study presents that participants are significantly more tired in mediated environment than in a physical environment. However, it is important to continue research into this topic. Below several recommendation will be made for future research

The effect of a mediated environment on the outcome of a game can be studied more extensively, especially in a quantitative way. Future research should include more participants and test sessions, evenly distributed between a physical and mediated environment, to better measure the effect of mediated versus physical presence instead of it being clouded by the quality of individual games. This will create more reliable quantitative results.

This study focuses on the result of game and player experience, and suggests that people in a mediated environment are more tired while other outcome variables are not significantly different. With working from home and meeting online being more and more usual, partly as a result of the coronavirus disease pandemic, it is important to study the effects of a mediated environment on people, beyond gaming experience. Especially psychological effects or health related issues should be studied. Fortunately, these studies are already announced and first results are already presented.

Finally, more scientific research needs to be done in how games can be played in a mediated way. This study only makes use of everyday objects, while much more is possible to play a game in a mediated way. Although this study give some insight on how to design a mediated game session, more scientific insights are needed that can help assess what is more and less suitable. For example, studies can include more professional tools, such as 3D or holographic experiences. Also, the effect of a fully digital game instead of or compared to a mediated facilitated tabletop game can be studied.

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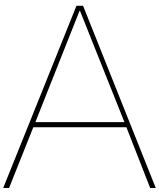


Application Human Research Ethics Committee

See next page for the content of this appendix

Delft University of Technology
ETHICS REVIEW CHECKLIST FOR HUMAN RESEARCH
(Version 22.01.2020)

This checklist should be completed for every research study that involves human participants and should be submitted before potential participants are approached to take part in your research study. This also applies for students doing their Master-thesis.

In this checklist we will ask for additional information if need be. Please attach this as an Annex to the application.

The data steward of your faculty can help you with any issues related to the protection of personal data. Please note that research related to medical questions/health may require special attention. See also the website of the CCMO.

Please upload the documents (go to this page for instructions).

Thank you and please check our website for guidelines, forms, best practices, meeting dates of the HREC, etc.

I. Basic Data

Project title:	**Master Thesis**
Name(s) of researcher(s):	**H.N. aan het Rot**
Research period (planning)	**8 April 2020 – 25 October 2020**
E-mail contact person	**H.N.aanhetRot@student.tudelft.nl**
Faculty/Dept.	**TPM**
Position researcher(s):[1]	**Student**
Name of supervisor (if applicable):	**L.J. Kortmann**
Role of supervisor (if applicable):	**Assistant Professor**

II. A) Summary Research

This master thesis will answer the research question: What is the effect of playing a facilitated tabletop game for complex systems in a mediated environment on the outcome of the game compared to a physical environment?

In the experiment phase of this project, the serious game Cue Kitchen will be played with ca. 60 test subjects (15 groups of 4 people). Some of the test subjects will have Parkinson's disease, however this will not be considered as vulnerable. The game sessions will be played in multiple setups: using mediated presence (i.e. with digital communication) and with physical presence (only if possible, see Risk Assessment).

After playing the game, subjects will be (digitally) interviewed, and/or conducting the Game Experience Questionnaire through an online questionnaire. Footage and audio of the game sessions will be recorded for behavioural analysis.

[1] For example: student, PhD, post-doc

B) Risk assessment

I don't expect any potential risk for the participants as a result of my research. I will gather personal data, as indicated in the data management plan. These data will be gather conform GDPR regulation: tests subjects will be asked to sign an online informed concent form and confirm their informed concent orally at the beginning of (recorded) game sessions. Personally data will be stored only locally on the student's laptop and with a backup on Surfdrive.

To measure the effect of mediated presence in serious gaming, it should be compared with the results of physical presence, by playing life test sessions of Cue Kitchen. Unfortunately, the current corona-crises creates uncertainty. Ideally the games are played with me (or delegate) as facilitator, who explains the game and guide the players through the process. The current situation makes it impossible (and undesirable) to be physical present with multiple groups. Therefore, there are 2 scenarios for life played sessions:

1. *The measures of the corona crisis will stay in place for the complete duration of the graduation project.*
   Life test sessions can be played with only with families or roommates that are already in physical presence of each other. This way, new contacts in proximity can be prevented. A facilitator is connected with the test group through Facetime or similar technology, during the whole game play, so no travel is necessary from and to the research loation. This scenario will be most likely.
2. *The corona measures will be reduced during the graduation project, before next August.*
   A facilitator can be present at the life test sessions, however precautionary measures should be taken. Life test sessions should be played with families or roommates as much as possible, to prevent unnecessary contacts. There can be no life test sessions with people that have an increased risk (e.g. elderly, people with cardiovascular disease). At all times, a distance of 1.5 meter should be taken into account, and material should be desïnfected before and after playing. If possible and desired, the facilitator and/or players could use personal protective equipment, such as a face mask and gloves.

The game is played by Parkinson patients and their friends, family members, colleagues or caregivers, and should enable the conversation about the invisible symptoms and cues of that particular patient. Cue Kitchen is considered to be a social game, and not a medical game regarding therapy or treatment.

The research concerns patients with Parkinson's disease. These could be considered vulnerable data subjects. However, these test subjects are able to give informed consent. If patient are in fact vulnerable, i.e. not able to give an informed consent, these data subjects will not participate in this study. Health data (whether a person is a Parkinson's patient or not) is considered as sensitive personal data. This data is only used to decide how to approach these test subjects (i.e. personal, direct contact is preferred above passive, indirect contact). However, the test sessions are recorded (video and audio) and it cannot be ruled out that sensitive information is included in those recordings.

III. Checklist

Question	Yes	No
1. Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g., children, people with learning difficulties, patients, people receiving counselling, people living in care or nursing homes, people recruited through self-help groups).	x	
2. Are the participants, outside the context of the research, in a dependent or subordinate position to the investigator (such as own children or own students)?[2]		x
3. Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g., covert observation of people in non-public places).		x
4. Will the study involve actively deceiving the participants? (For example, will participants be deliberately falsely informed, will information be withheld from them or will they be misled in such a way that they are likely to object or show unease when debriefed about the study).		x
5. Sensitive personal data • Will the study involve discussion or collection of personal sensitive data (e.g., financial data, location data, data relating to children or other vulnerable groups)? Definitions of sensitive personal data, and special cases thereof are provided here.	X	
6. Will drugs, placebos, or other substances (e.g., drinks, foods, food or drink constituents, dietary supplements) be administered to the study participants?		x
7. Will blood or tissue samples be obtained from participants?		x
8. Is pain or more than mild discomfort likely to result from the study?		x
9. Does the study risk causing psychological stress or anxiety or other harm or negative consequences beyond that normally encountered by the participants in their life outside research?		x
10. Will financial inducement (other than reasonable expenses and compensation for time) be offered to participants?		x
Important: if you answered 'yes' to any of the questions mentioned above, please submit a full application to HREC (see: website for forms or examples).		
11. Will the experiment collect and store videos, pictures, or other identifiable data of human subjects? [3] .	x	

[2] **Important note concerning questions 1 and 2.** Some intended studies involve research subjects who are particularly vulnerable or unable to give informed consent .Research involving participants who are in a dependent or unequal relationship with the researcher or research supervisor (e.g., the researcher's or research supervisor's students or staff) may also be regarded as a vulnerable group . If your study involves such participants, it is essential that you safeguard against possible adverse consequences of this situation (e.g., allowing a student's failure to complete their participation to your satisfaction to affect your evaluation of their coursework). This can be achieved by ensuring that participants remain anonymous to the individuals concerned (e.g., you do not seek names of students taking part in your study). If such safeguards are in place, or the research does not involve other potentially vulnerable groups or individuals unable to give informed consent, it is appropriate to check the NO box for questions 1 and 2. Please describe corresponding safeguards in the summary field.

[3] Note: you have to ensure that collected data is safeguarded physically and will not be accessible to anyone outside the study. Furthermore, the data has to be de-identified if possible and has to be destroyed after a scientifically appropriate period of time. Also ask explicitly for consent if anonymised data will be published as open data.

Question	Yes	No
12. Will the experiment involve the use of devices that are not 'CE' certified? *Only, if 'yes': continue with the following questions:*		x
➢ Was the device built in-house?		
➢ Was it inspected by a safety expert at TU Delft? (*Please provide device report, see: HREC website*)		
➢ If it was not built in house and not CE-certified, was it inspected by some other, qualified authority in safety and approved? *(Please provide records of the inspection).*		
13. Has or will this research be submitted to a research ethics committee other than this one? (*if so, please provide details and a copy of the approval or submission).*		x

IV. Enclosures (tick if applicable)

- ✓ Full proposal (if 'yes' to any of the questions 1 until 10)
- ✓ Informed consent form (if 'yes' to question 11)
- o Device report (if 'yes' to question 12)
- o Approval other HREC-committee (if 'yes' to question 13)
- o Any other information which might be relevant for decision making by HREC
- ✓ Data management plan approved by a data steward (always)
- ✓ Debriefing document

V. Signature(s

Signature(s) of researcher(s)

Harmen aan het Rot
Date: 20-5-2020

Signature (or upload consent by mail) research supervisor
Date:

II - FULL PROPOSAL

Research Ethics Application

Please fill in the checklist first if you have not done so already. Please complete this form digitally and send it the Ethics Committee.

Date of Submission:29-6-2020

Project Title: Masther Thesis – Testing Cue Kitchen

Name(s) of researcher(s): H.N. aan het Rot

Name of supervisor (if applicable): Rens Kortmann

Contact Information

Department: Master Complex Systems Engineering and Management – Graduation by Multi-Actor Systems

Telephone number: 06 33 62 50 30

E-mail address: H.N.aanhetRot@student.tudelft.nl

Contact information of external partners (if applicable): Stichting MaySways, May Koormean, maykooreman@gmail.com

Summary

Please provide a brief summary of the research.

This master thesis will answer the research question: What is the effect of different technologies that enable mediated presence in serious gaming on 1) the effectiveness of serious gaming and 2) the experience of its players?

In the experiment phase of this project, the serious game Cue Kitchen will be played with ca. 60 test subjects (15 groups of 4 people). Some of the test subjects will have Parkinson's disease, however this will not be considered as vulnerable. The game sessions will be played in multiple setups: using mediated presence (i.e. with digital communication) and with physical presence (only if possible, see Risk Assessment).

After playing the game, subjects will be (digitally) interviewed, and/or conducting the Game Experience Questionnaire through an online questionnaire. Footage and audio of the game sessions will be recorded for behavioural analysis.

Research

R.1. What is the research question? Please indicate what scientific contributions you expect from the research.

What is the effect of playing a facilitated tabletop game for complex systems in a mediated environment on the outcome of the game compared to a physical environment?

R.2. What will the research conducted be a part of?

☐Bachelor's thesis

☒Master's thesis
☐PhD thesis
☐Research shills training
Other, namely: Enter what the research is part of here.

R.3. What type of research is involved?
☒Questionnaire
☒Observation
☒Experiment
Other, namely: Enter the type of research here.

R.4. Where will the research be conducted?
☒Online
☐At the university
☒Off-campus / non-university setting: At test subjects home, taking corona measures into account.
Other, namely: Enter where the research will be conducted here.

R.5. On what type of variable is the research based?
Give a general indication, such a questionnaire scores, performance on tasks, etc.
Questionnaire scores

R.6. If the research is experimental, what is the nature of the experimental manipulation?
The experiment will be testing the game using a mediated environment or a physical environment

R.7. Why is the research socially important? What benefits may result from the study?
There are many reasons why it may not be possible to come together and play a serious game in physical presence of each other. For example, during the Coronavirus disease (COVID-19) pandemic, measures like working from home and social distance, did make it hard to organize physical activities. When it is not possible to play a serious tabletop game in a physical environment, digital tools such as Teams, Zoom or FaceTime, could enable a mediated environment for the players to play a facilitated serious tabletop game.

R.8. Are any external partners involved in the experiment? If so, please name them and describe the way they are involved in the experiment.
This graduation project is a collaboration with a foundation, Stichting MaySways. Stichting MaySways is a foundation based in Aerdenhout, the Netherlands, and is committed to create awareness invisible symptoms of Parkinson's disease. They are committed to creating empathy and understanding in the outside world by artfully expressing the invisible thought and emotional world of the patient. This foundation is the initiator of the development of the game. Contact person: May Koorman

Participants

Pa.1. What is the number of participants needed? Please specify a minimum and maximum.
Minimum: 60
Maximum: 100

Pa.2.a. Does the study involve participants who are particularly vulnerable or unable to give informed consent? *(e.g., children, people with learning difficulties, patients, people receiving counselling, people living in care or nursing homes, people recruited through self-help groups)*
The research concerns patients with Parkinson's disease. These could be considered vulnerable data subjects. However, these test subjects are able to give informed consent. If patient are in fact vulnerable, i.e. not able to give an informed consent, these data subjects will not participate in this study.

Pa.2.b. If yes and unable to give informed consent, has permission been received from caretakers/parents?

Enter if permission from the caretakers/parents can be received here.

Pa.3. Will the participants (or legal guardian) give written permission for the research with an 'Informed Consent' form that states the nature of the research, its duration, the risk, and any difficulties involved? If no, please explain.
Yes

Pa.4. Are the participants, outside the context of the research, in a dependent or subordinate position to the investigator (such as own children or students)? If yes, please explain.
No

Pa.5. How much time in total (maximum) will a participant have to spend on the activities of the study?
3 hours

Pa.6. Will the participants have to take part in multiple sessions? Please specify how many and how long each session will take.
No

Pa.7. What will the participants be asked to do?

1) Pregame questionnaire; 2) play the game, incl briefing and debriefing; 3) group interview; 4)post game questionnaire or individual interview (if preferred by the Parkinson patient)

Pa.8. Will participants be instructed to act differently than normal or be subject to certain actions which are not normal? *(e.g. subject to stress inducing methods)*
No

Pa.9. What are the possible (reasonably foreseeable) risks for the participants? Please list the possible harms if any.
None

Pa.10. Will extra precautions be taken to protect the participants? If yes, please explain.
Yes, active corona measures are taken into account if playing physically: 1.5 meter distance (if not possible, there will be no physical game) and mask

Pa.11. Are there any positive consequences for a participant by taking part in the research? If yes, please explain.
The aim of this game is to create awareness in the social environment of Parkinson patients about the invisible symptoms and the importance of so-called cues. The game also has to help initiate the conversation between the patient and its social environment about these symptoms and how they could help the patient with these symptoms by using cues.

Pa.12. Will the participants (or their parents/primary caretakers) be fully informed about the nature of the study? If no, please explain why and state if they will receive all information after participating.
Yes

Pa.13. Will it be made clear to the participants that they can withdraw their cooperation at any time?
Yes

Pa.14. Where can participants go with their questions about the research and how are they notified of this?
To Harmen aan het Rot, this will be made clear in the inform consent form.

Pa.15. Will the participants receive a reward?
☐Travel expenses
☐Compensation per hour
☒Nothing
Other, namely: Enter the reward here.

Pa.16. How will participants be recruited?
60

Privacy

Pr.1. Are the research data made anonymous? If no, please explain.
Yes

Pr.2. Will directly identifiable data (such as name, address, telephone number, and so on) be kept longer than 6 months? If yes, will the participants give written permission to store their information for longer than 6 months?
No

Pr.3. Who will have access to the data which will be collected?
Master student Harmen aan het Rot and supervisor Rens Kortman

Pr.4. Will the participants have access to their own data? If no, please explain.
Yes, they could request to see their data, which will be forwarded to them

Pr.5. Will covert methods be used? *(e.g. participants are filmed without them knowing)*
No

Pr.6. Will any human tissue and/or biological samples be collected? *(e.g. urine)*
No

Documents

Please attach the following documents to the application:

- Text used for ads (to find participants);
- ✓ Text used for debriefings;
- ✓ Form of informed consent for participants;
- Form of consent for other agencies when the research is conducted at a location (such as a hospital or school).

III - INFORMED CONSENT FORM

Consent Form for Experiment with Cue Kitchen

Please tick the appropriate boxes	Yes	No
Taking part in the study		
I have read and understood the study information dated [DD/MM/YYYY], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	○	○
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	○	○
I understand that taking part in the study involves the use and storage of my personal data such as my name, gender and age, contact information and other personal information I will enclose in the questionnaire and interviews as well as in a video recording of the game session.	○	○
Use of the information in the study		
I understand that information I provide will be used only for analysis in the research by Harmen aan het Rot. Video material is used for behavioural analysis as alternative for life observation and will be destroyed after the projects end date, expected to be 25 October 2020.	○	○
I understand that personal information collected about me that can identify me, such as my name and contact information, will not be shared beyond the study team.	○	○
Future use and reuse of the information by others		
I give permission for the data gathered in questionnaires as well as interview reports will be uploaded that I provide to be archived in the 4TU.Centre for Research Data so it can be used for future research and learning. This data will be anonymised, which means that all information that can identify me, such as my name and contact information, will be removed from this data.	○	○

Signatures

_____	_____	_____
Name of participant	Signature	Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____	_____	_____
Harmen aan het Rot	Signature	Date

Study contact details for further information: Harmen aan het Rot
H.N.aanhetRot@student.tudelft.nl 06 33 62 50 30

Toestemmingsformulier voor Experiment met Cue Kitchen

Vink de juiste vakjes aan	Ja	Nee
Deelname aan de studie		
Ik heb de informatie over deze studie gedateerd [DD/ MM/ YYYY] gelezen en begrepen, of het is aan mij voorgelezen. Ik heb vragen kunnen stellen over de studie en mijn vragen zijn naar mijn tevredenheid beantwoord.	□	□
Ik geef vrijwillig toestemming om deel te nemen aan deze studie en begrijp dat ik kan weigeren om vragen te beantwoorden en ik kan me op elk moment terugtrekken uit de studie, zonder hiervoor een reden te hoeven geven.	□	□
Ik begrijp dat deelname aan het onderzoek het gebruik en de opslag van mijn persoonlijke gegevens omvat, zoals mijn naam, geslacht, leeftijd, contactgegevens en andere persoonlijke informatie die ik openbaar in de vragenlijst en interviews, evenals in een video-opname van de gamesessie.	□	□
Gebruik van de informatie in de studie		
Ik begrijp dat informatie die ik geef alleen gebruikt zal worden voor analyse in het onderzoek van Harmen aan het Rot. Videomateriaal zal worden gebruikt voor gedragsanalyse als alternatief voor het een life observatie en zal worden vernietigd na de einddatum van het project, naar verwachting 25 oktober 2020.	□	□
Ik begrijp dat persoonlijke informatie die over mij wordt verzameld en die mij kan identificeren, zoals mijn naam en contactgegevens, niet verder wordt gedeeld dan het onderzoeksteam.	□	□
Toekomstig gebruik en hergebruik van de informatie door anderen		
Ik geef toestemming voor de data die is verzameld in vragenlijsten en interviewverslagen zullen worden geüpload en worden gearchiveerd in het 4TU.Centre for Research Data, zodat het kan worden gebruikt voor toekomstig onderzoek. Deze gegevens worden geanonimiseerd, wat betekent dat alle informatie die mij kan identificeren, zoals mijn naam en contactgegevens, uit deze gegevens wordt verwijderd.	□	□

Handtekeningen

_____	_____	_____
Naam van de deelnemer	Handtekening	datum

Ik heb het informatieblad nauwkeurig voorgelezen aan de potentiële deelnemer en er naar mijn beste vermogen voor gezorgd dat de deelnemer begrijpt wat hij of zij vrij instemt.

_____	_____	_____
Harmen aan het Rot	Handtekening	datum

Contactgegevens van studie voor meer informatie: Harmen aan het Rot
H.N.aanhetRot@student.tudelft.nl
06 33 62 50 30

IV – DATA MANAGEMENT PLAN

Graduation Project Harmen aan het Rot

A Data Management Plan created using DMPonline

Creator: Harmen aan het Rot

Affiliation: Delft University of Technology

Template: TU Delft Data Management Questions

Project abstract:
This master thesis will answer the research question: What is the effect of different technologies that enable mediated presence in serious gaming on 1) the effectiveness of serious gaming and 2) the experience of its players? In the experiment phase of this project, the serious game Cue Kitchen will be played with ca. 60 test subjects (15 groups of 4 people). The game sessions will be played in multiple setups: using mediated presence (i.e. with digital communication) and with physical presence (only if possible). After playing the game, subjects will be (digitally) interviewed, and/or be conducting the Game Experience Questionnaire through an online questionnaire. Footage and audio of the game sessions will be recorded for behavioural analysis.

Last modified: 25-05-2020

Graduation Project Harmen aan het Rot

General TU Delft data management questions

Name of data management support staff consulted during the preparation of this plan

Nicolas Dintzner, the Data Steward of the faculty of Technology, Policy and Management

Date of consultation with support staff [YYYY-MM-DD]

2020-05-08

1. Is TU Delft the lead institution for this project?

Yes, leading the collaboration

Collaboration with MaySways, with supervisor May Kooreman (maykooreman@gmail.com)

2. If you leave TU Delft (or are unavailable), who is going to be responsible for the data resulting from this project?

Rens Kortmann, assistant professor in the Multi-Actor Systems Department on TPM (l.j.kortmann@tudelft).nl

3. Where will the data (and code, if applicable) be stored and backed-up during the project lifetime?

- SURFdrive

The following data will be collected and/or stored:

- Questions and answers of questionnaires
- Interviews reports
- Interviews recordings (video and/or audio)
- Game session recordings (video and audio)
- Digital gaming data (manual, cards, etc.) of the used version of the game

4. How much data storage will you require during the project lifetime?

- < 250 GB

5. What data will be shared in a research data repository?

- Not all data can be publicly shared - please explain below which data and why cannot be publicly shared
- Questions and answers of questionnaires will be shared (anonymously) in the research data repository.
- Interviews reports will be shared (anonymously) in the research data repository.
- Interviews recordings (video and/or audio) will not be shared in the research data because of privacy reasons.
- Game session recordings (video and audio) because of privacy reasons (i.e. the players are recognizable); these recordings will be used for behavioural analysis as alternative for life observations
- Digital gaming data (manual, cards, etc.) of the used version of the game will be shared in the research data repository.

6. How much of your data will be shared in a research data repository?

- < 100 GB

7. How will you share your research data (and code)?

- Data will be uploaded to the 4TU.Centre for Research Data

8. Does your research involve human subjects?

- Yes

9. Will you process any personal data? Tick all that apply

- Date of birth/age
- Video materials
- Health data
- E-mail addresses
- Telephone numbers
- Name and addresses

Name and addresses, telephone numbers and e-mail addresses will be collected as contact information.
Age will be collected as age groups with size of 10 years, for analytical purposes.
Video materials will be used for behavioural analysis as alternative for life observations.
As health data will be collected whether a test subject has Parkinson's Disease or not; Parkinson's patients probably prefer an interview over a questionnaire.

TU Delft questions about management of personal research data

1. Please detail what type of personal data you will collect, for what purpose, how you will store and protect that data, and who has access to the data.

Type of data	How will the data be collected?	Purpose of processing	Storage location	Who will have access to the data
Name, e-mailadress, phone numbers	Through personal network and partner institution.	For contact with test subjects, creating test subjects and conducting interviews and questionnaire	SURFdrive	Reseracher and first supervisor
Date of birth/age	Through online questionnaire and/or digital interview	Evaluating the experiment, to see if age has any influence on sense of mediate presence	SURFdrive	Reseracher and first supervisor
Signed consent forms	Through an online form	To record the consent of the participants who agreed for their data processing	SURFdrive	Reseracher and first supervisor
Video material	By recording the digital/physical game session	To analyse behaviour of test subjects, as part of answering the research question	SURFdrive	Reseracher and first supervisor
Health data (only if a person has Parkinson's desease)	Through e-mail and through online questionnaire and/or digital interview	To determine who of the players had Parkinson's disease, so that this can be taken into account (i.e. no questionnaire)	SURFdrive	Reseracher and first supervisor

2. Will you be sharing personal data with individuals/organisations outside of the EEA (European Economic Area)?

- No

3. What is the legal ground for personal data processing?

- Informed consent - please describe the informed consent procedures you will follow

All test subjects has to fill in an online informed consent form, before or at the beginning of the briefing of the game session, in which the subject will be asked for consent for processing the data as mentioned before (name, e-mail, phone number, video material). The test subjects will also be asked to give orally their informed consent at the beginning of recording each group.

4. Will the personal data be shared with others after the end of the research project, and if so, how and for what purpose?

No

5. Does the processing of the personal data results in a high risk to the data subjects?

If the processing of the personal data results in a high risk to the data subjects, it is required to perform a Data Protection Impact Assessment (DPIA). In order to determine if there is a high risk for the data subjects, please check if any of the options below that are applicable to the processing of the personal data during your research (check all that apply).
If two or more of the options listed below apply, you will have to complete the DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to receive support with DPIA. If only one of the options listed below applies, your project might need a DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to get advice as to whether DPIA is necessary.

- Sensitive personal data

Health data (whether a person is a Parkinson's patient or not) is considered as sensitive personal data. This data is only used to decide how to approach these test subjects (i.e. personal, direct contact is preferred above passive, indirect contact).
The research concerns patient with Parkinson's disease. These could be considered vulnerable data subjects. However, these test subjects are able to give informed consent. Furthermore, the game is considered to be a social game and not a 'medical game', so no expectations regarding health are being created. If patient is in fact vulnerable, that is not able to give an informed consent, these data subjects will not participate in this study.

B

Cue Kitchen Manual (Dutch)

See next page for the content of this appendix

MENU-al:
Cue Kitchen

Welkom in de Cue Kitchen

In dit spel spelen jullie elk de rol van een professionele kok in een bijzondere keuken: Cue Kitchen.
In dit coöperatieve spel bereid je gerechten door het verzamelen en uitspelen van ingrediënt-kaarten.
Maar dit is niet zo makkelijk als het lijkt...

Speloverzicht

In dit spel zijn de spelers een kok in een professionele keuken en draaien samen een avonddienst om de gasten in hun restaurant te bedienen. Ze proberen zoveel mogelijk punten te verdienen door het koken van gerechten en door het raden van onzichtbare symptomen en cues.

Tijdens een beurt kunnen koks ingrediëntkaarten verzamelen, gebruik maken van hun speciale eigenschap en gerechten koken door hun verzamelde ingrediënten te gebruiken. Maar elke kok heeft ook een verborgen symptoom en een bepaalde cue: iets dat hem belemmert tijdens het spelen van het spel totdat een andere kok een cue geeft om hem te helpen.

Het spel eindigt nadat alle tafels zijn bediend of de koks geen tijd meer hebben. Daarna worden de punten van bereidde gerechten geteld om te zien hoe de koks hebben gepresteerd. Ook worden punten toegekend voor goed geraden symptomen en cues. Nadat het spel is geëindigd, worden de spelers 0 tot 3 sterren toegekend voor hun prestatie.

Materiaal in de doos

52 ingredientkaarten
36 gerechtkaarten
15 symptoomkaarten
4 rollenkaarten
4 overzichtskaarten
1 pantry kaart
1 restaurankaart
1 tijdkaart
6 speelstenen
1 dobbelsteen
Debriefing 1 & 2

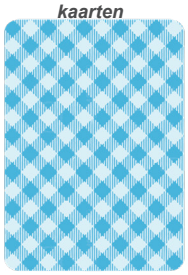
Speel Cue Kitchen eerst één keer zonder en daarna (minimaal) één keer met de symptomenkaarten.
Lees daarna de debriefing over de onzichtbare symptomen van de ziekte van Parkinson

Opzet

1. Leg de restaurantkaart, pantry kaart, tijdkaart en dobbelsteen in het midden van de tafel. Plaats de rode speelsteen op de gele klok op de tijdkaart. Leg de overige speelstenen in de buurt van de restaurantkaart.
2. Schud de ingrdieëntkaarten. Elke speler krijgt 3 ingrediëntkaarten en legt die open voor zich op tafel als persoonlijke voorraad. Leg de rest van de ingrediëntkaarten in een gesloten stapel aan de links naast de pantry (voorraad).
3. Schud de gerechtkaarten. Leg 3 gerechten als openstaande bestellingen naast de restaurantkaart. Leg de rest van de gerechtkaarten in een gesloten stapel aan de menukant van de restaurantkaart.
4. Schud de rollenkaarten en geef elke speler een rol.

Als je met symptoomkaarten speelt:
Schud de symptoomkaarten en geef elke speler een symptoomkaart zonder dat de andere spelers deze kunnen zien. De rest van de symptoomkaarten kunnen opzij worden gelegd.

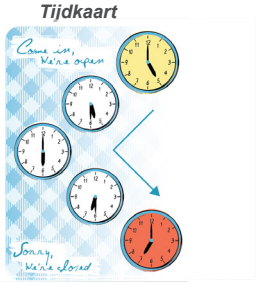
Gesloten ingredientkaarten



Pantry kaart

Open ingredienkaarten
Left-overs

Tijdkaart



Open gerechtkaarten
Openstaande bestellingen

Restaurankaart

Gesloten gerechtkaarten
Menu

Verborgen symptomen en cues

Elke kok heeft een verborgen symptoom, iets dat hij niet kan of juist moet doen. Dit symptoom belemmert hem in het spelen van het spel, tenzij een andere speler hem helpt door hem de juiste cue te geven.
Voorbeeld: Je kan geen nieuwe ingrediëntkaarten pakken, tenzij iemand deze aanwijst.

Een kok mag niet vertellen wat zijn symptoom en cue is, maar de andere koks mogen deze wel proberen te raden. Is één van deze twee goed geraden, dan mag de kok dit bevestigen. Zijn zowel het symptoom als de cue goed geraden? Dan mag de symptoomkaart worden omgedraaid. De kok blijft wel last houden van dit symptoom en heeft dus nog steeds de cue van de andere spelers nodig!

Mayways
TU Delft

Rondes en beurten

Tijdens een **beurt** kan een speler 3 acties uitvoeren:

1) Rol de dobbelsteen en pak 0, 1 of 2 kaarten:

⚁: 0 ⚃: 1 ⚅: 2

Je mag de bovenste kaart(en) pakken uit de pantry, zowel van de gesloten voorraadstapel als de open stapel met leftovers. Als je je handlimiet hebt bereikt, mag je geen nieuwe ingrediënten pakken.

2) Je mag je speciale eigenschap gebruiken.
(zie Rollen en speciale eigenschappen)

3) Je mag een gerecht uit de openstaande bestellingen koken met ingrediënten uit je eigen voorraad.

- *Leg de gerechtkaart naast je rollenkaart. Leg de benodigde ingrediënten onder de gerechtkaart.*
- *Plaats een speelsteen op een lege tafel op de restaurantkaart en draai een nieuwe gerecht open.*

In een **ronde** is elke kok aan de beurt in deze volgorde:
l'Aboyeur, le Cueilleur, le Chef de Cuisine, le Garçon de Cuisine.
Na elke ronde wordt de steen op de tijdkaart één klok vooruitgeschoven.

Let op: De acties in een beurt kunnen alleen in <u>bovenstaande volgorde</u> worden uitgevoerd.
Het is <u>verplicht</u> om de dobbelsteen te gooien en ingrediënten te verzamelen, tenzij je je handlimiet hebt bereikt.
Het is <u>optioneel</u> je speciale eigenschap te gebruiken of een gerecht te koken.

Rollen en speciale eigenschappen

l'Aboyeur

Pak 3 nieuwe gerechtkaarten van de menustapel. Kies 1 kaart en wissel deze om met een open gerechtkaart in de openstaande bestellingen. Leg de overige kaarten opzij.

le Cueilleur

Pak 4 verse ingrediëntkaarten van de voorraadstapel. Verdeel deze onder de koks. Je mag meerdere ingrediënten aan dezelfde kok geven, maar houd rekening met de handlimiet!

le Chef de Cuisine

Pak ingrediënten uit de voorraad van andere koks en leg deze in je eigen voorraad. Je hebt een verhoogde handlimiet van +2 (dus maximaal 8 kaarten).

Gerechten die door le Chef de Cuisine zijn bereid zijn -1 punt waard.

le Garçon de Cuisine

1) Je mag ingrediënten uit je eigen voorraad aan andere koks geven.
2) Je mag ingrediënten uit de voorraad van andere koks <u>afleggen</u> door ze op de stapel met leftovers te leggen.

Gerechten bereid door le Garçon de Cuisine zijn +1 punt waard

Einde van het spel

Het spel kan eindigen op twee manieren:

1) Wanneer een steen op de laatste tafel in het restaurant wordt geplaatst.
De koks hebben alle tafels bediend!

2) Wanneer de speelsteen op de tijdkaart op de rode klok wordt geplaatst, direct na de vierde ronde.
De avond is voorbij!

Let op: Het spel heeft dus nooit meer dan 4 ronden en er worden maximaal 5 gerechten bereid.

Score

- Tel alle punten van de bereidde gerechten bij elkaar op.
Onthoud de -1 van le Chef de Cuisine en +1 van le Garçon de Cuisine.
- Heb je met de symptoomkaarten gespeeld? Tel dan 2 bonuspunten bij het totaal op voor elke symptoomkaart die is omgedraad, dus waarvan zowel het symptoom als de cue goed zijn geraden.

Minder dan 10 punten: ☆☆☆
Iedereen kan koken maar veel verder dan een hardgekookt eitje kom je nog niet.

Tussen 10 en 18 punten: ★☆☆
Je voelt je thuis in de keuken, maar ratten doen dat helaas ook. Blijf proberen!

Tussen 18 en 26 punten: ★★☆
Jouw kookkunst is zeer verfijnd, zolang je jezelf niet in de vingers snijdt.

Meer dan 26 punten: ★★★
Speciaal voor jou wordt er binnenkort een vierde Michelinster ingevoerd…

Als je het spel met de symptoomkaarten hebt gespeeld, kun je met elkaar de debriefing lezen.
Let op: er zijn twee verschillende Debriefings: Debriefing 1 als je het spel speelt zonder iemand die de ziekte van Parkinson heeft en Debriefing 2 als je het spel speelt met een iemand die de ziekte van Parkinson heeft.

Mayways TUDelft

C

Cue Kitchen Debriefing guide (Dutch)

See next page for the content of this appendix

Cue Kitchen
Debriefing 1

Als je het spel hebt gespeeld zonder iemand met de ziekte van Parkinson.

We hopen dat je net zoveel plezier heb gehad tijdens het spelen van dit spel, als wij tijdens het maken ervan! Hoewel ons spel leuk mag zijn, heeft het ook een serieus doel. Het is een 'serious game' en daarbij hoort een debriefing: een nabespreking over wat er is gebeurd tijdens het spel en hoe dit zich verhoudt tot de realiteit. Bespreek met elkaar de volgende vragen en lees daarna samen de tekst eronder.

Vragen

Vraag 1: Hoe ervaarde je de symptomen en cues op de symptoomkaarten?

Vraag 2: Wat het moeilijk om te spelen met een verborgen symptoom en waarom?

Vraag 3: Was het moeilijk om de symptomen en cues te raden en waarom?

Vraag 4: Als jouw symptoom en cue goed waren geraden, hoe voelde je toen?

Vraag 5: Hoe veranderde het spel nadat een symptoom en cue goed waren geraden?

De onzichtbare symptomen van de ziekte van Parkinson

De ziekte van Parkinson is het meest bekend door de zichtbare symptomen, bijvoorbeeld de tremor (trillen van het lichaam) en langzame bewegingen. Een persoon met de ziekte van Parkinson heeft echter ook onzichtbare symptomen die zijn of haar leven en gedrag beïnvloedt. De symptoomkaarten in het spel zijn bedoeld om je een klein beetje te laten ervaren hoe het is om een onzichtbaar symptoom te hebben en hoe het voelt als iemand je helpt door de juiste cue te geven.

Een van de onzichtbare symptomen van de ziekte van Parkinson is het 'gebrek aan wilskracht'. Dit betekent dat een persoon met Parkinson moeite kan hebben om uit zichzelf een actie uit te voeren. Denk bijvoorbeeld aan: uit jezelf naar de sportschool gaan of het beantwoorden van een sms. Het is niet dat ze dat niet willen, maar door Parkinson zijn ze niet *in staat* om dat te willen. Dit kan hun sociale leven beïnvloeden, bijvoorbeeld bij het onderhouden van relaties of het nakomen van afspraken met mensen in hun omgeving. Daarom is het belangrijk dat de sociale omgeving van een persoon met Parkinson hiervan weet en het initiatief kan nemen. Je kan bijvoorbeeld afspreken om op een vaste dag in de week iemand thuis op te halen om een kop koffie te gaan drinken of samen naar de sportschool te gaan, in plaats van op locatie af te spreken. Je helpt dan door het initiatief te nemen en structuur aan te brengen, iets wat een persoon met Parkinson goed kan helpen.

Als jij iemand in je sociale omgeving kent die Parkinson heeft, kunnen de volgende tips je misschien helpen: wees geduldig, oordeel niet te snel, neem het initiatief en stel vooral vragen. De meeste mensen met Parkinson hebben een open mindset en zijn niet bang om over hun ziekte te praten. Vraag vooral ook door op welke manier jij deze persoon kan helpen, want niet iedereen is hetzelfde. Wees natuurlijk respectvol, vooral als hij of zij liever niet over zijn ziekte wil praten.

Door bewust te zijn van de onzichtbare symptomen van Parkinson, kunnen we elkaar net zoals in het spel helpen. Samen maken we elkaars leven beter!

Er zitten ook een aantal lege symptoomkaarten in de doos. Iedereen heeft wel iets wat hem belemmert in zijn leven. Misschien kun je een symptoom en cue bedenken dat van toepassing is op jou?

Cue Kitchen
Debriefing 2

Als je het spel hebt gespeeld samen met iemand met de ziekte van Parkinson.

We hopen dat je net zoveel plezier heb gehad tijdens het spelen van dit spel, als wij tijdens het maken ervan! Hoewel ons spel leuk mag zijn, heeft het ook een serieus doel. Het is een 'serious game' en daarbij hoort een debriefing: een nabespreking over wat er is gebeurd tijdens het spel en hoe dit zich verhoudt tot de realiteit. Bespreek met elkaar de volgende vragen en lees daarna samen de tekst eronder.

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Vraag 4: Als jouw symptoom en cue goed waren geraden, hoe voelde je toen?

Vraag 5: Hoe veranderde het spel nadat een symptoom en cue goed waren geraden?

De onzichtbare symptomen van de ziekte van Parkinson

De ziekte van Parkinson is het meest bekend door de zichtbare symptomen, bijvoorbeeld de tremor (trillen van het lichaam) en langzame bewegingen. Een persoon met de ziekte van Parkinson heeft echter ook onzichtbare symptomen die zijn of haar leven en gedrag beïnvloedt. De symptoomkaarten in het spel zijn bedoeld om je een klein beetje te laten ervaren hoe het is om een onzichtbaar symptoom te hebben en hoe het voelt als iemand je helpt door de juiste cue te geven.

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Cue Kitchen moet de onzichtbare symptomen van Parkinson onder de aandacht te brengen bij de sociale omgeving van een persoon met Parkinson. Dit spel heeft als doel het gesprek tussen jullie op gang te brengen. Probeer de volgende vragen te bespreken: Herkent hij zich in wat hierboven is geschreven, of juist niet? Van welke onzichtbare symptomen heeft de speler met Parkinson last in zijn leven? Hebben jullie dit wel eens, bewust of onbewust, aan hem gemerkt? En hoe kunnen andere mensen hem helpen? Wees respectvol naar elkaar en accepteer ook als de persoon met Parkinson liever niet over zijn ziekte wil praten.

Door bewust te zijn van de onzichtbare symptomen van Parkinson, kunnen we elkaar net zoals in het spel helpen. Samen maken we elkaars leven beter!

Er zitten ook een aantal lege symptoomkaarten in de doos. Misschien kan de speler met Parkinson onzichtbare symptomen en cues voor in het spel bedenken, die te lijken op zijn persoonlijke situatie?

MayWays TUDelft

D

Questionnaire (English)

See next page for the content of this appendix

Nr.	Question	Options
1	What is your age?	___ years
2	Do you consider yourself an experienced player of physical games such as board or card games?	Not at all Slightly Moderately Fairly Extremely
3	How often do you play physical games such as board or card games?	Almost never (less than 3 times per year) Sometimes (once every few months) Regularly (1 to 4 times a month) Often (1 to 2 times a week) All the time (More than 2 times per week)
4	Do you like playing physical games such as board or card games?	Not at all Slightly Moderately Fairly Extremely
5	How often do you use a mediated visual communication such as Skype, Facetime, Zoom, etc.?	Almost never (less than 3 times per year) Sometimes (once every few months) Regularly (1 to 4 times a month) Often (1 to 2 times a week) All the time (More than 2 times per week)
6	What is your gender?	○ Woman ○ Man ○ Other ○ Preferred not to answer
7	What is your highest level of education?	○ Primary education ○ Secondary education ○ MBO ○ HBO ○ University

Result of the game (patient's perspective)
Please indicate to what extent you agree with the following statements, on the following scale:

Totally disagree	Disagree	Neutral	Agree	Totally agree

Nr	Question
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	
I expect my fellow players to have an improved understanding of the concept of cues	
I expect my fellow players to have an improved understanding of Parkinson's disease	
The game helped me to start a conversation about my own symptoms and cues	
I expect that my fellow players can help me better in the future	
I have gained more respect for researches involved in research into Parkinson's Disease	

Result of the game (other players' perspective)
Please indicate to what extent you agree with the following statements, on the following scale:

Totally disagree	Disagree	Neutral	Agree	Totally agree

Question

I have an improved understanding of what it is to have an invisible symptom				
I have an improved understanding of the concept of cues				
I have an improved understanding of Parkinson's disease?				
I have an improved understanding for the specific situation of the patient that I know myself				
I expect that in the future I can better help the patient that I know myself				
I have gained more respect for researches involved in research into Parkinson's Disease				
Game experience during the game *Please indicate how you felt while playing the for each of the items below, on the following scale:*				
Totally disagree	Disagree	Neutral	Agree	Totally agree

Core Module

Item	**Variable**
I felt content	Positive affect
I was interested in the game's story	Sensory and Imaginative Immersion
I thought it was fun	Positive affect
I was fully occupied with the game	Flow
I felt happy	Negative affect
It gave me a bad mood	Negative affect
I thought about other things	Negative affect
I found it tiresome	Negative affect
It was aesthetically pleasing	Sensory and Imaginative Immersion
I forgot everything around me	Flow
I felt good	Positive affect
I felt bored	Negative affect
I felt imaginative	Sensory and Imaginative Immersion
I felt that I could explore things	Sensory and Imaginative Immersion
I enjoyed it	Positive affect
I felt annoyed	Tension / Annoyance
I felt irritable	Tension / Annoyance
I lost track of time	Flow
I found it impressive	Sensory and Imaginative Immersion
I was deeply concentrated in the game	Flow
I felt frustrated	Tension / Annoyance
It felt like a rich experience	Sensory and Imaginative Immersion
I lost connection with the outside world	Flow

Social Presence Module

Item	**Variable**
I empathized with the other(s)	Psychological Involvement – Empathy
My actions depended on the other(s) actions	Behavioural Involvement
The other's actions were dependent on my actions	Behavioural Involvement
I felt connected to the other(s)	Psychological Involvement – Empathy
The other(s) paid close attention to me	Behavioural Involvement
I paid close attention to the other(s)	Behavioural Involvement
I felt jealous about the other(s)	Psychological Involvement – Negative Feelings

I found it enjoyable to be with the other(s)	Psychological Involvement – Empathy
When I was happy, the other(s) was(were) happy	Psychological Involvement – Empathy
When the other(s) was(were) happy, I was happy	Psychological Involvement – Empathy
I influenced the mood of the other(s)	Psychological Involvement – Negative Feelings
I was influenced by the other(s) moods	Psychological Involvement – Negative Feelings
I admired the other(s)	Psychological Involvement – Empathy
What the other(s) did affected what I did	Behavioural Involvement
What I did affected what the other(s) did	Behavioural Involvement
I felt revengeful	Psychological Involvement – Negative Feelings
I felt schadenfreude (malicious delight)	Psychological Involvement – Negative Feelings

Game experience <u>after</u> playing the game

Please indicate how you after you finished playing the game the for each of the items below, on the following scale:

Totally disagree (Not at all)	Disagree (Slightly)	Neutral (Moderately)	Agree (Fairly)	Totally agree (Extremely)

Post-game Module

Item	**Variable**
I felt revived	Positive Experience
I felt bad	Negative Experience
I found it hard to get back to reality	Returning to reality
I felt guilty	Negative Experience
It felt like a victory	Positive Experience
I found it a waste of time	Negative Experience
I felt energised	Positive Experience
I felt satisfied	Positive Experience
I felt disoriented	Returning to reality
I felt exhausted	Tiredness
I felt that I could have done more useful things	Negative Experience
I felt powerful	Positive Experience
I felt weary	Tiredness
I felt regret	Negative Experience
I felt ashamed	Negative Experience
I felt proud	Positive Experience
I had a sense that I had returned from a journey	Returning to reality

E

Questionnaire (Dutch)

See next page for the content of this appendix

TU Delft Delft University of Technology

Welkom

Welkom bij dit de evaluatie van Cue Kitchen!

Kort geleden hebben we samen het spel Cue Kitchen gespeeld. Met deze enquête wil ik onderzoeken hoe je het spel hebt ervaren. Het invullen ervan kost ongeveer 10 tot 15 minuten.

De enquête bestaat uit drie onderdelen: 1) achtergrond van de speler, 2) speldoel en 3) spelervaring

Alvast hartelijk bedankt voor het invullen!

Harmen aan het Rot

Voor meer informatie over het onderzoek en het verwerken van uw gegevens kunt contact met mij opnemen.
h.n.aanhetrot@student.tudelft.nl
06 33 62 50 30

Achtergrond van de speler 1

Wat is je voornaam?

Op welke datum (dd/mm/jjjj) heb je het spel gespeeld?

Op welke manier heb je het spel Cue Kitchen gespeeld?

- ○ Met het spel voor mij op tafel en de spelers fysiek bij mij aanwezig
- ○ Met het spel en de spelers op een beeldscherm via een video-verbinding

Wat is je leeftijd?

Wat is je geslacht?

- ○ Vrouw
- ○ Man
- ○ Anders
- ○ Wil ik liever niet beantwoorden

Wat is je hoogst genoten opleidingsniveau?

- ○ Basisonderwijs
- ○ Voortgezet onderwijs
- ○ Mbo
- ○ Hbo
- ○ Universiteit

Achtergrond van de speler 2

In hoeverre beschouw je jezelf als een ervaren speler van gezelschapsspellen zoals bord- of kaartspellen?

- ○ Ver boven het gemiddelde
- ○ Boven het gemiddelde
- ○ Gemiddelde
- ○ Onder het gemiddelde
- ○ Ver onder het gemiddelde

Hoe vaak speel je een gezelschapsspelletje?

- ○ Heel vaak (minimaal 4 keer per maand)
- ○ Vaak (2 tot 4 keer per maand)
- ○ Regelmatig (1 tot 2 keer per maand)
- ○ Af en toe (eens in de paar maanden)
- ○ Bijna nooit (minder dan 3 keer per jaar)

Vind je het leuk om gezelschapsspelletjes te spelen?

- ○ Heel leuk
- ○ Leuk
- ○ Neutraal
- ○ Onleuk
- ○ Heel onleuk

Hoe vaak maak je gebruik van digitale communicatiemiddelen zoals Skype, Facetime, Zoom, enz.?

- ○ Heel vaak (minimaal 4 keer per maand)
- ○ Vaak (2 tot 4 keer per maand)

○ Regelmatig (1 tot 2 keer per maand)
○ Af en toe (eens in de paar maanden)
○ Bijna nooit (minder dan 3 keer per jaar)

Speldoel

Het doel van het spel kan worden benaderd vanuit het perspectief van een persoon met de ziekte van Parkinson of als iemand uit de sociale omgeving.

Welk perspectief is op jou van toepassing?

○ Vanuit iemand sociale omgeving
○ Vanuit iemand met de ziekte van Parkinson

Perspectief patiënt

Geef aan hoe in hoeverre je het eens bent met onderstaande stellingen, **na het spelen van het spel en de debriefing**:

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik verwacht dat mijn medespelers beter begrijpen wat het is om een onzichtbaar symptoom te hebben	○	○	○	○	○
Ik verwacht dat mijn medespelers het concept van cues beter begrijpen	○	○	○	○	○

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik verwacht dat mijn medespelers de ziekte van Parkinson beter begrijpen	○	○	○	○	○
Het spel hielp mij om een gesprek over mijn eigen symptomen en cues op gang te brengen	○	○	○	○	○
Ik verwacht dat mijn medespelers mij in de toekomst beter kunnen helpen	○	○	○	○	○
Ik heb meer respect gekregen voor onderzoekers die zich bezighouden met de ziekte van Parkinson	○	○	○	○	○

Perspectief sociale omgeving

Geef aan hoe in hoeverre je het eens bent met onderstaande stellingen **na het spelen van het spel en de debriefing**:

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik begrijp beter wat het is om een onzichtbaar symptoom te hebben	○	○	○	○	○
Ik begrijp het concept van cues beter	○	○	○	○	○

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik heb meer geleerd over de ziekte van Parkinson	○	○	○	○	○
Ik heb meer begrip gekregen voor de specifieke situatie van de patient die ik zelf ken	○	○	○	○	○
Ik verwacht dat ik in de toekomst de patient die ik zelf ken, beter kan helpen	○	○	○	○	○
Ik heb meer respect gekregen voor onderzoekers die zich bezighouden met de ziekte van Parkinson	○	○	○	○	○

Spelervaring 1

Geef aan hoe je je voelde **tijdens** het spelen, door het beoordelen van de volgende stellingen. (*1 van 7*)

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik voelde me tevreden	○	○	○	○	○
Ik was geïnteresseerd in het verhaal van het spel	○	○	○	○	○
Ik vond het leuk	○	○	○	○	○

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik was volledig bezig met het spel	○	○	○	○	○
Ik voelde me gelukkig	○	○	○	○	○
Het gaf me een slecht humeur	○	○	○	○	○

Spelervaring 2

Geef aan hoe je je voelde **tijdens** het spelen, door het beoordelen van de volgende stellingen. *(2 van 7)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik dacht aan andere dingen.	○	○	○	○	○
Ik vond het vermoeiend	○	○	○	○	○
Het spel was mooi gemaakt	○	○	○	○	○
Ik ben alles om me heen vergeten.	○	○	○	○	○
Ik voelde me goed	○	○	○	○	○
Ik verveelde me.	○	○	○	○	○

Spelervaring 3

Geef aan hoe je je voelde **tijdens** het spelen, door het beoordelen van de volgende stellingen. *(3 van 7)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik voelde me fantasierijk	○	○	○	○	○
Ik voelde dat ik dingen kon verkennen.	○	○	○	○	○
Ik heb ervan genoten	○	○	○	○	○
Ik voelde me geïrriteerd	○	○	○	○	○
Ik voelde me prikkelbaar	○	○	○	○	○
Ik verloor de tijd uit het oog.	○	○	○	○	○

Spelervaring 4

Geef aan hoe je je voelde **tijdens** het spelen, door het beoordelen van de volgende stellingen. *(4 van 7)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik vond het indrukwekkend	○	○	○	○	○
Ik was diep geconcentreerd in het spel	○	○	○	○	○
Ik voelde me gefrustreerd	○	○	○	○	○

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Het voelde als een rijke ervaring	○	○	○	○	○
Ik verloor de verbinding met de buitenwereld	○	○	○	○	○

Spelervaring 5

Geef aan hoe je je voelde **tijdens** het spelen, door het beoordelen van de volgende stellingen. *(5 van 7)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik leefde met de andere spelers mee	○	○	○	○	○
Mijn acties waren afhankelijk van de acties van de andere spelers	○	○	○	○	○
De acties van de andere spelers waren afhankelijk van mijn acties.	○	○	○	○	○
Ik voelde me verbonden met de andere spelers	○	○	○	○	○
De andere spelers besteedden aandacht aan mij	○	○	○	○	○

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik heb veel aandacht besteed aan de andere spelers	○	○	○	○	○

Spelervaring 6

Geef aan hoe je je voelde **tijdens** het spelen, door het beoordelen van de volgende stellingen. *(6 van 7)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik was jaloers op de andere spelers	○	○	○	○	○
Ik vond het leuk om met de andere spelers samen te zijn	○	○	○	○	○
Toen ik gelukkig was, waren de ander spelers ook gelukkig	○	○	○	○	○
Toen de andere spelers gelukkig waren, was ik dat ook	○	○	○	○	○
Ik beïnvloedde de stemming van de andere spelers	○	○	○	○	○
Ik werd beïnvloed door het humeur van de andere spelers	○	○	○	○	○

Spelervaring 7

Geef aan hoe je je voelde **tijdens** het spelen, door het beoordelen van de volgende stellingen. *(7 van 7)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik bewonderde de andere spelers	○	○	○	○	○
Wat de andere spelers deden, beïnvloedde wat ik deed	○	○	○	○	○
Wat ik deed, beïnvloedde wat de andere spelers deden	○	○	○	○	○
Ik voelde me wraakzuchtig	○	○	○	○	○
Ik voelde leedvermaak	○	○	○	○	○

Post-game spelervaring 0

De volgende vragen gaan over hoe je je direct **na** het spelen van het spel voelde.

Post-game spelervaring 1

Geef aan hoe je je **na** het spelen van het spel voelde, door het beoordelen van de onderstaande stellingen. *(1 van 3)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik voelde me nieuw leven ingeblazen	○	○	○	○	○
Ik voelde me slecht.	○	○	○	○	○
Ik vond het moeilijk om terug te keren naar de realiteit	○	○	○	○	○
Ik voelde me schuldig	○	○	○	○	○
Het voelde als een overwinning	○	○	○	○	○
Ik vond het een verspilling van tijd	○	○	○	○	○

Post-game spelervaring 2

Geef aan hoe je je **na** het spelen van het spel voelde, door het beoordelen van de onderstaande stellingen. *(2 van 3)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik voelde nieuwe energie	○	○	○	○	○
Ik voelde me tevreden	○	○	○	○	○
Ik voelde me gedesoriënteerd	○	○	○	○	○
Ik voelde me uitgeput	○	○	○	○	○

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik had het gevoel dat ik meer nuttige dingen had kunnen doen.	○	○	○	○	○
Ik voelde me krachtig	○	○	○	○	○

Post-game spelervaring 3

Geef aan hoe je je **na** het spelen van het spel voelde, door het beoordelen van de onderstaande stellingen. *(3 van 3)*

	Helemaal mee eens	Enigszins mee eens	Neutraal	Enigszins mee oneens	Helemaal niet mee eens
Ik voelde me moe	○	○	○	○	○
Ik voelde spijt	○	○	○	○	○
Ik schaamde me	○	○	○	○	○
Ik voelde me trots	○	○	○	○	○
Ik had het gevoel dat ik was teruggekeerd van een reis	○	○	○	○	○

Feedback

Bedankt voor het invullen van deze enquête.
Als ik in de komende weken nog verdere vragen hebben over je ervaring van het spel, mag ik dan contact met je opnemen?

- ○ Ja
- ○ Nee

Heb je feedback over onze spelsessie, de manier van spelen of het spel *Cue Kitchen* in het algemeen?
Ik ben benieuwd naar wat je goed vindt, maar ook naar wat beter kan.

F

Quantitative Results

This appendix contains tables and figures supporting the qualitative results as presented in Chapter 4. This appendix has no supporting text for the tables and figures. The tables contain the data of the statistical tests that have been carried out.

This appendix continues on the next page.

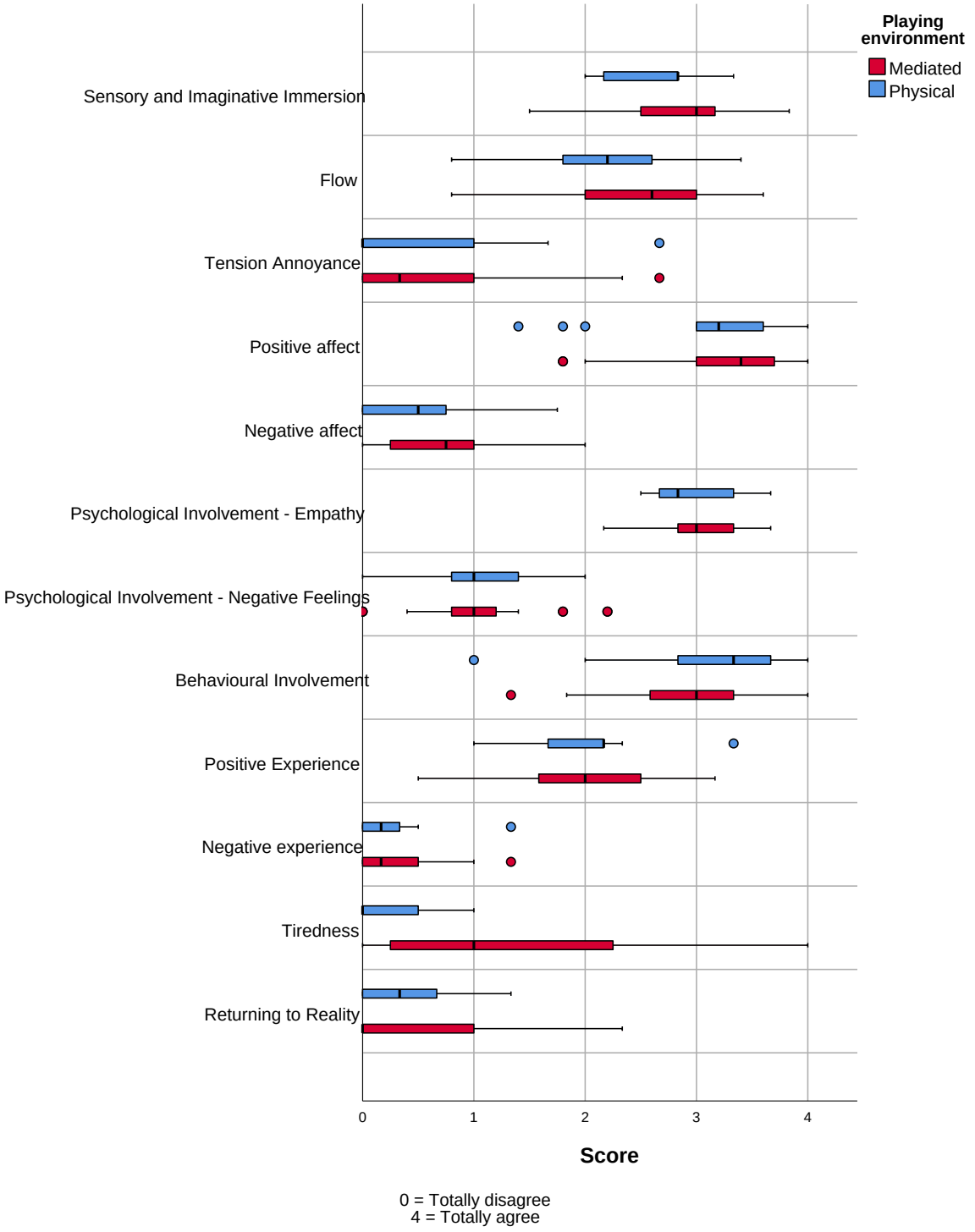

Figure F.1: Player experience - Physical vs Mediated environment

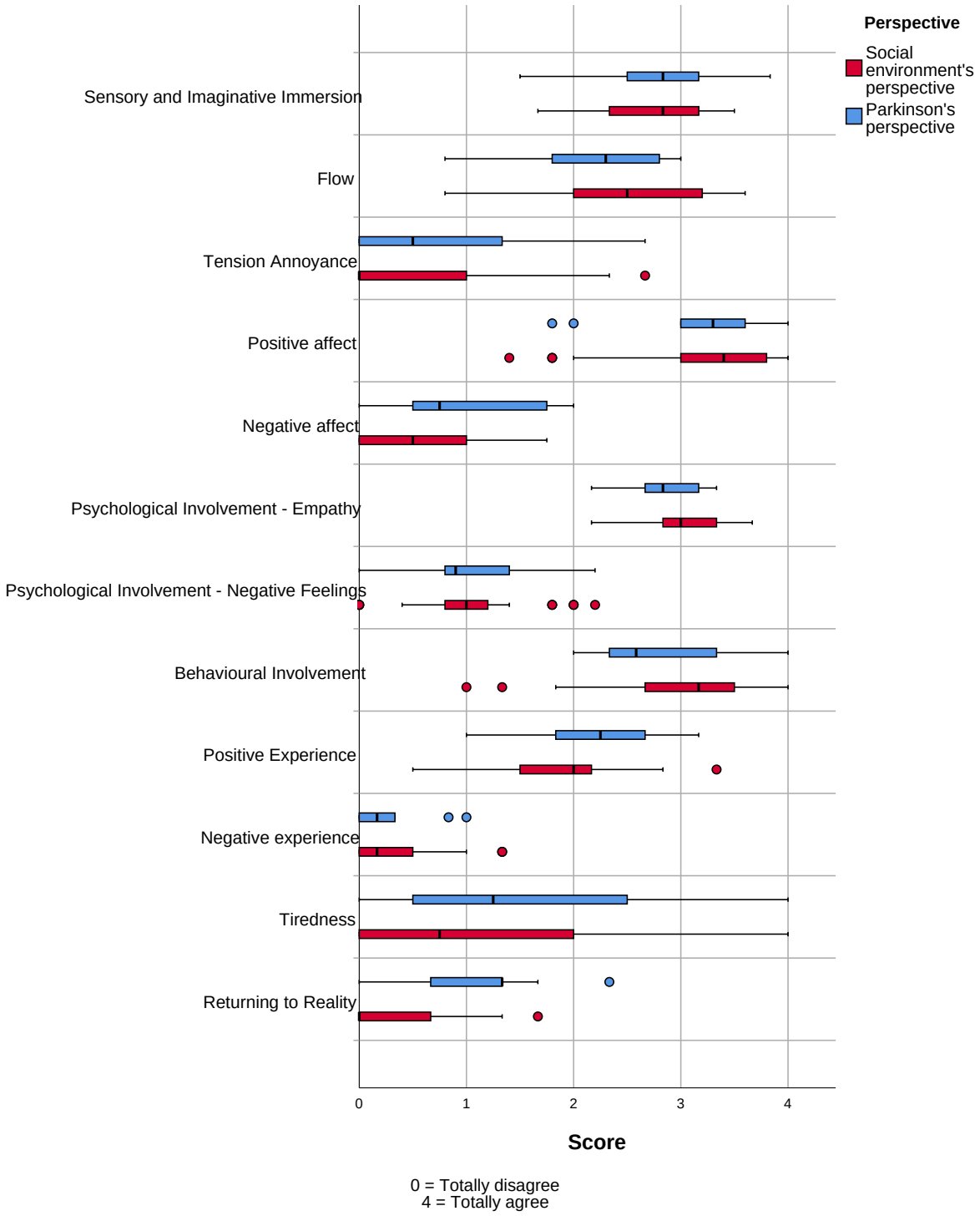

Figure F.2: Player experience - Parkinson’s vs Social environment’s perspective

Table F.1: Correlation between Age, Gender and Education, Player experience and Result of Cue Kitchen (Spearman's rank)

		Age	Gender	Level of education
Improved understanding what it is like to have an invisible symptom	Correlation Coefficient	-,184	,128	-,088
	Sig. (2-tailed)	,232	,409	,569
Improved understanding of the concept of cues	Correlation Coefficient	-,265	-,191	,036
	Sig. (2-tailed)	,082	,214	,818
Improved understanding of Parkinson's disease	Correlation Coefficient	-,267	,237	-,171
	Sig. (2-tailed)	,080	,122	,268
Game helped to start a conversation about individual symptoms and cues	Correlation Coefficient	-,053	,066	-,101
	Sig. (2-tailed)	,734	,672	,514
Social environment is able to help the person with Parkinson better in the future	Correlation Coefficient	-,200	,123	,004
	Sig. (2-tailed)	,194	,427	,982
Sensory and Imaginative Immersion	Correlation Coefficient	-,196	,061	-,210
	Sig. (2-tailed)	,202	,695	,171
Flow	Correlation Coefficient	-,023	-,034	-,206
	Sig. (2-tailed)	,881	,826	,180
Tension / Annoyance	Correlation Coefficient	,089	-,094	,201
	Sig. (2-tailed)	,565	,543	,191
Positive affect	Correlation Coefficient	-,213	-,032	-,254
	Sig. (2-tailed)	,165	,835	,096
Negative affect	Correlation Coefficient	,180	,023	,126
	Sig. (2-tailed)	,243	,882	,417
Psychological Involvement - Empathy	Correlation Coefficient	-,198	,115	,063
	Sig. (2-tailed)	,198	,458	,686
Psychological Involvement - Negative Feelings	Correlation Coefficient	-,280	,352	,097
	Sig. (2-tailed)	,065	,019	,529
Behavioural Involvement	Correlation Coefficient	-,410	,042	,069
	Sig. (2-tailed)	,006	,788	,658
Positive Experience	Correlation Coefficient	-,193	,106	-,153
	Sig. (2-tailed)	,210	,492	,322
Negative Experience	Correlation Coefficient	,085	-,032	,227
	Sig. (2-tailed)	,583	,838	,139
Tiredness	Correlation Coefficient	,033	-,045	-,106
	Sig. (2-tailed)	,833	,773	,493
Returning to Reality	Correlation Coefficient	,237	,088	-,095
	Sig. (2-tailed)	,122	,569	,539

Table F.2: Correlation between variables about players' relation with board games (Spearman's rank)

		Experience with playing board games	Frequency of playing board games	Opinion on playing board games	Frequency of using digital communication tools
Experience with playing board games	Correlation Coefficient	1,000	,738	,679	,060
	Sig. (2-tailed)	.	,000	,000	,701
Frequency of playing board games	Correlation Coefficient	,738	1,000	,660	-,003
	Sig. (2-tailed)	,000	.	,000	,982
Opinion on playing board games	Correlation Coefficient	,679	,660	1,000	,116
	Sig. (2-tailed)	,000	,000	.	,453
Frequency of using digital communication tools	Correlation Coefficient	,060	-,003	,116	1,000
	Sig. (2-tailed)	,701	,982	,453	.

Table F.3: Correlation between Social Desirable Behaviour, Player experience and Result of Cue Kitchen (Spearman's rank)

		More respect for researchers involved in research into Parkinson's disease
Improved understanding what it is like to have an invisible symptom	Cor. Coefficient	,122
	Sig. (2-tailed)	,430
Improved understanding of the concept of cues	Cor. Coefficient	-,008
	Sig. (2-tailed)	,958
Improved understanding of Parkinson's disease	Cor. Coefficient	,173
	Sig. (2-tailed)	,261
Game helped to start a conversation about individual symptoms and cues	Cor. Coefficient	,238
	Sig. (2-tailed)	,120
Social environment is able to help the person with Parkinson better in the future	Cor. Coefficient	,200
	Sig. (2-tailed)	,193
Sensory and Imaginative Immersion	Cor. Coefficient	,405
	Sig. (2-tailed)	,006
Flow	Cor. Coefficient	,390
	Sig. (2-tailed)	,009
Tension / Annoyance	Cor. Coefficient	-,357
	Sig. (2-tailed)	,017
Positive affect	Cor. Coefficient	,369
	Sig. (2-tailed)	,014
Negative affect	Cor. Coefficient	-,229
	Sig. (2-tailed)	,135
Psychological Involvement - Empathy	Cor. Coefficient	,099
	Sig. (2-tailed)	,522
Psychological Involvement - Negative Feelings	Cor. Coefficient	-,141
	Sig. (2-tailed)	,361
Behavioural Involvement	Cor. Coefficient	-,060
	Sig. (2-tailed)	,700
Positive Experience	Cor. Coefficient	,117
	Sig. (2-tailed)	,450
Negative Experience	Cor. Coefficient	-,307
	Sig. (2-tailed)	,043
Tiredness	Cor. Coefficient	,205
	Sig. (2-tailed)	,181
Returning to Reality	Cor. Coefficient	-,005
	Sig. (2-tailed)	,973

Table F.4: Correlation between Result variables (Spearman's rank)

		Improved understanding what it is like to have an invisible symptom	Improved understanding of the concept of cues	Improved understanding of Parkinson's disease	Game helped to start a conversation about individual symptoms and cues	Social environment is able to help the person with Parkinson better in the future
Improved understanding what it is like to have an invisible symptom	Correlation Coefficient	1,000	,273	,558	,474	,563
	Sig. (2-tailed)	.	,073	,000	,001	,000
Improved understanding of the concept of cues	Correlation Coefficient	,273	1,000	,413	,178	,370
	Sig. (2-tailed)	,073	.	,005	,247	,014
Improved understanding of Parkinson's disease	Correlation Coefficient	,558	,413	1,000	,535	,596
	Sig. (2-tailed)	,000	,005	.	,000	,000
Game helped to start a conversation about individual symptoms and cues	Correlation Coefficient	,474	,178	,535	1,000	,666
	Sig. (2-tailed)	,001	,247	,000	.	,000
Social environment is able to help the person with Parkinson better in the future	Correlation Coefficient	,563	,370	,596	,666	1,000
	Sig. (2-tailed)	,000	,014	,000	,000	.

Table F.5: Ranks of Result variables with Playing environment as grouping variable

	Playing environment	N	Mean Rank	Sum of Ranks
Improved understanding what it is like to have an invisible symptom	Physical	13	21,31	277,00
	Mediated	31	23,00	713,00
Improved understanding of the concept of cues	Physical	13	25,58	332,50
	Mediated	31	21,21	657,50
Improved understanding of Parkinson's disease	Physical	13	20,38	265,00
	Mediated	31	23,39	725,00
Game helped to start a conversation about individual symptoms and cues	Physical	13	22,42	291,50
	Mediated	31	22,53	698,50
Social environment is able to help the person with Parkinson better in the future	Physical	13	23,23	302,00
	Mediated	31	22,19	688,00

Table F.6: Mann-Whitney test statistics of Result variables with Playing environment as grouping variable

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Point Probability
Improved understanding what it is like to have an invisible symptom	186,000	277,000	-,427	,669	,674	,019
Improved understanding of the concept of cues	161,500	657,500	-1,133	,257	,256	,024
Improved understanding of Parkinson's disease	174,000	265,000	-,752	,452	,464	,009
Game helped to start a conversation about individual symptoms and cues	200,500	291,500	-,027	,978	,995	,015
Social environment is able to help the person with Parkinson better in the future	192,000	688,000	-,270	,787	,802	,028

Table F.7: Ranks of Result variables with Player's perspective as grouping variable

	Perspective	N	Mean Rank	Sum of Ranks
Improved understanding what it is like to have an invisible symptom	Social environment's perspective	34	21,88	744,00
	Parkinson's perspective	10	24,60	246,00
Improved understanding of the concept of cues	Social environment's perspective	34	24,24	824,00
	Parkinson's perspective	10	16,60	166,00
Improved understanding of Parkinson's disease	Social environment's perspective	34	22,16	753,50
	Parkinson's perspective	10	23,65	236,50
Game helped to start a conversation about individual symptoms and cues	Social environment's perspective	34	20,40	693,50
	Parkinson's perspective	10	29,65	296,50
Social environment is able to help the person with Parkinson better in the future	Social environment's perspective	34	21,51	731,50
	Parkinson's perspective	10	25,85	258,50

Table F.8: Mann-Whitney test statistics of Result variables with Player's perspective as grouping variable

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Point Probability
Improved understanding what it is like to have an invisible symptom	149,000	744,000	-,631	,528	,523	,041
Improved understanding of the concept of cues	111,000	166,000	-1,819	,069	,079	,016
Improved understanding of Parkinson's disease	158,500	753,500	-,342	,732	,758	,043
Game helped to start a conversation about individual symptoms and cues	98,500	693,500	-2,108	,035	,038	,009
Social environment is able to help the person with Parkinson better in the future	136,500	731,500	-1,035	,301	,311	,003

Table F.9: Correlation between Player experience variables (Spearman's rank)

		Sensory and Imaginative Immersion	Flow	Tension / Annoyance	Positive affect	Negative affect	Psychological Involvement - Empathy	Psychological Involvement - Negative Feelings	Behavioural Involvement	Positive Experience	Negative Experience	Tiredness	Returning to Reality
Sensory and Imaginative Immersion	Corr. Coefficient	1,000	,597	-,206	,754	-,403	,616	-,097	,319	,393	-,473	-,168	,094
	Sig. (2-tailed)	.	,000	,179	,000	,007	,000	,531	,035	,008	,001	,275	,546
Flow	Corr. Coefficient	,597	1,000	-,406	,598	-,378	,465	-,326	,213	,171	-,386	-,004	-,084
	Sig. (2-tailed)	,000	.	,006	,000	,011	,001	,031	,166	,266	,010	,978	,590
Tension / Annoyance	Corr. Coefficient	-,206	-,406	1,000	-,369	,607	-,255	,201	-,185	-,181	,553	,175	,350
	Sig. (2-tailed)	,179	,006	.	,014	,000	,095	,192	,230	,240	,000	,255	,020
Positive affect	Corr. Coefficient	,754	,598	-,369	1,000	-,484	,569	-,160	,328	,405	-,597	-,146	-,111
	Sig. (2-tailed)	,000	,000	,014	.	,001	,000	,298	,030	,006	,000	,343	,475
Negative affect	Corr. Coefficient	-,403	-,378	,607	-,484	1,000	-,495	-,017	-,245	-,300	,546	,479	,305
	Sig. (2-tailed)	,007	,011	,000	,001	.	,001	,914	,110	,048	,000	,001	,044
Psychological Involvement - Empathy	Corr. Coefficient	,616	,465	-,255	,569	-,495	1,000	,007	,354	,406	-,473	-,357	-,044
	Sig. (2-tailed)	,000	,001	,095	,000	,001	.	,962	,018	,006	,001	,018	,777
Psychological Involvement - Negative Feelings	Corr. Coefficient	-,097	-,326	,201	-,160	-,017	,007	1,000	-,154	,304	,197	,127	,308
	Sig. (2-tailed)	,531	,031	,192	,298	,914	,962	.	,318	,045	,200	,411	,042
Behavioural Involvement	Corr. Coefficient	,319	,213	-,185	,328	-,245	,354	-,154	1,000	,196	-,163	-,311	-,126
	Sig. (2-tailed)	,035	,166	,230	,030	,110	,018	,318	.	,203	,291	,040	,414
Positive Experience	Corr. Coefficient	,393	,171	-,181	,405	-,300	,406	,304	,196	1,000	-,241	-,040	,387
	Sig. (2-tailed)	,008	,266	,240	,006	,048	,006	,045	,203	.	,115	,797	,010
Negative Experience	Corr. Coefficient	-,473	-,386	,553	-,597	,546	-,473	,197	-,163	-,241	1,000	,081	,357
	Sig. (2-tailed)	,001	,010	,000	,000	,000	,001	,200	,291	,115	.	,600	,017
Tiredness	Corr. Coefficient	-,168	-,004	,175	-,146	,479	-,357	,127	-,311	-,040	,081	1,000	,086
	Sig. (2-tailed)	,275	,978	,255	,343	,001	,018	,411	,040	,797	,600	.	,578
Returning to Reality	Corr. Coefficient	,094	-,084	,350	-,111	,305	-,044	,308	-,126	,387	,357	,086	1,000
	Sig. (2-tailed)	,546	,590	,020	,475	,044	,777	,042	,414	,010	,017	,578	.

Table F.10: Correlation between Result and Player experience (Spearman's rank)

		Improved understanding what it is like to have an invisible symptom	Improved understanding of the concept of cues	Improved understanding of Parkinson's disease	Game helped to start a conversation about individual symptoms and cues	Social environment is able to help the person with Parkinson better in the future
Sensory and Imaginative Immersion	Correlation Coefficient	,465	,359	,598	,417	,390
	Sig. (2-tailed)	,001	,017	,000	,005	,009
Flow	Correlation Coefficient	,261	,081	,339	,257	,176
	Sig. (2-tailed)	,087	,601	,024	,093	,254
Tension / Annoyance	Correlation Coefficient	,021	-,075	-,149	-,160	-,036
	Sig. (2-tailed)	,894	,628	,334	,298	,816
Positive affect	Correlation Coefficient	,406	,298	,521	,292	,315
	Sig. (2-tailed)	,006	,050	,000	,055	,037
Negative affect	Correlation Coefficient	,082	-,263	-,220	-,090	,006
	Sig. (2-tailed)	,595	,084	,151	,561	,968
Psychological Involvement - Empathy	Correlation Coefficient	,258	,323	,516	,076	,236
	Sig. (2-tailed)	,090	,032	,000	,624	,124
Psychological Involvement - Negative Feelings	Correlation Coefficient	-,087	-,050	,100	-,223	-,123
	Sig. (2-tailed)	,576	,745	,518	,145	,425
Behavioural Involvement	Correlation Coefficient	,234	,480	,313	,238	,234
	Sig. (2-tailed)	,126	,001	,038	,119	,126
Positive Experience	Correlation Coefficient	,329	,116	,374	,127	,243
	Sig. (2-tailed)	,029	,455	,012	,410	,113
Negative Experience	Correlation Coefficient	-,304	-,337	-,419	-,272	-,327
	Sig. (2-tailed)	,045	,025	,005	,074	,030
Tiredness	Correlation Coefficient	,121	-,199	-,135	,038	-,001
	Sig. (2-tailed)	,433	,194	,383	,807	,997
Returning to Reality	Correlation Coefficient	,087	-,076	,043	,042	,080
	Sig. (2-tailed)	,575	,622	,779	,785	,605

Table F.11: Ranks of Player experience variables with Playing environment as grouping variable

	Playing environment	N	Mean Rank	Sum of Ranks
Sensory and Imaginative Immersion	Physical	13	18,96	246,50
	Mediated	31	23,98	743,50
Flow	Physical	13	18,50	240,50
	Mediated	31	24,18	749,50
Tension / Annoyance	Physical	13	19,85	258,00
	Mediated	31	23,61	732,00
Positive affect	Physical	13	20,04	260,50
	Mediated	31	23,53	729,50
Negative affect	Physical	13	18,54	241,00
	Mediated	31	24,16	749,00
Behavioural Involvement	Physical	13	24,65	320,50
	Mediated	31	21,60	669,50
Psychological Involvement - Empathy	Physical	13	22,00	286,00
	Mediated	31	22,71	704,00
Psychological Involvement - Negative Feelings	Physical	13	21,88	284,50
	Mediated	31	22,76	705,50
Positive Experience	Physical	13	22,00	286,00
	Mediated	31	22,71	704,00
Negative Experience	Physical	13	21,62	281,00
	Mediated	31	22,87	709,00
Tiredness	Physical	13	14,04	182,50
	Mediated	31	26,05	807,50
Returning to Reality	Physical	13	23,27	302,50
	Mediated	31	22,18	687,50

Table F.12: Mann-Whitney test statistics of Player experience variables with Playing environment as grouping variable

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Point Probability
Sensory and Imaginative Immersion	155,500	246,500	-1,190	,234	,240	,003
Flow	149,500	240,500	-1,343	,179	,184	,002
Tension / Annoyance	167,000	258,000	-,962	,336	,345	,005
Positive affect	169,500	260,500	-,830	,407	,416	,004
Negative affect	150,000	241,000	-1,346	,178	,182	,002
Behavioural Involvement	173,500	669,500	-,724	,469	,477	,003
Psychological Involvement - Empathy	195,000	286,000	-,169	,866	,873	,006
Psychological Involvement - Negative Feelings	193,500	284,500	-,209	,835	,847	,010
Positive Experience	195,000	286,000	-,168	,866	,873	,005
Negative experience	190,000	281,000	-,310	,757	,764	,007
Tiredness	91,500	182,500	-2,915	,004	,003	,000
Returning to Reality	191,500	687,500	-,273	,784	,794	,015

Table F.13: Ranks of Player experience variables with Player's perspective as grouping variable

	Perspective	N	Mean Rank	Sum of Ranks
Sensory and Imaginative Immersion	Social environment's perspective	34	22,38	761,00
	Parkinson's perspective	10	22,90	229,00
Flow	Social environment's perspective	34	23,43	796,50
	Parkinson's perspective	10	19,35	193,50
Tension / Annoyance	Social environment's perspective	34	21,76	740,00
	Parkinson's perspective	10	25,00	250,00
Positive affect	Social environment's perspective	34	22,87	777,50
	Parkinson's perspective	10	21,25	212,50
Negative affect	Social environment's perspective	34	20,99	713,50
	Parkinson's perspective	10	27,65	276,50
Psychological Involvement - Empathy	Social environment's perspective	34	23,91	813,00
	Parkinson's perspective	10	17,70	177,00
Psychological Involvement - Negative Feelings	Social environment's perspective	34	22,71	772,00
	Parkinson's perspective	10	21,80	218,00
Behavioural Involvement	Social environment's perspective	34	23,81	809,50
	Parkinson's perspective	10	18,05	180,50
Positive Experience	Social environment's perspective	34	21,32	725,00
	Parkinson's perspective	10	26,50	265,00
Negative Experience	Social environment's perspective	34	22,47	764,00
	Parkinson's perspective	10	22,60	226,00
Tiredness	Social environment's perspective	34	21,28	723,50
	Parkinson's perspective	10	26,65	266,50
Returning to Reality	Social environment's perspective	34	19,66	668,50
	Parkinson's perspective	10	32,15	321,50

Table F.14: Mann-Whitney test statistics of Player experience variables with Player's perspective as grouping variable

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)	Point Probability
Sensory and Imaginative Immersion	166,000	761,000	-,113	,910	,918	,006
Flow	138,500	193,500	-,886	,376	,386	,004
Tension / Annoyance	145,000	740,000	-,759	,448	,457	,004
Positive affect	157,500	212,500	-,353	,724	,733	,006
Negative affect	118,500	713,500	-1,465	,143	,147	,002
Psychological Involvement - Empathy	122,000	177,000	-1,361	,173	,177	,003
Psychological Involvement - Negative Feelings	163,000	218,000	-,199	,842	,856	,012
Behavioural Involvement	125,500	180,500	-1,253	,210	,217	,003
Positive Experience	130,000	725,000	-1,127	,260	,267	,003
Negative Experience	169,000	764,000	-,029	,977	,985	,004
Tiredness	128,500	723,500	-1,197	,231	,238	,004
Returning to Reality	73,500	668,500	-2,873	,004	,003	,000

Table F.15: Correlation between Player characteristics variables (Spearman's rank)

		Experience with playing board games	Frequency of playing board games	Opinion on playing board games	Frequency of using digital communication tools
Age	Correlation Coefficient	-,359	-,359	-,306	-,246
	Sig. (2-tailed)	,017	,017	,043	,108
Gender	Correlation Coefficient	,318	,292	,129	-,046
	Sig. (2-tailed)	,036	,054	,403	,766
Level of education	Correlation Coefficient	-,262	-,084	-,210	,167
	Sig. (2-tailed)	,086	,586	,172	,279

Table F.16: Correlation between Experience with board games and digital communication tools, Player experience and Result of Cue Kitchen (Spearman's rank)

		Experience with playing board games	Frequency of playing board games	Opinion on playing board games	Frequency of using digital communication tools
Improved understanding what it is like to have an invisible symptom	Cor. Coefficient	,263	,458	,243	-,182
	Sig. (2-tailed)	,085	,002	,113	,238
Improved understanding of the concept of cues	Cor. Coefficient	,011	,046	,304	,286
	Sig. (2-tailed)	,943	,769	,045	,060
Improved understanding of Parkinson's disease	Cor. Coefficient	,160	,369	,348	,053
	Sig. (2-tailed)	,298	,014	,021	,732
Game helped to start a conversation about individual symptoms and cues	Cor. Coefficient	-,029	,058	,048	-,133
	Sig. (2-tailed)	,849	,709	,758	,389
Social environment is able to help the person with Parkinson better in the future	Cor. Coefficient	,129	,170	,178	,054
	Sig. (2-tailed)	,405	,270	,247	,727
Sensory and Imaginative Immersion	Cor. Coefficient	,064	,201	,312	,212
	Sig. (2-tailed)	,678	,191	,039	,168
Flow	Cor. Coefficient	,104	,249	,227	-,022
	Sig. (2-tailed)	,500	,104	,139	,889
Tension / Annoyance	Cor. Coefficient	,027	,194	,105	,165
	Sig. (2-tailed)	,862	,207	,499	,286
Positive affect	Cor. Coefficient	-,001	,159	,204	,117
	Sig. (2-tailed)	,995	,302	,183	,448
Negative affect	Cor. Coefficient	,179	,329	,121	-,058
	Sig. (2-tailed)	,244	,029	,436	,708
Psychological Involvement - Empathy	Cor. Coefficient	,074	,194	,208	,391
	Sig. (2-tailed)	,635	,208	,176	,009
Psychological Involvement - Negative Feelings	Cor. Coefficient	,251	,110	,019	,171
	Sig. (2-tailed)	,100	,477	,904	,266
Behavioural Involvement	Cor. Coefficient	,012	,192	,247	,106
	Sig. (2-tailed)	,940	,213	,105	,495
Positive Experience	Cor. Coefficient	,232	,145	,058	,129
	Sig. (2-tailed)	,130	,348	,708	,404
Negative Experience	Cor. Coefficient	-,071	,012	-,117	,073
	Sig. (2-tailed)	,647	,936	,449	,637
Tiredness	Cor. Coefficient	,330	,362	,007	-,234
	Sig. (2-tailed)	,029	,016	,964	,126
Returning to Reality	Cor. Coefficient	,321	,211	,275	,080
	Sig. (2-tailed)	,034	,168	,070	,605

Table F.17: Correlation between Duration, Result and Player experience (Spearman's rank)

		Session duration (min)
Improved understanding what it is like to have an invisible symptom	Correlation Coefficient	-,158
	Sig. (2-tailed)	,305
Improved understanding of the concept of cues	Correlation Coefficient	-,268
	Sig. (2-tailed)	,079
Improved understanding of Parkinson's disease	Correlation Coefficient	-,141
	Sig. (2-tailed)	,362
Game helped to start a conversation about individual symptoms and cues	Correlation Coefficient	-,070
	Sig. (2-tailed)	,650
Social environment is able to help the person with Parkinson better in the future	Correlation Coefficient	-,150
	Sig. (2-tailed)	,333
Sensory and Imaginative Immersion	Correlation Coefficient	-,048
	Sig. (2-tailed)	,759
Flow	Correlation Coefficient	,050
	Sig. (2-tailed)	,749
Tension / Annoyance	Correlation Coefficient	,222
	Sig. (2-tailed)	,147
Positive affect	Correlation Coefficient	-,056
	Sig. (2-tailed)	,718
Negative affect	Correlation Coefficient	,207
	Sig. (2-tailed)	,178
Psychological Involvement - Empathy	Correlation Coefficient	-,001
	Sig. (2-tailed)	,994
Psychological Involvement - Negative Feelings	Correlation Coefficient	,047
	Sig. (2-tailed)	,760
Behavioural Involvement	Correlation Coefficient	-,040
	Sig. (2-tailed)	,799
Positive Experience	Correlation Coefficient	-,039
	Sig. (2-tailed)	,799
Negative Experience	Correlation Coefficient	,253
	Sig. (2-tailed)	,098
Tiredness	Correlation Coefficient	,258
	Sig. (2-tailed)	,091
Returning to Reality	Correlation Coefficient	-,072
	Sig. (2-tailed)	,641

Table F.18: Ranks of Result variables with Player's perspective and Playing environment as grouping variable

	N				Mean Rank			
	Playing envrionment and Player's perspective				Playing envrionment and Player's perspective			
	Physical and social	Physical and Parkinson's	Mediated and social	Mediated and Parkinson's	Physical and social	Physical and Parkinson's	Mediated and social	Mediated and Parkinson's
Improved understanding what it is like to have an invisible symptom	10	3	24	7	22,90	16,00	21,46	28,29
Improved understanding of the concept of cues	10	3	24	7	29,40	12,83	22,08	18,21
Improved understanding of Parkinson's disease	10	3	24	7	20,80	19,00	22,73	25,64
Game helped to start a conversation about individual symptoms and cues	10	3	24	7	19,10	33,50	20,94	28,00
Social environment is able to help the person with Parkinson better in the future	10	3	24	7	21,35	29,50	21,58	24,29
Sensory and Imaginative Immersion	10	3	24	7	18,60	20,17	23,96	24,07
Flow	10	3	24	7	18,05	20,00	25,67	19,07
Tension / Annoyance	10	3	24	7	22,20	12,00	21,58	30,57
Positive affect	10	3	24	7	21,10	16,50	23,60	23,29
Negative affect	10	3	24	7	19,00	17,00	21,81	32,21
Psychological Involvement - Empathy	10	3	24	7	24,50	13,67	23,67	19,43
Psychological Involvement - Negative Feelings	10	3	24	7	22,10	21,17	22,96	22,07
Behavioural Involvement	10	3	24	7	27,05	16,67	22,46	18,64
Positive Experience	10	3	24	7	20,45	27,17	21,69	26,21
Negative Experience	10	3	24	7	21,80	21,00	22,75	23,29
Tiredness	10	3	24	7	12,95	17,67	24,75	30,50
Returning to Reality	10	3	24	7	20,50	32,50	19,31	32,00

Table F.19: Kruskal-Wallis test statistics of Result variables with Player's perspective and Playing environment as grouping variables

	Kruskal-Wallis H	df	Asymp. Sig.
Improved understanding what it is like to have an invisible symptom	2,708	3	,439
Improved understanding of the concept of cues	6,534	3	,088
Improved understanding of Parkinson's disease	,932	3	,818
Game helped to start a conversation about individual symptoms and cues	5,030	3	,170
Social environment is able to help the person with Parkinson better in the future	1,496	3	,683
Sensory and Imaginative Immersion	1,450	3	,694
Flow	3,296	3	,348
Tension / Annoyance	5,756	3	,124
Positive affect	,993	3	,803
Negative affect	5,535	3	,137
Psychological Involvement - Empathy	2,317	3	,509
Psychological Involvement - Negative Feelings	,083	3	,994
Behavioural Involvement	2,534	3	,469
Positive Experience	1,348	3	,718
Negative Experience	,116	3	,990
Tiredness	9,978	3	,019
Returning to Reality	8,327	3	,040

Table F.20: Ranks of Tiredness and Returning to Reality for groups 'Physical and Parkinson's' and 'Mediated and Parkinson's'

	Playing envrionment and Player's perspective	N	Mean Rank	Sum of Ranks
Tiredness	Physical and Parkinson's	3	3,33	10,00
	Mediated and Parkinson's	7	6,43	45,00
Returning to Reality	Physical and Parkinson's	3	4,50	13,50
	Mediated and Parkinson's	7	5,93	41,50

Table F.21: Mann-Whitney s test statistics of Tiredness and Returning to Reality for groups 'Physical and Parkinson's' and 'Mediated and Parkinson's' (significance level is 0.008, after Bonferroni correction*

	Tiredness	Returning to Reality
Mann-Whitney U	4,000	7,500
Wilcoxon W	10,000	13,500
Z	-1,491	-,710
Asymp. Sig. (2-tailed)	,136	,478
Exact Sig. (2-tailed)	,175	,517
Point Probability	,042	,033

* Bonferroni correction: After conducting the Kruskal-Wallis, the significance level is corrected to prevent a Type I Error. The correct significance level is the normal alpha-value (in this case 0.05) divided by the number of pairs that will be tested. In this case, 4! = 6 pairs have been tested, so the corrected alpha-value is 0.05/6 = 0.008

Table F.22: Ranks of Tiredness and Returning to Reality for groups 'Physical and Social environment' and 'Physical and Parkinson's'

	Playing envrionment and Player's perspective	N	Mean Rank	Sum of Ranks
Tiredness	Physical and social	10	6,50	65,00
	Physical and Parkinson's	3	8,67	26,00
Returning to Reality	Physical and social	10	6,05	60,50
	Physical and Parkinson's	3	10,17	30,50

Table F.23: Mann-Whitney s test statistics of Tiredness and Returning to Reality for groups 'Physical and Social environment' and 'Mediated and Parkinson's' (significance level is 0.008, after Bonferroni correction)

	Tiredness	Returning to Reality
Mann-Whitney U	10,000	5,500
Wilcoxon W	65,000	60,500
Z	-,972	-1,666
Asymp. Sig. (2-tailed)	,331	,096
Exact Sig. (2-tailed)	,483	,098
Point Probability	,168	,021

Table F.24: Ranks of Tiredness and Returning to Reality for groups 'Physical and Social' and 'Mediated and Social'

	Playing envrionment and Player's perspective	N	Mean Rank	Sum of Ranks
Tiredness	Physical and social	10	11,05	110,50
	Mediated and social	24	20,19	484,50
Returning to Reality	Physical and social	10	18,30	183,00
	Mediated and social	24	17,17	412,00

Table F.25: Mann-Whitney s test statistics of Tiredness and Returning to Reality for groups ’Physical and Social’ and ’Mediated and Social’ (significance level is 0.008, after Bonferroni correction)

	Tiredness	Returning to Reality
Mann-Whitney U	55,500	112,000
Wilcoxon W	110,500	412,000
Z	-2,543	-,334
Asymp. Sig. (2-tailed)	,011	,739
Exact Sig. (2-tailed)	,011	,755
Point Probability	,002	,026

Table F.26: Ranks of Tiredness and Returning to Reality for groups’ Mediated and Social’ and ’Mediated and Parkinson’s’

	Playing envrionment and Player's perspective	N	Mean Rank	Sum of Ranks
Tiredness	Mediated and social	24	15,02	360,50
	Mediated and Parkinson's	7	19,36	135,50
Returning to Reality	Mediated and social	24	14,13	339,00
	Mediated and Parkinson's	7	22,43	157,00

Table F.27: Mann-Whitney s test statistics of Tiredness and Returning to Reality for groups ‘Mediated and Social’ and ’Mediated and Parkinson’s’ (significance level is 0.008, after Bonferroni correction)

	Tiredness	Returning to Reality
Mann-Whitney U	60,500	39,000
Wilcoxon W	360,500	339,000
Z	-1,126	-2,294
Asymp. Sig. (2-tailed)	,260	,022
Exact Sig. (2-tailed)	,271	,017
Point Probability	,006	,001

G

Game Session Reports

See next page for the content of this appendix

Game session 1

Date and time
20 July 2020, 14:00

Environment
Mediated, using Big Blue Button

Duration
2 hours, 15 minutes

Player group
A person with Parkinson's Disease, her husband, her mother and a healthcare professional

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
1A	Parkinson's	51	Female	University	Above average	Regularly (1 to 2 times per month)	A lot of fun	Very often (at least 4 times per month)
1B	Social environment	50	Male	University	Below average	Almost never (less than 3 times per year)	Neutral	Very often (at least 4 times per month)
1C	Social environment	71	Female	University	Below average	Sometimes (once every few months)	Neutral	Regularly (1 to 2 times per month)
1D	Social environment	48	Male	University	Far above average	Very often (at least 4 times per month)	A lot of fun	Very often (at least 4 times per month)

Social desired behaviour
This group scored a 2.3 on average, 0.4 below the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is "Neutral" and 4 is "Totally agree" for the statement "I have more respect for researcher involved in research into Parkinson's Disease".

Report of quality of game session
This was the first session, so there were still teething problems in the use of Big Blue Button. It took about half an hour to make sure everyone was visible and audible. Retrospectively, this was mainly due to the use of the wrong web browsers. One of the player was therefore not audible. This was solved by calling in by telephone. Another player had a bad Wi-Fi connection which could be remedied by using his mobile hotspot. Halfway through the game, there was so much delay in the video from the table that the phone that was filming the table had to switch to a mobile hotspot.

Report of the game play
This game was not explained in detail to the players in this session before the session. It therefore took quite a long time (about 20 minutes) before the game was well explained to all players. Due to

time pressure, as there was relatively little time left to play, it was decided to play with the invisible symptoms immediately. The big disadvantage of this was that the players had to learn the game and at the same time were hindered in playing it. This made it unclear what exactly the invisible symptoms were and what resulted from not understanding the game. Halfway through the game, when it became increasingly clear what the intention was, the players got more fun. There was, however, a visible difference between the enthusiasm of players with much and little experience playing board games. The most experienced player was taking the lead, which worked well because Cue Kitchen is a cooperative game.

Report of the debriefing

The debriefing got off to a slow start, mainly because of the way it was facilitated. I started with reading the debriefing guide (see appendix X). The players indicated that what was read was well-known material and was therefore not necessarily of added value. Because the game was quite chaotic, the debriefing was mainly about what could be improved in the game and to a lesser extent about the invisible symptoms of Parkinson's. While this is useful feedback for the development of the game, it was obviously not the intention of the game session. The player with PD indicated that in her opinion, because of the chaotic game session the message of the game didn't came through. Some players did indicate that if the game were simpler and less chaotic, it could be an added value in raising awareness of the invisible symptoms of Parkinson's disease.

Questionnaire results – Player Experience

Variable	Avg. Group Score*	Difference with overall avg. score
Sensory and Imaginative Immersion	2.0	-0.7
Flow	2.0	-0.5
Tension / Annoyance	1.4	0.8
Positive affect	2.2	-1.0
Negative affect	1.2	0.5
Psychological Involvement - Empathy	2.7	-0.3
Psychological Involvement - Negative Feelings	1.3	0.3
Behavioural Involvement	2.8	-0.2
Positive Experience	1.3	-0.6
Negative Experience	0.8	0.5
Tiredness	1.3	0.1
Returning to Reality	1.0	0.5

* 0 corresponds to "Totally disagree", 4 corresponds to "Totally agree"

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score*	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	2	-1.2
I expect my fellow players to have an improved understanding of the concept of cues	3	0.1
I expect my fellow players to have an improved understanding of Parkinson's disease	1	-1.6

The game helped me to start a conversation about my own symptoms and cues	3	-0.4
I expect that my fellow players can help me better in the future	1	-1.7

* 0 corresponds to “Totally disagree”, 4 corresponds to “Totally agree”

Questionnaire results – Result of the game (Social Environment’s perspective)

Question	Avg. Group Score*	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	2.0	-1.0
I have an improved understanding of the concept of cues?	2.3	-1.0
I have an improved understanding of Parkinson’s disease?	1.7	-0.8
I have an improved understanding for the specific situation of the patient that I know myself	2.3	-0.3
I expect that in the future I can better help the patient that I know myself	2.3	-0.1

* 0 corresponds to “Totally disagree”, 4 corresponds to “Totally agree”

Feedback in the questionnaire

Original comment

Goede opzet, maar het gevoel blijft dat de medespelers mij niet beter hebben leren begrijpen door het spel. Ik snap dat het leuk moet zijn, maar voor mij persoonlijk voelt parkinson niet als een spel maar heel serieus. De nabespreking kan veel goed maken, maar mentale flexibiliteit is niet een van de sterkere kanten van de mens met parkinson. Het eerste gevoel dat ik kreeg tijdens het spel blijft dan toch vooral hangen. Niet dat wat uit de nabespreking komt. Misschien als ik het spel zou mogen leiden dat het wel zou werken. Dat ik degene ben die anderen iets laat ervaren; niet dat ik het tegelijkertijd met hen ervaar en me wederom eenzaam voel.

Translation

Good setup, but the feeling remains that the fellow players have not learned to understand me better through the game. I understand that it should be fun, but for me personally, Parkinson's doesn't feel like a game but very serious. The debriefing can make up for a lot, but mental flexibility is not one of the stronger sides of people with Parkinson's. The first feeling I got during the game mainly lingers. Not what comes out of the debriefing. Maybe if I could run the game it would work. That I am the one who lets others experience something; not that I experience it simultaneously with them and feel lonely again.

Conclusion and additional comments

In relation to its goal of starting the conversation about the invisible symptom , this game session was unfortunately not successful. Because the communication technology did not work well, the game did not go according to plan and the debriefing was not really about the invisible symptoms of Parkinson's disease, it nevertheless provided insightful insights. It is important to be flexible when playing a game in a mediated environment. The function of calling in by telephone into Big Blue Button and using a mobile hotspot instead of Wi-Fi was of great importance. In addition, it is important to know what does and doesn’t work using a given digital communications tool. In this case, for example, using the Safari browser did not work properly. This session also gave cause to pay more attention to the explanation of the game prior to the game session. It is not necessary to have

a live connection with the players for a basic explanation of the game. Based on this, an explanatory video has been made that can be shared with the players prior to a game session.

Positive affect (during game) and positive experience (after game) were low, while negative affect, negative feelings, and Negative Experience were all higher than the overall average. The positive effect in particular is just above a 2, so the players just liked it a little bit. This is consistent with the observations in the game session, which were also not really positive.

From Parkinson's perspective, the game was not really a success, only a better understanding of cues was answered positively. While the game helped spark a conversation about the individual situation, there is no positive expectation of better help in the future. The game was also not really successful from the perspective of the social environment. There was no better understanding of invisible symptoms or PD in general. The answers to the question about a better understanding of Cues and two questions about the effect of the game on the social interaction with the person with PD were hardly positive.

The feedback in the questionnaire reflects a disappointment from the player with a Parkinson's perspective. Although she is positive about and appreciates the debriefing, the negative feeling during the game dominates her feeling.

In general, both the negative measurements and the observations reflect a rather unsuccessful game session, which can be explained by the fact that this was the very first official session.

Game session 2

Date and time
23 September 2020, 20:00

Environment
Mediated using Big Blue Button

Duration
1 hours, 55 minutes

Player group
A person with Parkinson's disease, her daughter, a colleague and a close friend.

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
2A	Parkinson's	51	Female	MBO	Average	Regularly (1 to 2 times per month)	A lot of fun	Regularly (1 to 2 times per month)
2B	Social environment	25	Male	HBO	Above average	Very often (at least 4	A lot of fun	Often (2 to 4 times per month)

						times per month)		
2C	Social environment	56	Female	HBO	Average	Sometimes (once every few months)	A lot of fun	Very often (at least 4 times per month)
2D	Social environment	21	Female	University	Above average	Regularly (1 to 2 times per month)	Fun	Very often (at least 4 times per month)

Social desired behaviour

This group scored a 3.5 on average, 0.7 above the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is “Neutral” and 4 is “Totally agree” for the statement “I have more respect for researcher involved in research into Parkinson’s Disease”.

Report of quality of game session

Compared to the previous game session, this one went a lot better. A player did not have the correct web browser (Google Chrome) so that this player was not visible at first. After this was resolved, there were no significant problems with the use of communication technology. This game was played in the evening. It was noticeable that the concentration diminished while playing and that a number of players looked a bit tired. Because the session took longer than expected, one of the player had to delay another social meeting.

Report of the game play

The players had previously watched the explanation video. Everyone was also online before the agreed time, so the game could start on time. After the first round, everyone understood how the game worked. This was also noticeable in the interaction, they tried to think along with each other and find the right strategy together. A problem that arose was that people regularly spoke at the same time. Due to this problem and use of a mediated environment, comments were occasionally lost due to noise. The facilitator had an important role to play in making sure that people took turns talking or repeating what was said. The first time, without the symptoms, went quite quickly (about 20 minutes). The second game, with the symptoms, took a lot longer (about 45 minutes).

Report of the debriefing

Unlike the first test session, the debriefing was more natural. As a facilitator, I guided the conversation more than I tried to give a presentation. The players enjoyed playing the game. One of the players indicated that she did not like it beforehand, also because she was quite insecure and doubted whether she could do it. But after playing she thought it was fun and going well. The debriefing was very substantive and also concerned the individual symptoms of the player with PD. Later in the debriefing, the players increasingly started talking to each other independently and actively asked questions about her symptoms to the player with PD. An advantage of the mediated environment was that people let everyone express themselves very much and that people could therefore take the time for questions and answers.

At the beginning of the debriefing, the players evaluated the symptoms in the game. A link with Parkinson's disease was soon established. The player with PD recognized her symptom in the game as a symptom in real live. Also how people dealt with each other's symptoms during the game was recognizable. For example, some personal characteristics (e.g. being chaotic) do not belong to Parkinson's and others do.

The players appreciated the explanation that player with PD was able to give. For example, she explained that she finds it difficult to perform daily tasks on her own and that it is nice if she can do this with someone else. She said that her daughter who lives at home asks what time they go shopping, that she is unable to take the initiative. On the other hand, if another daughter comes to visit and proposes to go shopping, then it will work. Although the other players recognized the symptoms, for example the chaotic and need for structure, it was still a good thing to talk about. For example, one of the players sometimes makes a to-do list for the person with Parkinson's, but didn't realize that this really had to do with Parkinson's disease.
The player with PD also said, "Cooking is a good topic for the game, because that's one of the things that I'm less able to do now because I've become more chaotic." Step-by-step recipes will help her keep cooking.
At the end of the debriefing all players were very interested in my project and my motives to do this project. They expressed their enthusiasm about this.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	3.0	0.2
Flow	2.7	0.3
Tension / Annoyance	0.5	-0.1
Positive affect	3.4	0.2
Negative affect	0.8	0.1
Psychological Involvement - Empathy	2.6	-0.4
Psychological Involvement - Negative Feelings	0.7	-0.4
Behavioural Involvement	3.3	0.2
Positive Experience	1.9	-0.1
Negative Experience	0.3	0.0
Tiredness	1.0	-0.1
Returning to Reality	0.6	0.1

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	4	0.8
I expect my fellow players to have an improved understanding of the concept of cues	4	1.1
I expect my fellow players to have an improved understanding of Parkinson's disease	3	0.4
The game helped me to start a conversation about my own symptoms and cues	4	0.6
I expect that my fellow players can help me better in the future	3	0.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score

I have an improved understanding of what it is to have an invisible symptom	2.3	-0.6
I have an improved understanding of the concept of cues?	3.3	0.0
I have an improved understanding of Parkinson's disease?	2.0	-0.5
I have an improved understanding for the specific situation of the patient that I know myself	3.0	0.4
I expect that in the future I can better help the patient that I know myself	2.0	-0.4

Feedback in the questionnaire

Original comment

Duidelijke uitleg en sympathieke begeleider hierin.

Translation

Clear explanation and sympathetic facilitation.

Conclusion and additional comments

In relation to its goal of starting the conversation about the invisible symptom, this game session was quite successful. The players were enthusiastic and involved, although it was also visible that they were getting a little tired, possibly because the players were very much and concentrated focused on the game play. The debriefing went well, especially because it was not presented, as in the first test session, but was facilitated with the focus on the players. While playing the game there was a lot of interaction which unfortunately sometimes got lost in the mediated environment. On the other hand, this way of playing ensured that the debriefing was calm and substantive, where all players could tell their story and ask questions.

The measurements reflect a pronounced experience during the game: Positive affect was very high, while the negative variables (Negative Affect, Negative Feelings and Negative Experience) were very low. However, it should be noticed that Positive Experience is on average lower than a neutral score (value of 2). There is no clear explanation for this, except that the session lasted longer than expected and one of the players had to delay another social meeting. The Psychological Involvement variables are lower than the overall mean, which could be explained by the observation that there was relatively little interaction.

From a Parkinson's perspective it was a successful game. It shows that an improved understanding of symptoms and cues also seems to contribute to a conversation about the personal situation of the person with PD. Also from the Social Environment's perspective measurements it seemed to be a fairly successful game, in line with what the players said about this during the debriefing. Yet the measurements also show that all players are close to the person with Parkinson's and therefore able to help her properly already.

Finally, it is noticeable, both from the measurement of 'social desired behaviour and feedback in the questionnaire, that there was a large degree of socially desirable behaviour in giving the answers. This is consistent with their behaviour, especially at the end of the debriefing.

Game session 3

Date and time

26 September, 16:30

Environment
Physical, facilitated via a video connection

Duration
1 hour, 40 minutes, including 5 minute break

Player group
A person with Parkinson's in a group of 7 friends.

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communication tools
3A	Parkinson's (observer)	51	Female	University	Above average	Almost never (less than 3 times per year)	Fun	Sometimes (once every few months)
3B	Social environment	47	Female	University	Below average	Sometimes (once every few months)	Neutral	Regularly (1 to 2 times per month)
3C	Social environment	52	Female	University	Below average	Almost never (less than 3 times per year)	Fun	Very often (at least 4 times per month)
3D	Social environment	47	Female	University	Average	Sometimes (once every few months)	A lot of fun	Very often (at least 4 times per month)
3E	Social environment	50	Female	University	Above average	Often (2 to 4 times per month)	Fun	Very often (at least 4 times per month)
3F	No questionnaire completed							
3G								

Social desired behaviour
This group scored a 2.4 on average, 0.4 below the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is "Neutral" and 4 is "Totally agree" for the statement "I have more respect for researcher involved in research into Parkinson's Disease".

Report of quality of game session
The approach of the players in this test session was to make it a fun game. It was played during a holiday weekend with 7 friends. 4 players played the game while 3 people watched, including the one with PD. During the games, the players had some snacks, wine and beer. This created a relaxed atmosphere. The game had already been set up in advance and the players had already read the manual so that they could start playing quickly. The game was further explained with a video tutorial. The first play went pretty fast and lasted 25 minutes. Between the first and second time, the players

took a break of about 5 minutes to prepare snacks and drinks. The second play lasted about half an hour. It was visible that the players enjoyed the game and felt at ease.

Report of the game play

The players understood the rules relatively quickly. In the beginning they played a bit more individual and there was less cooperation. As the game progressed, after one or two rounds in the first game session, more was discussed as a group and a joint strategy was discussed. There was a lot of interaction in which the three spectators also actively participated. The physical nature of the game was evident in three ways. First, there was a lot of interaction back and forth, at a fast pace with visible dynamics. For example, the players worked together, almost process-based, from a problem to a solution. Because of this, almost no intervention and facilitation was required while playing the game. There was also a lot of one-on-one interaction where the other players did not (visibly) listen to what was discussed. Finally, the players often had small conversations and laughter about matters not directly related to the game. In other words, more opportunity was taken for social conversations.

Report of the debriefing

Due to the physical nature of this test session, the debriefing was based on the debriefing guide. Although in general the conversation got off to a good start and went by itself, it was occasionally necessary as a facilitator to occasionally guide the players in their conversation. For example, while dealing with the first question in the debriefing, the players had actually also covered the second to fourth questions. I instructed, as facilitator, to go straight to question five. The second part of the debriefing (about the invisible symptoms of Parkinson's) was led by the person with Parkinson's (who was a spectator at the game). This was not arranged beforehand but came naturally.
The players enjoyed playing the game. They found it quite easy to deal with the symptoms, but this was also because the symptoms that were random did not affect the game much. The person with PD reported that sometimes her symptoms are in the little things and therefore are not noticed as symptoms of Parkinson's. In addition, some players found the symptoms a bit distracting from the game, they felt that the focus was sometimes too much on discovering the symptom. However, the person with PD responded that it is sometimes nice to reflect on the symptoms that someone with Parkinson's has and to take the time for this.
During the last part of the debriefing in particular, the discussion was about the personal symptoms of the person with PD. She was not very affected by invisible symptoms yet. It was also discussed to what extent the friends could notice this in her and how they could try to help. Much of this part of the conversation took place without me being involved as a facilitator.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	2.6	-0.1
Flow	2.1	-0.3
Tension / Annoyance	0.9	0.3
Positive affect	2.9	-0.3
Negative affect	0.7	0.0
Psychological Involvement - Empathy	2.9	-0.1
Psychological Involvement - Negative Feelings	1.0	-0.1

Behavioural Involvement	2.6	-0.4
Positive Experience	1.6	-0.4
Negative Experience	0.3	0.0
Tiredness	0.2	-0.9
Returning to Reality	0.4	-0.1

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	3	-0.2
I expect my fellow players to have an improved understanding of the concept of cues	2	-0.9
I expect my fellow players to have an improved understanding of Parkinson's disease	2	-0.6
The game helped me to start a conversation about my own symptoms and cues	4	0.6
I expect that my fellow players can help me better in the future	3	0.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	3.3	0.3
I have an improved understanding of the concept of cues?	3.8	0.4
I have an improved understanding of Parkinson's disease?	2.8	0.3
I have an improved understanding for the specific situation of the patient that I know myself	3.0	0.4
I expect that in the future I can better help the patient that I know myself	3.0	0.6

Feedback in the questionnaire

Original comment ik heb zelf niet gespeeld, alleen geobserveerd. vandaar veel 'neutraal' als antwoord. ik mis het ultieme speldoel: dat is zoveel mogelijk punten halen. je zou een online highscore kunnen toevoegen of een score tabel. bv 0-20 punten = dat kan beter, 20-30 punten = aardig geprobeerd etc

Translation I did not play myself, only observed. hence many "neutral" answers. I miss the ultimate game goal: that is to get as many points as possible. You could add an online high score or a score table. eg 0-20 points = that could be better, 20-30 points = nice try etc.

Original comment Leuk spel, mooi vormgegeven en een leuke manier om meer te leren over de ziekte van Parkinson.

Translation Nice game, beautifully designed and a fun way to learn more about Parkinson's disease.

Original comment Ik heb zelf niet echt meegespeeld maar ernaast gezeten. Ik vond het spel heel mooi gemaakt/uitgevoerd. De vorm van een spel om informatie/kennis/gevoel over te brengen vind ik geweldig. Ik vond het spel ook verwarrend, met teveel elementen erin verwerkt, waardoor het

even duurt voordat je door hebt hoe het werkt. Misschien is dat de bedoeling, maar dat irriteerde me in het begin.
Translation I did not really play along myself but sat next to it. I thought the game was very nicely made / executed. I love the form of a game to convey information / knowledge / feeling. I also found the game confusing, with too many elements incorporated, so it takes a while to understand how it works. Maybe that's the intention, but that irritated me at first.

Original comment Ik vond met name ook de discussie erna heel erg waardevol. Toen bespraken we met onze vriendin hoe zij parkinson echt ervaart gegeven ook het spel dat we hebben gespeeld.
Translation For me, the discussion afterwards was very valuable, when we discussed with our friend how she really experiences Parkinson's, given the game we have played.

Original comment dag Harmen, allereerst excuus voor mijn late invullen van de enquete. ik heb het wel als bijzonder ervaren door het gesprek achteraf en dat mis ik in de enquete. verder hebben wij het spel nog geevalueerd achteraf en kwamen een aantal dingen naar voren:
- we vonden het wat saai dat je maar 1 cue kreeg, leuker is om elke beurt een andere te moeten doen. want na 1 ronde wisten we het al.
- cues vond ik niet zo goed toegelicht aan het begin, de definitie bij begin van het spel duidelijker neerzetten zou handig zijn wat mij betreft
- ik zou het mooi vinden als er vragenkaartjes bij zou zitten om het gesprek daarna op gang te krijgen ik heb weldegelijk meer begrip gekregen voor kleine cue's. wat mij betreft zou er nog meer kennis van de ziekte van Parkinson in het spel verwerkt mogen worden.
Ik ben intervisiebegeleider van een lotgenoten intervisiegroep van 3A, vandaar dat ik inhoudelijk wel al veel over Parkinson wist. Succes met je mooie werk! hartelijke groet
Translation Hi Harmen, first of all, apologies for my late completion of the survey. I did experience the game as special because of the conversation afterwards and I miss that in the survey. We also evaluated the game afterwards and a number of things came up:
- we thought it was a bit boring that you only got 1 cue, it is more fun to have to do a different one every turn. because after 1 round we already knew.
- I thought cues were not so well explained at the beginning, making the definition clearer at the start of the game would be useful to me
- I would like it if there were question cards to get the conversation going afterwards, I have indeed gained a better understanding of small cues. as far as I am concerned, even more knowledge of Parkinson's disease could be incorporated into the game.
I am a peer counselor for a peer peer peer group of 3A, which is why I already knew a lot about Parkinson's. Good luck with your beautiful work! Sincerely

Conclusion and additional comments
This was the first test session in a physical environment. There were no problems during the game and during the debriefing affecting the quality of the game play. Instead, the atmosphere was relaxed and pleasant. Both during playing the game and the debriefing, there was a lot of interaction, especially compared to test sessions in a mediated environment. While playing the game, the physical environment was particularly visible in the dynamic interactions, the one-on-one interactions where the other players were not involved and the many social interactions and laughs. Much of the debriefing took place without me being involved in the conversation as a facilitator.

It could be that because I was present via a video connection and not physically present, the players felt more private in their environment, as if I was not really or 'less' present there.

The relaxed nature of the session is reflected in the measurement results. For example, the players indicate that they are hardly tired, which is also very low in relation to the overall. In addition, it should be noticed that almost no Flow was experienced during the session. An explanation for this could be the fact that a drink was regularly taken or snacks were passed on, in other words the focus was not totally in the game. It can also be noted that the social presence variables (Empathy, Negative Feelings and Behavioural Involvement) are lower than the average, despite the fact that people are physically present together.

The social environment finds the game more successful than the one with the Parkinson's perspective. There is no clear reason for this difference. On the other hand, the positive responses from the social environment match what they write in the feedback about the game; they particularly appreciated the conversation afterwards. This is also consistent with what the person with PD answers about it. What does not match is the positive answer with regard to the concept of cues, whereby the feedback indicates that this could have been further explored.

Game session 4

Date and time
27 September, 2020, 14:00

Environment
Physical, facilitated via a video connection

Duration
1 hour, 30 minutes

Player group
A person with Parkinson's Disease, his wife, his daughter and his son

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
4A	Parkinson's	64	Male	Secondary education	Average	Sometimes (once every few months)	Neutral	Very often (at least 4 times per month)
4B	Social environment	64	Female	MBO	Average	Almost never (less than 3 times per year)	Fun	Very often (at least 4 times per month)
4C	Social environment	32	Male	HBO	Above average	Regularly (1 to 2 times per month)	A lot of fun	Sometimes (once every few months)
4D	Social environment	36	Female	University	Average	Almost never (less than 3	Fun	Very often (at least 4 times per month)

						times per year)		

Social desired behaviour
This group scored a 2.3 on average, 0.5 below the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is “Neutral” and 4 is “Totally agree” for the statement “I have more respect for researcher involved in research into Parkinson’s Disease”.

Report of quality of game session
This session was in a physical environment with the facilitation through a video connection. The game was set up in advance and the players had watched the tutorial video beforehand. This made it possible to quickly start playing the game. Regarding the quality of the game session, there were no significant problems. Someone rang the bell at the front door and the game had to be stopped briefly, but this had no visible negative effect on the playing of the game.

Report of the game play
The players were well prepared, but a number of players needed help from time to time. This could be related to having less experience playing board games. There were also few problems in playing the game, the game was smooth and the players seemed motivated and focused on playing the game. It was evident that the game was being taken seriously, and the players were playing the game calmly and in a controlled manner. It was a very peaceful atmosphere, and with almost no disagreement or tension about game tactics and strategy. This resulted in relatively little interaction and short conversations back and forth in the player group. During the second game there was a little more discussion about a common strategy.

During the distribution of the symptoms prior to the second game, one of the players needed extra explanation about her symptom. Because the facilitation was via a video connection, it was decided that the other players would leave briefly to the hallway so that I could explain the symptom to the player. There wase no indication that this affected the game in a negative way: the players thought it was funny.

Report of the debriefing
The debriefing was done using the debriefing guide and went very well. The players dealt with the first part of the debriefing (the reflection on the game) in a systematic way and went by the book in that respect. Under the guidance of one of the players, the questions were answered and each time they did a round so that everyone was involved in the debriefing. As a facilitator I only had to explain something now and then.
The debriefing naturally passed from the first part to the second part. The partner of the person with PD played a big role in this, she actually took on the role of the debriefer. In a natural way she was also able to link the invisible symptoms well with the symptoms that the player with Parkinson's has and how she noticed them. It was remarkable to see that the children of the Parkinson's patient had noticed some symptoms but had not linked them with Parkinson's. A good example of this was that one of the players actively visited the person with PD at home to play sports twice a week, when the gyms were closed due to the corona crisis. This helped the person with PD very well, and he was even looking forward to this moment. If it had to come from within itself, then it would have been impossible to take the initiative because of Parkinson's disease. So this help and initiative was really

needed. In addition to this example, many other personal examples of symptoms and ways to help the person with PD were mentioned. In short, the goal of the game was well achieved in this session.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	2.6	-0.2
Flow	2.2	-0.3
Tension / Annoyance	0.0	-0.6
Positive affect	3.0	-0.2
Negative affect	0.4	-0.3
Psychological Involvement - Empathy	3.1	0.1
Psychological Involvement - Negative Feelings	0.7	-0.3
Behavioural Involvement	3.5	0.5
Positive Experience	2.1	0.1
Negative Experience	0.1	-0.2
Tiredness	0.1	-1.0
Returning to Reality	0.4	-0.1

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	2	-1.2
I expect my fellow players to have an improved understanding of the concept of cues	3	0.1
I expect my fellow players to have an improved understanding of Parkinson's disease	3	0.4
The game helped me to start a conversation about my own symptoms and cues	4	0.6
I expect that my fellow players can help me better in the future	3	0.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	3.0	0.0
I have an improved understanding of the concept of cues?	4.0	0.7
I have an improved understanding of Parkinson's disease?	2.3	-0.1
I have an improved understanding for the specific situation of the patient that I know myself	2.3	-0.3
I expect that in the future I can better help the patient that I know myself	2.3	-0.1

Feedback in the questionnaire

Player 4B (Translation from Dutch): I thought it was a fun game, we had a lot of fun together!

And the goal of having a good conversation with each other afterwards certainly succeeded!

Conclusion and additional comments
When I picked up the game several hours after the game was played, one of the players told me that their conversation about the invisible symptoms of PD in their situation continued, after the video connection with me ended. She found it useful to reflect on the invisible symptoms of Parkinson's, especially when they are actually used to it and when it is such a part of their daily life. They appreciated the focus on how to help the person with PD.
There were few relevant details or insights with regard to the way of playing, probably because the game play and debriefing went smoothly. For me as facilitator it felt special to be part of the intimate conversation these players had about their specific situation. It was almost like I was not there, which in a way was true of course. Perhaps the reason for this was that I was present via video connection and not physically.
First of all, it should be noted that during this physical session, the social presence variables Empathy and Behavioural Involvement are quite high. This is fully consistent with the observation that the players had almost no discussions or disagreements, and really played the game cooperatively. This can also be seen in a very low score on Tension / Annoyance. The players indicated that the game did not cause them being more tired. However, this could also have to do with the time of the session (the middle of the day).
The person with a Parkinson's perspective was particularly positive about how a personal conversation was started. This is in line with the observation that it was very successful to initiate the conversation and that it became very personal. The social circle seems particularly enthusiastic about being able to better understand the concept of cues, probably because the discussion regularly focused on how best to help the person with Parkinson's.

Game session 5

Date and time
29 September 2020, 20:00

Environment
Mediated, using Big Blue Button

Duration
1 hour, 40 minutes

Player group
A person with Parkinson’s, his wife and two daughters

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
5A	Parkinson’s	60	Male	MBO	Far above average	Very often (at least 4 times per month)	A lot of fun	Very often (at least 4 times per month)

5B	Social environment	54	Female	Secondary education	Far above average	Very often (at least 4 times per month)	A lot of fun	Almost never (less than 3 times per year)
5C	Social environment	24	Female	University	Average	Sometimes (once every few months)	A lot of fun	Very often (at least 4 times per month)
5D	Social environment	28	Female	HBO	Above average	Sometimes (once every few months)	Fun	Very often (at least 4 times per month)

Social desired behaviour

This group scored a 3.3 on average , 0.5 above the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is “Neutral” and 4 is “Totally agree” for the statement “I have more respect for researcher involved in research into Parkinson’s Disease”.

Report of quality of game session

During this game session, players 5A and 5B were behind the same laptop and 5C and 5D each sat behind their own laptop. This affected the quality of the game session. Since players 5A and 5B could have a lot of direct interaction with each other, it was visible that the other two players were slightly less involved in the game. When players 5A and 5B communicated with each other, it caused noise on the video connection, which meant that things the other players said were occasionally lost. In addition, players 5A and 5B could not get a symptom individually. This was solved by giving both players the same symptom. This fix worked fine and didn't seem to affect gameplay further.
During the debriefing, the webcam of one of the players did not work for a long time, probably due to a bad Wi-Fi connection. Unfortunately, this could not be resolved quickly, so one of the players was not visible for a while. Although attempts were made to involve her in the conversation, it was visible that because she was not visible, she was less involved in the conversation than the other three players. This also improved after the connection improved and she became visible again.
The sound of me as a facilitator also had problems halfway through the debriefing. Fortunately, this could be solved by calling the session in Big Blue Button by telephone. This did cause a pause of a few minutes. During the video observation it could be seen that this pause seemed to have a relaxing effect on the players; they looked a little less tired after this short break.

Report of the game play

The players were well prepared and in this game it was also possible to start playing fairly quickly. Player 5B occasionally had some difficulty understanding the game. The advantage of this session was that player 5A sat next to her and could therefore guide her well in the game. The disadvantage was that during these interactions the other players played a smaller role. There was relatively little consultation about a common strategy, but as most players understood well what was intended, this had little effect on the course of the game. The second game, with the symptoms, went too fast. There was too little time for the players too guess the symptoms. The main reason for this was that the players were unusually lucky with the cards they got from the stacks, allowing them to quickly prepare dishes with many points. After playing the game the players indicated that they would have liked some more time and opportunity to play the game, especially during the second round.
Also during the second game, a small problem arose. Player 5C had the symptom that she couldn't start her turn. At the end of the previous turn, player 5A had to go to the toilet and for the sake of

time it was decided to continue playing. Partly because of this situation, her symptom was less visible. Players 5A and 5B both had the symptom of getting angry when someone else cooks a dish. This was quite visible, but because the two of them were behind one laptop, they mainly interacted with each other, which meant that the interaction with the other players was somewhat lost because this caused noise on the video connection.

Report of the debriefing

The debriefing went according to plan. The relationship between the symptoms at play and the symptoms of Parkinson's was quickly established. Player 5A recognized could relate the symptoms in the game to his own situation. The personal symptoms of this player were also quickly addressed. An example that has been given is forgetting things, for example something that is on the table and needs to be cleaned up is still there at the end of the day. Unless someone says to him, you would clean this up. Someone then helps him to take the initiative. Also having more difficulty with calling or emailing someone back was also discussed. The person with Parkinson's also reported looking for different things to stay cognitively active, such as maintaining a website and participating in studies on Parkinson's. The player with Parkinson's also recognizes the need for structure. Fixed things should have fixed times and fixed places.

An interesting insight was that player 5C indicated that she actually did not notice much of the invisible symptoms and did not notice that 5A calls or texts less often. 5B indicates, however, that this could also be because she reminds 5A to call someone. This makes this symptom less noticeable for others like player 5C.

The players indicated that they thought it was a cool and fun game, although also thought the session was quite intense. They would be interested in purchasing it if the game became available, so they could play it themselves in their own time.

Number of completed questionnaires

4

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	2.9	0.1
Flow	2.4	0.0
Tension / Annoyance	0.7	0.1
Positive affect	3.5	0.3
Negative affect	1.0	0.3
Psychological Involvement - Empathy	3.0	0.0
Psychological Involvement - Negative Feelings	0.6	-0.5
Behavioural Involvement	2.6	-0.4
Positive Experience	1.7	-0.3
Negative Experience	0.1	-0.2
Tiredness	2.8	1.6
Returning to Reality	0.4	-0.1

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	4	0.8
I expect my fellow players to have an improved understanding of the concept of cues	3	0.1
I expect my fellow players to have an improved understanding of Parkinson's disease	3	0.4
The game helped me to start a conversation about my own symptoms and cues	4	0.6
I expect that my fellow players can help me better in the future	4	1.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	3.0	0.0
I have an improved understanding of the concept of cues?	3.0	-0.3
I have an improved understanding of Parkinson's disease?	2.0	-0.5
I have an improved understanding for the specific situation of the patient that I know myself	2.3	-0.3
I expect that in the future I can better help the patient that I know myself	2.3	-0.1

Feedback in the questionnaire

Original comment

Persoonlijk vond ik het spel erg leuk om te doen en heel goed uitgedacht. Mijn complimenten hiervoor. Het geeft inderdaad goed inzicht in wat de ander zou kunnen hebben als verborgen .... (Woord kwijt) en welke ques er gebruikt kunnen worden. Fijn dat anderen zo meer inzicht in Parkinson kunnen krijgen zodat ze kunnen begrijpen wat het betekent en waarom een Parkinsonian doet wat hij op dat moment doet. Enige tip die ik kan geven is om de afbeelding op de kaart van manusje van alles een ander persoon (dus niet een afbeelding van een donker persoon, maar die te wisselen voor een blank persoon)te geven voordat het spel wellicht definitief in de handel gaat. Dit om voor te zijn dat sommige mensen er zich aan zouden kunnen storen. Verder heel goed en mooi gedaan. Complimenten.

Translation

Personally, I really liked the game and it was thought out very well. My compliments for this. It does indeed provide good insight into what the other might have as hidden .... (lost the word) and which ques can be used. It's great that others can gain more insight into Parkinson's so that they can understand what it means and why a Parkinsonian does what he is doing at that moment. The only tip I can give is to give the picture on the card of jack of all trades to another person (so not an image of a dark person, but to exchange it for a white person) before the game may be finally marketed. This is to prevent some people from being bothered by it. Otherwise very well and nicely done. Compliments.

Original comment

Het was een leuk spel! Nog een ronde toevoegen zie ik zeker als een meerwaarde.

Translation
It was a fun game! I certainly see adding another round as an added value.

Conclusion and additional comments
Although the game was not quite to my liking, the debriefing was. Afterwards, player 1A contacted me personally and indicated that they thought it was a fun, good and useful game. It was also a good eye opener for his daughters.

What didn't work so well during gameplay was that two players were behind the same laptop and occasionally caused noise on the video connection due to their interaction with each other. This made the other players a little more in the background. It should be noted that this may also be due to the character and way of playing of the other players.

A debriefing where one of the players is not visible via the webcam is also less suitable. I noticed that as a facilitator I found it more difficult to involve this person in the conversation. Therefore I could not see from her expression how she reacted to what was discussed. I noticed that this was also true for the other players, who had a little more interaction with the player who was visible.
Finally, it was nice that Big Blue Button has the flexible option to call in by phone. Using this resolved a problem with my microphone quickly. Also remarkable was the short break, created by my absence, having a visibly relaxing effect on the players.

Although this mediated game lasted for a relatively short time, the players still found it tiring. This is clearly reflected in the measurements. A reason for this could be found in the observations that the game play did not go according to plan. Although they indicated that they liked the game, it can still be seen that Positive Experience, i.e. the experience just after the game, is lower than "Neutral" (value 2). This could be due to the fatigue of the players. It is noticeable that two of the three social presence variables are well below the average. This could be due to the fact that two people were behind the same screen, and visual connection with another player was lost, causing a reduced feeling of social presence.

The player with PD was very positive and enthusiastic about the game. This was also clear in the observations. Despite the fatigue and relatively little Positive Experience, the social environment also felt that the game was successful, except that the game did not really contribute to an improved understanding of Parkinson's disease in general.

Game session 6

Date and time
18 October 2020, 10:00

Environment
Mediated, using Big Blue Button

Duration
2 hours 10 minutes

Player group

A person with Parkinson, two friends and a daughter of one of the friends who was substitute for an absent player due to illness.

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
6A	Parkinson's	49	Female	HBO	Average	Sometimes (once every few months)	Fun	Regularly (1 to 2 times per month)
6B	Social environment	49	Female	University	Average	Often (2 to 4 times per month)	A lot of fun	Very often (at least 4 times per month)
6C	Social environment	49	Female	HBO	Below average	Almost never (less than 3 times per year)	Fun	Very often (at least 4 times per month)
6D	No questionnaire completed							

Social desired behaviour

This group scored a 2.3 on average , 0.4 below the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is "Neutral" and 4 is "Totally agree" for the statement "I have more respect for researcher involved in research into Parkinson's Disease".

Report of quality of game session

Just prior to playing the game, I was informed that one of the participants was ill and could not play. I decided to let it go anyway, because it had been difficult to schedule a time. I could have taken on one of the roles in the game myself. When we started playing the game it turned out that a daughter of one of the players wanted to play. She was a minor, so decided not to record the session for privacy and ethical considerations.

One of the players wanted to play the game on her laptop from work. Probably due to the security setting on her laptop, she could not see the image (the webcams) of the other players and the table. We tried for almost half an hour to fix this, which didn't work. Fortunately her daughter did have a working laptop, so they could experience the game together behind one laptop. Because player 6C could see the chat on her laptop in which the invisible symptoms were shared, both players could each get their own invisible symptom.

Because the daughter could not prepare for the game in advance and did not see the video tutorial, the game also had to be explained to her. Fortunately, she picked up on that relatively quickly.

The problems with the technology and the extra explanation did ensure that the game could only start 45 minutes after the agreed time. Fortunately, the players were patient, but it was noticeable that the concentration decreased somewhat at the end of the game and the debriefing. This was particularly visible because as a facilitator I had to involve the players more actively in final stage of the game and the debriefing. My own concentration also decreased during the debriefing, due to the intensity and long duration of the session. During the second half the daughter was playing on her phone (she even ordered a take-away drink we discovered later), but since she was not a close friend or relative her contribution to the debriefing was less important.

Report of the game play

There were actually no details to report about the game progress. Despite the fact that one of the players had not received the explanation in advance, both the first and second round were played efficiently. The players clearly enjoyed it. During the second round, the symptoms were also clearly visible, although only three were guessed. This might be a bit unfortunate in terms of gameplay, but given the serious purpose of the game it actually worked out well. This formed a good bridge to the debriefing.

Report of the debriefing

The debriefing went as desired, although the conversation did not proceed by itself. This gave me more responsibility as a facilitator, to keep the conversation going and to actively ask questions. In terms of content, the relevant matters were discussed, such as the personal symptoms of the person with Parkinson's. The daughter paid a lot of attention to her phone during the second part. Because at that time the conversation mainly took place between the friends and the daughter was not a close friend or relative to the person with PD, this was not a problem.

One of the players looked at a different screen than the one above which the webcam was on. As a result, she didn't really look into the camera and it seemed as if she was distracted or not following the conversation. She did join the conversation with the other two players, although there was less interaction from her. However, this can also be due to the character of the player (s) and the group dynamics.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	3.0	0.2
Flow	2.7	0.3
Tension / Annoyance	0.3	-0.3
Positive affect	3.6	0.4
Negative affect	0.5	-0.2
Psychological Involvement - Empathy	3.2	0.2
Psychological Involvement - Negative Feelings	0.9	-0.2
Behavioural Involvement	3.1	0.1
Positive Experience	2.3	0.3
Negative Experience	0.0	-0.3
Tiredness	1.5	0.4
Returning to Reality	0.0	-0.5

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	3	-0.2
I expect my fellow players to have an improved understanding of the concept of cues	3	0.1
I expect my fellow players to have an improved understanding of Parkinson's disease	3	0.4

The game helped me to start a conversation about my own symptoms and cues	4	0.6
I expect that my fellow players can help me better in the future	3	0.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	2.5	-0.5
I have an improved understanding of the concept of cues?	3.5	0.2
I have an improved understanding of Parkinson's disease?	3.0	0.5
I have an improved understanding for the specific situation of the patient that I know myself	3.5	0.9
I expect that in the future I can better help the patient that I know myself	3.0	0.6

Feedback in the questionnaire

Original comment goed: originele aanpak, het spel kan fungeren als een praatstuk mbt parkinson, het maakt mensen bewust van de ziekte en hetgeen een persoon met parkinson ervaart.
kan beter: de Franse benamingen zou ik veranderen in Nederlandse, het poppetje van het manusje-van-alles zou ik veranderen in een wit poppetje gezien de heisa in de maatschappij. Maak een ander karakter afro, aziatisch oid
Translation good: original approach, the game can function as a talking point about Parkinson's, it makes people aware of the disease and what a person with Parkinson's experiences.
could be better: I would change the French names to Dutch, I would change the doll of the jack of all trades into a white doll given the fuss in society. Make a different character Afro, Asian or similar "

Conclusion and additional comments

Although the game and debriefing went well, it was a shame that in the beginning a lot of time was lost on technical problems and an explanation. This caused a decrease in concentration. The players took a little less initiative when playing and the conversation during the debriefing was less automatic. In such a case, the role of the debriefer is even more important to activate the players, make them enthusiastic, ask questions and keep the conversation going. A disadvantage of a long and intense session is that concentration is also lost in the facilitator. Another insight is that during a debriefing it is preferable to look at a screen with the webcam directly above it. If this is not the case, it is difficult to see if this person can follow the conversation well enough.

In the player experience of this group, it is especially noticeable that the players had absolutely no trouble returning to reality. This could be due to the fact that the game was played in the morning, and the players were able to engage in other activities quite soon after playing the game, something that also emerged during the observations (e.g. the home delivery was ordered by one of the players). It is noticeable that this group is also more tired than average despite the time of day. This score can be explained by the observations: the difficulties with the technique, the extra time required to explain the game, the reduced interaction and the length of the session.
It was successful to initiate the conversation about the individual symptoms, which is clearly reflected in the scores of both the player with a Parkinson's perspective and the social environment.

The players were interested in the further development of the game and indicated that they are interested in purchasing the game.

Game session 7

Date and time
24 October 2020, 14:00

Environment
Physical, facilitated in person on location

Duration
1 hour, 40 minutes

Player group
A person with Parkinson's, his wife and two sons

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
7A	Parkinson's	59	Male	HBO	Average	Almost never (less than 3 times per year)	Fun	Almost never (less than 3 times per year)
7B	Social environment	27	Male	University	Average	Sometimes (once every few months)	Fun	Very often (at least 4 times per month)
7C	Social environment	24	Male	University	Average	Sometimes (once every few months)	Neutral	Very often (at least 4 times per month)
7D	Social environment	56	Female	University	Average	Sometimes (once every few months)	Fun	Very often (at least 4 times per month)

Social desired behaviour
This group scored a 2.0 on average , 0.8 below the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is "Neutral" and 4 is "Totally agree" for the statement "I have more respect for researcher involved in research into Parkinson's Disease".

Report of quality of game session
Initially, this game was to be played in a mediated environment. When it turned out that all players were together at a location just 10 minutes away from my location, it was decided to play the game in a physical environment. There was enough space to keep a distance, so we chose to also do the facilitation at the physical location. As a facilitator, I wore a face mask for extra safety.

The game was played on a coffee table with three players on a sofa and one player on a chair. The disadvantage of this was that the players did not have to pass cards or the die to each other immediately.
Prior to the session, the players had watched the video tutorial for a game in a mediated environment. Because the game was adapted for a mediated environment, a short explanation was needed to play the game properly. It was not noticeable that this affected the quality of the game.

Report of the game play
The first round of the game was played very strategically. The two sons, both technical students, were very analytical, so they understood and tried to apply the mechanisms of the game well. It was noticeable that the strategy was mainly devised by the two sons, and that the other two players followed them.
At the beginning of the round, one player got the symptom of not being able to give cards to other players. These players sat on a chair on a corner of the coffee table, relatively far from the playing cards on the table. He also played the role of 'l Aboyeur, which meant he would have to give away few cards at all. That's why I chose to give him a different symptom.
When guessing the cues, the players came up with original cues in the theme of the game, for example addressing the other with 'Chef'. However, the cues are designed for the gameplay, for example explaining that the players have a common goal or asking whether someone wants to listen to you. Because they did not thought of this, it was more difficult to guess a number of cues correctly. One player had a symptom of ignoring another player, while the cue is to ask him to listen. The players were not able to guess this cue, which caused some irritation among the players.

Report of the debriefing
The players thought it was a fun game to play, but the players couldn't really relate the symptoms in the game to the symptoms of Parkinson's. This required more explanation from the facilitator. This also made the conversation less fluid from the symptoms in Cue Kitchen to the symptoms of Parkinson's. During the rest of the debriefing, the conversation did not go entirely by itself and, as a facilitator, I had to actively guide and ask for the debriefing.
The player with Parkinson's recognized the lack of willpower and initiative. He confirmed that other people could indeed help him with this. One of the sons recognized that it helps to propose to ‘DIY’ and that this is appreciated by the father.
The person with Parkinson's has been diagnosed with Parkinson's for a long time: 24 years. The two sons therefore did not know him in any other way. The person with Parkinson's himself could not remember what he was like before he got Parkinson's. The partner could still remember this and told about it. The other players found this visibly interesting, but it could also be seen that this was a sensitive topic. Although it is the intention of the debriefing to talk about this, it felt uncomfortable for me to continue asking about this. Moreover, the person with Parkinson's has had this diagnosis for such a long time that it is also less relevant to know exactly what changes. I observed that these individuals are already so used to diagnosing and living with Parkinson's that the game may have been less useful in this situation. The person with Parkinson's did indicate, at the direction of his partner, that it might be interesting to play the game with others who are less aware of the invisible symptoms of Parkinson's. But at the moment the people who are important to him are all aware, partly because of the long time he has had this diagnosis.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	2.7	-0.1
Flow	2.4	-0.1
Tension / Annoyance	0.5	-0.1
Positive affect	3.3	0.1
Negative affect	0.5	-0.2
Psychological Involvement - Empathy	3.1	0.1
Psychological Involvement - Negative Feelings	1.5	0.4
Behavioural Involvement	3.1	0.1
Positive Experience	2.2	0.2
Negative Experience	0.3	0.0
Tiredness	0.6	-0.5
Returning to Reality	0.7	0.2

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	3	-0.2
I expect my fellow players to have an improved understanding of the concept of cues	3	0.1
I expect my fellow players to have an improved understanding of Parkinson's disease	2	-0.6
The game helped me to start a conversation about my own symptoms and cues	3	-0.4
I expect that my fellow players can help me better in the future	3	0.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	3.0	0.0
I have an improved understanding of the concept of cues?	3.0	-0.3
I have an improved understanding of Parkinson's disease?	2.0	-0.5
I have an improved understanding for the specific situation of the patient that I know myself	2.3	-0.3
I expect that in the future I can better help the patient that I know myself	2.0	-0.4

Feedback in the questionnaire

Original comment Tof spel! De meer meta cues (e.g. "het is maar een spel") denk je niet aan als je in het spel zit omdat het "buiten het spel" is. Daardoor zijn die lastig te raden.
Translation Great game! The more meta cues (e.g. "it's just a game") you don't think about when you're in the game because it's "out of the game". This makes them difficult to guess.

Original comment Ik vond sommige meta que's lastig te raden, maar het was ook geen ramp.

Translation I found some meta cues hard to guess, but it wasn't a disaster either

Conclusion and additional comments
The players clearly enjoyed playing the game together. People did not sit at a normal table, but at a coffee table. This meant that not all players were equally close to the game. This was not ideal for the involvement of the players who were a bit further away.
I was physically present as a facilitator. As a result, the conversation and debriefing was not as intimate as it was in other cases. At times it felt uncomfortable to continue asking about certain topics, while the debriefing does bring up these sensitive topics.

Finally, this group was perhaps to a lesser extent the target group of Cue Kitchen. The person with Parkinson's had been diagnosed with Parkinson's and had invisible symptoms for so long that he couldn't remember how he changed. The sons also did not know their father in any other way. In that respect, the game is better suited for people who have recently been diagnosed with Parkinson's and the social environment that is less familiar with the invisible symptoms of Parkinson's.

The measured player experience is quite similar to the overall average. However, it is to be noted there are more negative feelings. This could be related to the observation that there were irritations among the players about not guessing a cue. In addition, it should be noted that the players became less tired than average in this physical session.

Both the player with PD and the social environment are moderately positive about the outcome of the game. This relates to the observation that the personal conversation did not really get going and a lot had to be told by me, as a facilitator, about invisible symptoms and cues related Parkinson's Disease. However, it can also be noted that this group does not show any socially desirable behaviour on average.

Game session 8

Date and time
2 November 2020, 20:00

Environment
Mediated, using Big Blue Button

Duration
2 hours, 10 minutes, including 5 minute break

Player group
A person with Parkinson, her son, daughter-in-law and grandson.

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools

8A	Parkinson's	71	Female	University	Below average	Regularly (1 to 2 times per month)	Neutral	Sometimes (once every few months)
8B	Social environment	45	Male	HBO	Above average	Very often (at least 4 times per month)	A lot of fun	Very often (at least 4 times per month)
8C	Social environment	42	Female	University	Above average	Very often (at least 4 times per month)	A lot of fun	Often (2 to 4 times per month)
8D	Social environment	19	Male	University	Above average	Very often (at least 4 times per month)	A lot of fun	Very often (at least 4 times per month)

Social desired behaviour

This group scored a 2.3 on average , 0.5 below the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is "Neutral" and 4 is "Totally agree" for the statement "I have more respect for researcher involved in research into Parkinson's Disease".

Report of quality of game session

In this game session, there was relatively little time between the preparation of the players and the playing of the game. This may have contributed to the fact that it was unclear to Player 8A that the session would be recorded and that they feared it would be made public. To address these concerns, it was decided not to record the test session.

Player 8A already indicated in advance that this game was not what she expected. She also indicated that she had no experience playing games and that she did not understand the explanation of the game. During the game it took a lot of patience to get her involved in the game. An additional problem was that she is hard of hearing, which made it difficult for her to understand and play the game. As a result, the explanation and the initial phase of the game took a lot of time.

There were almost no technical issues while playing the game. For one of the players the image was occasionally frozen, which could be resolved by turning the camera of my phone off and on. This had little or no effect on the game.

Report of the game play

As mentioned above, the player with Parkinson's had a lot of difficulty playing the game. She indicated (afterwards) that this was not due to her illness, but mainly that she hardly ever plays board games. The other players were well prepared and watched the video tutorial. This had a major effect on the game: playing with the other players went smoothly while a lot of time and attention was paid to the player with Parkinson's.

During the second round, I chose not to give the player with Parkinson's a game symptom, because she still had a lot of trouble playing. She already indicated that she did not like the game very much and that she thought it was all a bit far-fetched. That's why I focused more actively on the other three players, who by the way worked well together and had visible fun in the game. These players understood the game very well and because they gave instructions on what exactly the player with Parkinson's should do on their turn, the players managed to get a good score. The player with Parkinson's was not involved in guessing the symptoms and cues, the other players were able to guess the other symptoms and cues

Report of the debriefing

The debriefing was not very smooth. The player with Parkinson's did not recognize himself in the symptoms used in the game. She also failed to explain her own situation to the other players. She thought, however, that you should be careful with labelling 'Parkinson's' on symptoms or vice versa. It was not possible to make the conversation personal. That is why, as a facilitator, I gave a general explanation about invisible symptoms in Parkinson's disease. The person with Parkinson's stated that he actually did not recognize himself in this. Questions focused on her personal situation, such as which invisible symptoms she suffered from, were not really answered. Also said that her whole life revolves around Parkinson's but at the same time didn't want to blame everything on Parkinson's. She also indicated that she did not have many invisible symptoms, but at the same time did suffer from a number of symptoms and hoped that others could see them. In summary, it was difficult to initiate a personal conversation. In my opinion, it boiled down to the fact that she found it very difficult to figure out exactly what the invisible symptoms were and she was reluctant to tell them. Towards the end of the debriefing, the person with Parkinson's indicated that she actually did not want to bother others about her illness and what was bothering her. The other players indicated that they would not mind and, on the contrary, would like to know what is going on and how they can best help the person with Parkinson's. One of the players expressed his hope that this game might be a starting point in the future to continue the conversation about the invisible symptoms.
The grandson said at the end that he had learned a lot and had a good and nuanced picture of what the various symptoms of someone with Parkinson's might be.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score	Player 8A	Avg. player 8B, 8C and 8D
Sensory and Imaginative Immersion	2.5	-0.3	1.5	2.8
Flow	2.2	-0.2	0.8	2.7
Tension / Annoyance	0.8	0.2	2.3	0.2
Positive affect	3.2	0.0	2.0	3.6
Negative affect	1.0	0.3	1.8	0.8
Psychological Involvement - Empathy	3.1	0.1	2.8	3.2
Psychological Involvement - Negative Feelings	0.9	-0.2	0.8	0.9
Behavioural Involvement	3.2	0.2	2.3	3.4
Positive Experience	1.8	-0.2	1.2	1.9
Negative Experience	0.4	0.1	1.0	0.2
Tiredness	0.9	-0.2	1.5	0.7
Returning to Reality	0.3	-0.3	0.0	0.3

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	3	-0.2

I expect my fellow players to have an improved understanding of the concept of cues	2	-0.9
I expect my fellow players to have an improved understanding of Parkinson's disease	2	-0.6
The game helped me to start a conversation about my own symptoms and cues	2	-1.4
I expect that my fellow players can help me better in the future	1	-1.7

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	3.3	0.0
I have an improved understanding of the concept of cues?	2.7	0.2
I have an improved understanding of Parkinson's disease?	2.0	-0.6
I have an improved understanding for the specific situation of the patient that I know myself	2.7	0.2
I expect that in the future I can better help the patient that I know myself	3.3	0.0

Feedback in the questionnaire

Original comment

Er was nauwelijks tijd voor voorbereiding, dat is jammer want je weet niet waar je aan begint. Je vraag over akkoord gaan met publicatie van het met het spel verzamelde materiaal was niet goed te vinden omdat informatie te laat kwam. Ik wist niet dat ik daar positief op moest reageren om mee te kunnen doen met het spel. Ik moest je nu maar geloven toen je me beloofde dat je het zou anonimiseren. Voor mij was dat m.n. een morele kwestie (persoonlijk interesseert het me niet als je alles gebruikt). Dit hoort niet bij wetenschappelijk onderzoek en was dus niet zorgvuldig. Wat ik leuk vond was jouw inbreng, m.n. de vele vragen die je stelde, zowel tijdens het spel en daarna. Ik vind het idee dat je Parkinson bespreekbaar wil maken aan de hand van een spel leuk. Ik vraag me alleen af of daar veel mee gedaan gaat worden. Het lijkt me typisch iets dat in de kast belandT en vergeten wordt. Zelf zou ik liever naar een film over Parkinson kijken en napraten, maar toen ik appjes ontving van spelers 8B en 8D, viel me op dat zij vonden dat het ze iets opgeleverd heeft. Tot slot: je had je wel goed verdiept in de ziekte, maar wat mij betreft zou dat toch wel breder getrokken mogen worden. Je noemde m.n. Kenmerken/verschijningsvormen als freezing, motoriek en tremor. Maar Parkinson is veel breder, en als je iets aan verborgen symptomen wilt doen, kan je die beter in het spel stoppen, zodat ze zichtbaar worden.

Translation

There was hardly any time for preparation, which is a shame because you don't know what it is you get yourself into. Your question about agreeing to the publication of the material collected with the game was difficult to find beforehand because information came too late. I didn't know that I had to respond positively to be able to participate in the game. I had to believe you now when you promised me you'd anonymize it. For me that was mainly a moral issue (I personally don't care if you use everything). This is not part of scientific research and was therefore not careful. What I liked was your input, especially the many questions you asked, both during the game and afterwards. I like the idea that you want to discuss Parkinson's through a game. I just wonder whether a lot will be done with it. It seems to me typically something that ends up in the closet and is forgotten. I would rather

watch and talk about a movie about Parkinson's, but when I received text messages from players 8B and 8D, I noticed that they thought the game was somewhat useful. Finally: you had thoroughly studied the disease, but as far as I am concerned it could be broader. You mentioned in particular characteristics / manifestations such as freezing, motoric skills and tremor. But Parkinson's is much broader, and if you want to do something about hidden symptoms, it is better to put them in the game so that they become visible.

> ***Personal note by the researcher***
> 12 days before the game session, on 21 October 21 2020, extensive information about this research was sent. On October 26, 8A indicated that she wanted to participate in this study. A date picker was sent on 29 October, and on the following day (30 November) the session date was set for 2 November. A informed consent form was also sent on 30 October, in which permission is requested for data processing. 8A has filled in the form, in which she gives her consent on all aspects, on 30 October.
> I do not recognize what is stated in the feedback, that information was sent too late or that I acted carelessly when asking for consent to data processing. It is true that there was little time between scheduling this session, asking for data processing permission, and playing the game, and as a result, participants were more likely to have been able to read over important information. At the beginning of the session I explained how I process the data of the participants and that they will be anonymized.
> 8A did not object to the recording, but did object to the publication of the recording. Although this is fully in line with intended use, I have chosen to avoid any kind of ambiguity and uncertainty by not recording the session. When a session is recorded, this is clearly visible to the participants, at the top of their screen.

Original comment
Misschien kun je een mic gebruiken volgende keer om nog beter verstaanbaar te zijn. Verder gaf je aan 8A wel heel vaak aan dat ze ook ‘nee’ mocht zeggen op vragen. Heel keurig van je, maar iig 8A zegt het heus wel als ze geen antwoord wil geven. Verder vond ik dat je het superleuk deed, duidelijk, vriendelijk en geduldig. En leuk persoonlijk detail: 8D is net begonnen op de TU in Delft; mooi om in de praktijk te zien hoe breed afstudeermogelijkheden zijn. Veel succes met het onderzoek en wie weet tot ziens!
Translation
Maybe you can use a mic next time to be even more audible. Furthermore, you often indicated to 8A that she was also allowed to say "no" to questions. Very neat of you, but especially 8A will tell you if she doesn't want to answer. I also thought you did it super nice, clear, friendly and patient. And a nice personal detail: 8D has just started at the TU in Delft; nice to see in practice how extensive the graduation options are. Good luck with the research and who knows, maybe we'll see you soon!

Original comment
Ik vond het een erg leuk spel. Ik denk dat als je het fysiek speelt, dat dingen dan wel duidelijker worden. 8A heeft bijvoorbeeld wel echt moeite met kaarten oppakken van tafel. Dat zijn dingen die online niet zichtbaar zijn. Ik denk dat het spel nog beter te spelen was met mensen die toch nog wat

verder van 8A af staan en die echt weinig weten over de onzichtbare symptomen. Ik vond het gesprek achteraf wel waardevol, maar zou waarschijnlijk live nog waardevoller zijn. Succes!
Translation
I thought it was a very nice game. I think if you play it physically, things will become clear. For example, it is really difficult for 8A to pick up cards from the table. Those are things that are not visible online. I think the game could be played even better with people who are a bit further away from 8A and who really know little about the invisible symptoms. I thought the conversation was valuable afterwards, but it would probably be even more valuable live. Good luck!

Conclusion and additional comments
This was a difficult but interesting session. The player with PD, about whom the game actually revolves, was not enthusiastic about the short period leading up to the game, the game itself and the debriefing. She had trouble understanding the game, while also having a hearing problem. It was also difficult to get her input during the debriefing. The other players, on the other hand, clearly enjoyed the game, understood the game well, and also found the debriefing useful. Most of the debriefing didn't get very personal. However, eventually the conversation turned to how it should be possible to tell your personal problems without people thinking it is affectation. The social environment also indicates, both during the session as in the feedback from the questionnaire, that they really valued the conversation, although in a physical environment this could perhaps be even more valuable.

On the one hand, for me as a facilitator it was nice that the mediated session formed a 'barrier' (the screen) between me and the players, so that I could handle the criticism better. However, this may also have been the cause, the impersonality may have caused the negative experience for player 8A. The fact that the session could be recorded also caused extra stress for this player, something that would not have been necessary in a physical environment.

The problems during gameplay are not very clear in the measured player experience, which is quite similar to the overall average. However, if a difference is made between player 8A and the other players, it is clear that player 8A has experienced the game much more negatively. Mostly she has experienced more Tension / Annoyance in the game, so she was more annoyed and frustrated. This is completely consistent with the observations made during the game. On the other hand, she experienced almost no Flow, which can be explained by the observation that she became little involved in the common decisions in the game and therefore did not stay in the flow of the game.

According to the observations, the player with the Parkinson's perspective did not find the outcome of the game very successful, while the players from the social circle generally thought it was. Especially noteworthy is the difference between the expectation of whether the social environment can help the person with Parkinson's better in the future. The player with PD totally disagrees with this expectation, while the social environment is more than positive.

Game session 9

Date and time
4 November 2020, 20:00

Environment
Mediated, using Big Blue Button

Duration
1 hour, 55 minutes

Player group
Four friends

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
9A	Parkinson's	49	Female	HBO	Above average	Often (2 to 4 times per month)	A lot of fun	Very often (at least 4 times per month)
9B	Social environment	46	Female	HBO	Below average	Almost never (less than 3 times per year)	Neutral	Regularly (1 to 2 times per month)
9C	Social environment	49	Female	HBO	Average	Almost never (less than 3 times per year)	Not so much fun	Very often (at least 4 times per month)
9D	No questionnaire completed							

Social desired behaviour
This group scored a 3.0 on average , 0.2 above the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is "Neutral" and 4 is "Totally agree" for the statement "I have more respect for researcher involved in research into Parkinson's Disease".

Report of quality of game session

Report of the game play

Report of the debriefing

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	3.0	0.2
Flow	2.6	0.2
Tension / Annoyance	0.4	-0.1
Positive affect	3.6	0.4
Negative affect	0.2	-0.5
Psychological Involvement - Empathy	2.8	-0.2
Psychological Involvement - Negative Feelings	1.2	0.2
Behavioural Involvement	2.5	-0.5

Positive Experience	2.3	0.3
Negative Experience	0.3	0.0
Tiredness	1.2	0.1
Returning to Reality	0.4	-0.1

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	4	0.8
I expect my fellow players to have an improved understanding of the concept of cues	3	0.1
I expect my fellow players to have an improved understanding of Parkinson's disease	3	0.4
The game helped me to start a conversation about my own symptoms and cues	3	-0.4
I expect that my fellow players can help me better in the future	3	0.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	2.5	-0.5
I have an improved understanding of the concept of cues?	3.0	-0.3
I have an improved understanding of Parkinson's disease?	1.0	-1.5
I have an improved understanding for the specific situation of the patient that I know myself	1.5	-1.1
I expect that in the future I can better help the patient that I know myself	1.0	-1.4

Feedback in the questionnaire

Original comment

Hoi harmen, ik vond het een mooie ervaring om dit spel te mogen spelen. Ik heb wel een opmerking over de persoonlijke vragen die je achteraf stelde. Ik heb daar geen problemen mee omdat de meiden niet iets nieuws vertelden. Misschien kwam het ook door de ruimte die je voelde om door te vragen. Toen ik 10 jaar geleden de diagnose kreeg was ik daar niet zo open in als nu. Ik wil je als tip meegeven voor een volgende keer, dat je het spel gaat spelen. De mensen vooraf gaat vertellen dat je na het spel vragen voor ze hebt en dat ze zelf kunnen aangeven of ze die willen beantwoorden. Ik vond wel dat je oprecht en een goede intentie had , wat maakt dat ik wel het vertrouwen voelde om de vragen eerlijk te beantwoorden. Mocht je nog vragen hebben dan weet je mij te vinden. Ik ben ook wel benieuwt naar het eindresultaat van je onderzoek. Succes

Translation

Hi harmen, I thought it was a great experience to play this game. I do have a comment about the personal questions you asked afterwards. I have no problem with that because the girls didn't tell anything new. Maybe it was also because of the space you felt to keep asking.

When I was diagnosed 10 years ago I was not as open about it as I am now. I want to give you a tip for next time you play the game: tell the people in advance that you have questions for them after

the game and that they can indicate themselves whether they want to answer them. I thought you had sincere and good intentions, which means that I felt the confidence to answer the questions honestly. If you have any questions, you know where to find me. I am also curious about the end result of your research. Good luck.

Original comment
Ik zou willen dat ik zo goed en georganiseerd overweg kon met digitale wereld. Alleen al communiceren via Teams is voor mij een uitdaging. Laat staan een fysiek spel spelen via beeldbellen. Mooi dat het geen digitaal spel is geworden. Het fysieke maakt de beleving groter. Maakt ook mijn betrokkenheid groter. Complimenten
Translation
I wish I could handle the digital world in such a good and organized way. Communicating via Teams alone is a challenge for me. Let alone play a physical game via video calling. Nice that it has not become a digital game. The physical makes the experience bigger. Also increases my involvement. Compliments

Original comment
Het werd voor ons duidelijk dat we diegene met Parkinson goed kennen en ook wel zicht hebben op haar ‘onzichtbare’ sociale beperkingen. Dat zie je ook wel bij mijn antwoorden hierover. Ik vond het een erg leuke manier om het gesprek aan te gaan over Parkinson voor mensen die dat uit zichzelf moeilijk vinden.
Translation
It became clear to us that we know the person with Parkinson's very well and that we also understand her "invisible" social limitations. You can see that in my answers about this. I thought it was a very nice way to start a conversation about Parkinson's for people who find it difficult on their own.

Conclusion and additional comments
The players really enjoyed playing the game and had a good time with each other. It was clear that these friends knew the person with Parkinson's well. The illness was not the most important thing in looking after her, but rather the close friendship. The session focused more on what has changed in the 10 years after diagnosis. In that respect it became personal, but no new things came to light. Yet the friend who lived further away indicated that she thought it was good that they thought about it. During this session, two players sat side by side at the same table. Although they both had their own screens, it was distracting that these two interacted a lot. It was noticeable that the other two players were therefore slightly less (continuously) involved in the game.

The high score on Positive Affect and low score on Negative Affect can be well indicated by the pleasant time the players had together. Behavioural Involvement scores lower than the overall average. The reason for this can be found in the observation that two players were less involved because there was a lot of noise on the line.

The observation that the players know each other well and that not many new things have been discussed, is clearly reflected in the assessment of the effect by the social environment, where three of the five variables score negatively. This interpretation can also be found in the feedback of the questionnaire, in which it is clearly indicated that the players know the person with Parkinson's well.

Interestingly enough, the person with Parkinson's was positive about the (expected) effect of the game.

Game session 10

Date and time
8 November 2020, 20:00

Environment
Mediated, using Big Blue Button

Duration
1 hour, 40 minutes

Player group
A father with PD and his partner (both observers), three sons and a daughter

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools
10A	PD	61	Male	University	Average	Regularly (1 to 2 times per month)	Fun	Regularly (1 to 2 times per month)
10B	Social Environment	30	Male	HBO	Far above average	Often (2 to 4 times per month)	A lot of fun	Regularly (1 to 2 times per month)
10C	Social Environment	29	Female	HBO	Average	Sometimes (once every few months)	A lot of fun	Very often (at least 4 times per month)
10D	Social Environment	20	Male	Secondary education	Far above average	Very often (at least 4 times per month)	A lot of fun	Very often (at least 4 times per month)
10E	Social Environment	21	Male	Secondary education	Far above average	Very often (at least 4 times per month)	A lot of fun	Often (2 to 4 times per month)

Social desired behaviour
This group scored a 3.0 on average , 0.2 above the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is “Neutral” and 4 is “Totally agree” for the statement “I have more respect for researcher involved in research into Parkinson’s Disease”.

Report of quality of game session
This game was played by a family whose father has Parkinson's disease. There was a relaxed atmosphere, for example some player had a beer while playing. Apart from the fact that one of the players was running late, there were no special issues regarding the quality of the session. There were no problems with Wi-Fi connection or the software. At the end of the debriefing, the observers' tablet battery was empty. Because their input was needed, a hybrid solution was found where they

dialled in with their phone while following the image on their computer screen. During the session, especially during the debriefing, one of the players was clearly loosing concentration and looked tired. At the end of the sessions, a couple of players indicated that they found it intense and exhausting.

Report of the game play

Two players were well prepared, watched the tutorial and already thought about the best strategy and which role they wanted to play. The other two watched a part of the tutorial last-minute, and needed some time to get into the game. Although the first two players did take the lead most of the time, after a while and especially during the second time playing the game, the difference in preparation was not visible anymore. The players were very focused to try and get the most points possible and play the best strategy. This caused some passionate exchanges between the players, trying to convince each other about the best strategy. Although they really understood the working of the game, their eagerness to win came at the expense of smooth collaboration and communication. Especially during the second game they hesitated to cook the available dishes and tried to wait for better possibilities, which resulted into a less smooth game. Nevertheless, they did score very well and really mastered the game. Their focus on playing the game well, resulted in an attitude towards the invisible symptoms and cues that was different than the intended idea of the game. For example, one player did not act like his invisible symptom and just said: “I find it difficult to cook dishes, you have to help me”.

Report of the debriefing

During the debriefing, a conversation started between the observers (the father with Parkinson’s and his partner) and the players (their children). Although the invisible symptoms from the game were not directly related to the personal situation of the person with Parkinson’s, the children asked questions about what the invisible symptoms were. For example, the person with PD indicated that he experiences periods when he is more emotional. For example when seeing a sad movie or add on television. This could be a side effect of medication for PD.

There was a clear difference between the oldest two and youngest two children: the oldest recognized changed behaviour of their father, while the youngest children did not know better because they did not had any reference point. Because of that it was visible that the youngest players found out during this session what changed after the diagnosis with PD. For example, although before the father was the best in multi-tasking, this became more and more worse over the years. This was clear for the oldest players while the youngest player did not know any better.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	3.0	0.3
Flow	2.7	0.3
Tension / Annoyance	0.5	-0.1
Positive affect	3.4	0.1
Negative affect	0.7	0.0
Psychological Involvement - Empathy	3.0	0.0
Psychological Involvement - Negative Feelings	1.7	0.7
Behavioural Involvement	2.9	-0.1

Positive Experience	2.3	0.3
Negative Experience	0.3	0.0
Tiredness	1.4	0.3
Returning to Reality	0.7	0.2

Questionnaire results – Result of the game (Parkinson's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I expect my fellow players to have an improved understanding of what it is to have an invisible symptom	4	0.8
I expect my fellow players to have an improved understanding of the concept of cues	3	0.1
I expect my fellow players to have an improved understanding of Parkinson's disease	4	1.4
The game helped me to start a conversation about my own symptoms and cues	3	-0.4
I expect that my fellow players can help me better in the future	3	0.3

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	3.5	0.5
I have an improved understanding of the concept of cues?	3.3	-0.1
I have an improved understanding of Parkinson's disease?	3.5	1.0
I have an improved understanding for the specific situation of the patient that I know myself	3.3	0.6
I expect that in the future I can better help the patient that I know myself	2.8	0.3

Feedback in the questionnaire

Original comment

Ten eerste is het heel goed dat er aandacht wordt besteed aan de onzichtbare symptomen van Parkinson. Ik vond de debriefing na het spel relevanter dan het spel zelf. Bij ons had de verdeling net iets beter gekund. Iets minder spel, iets langer erna. Erg fijn contact met de onderzoeker. Zeer vriendelijk en geduldig.

Translation

First, it is very good that attention is paid to the invisible symptoms of Parkinson's. I found the post-game debriefing more relevant than the game itself. With us, the distribution could have been slightly better. Slightly less play, a little longer afterwards. Very nice contact with the researcher. Very kind and patient.

Original comment

Bedankt spelleider, je hebt het leuk gedaan. We vonden het een positieve ervaring. Het voelde niet zoals een reis, waarbij ik het contact met de buitenwereld verloor, zoals de vragen suggereren, maar het was erg leuk om mee te doen. Bedankt!

Translation

Thanks gamemaster, you did a nice job. We thought it was a positive experience. It didn't feel like a journey where I lost touch with the outside world, as the questions suggest, but it was a lot of fun to join. Thanks!

Conclusion and additional comments
There was a very relaxed atmosphere during this session, the players were completely absorbed in the game while playing. Just because the players were very focused during the game, it was also clear to see that they lost some concentration during the debriefing. Other than that, there were actually very few special observations in this game. Both the players, observers and myself had a good time.

The observed immersion in the game during the game play is also clearly reflected in the score on Sensory and Imaginative Immersion. The higher score on Tiredness corresponds to what the players themselves said about this and what was observed: the players lost concentration during the debriefing.
An interesting, high score is that of Negative Feelings. This could well be explained by the passionate discussions about the strategy to be pursued, which could cause the players to irritate each other. It is interesting to note that for these players the fact that the other players were not physically present was no reason to hold back during those discussions.

The players are very positive about the effect of the game. Player 10B indicated that he wouldn't mind playing this game just for fun and that it was really much more amusing than he expected. There was a problem with the connection with the observers just when they were about to talk about the individual symptoms of the person with PD. This may have contributed to the fact that the score for starting a conversation about the individual symptoms is slightly lower than the overall average when it comes to the Parkinson's perspective. In the Social Environment's perspective this effect is not visible.

Game session 11

Date and time
16 November 2020, 20:00

Environment
Mediated, using Big Blue Button

Duration
1 hour, 55 minutes

Player group
Four healthcare professionals

Player characteristics

ID	Perspective	Age	Gender	Education	Experience with games	Frequency of playing games	Opinion about games	Use of digital communica-tion tools

11A	Social environment	26	Female	University	Far above average	Very often (at least 4 times per month)	A lot of fun	Very often (at least 4 times per month)
11B	Social environment	27	Female	University	Above average	Often (2 to 4 times per month)	A lot of fun	Very often (at least 4 times per month)
11C	Social environment	26	Female	University	Average	Often (2 to 4 times per month)	Fun	Often (2 to 4 times per month)
11D	Social environment	25	Female	University	Average	Often (2 to 4 times per month)	Fun	Very often (at least 4 times per month)

Social desired behaviour
This group scored a 2.8 on average , this is equal to the overall average. Between 2 and 4 means a certain degree of social desired behaviour; 2 is “Neutral” and 4 is “Totally agree” for the statement “I have more respect for researcher involved in research into Parkinson’s Disease”.

Report of quality of game session
During this session, no person with Parkinson’s Disease was present. The four friends have (had) professional interactions with persons with PD and were playing from that perspective. Therefore, it was not possible to start a conversation between the person with PD and the healthcare professionals during the debriefing, Nevertheless, a substantive conversation could be held, partly based on the personal experiences of the players, in which I was, as debriefer, the 'expert' on the invisible symptoms of PD.

One player had problems with the software of Big Blue Button(BBB): the microphone was not working. This person did not use the right browser (Google Chrome) but after this problem was solved, the problem still occurred. It took a long time trying to solve this problem. In the end a workaround was found; the player used BBB on her phone for the audio connection while seeing the video on the screen of her laptop. Unfortunately, it took almost 30 minutes before this problem was solved.

The solution as described before worked for some time, but after a while (somewhere halfway the second time of playing the game), this stopped working, probably because of a poor Wi-Fi connection. From that moment on, this player was watching the game on her phone. The playing cards are not readable on a small screen, so the content of each card had to be read out loud for this player. As a result, interaction with this player during this part of the game was much less than before, also because she was not visible anymore during the debriefing.

Report of the game play
Two players had watched the tutorial before playing the game. After a short explanation, the other players understood the game quit quickly. During the first game, the players were not very fanatical to get as many points as possible. They mainly played it for fun and tried to figure out the game in a playful way. The second round, however, the players were a lot more fanatic. The fact that the players are highly rated and play board games relatively often, was clearly visible during the second

game. The players understood the game and the mechanics behind it very well, which (also due to some luck) resulted in a record score.

The players understood well the importance of the symptoms and were therefore extra observant towards each other. The game was paused to guess the symptoms. Interestingly, during guessing, the character traits of the players, such as being chaotic, indecisiveness or stubbornness, were suggested as a symptom. By urging the players to continue playing and in this way looking closely at how the others in the game were being hindered, all symptoms were guessed.

Report of the debriefing

The players knew a lot about the mechanisms of Parkinson's from their profession. Some were able to make the connection between the symptoms at play and the real symptoms of Parkinson's, although there was mainly knowledge about the visible physical symptoms of PD. The players did not have any questions about their relationship with a person with Parkinson's, but mainly had a professional interest and wanted to know more about the invisible symptoms. This made it more of a 'lecture' from my point of view as an 'expert' about invisible symptoms of PD, instead of a dialogue between a person with PD and their social environment. In that respect, this session lacked a personal conversation in which personal examples, questions, recognition and confirmation can emerge. Nevertheless, the players indicated that it was an eye-opener that could be useful in future professional contact with persons with PD.

Questionnaire results – Player Experience

Variable	Avg. Group Score	Difference with overall avg. score
Sensory and Imaginative Immersion	3.3	0.5
Flow	2.9	0.5
Tension / Annoyance	0.3	-0.3
Positive affect	3.6	0.3
Negative affect	0.5	-0.2
Psychological Involvement - Empathy	3.4	0.4
Psychological Involvement - Negative Feelings	1.0	0.0
Behavioural Involvement	3.5	0.5
Positive Experience	2.5	0.5
Negative Experience	0.2	-0.1
Tiredness	1.5	0.4
Returning to Reality	0.6	0.1

Questionnaire results – Result of the game (Social Environment's perspective)

Question	Avg. Group Score	Difference with overall avg. score
I have an improved understanding of what it is to have an invisible symptom	3.5	0.5
I have an improved understanding of the concept of cues?	3.8	0.4
I have an improved understanding of Parkinson's disease?	3.3	0.8
I have an improved understanding for the specific situation of the patient that I know myself	3.0	0.4

I expect that in the future I can better help the patient that I know myself	2.8	0.3

Feedback in the questionnaire

Original comment

Erg leuk! Dank voor het initiatief en heel veel succes met afstuderen!

Translation

Very nice! Thanks for the initiative and good luck with your graduation!

Original comment

Heel knap gemaakt, ziet er goed uit, mooie kaarten. Tweede sessie zonder duidelijke 'hulp' van de spelleider vond ik het leukst, maar logisch dat er in de eerste ronde wel wat meer hulp nodig is.

Translation

Very cleverly made, looks good, beautiful cards. I liked the second session without clear 'help' from the game master, but it makes sense that a little more help is needed in the first round.

Original comment

Spel zit goed in elkaar, leuke kaarten, fijn om samen te werken ipv tegen elkaar. Leuke, letterlijk speelse manier om meer te leren over verborgen symptomen van Parkinson.

Translation

Game is well put together, nice cards, nice to work together instead of against each other. A fun, literally playful way to learn more about hidden symptoms of Parkinson's.

Conclusion and additional comments

It took a long time for the video and audio problems to be resolved. Even after that, the game did not go smoothly, so one of the players had to follow the game on the telephone. This was clearly less suitable and her involvement decreased as a result. She was not visible during the debriefing and was therefore less involved in the conversation.

Still, most of the time, the players visibly enjoyed playing. They understood the game very well and, without losing sight of the serious goal (the symptoms and cues), managed to set a record score, especially by working well together. Afterwards they shared their enthusiasm about the game with each other and with me as a facilitator.

Because there was no person with Parkinson's involved, the debriefing missed the personal note for which the game is intended. Nevertheless, the players indicated that they found it interesting and that it could be useful in future interactions with Parkinson's patients.

The relatively high score on a large part of the variables can be attributed to their positive feeling during the game.

The Social Presence variables Empathy and Behavioural Involvement score high, which can be explained by the degree to which the players worked together to achieve the goal, while paying close attention to each other's symptoms and cues.

The fact that the players felt they had learned a lot can be seen in the good assessment of the outcome of the game. The high scores for improved understanding may be related to the extensive explanation I have tried to give about Parkinson's, hidden symptoms and cues. The fact that, as

healthcare professionals, they can also relate this to Parkinson's mechanisms could also contribute to this.