What I remember of last year, is that delirium is a bit of confusion with or without hallucinations.

- Medical student after four years of medical education before playing The Delirium Experience

The way I look back now is that I don’t ever want an operation ever again. If I need an operation of any kind, I’ll tell them to just let me die instead. If I ever get another delirium I don’t think I’ll survive it. No, I know for sure I wouldn’t survive another one.

- Patient after experiencing delirium once
The first time I heard of delirium was when I wrote my MSc thesis that was part of a larger study in a hospital. One of the exclusion criteria was delirium. As I had never heard of delirium, I asked a nurse what delirium is and why we couldn’t include patients with delirium. She explained to me that patients with delirium are somewhat confused and were therefore unable to answer the questionnaires or perform physical tests. 

One year later, I started my PhD project on The Delirium Experience, a serious game to train and educate healthcare professionals about delirium. I was of course curious about the game, and started playing on a dark winter evening. My lack of a medical background or sufficient knowledge on delirium resulted in severe delirious episodes for the patient in The Delirium Experience. These delirious episodes were so frightening that I quit playing and decided to play this interesting but somewhat scary game during daytime! That evening, I became aware that there was an important misbalance between the nurse’s explanation of delirium and the patient’s experience I encountered in The Delirium Experience. I was however not aware yet, that this misbalance is one of the challenges in delirium education and would play a central role throughout my PhD project.

**Delirium**

Delirium is an acute neuropsychiatric syndrome due to a physical condition that affects patients’ attention and awareness.\(^1\) Patients experience reduced ability to direct, focus, sustain and shift their attention, and orientation to the environment. This disturbance in attention and awareness usually develops within hours to a few days and the severity tends to fluctuate over the day. Furthermore, patients experience an additional disturbance in cognition such as memory deficit, language problems, visuospatial ability, or perception. It is a multifactorial condition, always triggered by medical causes, such as surgery, infection, pain, and/or drugs.\(^1,2\) Delirium develops from a complex interrelation between patients’ vulnerability and the exposure to triggers, e.g. older hospitalized patients are more susceptible to develop delirium.\(^3\) It is associated with serious consequences such as increased length of hospital stay, functional and cognitive decline, institutionalization, and mortality.\(^1,\)\(^2\) For patients, experiencing delirious episodes is frightening and affects their psychological and emotional well-being.\(^4,5\) Depending on the clinical setting the incidence of delirium varies between 29 to 64% in medical and geriatric wards, up to 80% in Intensive Care Units, and is also present in about 40% of nursing home residents.\(^2\)

Adequate recognition and management of delirium is important to reduce its incidence and severity.\(^6,7\) but unfortunately delirium often goes unrecognized.\(^8,9\) To treat and manage delirium, healthcare professionals can use both pharmacological and non-pharmacological interventions. In past years, delirium was often treated with pharmacological interventions, recent studies show however that pharmacological interventions are not proven to be effective, both regarding effects on incidence and/or severity of delirium. Because pharma-
ological interventions are also associated with adverse effects, it is recommended to only use pharmacological interventions if other interventions do not succeed in reducing the psychomotor symptoms of delirium.5–12 Clinicians are nowadays advised to implement multicomponent non-pharmacological interventions to prevent, treat, and manage their patients with delirium. The interventions in delirium care focus for example on: treatment or prevention of possible precipitating medical conditions, re-orientation, early mobilization, avoidance of sensory deprivation, hydration, and involvement of family.11 They have found to be effective, low-risk, and consistent with standards for quality care.11,13,14 It is estimated that these multicomponent non-pharmacological interventions may reduce delirium incidence by 30 to 50%.11,14

The patient’s experience

Patients who experienced delirious episodes can frequently recall their experiences.15,16 They describe these experiences as distressing, frightening, or even terrifying.17–19 During delirious episodes patients feel confused or disoriented and they can have hallucinations or delusions.12,19 Delirium and altered behavior due to delirium also made patients lose their self-control and dignity.17–19 These feelings withhold some patients from sharing information about their experiences with healthcare professionals. Sharing these experiences with healthcare professionals is even less if patients do not trust the healthcare professionals; this lack of trust may be a result of delirium.18,19 However, this information may be of essential value to healthcare professionals to reduce the severity of delirium symptoms, and thereby also reduce the level of distress of patients who experienced delirium.5,15,16

Not only during or directly after the delirious episodes do patients describe remembering the feelings of distress or hallucinations, but also long after the episodes ceased, patients still experience consequences of delirium.5,37–39 The loss of self-control and dignity during the delirious episodes may lead to feelings of embarrassment and feeling humiliated after the delirious episodes ceased.17–19 Patients often describe nightly struggles such as the inability to fall asleep and sleeplessness as a result of delirium lasting for a long time.17 In addition, patients may also describe an altered sense of self, doubt about perceptions, unresolved feeling of anxiety, and a reduced feeling of autonomy.17–19 About 30% of patients who experienced delirious episodes even develop post-traumatic stress disorder4 or depression.5 Not only does delirium affect patients, but it also affects their spouses, healthcare professionals and/or other caregivers experience severe distress.16,20 For example, overt agitations and hallucinations cause worry and distress in spouses and caregivers of delirious patients.16,20

Barriers in delirium detection and management

Several factors play a role in why delirium or an increase risk often goes unrecognized. One factor is a lack of delirium awareness and a disconnection between the perceived clinical importance and level of screening for delirium.21,22 Also, healthcare professionals often have inadequate levels of knowledge and lack education on delirium.21–24 In addition, the limited availability of time and staff to assess patients at increased risk of developing delirium, and their experienced discomfort with delirium assessment contribute to low delirium detection rates.21–23,25

Even when (an increased risk of) delirium is detected, preventive or therapeutic delirium management is often suboptimal. Many healthcare professionals state that they are unsatisfied with the organization of delirium management in their work environment.21,22,23,26 The factors that affect low delirium detection rates also play a role in suboptimal delirium management. These factors include: inadequate knowledge and education,21,23,24,27,28 insufficient time, tools, and staff,23,27,29 and experiencing discomfort with delirium management.25 But also a lack of effective collaboration between disciplines resulting in suboptimal coordinated and integrated plans for treatment and follow-up seems to play a role as well.22,23,29 In addition, negative attitudes of healthcare professionals towards delirium contribute to the suboptimal management of delirium and thereby care for delirious patients.28,30 Caring for delirious patients is often experienced as burdensome and distressing and delirious patients are frequently stigmatized because of for example aggressive behavior and the complexity of providing them with medical care as they often remove intravenous lines and indwelling catheters.16,24,25,27,31–33 Furthermore, healthcare professionals often lack an understanding of the patients’ experiences, emotions, and needs when patients endure delirious episodes, even though we know this understanding enhances delirium management and care and benefits a patient’s recovery.18,19,26,28,30

Delirium education

Current delirium education fails to educate healthcare professionals in such a way that they can overcome the barriers described above leading to suboptimal delirium detection and management.21,22,30,34–37 There is thus an urgent need for improvements in delirium education to decrease the burden for all people involved. Delirium education that focuses solely on increasing knowledge and skills in recognition, without paying attention to attitudes, is not sufficient to improve delirium detection and management.34,35 Researchers emphasize the need to design delirium education that enables changes in the focus as well as on the delivery methods of delirium education.24,30,36

On the one hand, delirium education should not only focus on specific disease-related knowledge, but should increase the patient-oriented focus by involving patients and their experiences.30,34 Issues that were identified as important to improve delirium care are the negative attitudes of healthcare professionals towards delirium, lack of understanding the patients’ experience, and behavior and communication skills related to delirium care.9,16 Attitudes are learned evaluations of persons, places, or issues that affect feelings, beliefs, and behavior.38–40
On the other hand, there is increasing interest for educating delirium care with more interactive methods that actively involve learners to address the issues raised above. Feedback on how learners are performing and the use of simulations contribute to this more interactive way of teaching. Furthermore, the involvement of patients and patients’ experiences in delirium education is expected to address the negative attitudes towards delirium and improve delirium care. However, little is yet known about which specific aspects of education affect learning about delirium care, and how this knowledge is translated into skills needed to improve daily practice.

Content in delirium education should have a more patient-oriented and experience-based focus. It relies more on exploring new experiences than on factual knowledge or skills. Not only are the experiences of the patients important in delirium education, experiences of the learner also play an important role to improve learning outcomes. Acquiring clinical experience with delirium care is one way to address this, but it takes time to master this and it is often hard to expose all students to delirious patients without causing extra burden to these vulnerable patients. A suitable learning strategy in delirium education to overcome these practical challenges may be experiential learning.

Experiential learning

Experiential learning considers how learners bring their own experiences gathered in reality into their learning process. Learning is therefore dependent on the context in which it occurs. The principles of experiential learning describe how new knowledge is created by interpreting and integrating an experience into what a learner already knows. This means that learners try or do something that will create an experience. Reflection is in turn essential to make sense of the experience and helps to solidify the experience into the learner’s memory. The emotion the memory evokes helps to integrate the experience into the learners knowledge. Also critical reflection about the experience and how it may have been improved is important in experiential learning. In this way, learners theorize on how they may improve the experience before they test their theories and try to improve the experience in reality. This leads to active experimentation with their theories and experiences, which helps learners with the interpretation of the experience. This can in turn contribute to a new experience that needs to be interpreted and integrated to create new knowledge.

In experiential learning a learner’s experience thus plays an important role in creating new knowledge. As explained above, intertwining the patient’s experience of delirium into the learners’ experiences is recommended to improve delirium education. The principles of experiential learning may therefore serve as a lens to study the recommended improvements in delirium education.

Experiential learning in delirium care

Experiential learning is not yet been used often as a foundation to teach delirium care. However, healthcare professionals describe they often rely on experiential learning when providing care to delirious patients. They especially use principles of experiential learning in cases where they report insufficient education or cannot rely on their own experience to provide good care to delirious patients. Experiential learning in delirium care allows healthcare professionals to learn the acquired clinical and communication skills, and creates more understanding of the delirious patient’s case.

Serious games

A medium suited to apply principles of experiential learning is a serious game. Serious games are games that are active and entertaining learning environments. Serious games focus on the main objective of educating the player, but also have many play characteristics of entertainment games. They provide environments in which players can safely experiment, thereby connecting to one of the key aspects of experiential learning. Serious games are applied for many different purposes such as cognitive training, health education or promotion, and to increase physical activity (e.g. exergames). Serious games for medical education as well as other serious game domains. There is a number of methodological issues that need to be addressed in future studies of serious games.

Current challenges in studying serious games

To draw more reliable conclusions on the effectiveness of serious games, there are a number of methodological issues that need to be addressed in future studies of serious games for medical education as well as other serious game domains. There is a need for (clustered) randomized controlled trials following a published detailed protocol with information about appropriate control groups, randomization of participants, and blinding of assessors instead of quasi-experimental study designs to
study serious games. In addition, the use of standardized or validated measurement instruments is recommended to enhance the quality of evidence and comparability of serious games. A plea was made to also investigate attitudes, patient outcomes, and clinician behavior as serious games outcomes in addition to knowledge, skills, and player satisfaction. And it was found important to broaden participant characteristics, and make sure studies on serious games are adequately powered. To enhance the quality of evidence, researchers emphasize the need to implement and test serious games multiple times and in different settings. One other important recommendation is to evaluate interventions that have a robust theoretical underpinning. This theoretical underpinning with educational or behavioral theories may increase the game’s effectiveness, however less than 40% of educational games includes a theoretical underpinning.

In addition to the methodological issues contributing to more reliable conclusions, to develop more efficacious serious games, we need to know what makes a game effective in achieving its goals. However, current research often investigates serious games as a whole artifact with a predefined outcome (e.g. knowledge) without distinguishing between individual game aspects. This contributes to evidence on the effectiveness of a specific serious game, but does not provide us insight in the particular aspects of the serious game contributing to this effect. More research is therefore needed on game aspects that promote engagement, support learning, and connect to pedagogical principles.

The Delirium Experience

The Delirium Experience is a serious game that was developed in 2015. It makes use of video simulation and was developed with the intention to address identified gaps in delirium education, as described above. It aims to teach players how to care for patients with (an increased risk of developing) delirium, provide them with insight in what patients endure during delirious episodes, and how the actions of a healthcare professional influence the patient’s experience. The game incorporates narratives of a patient undergoing a hip surgery and a healthcare professional who has to provide care to this patient. After the surgery, the patient experiences delirious episodes which differ in severity depending on the care provided by the healthcare professional. The Delirium Experience was designed to make a contribution to interactive delirium education that actively involves learners and to have a more patient-oriented focus.

In the game the player plays four “days”, which take about twenty minutes playtime. During daytime, the player has the perspective of a healthcare professional of a delirious patient and provides care for the patient (Figure 1). During the corresponding nights, the player receives the perspective of the delirious patient himself (Figure 2). The daytime actions of the healthcare professional determine what happens to the patient during the night, hence different choices interact with the course of the delirium symptoms. In this way, players should gain insight into what a patient endures in delirious episodes, and how the concrete actions as a healthcare professional can influence this.
Development
The Delirium Experience was developed together with professionals who have experience in developing serious games, designing education, training healthcare personnel, and providing care to delirious patients. The close collaboration of these professionals resulted in clearly defined transfer of concepts from the various involved fields into the game. To produce the game’s content, experiences of patients who experienced several delirious episodes and the national delirium guidelines from the United Kingdom (NICE guidelines) and the Netherlands were used in addition to the input of the professionals involved in the development process. An iterative process within the development team was used to develop and review prototypes of the game and its elements. After consensus was reached on the serious game within the team, a group of healthcare professionals played the game with a think-aloud protocol. This allowed the development team to identify final improvements in the games usability, playability, and functionality. Based on the outcome of these play sessions, the final version of The Delirium Experience was made. The primary author of this thesis (Kiki Buijs-Spanjers) was not involved in the development of The Delirium Experience, neither were the second promoter (Debbie Jaarsma) and the two co-supervisors (Fokie Croonen and Hanneke Hegge). The first promoter (Sophia de Rooij) was the professional on providing care to delirious patients in the development of The Delirium Experience.

Goals and design principles
Within the design of The Delirium Experience, experiential learning was used as a lens. In addition, to achieve the serious game’s goals (teach players how to care for delirium, provide players insight in the patient’s experience and in how their actions influence this experience), several design principles were used.

The serious game provides players a safe environment to experiment and practice caring for a delirious patient without the risk of harming a patient. This encourages players to actively experiment with the different care options incorporated in The Delirium Experience to create new experiences and knowledge. This provides a safe environment for players to practice behaviour and communication skills that are needed in delirium care. Both narratives were provided to the player in a first-person perspective because this facilitates better comprehension of the study material. The idea was that it also enhances the transfer of what players saw to their own performance.

Rationale and outline of this thesis
From the introduction provided above it becomes clear that good quality delirium care is important because of the high burden on all people involved. To provide good quality delirium care, there are however important issues that need to be addressed in delirium education. The aim of this thesis therefore is to investigate whether a serious game on delirium that uses principles of experiential learning is a suited strategy to improve delirium education. In addition, this thesis aims to identify aspects of a serious game that contribute to specific improvements in delirium education. This, to enhance the needed understanding of effective aspects of both delirium education and serious games.

Next to the outline of this thesis described below, an overview of this outline and how the corresponding chapters relate to the aims of this thesis is provided in Figure 3.

In chapter 2 we describe a three-arm randomized controlled trial in which we investigate the effects of the serious game The Delirium Experience on medical students’ skills, learning outcomes and motivations, and attitude. We therefore compared the game to watching two videos on delirium and a patient’s experience on delirium, and to watching a video on healthy ageing.

To broaden our study population and setting, we investigated The Delirium Experience to teach delirium care to nursing students in chapter 3. We used a before-after design to evaluate the game’s effect on students’ quality of care advice for delirious patients and perceived self-efficacy in providing care to delirious patients.

Chapter 4 shows a two-arm randomized controlled trial to gain insight in the effect of different play strategies in the serious game on its effectiveness. Furthermore, we used open-ended questions to explore the different game aspects of these play strategies and how these aspects contributed to improving delirium education. In this study we randomly assigned medical students to either play strategy.

We describe a study in which medical students were allowed to choose their preferred play strategy in chapter 5. We investigated differences in medical students’ characteristics, reasons to choose the play strategy, and learning experiences between the two play strategies. By answering open-ended questions students described their reasons to choose the play strategy and learning experiences.

Finally, we explore how the narrative and its aspects within The Delirium Experience affects students attitudes an learning experiences toward delirium in chapter 6. We conducted semi-structured interviews with both nursing and medical students.
General Introduction

References


Figure 3. Thesis outline
77. Reeve C. Narrative-Based Serious Games. In: Petrovic O, Brand A, eds. Serious Games on the Move. Vienna: Springer Vienna, 2009;73-89. doi:10.1007/978-3-211-09418-1_3