

Reducept whitepaper

Introduction

The treatment of the emotional component of pain, including the influence of multidimensional, psychological and social aspects increased rapidly over the past few years (Eccleston, 2010; Moseley & Butler, 2015; Nicholas et al., 2019). New non-invasive ways of influencing the emotional pain experience are successfully used in combination with existing treatment methods (Eccleston, 2010; Jin, Choo, Gromala, Shaw, & Squire, 2016; Mittinty, Vanlint, Stocks & Moseley, 2018; Moseley & Lorimer Moseley, 2004; Roy, 2008).

In the Netherlands, more than 18% of the population experiences moderate to severe pain lasting longer than 3 months (Bala, 2011). In adult Europeans, 19% of the population suffer from chronic pain, which severely affects the quality of social and professional life (Dezutter, Dewitte, Thauvoeye, & Vanhooren, 2017; Leadley et al., 2014; O'Brien & Breivik, 2012; Reid et al., 2011). The negative consequences of chronic pain are reflected in reduced quality of life, the inability to perform certain movements, a reduction in daily activities, social isolation, depression and helplessness (Eisenberg, O'Brien et al., 2013; Outcalt et al., 2015; Reid et al., 2011). 46% of the Dutch chronic pain patients indicate that their pain problem is not adequately treated. Of the patients with a VAS pain score (Visual Analogue Scale) of 5 or higher, 78% experience their treatment as inadequate (Bekkering et al., 2011). The number of times that chronic pain recurs is increasing, together with the time spent in a clinical setting (Outcalt et al., 2015; Reid et al., 2011).

National and international guidelines prescribe pain education as pain management skills as the first intervention for chronic pain (Briggs, 2012; Eccleston, Wells, & Morlion, 2018; van Cranenburgh, 2016; Wilgen & Nijs, 2007). Despite the priority and recommendations, less than 4% of patients receive these interventions during treatment (Bekkering et al., 2011; Briggs & Mayor, 2013; van Cranenburgh, 2016; Vrolijk, 2016; Wilgen & Nijs, 2007).

Research into virtual reality (VR) training has shown that VR applications can reduce pain levels in adults in various ways (Jones et al., 2016). The number of VR applications designed and



developed to reduce patient pain levels has increased rapidly in recent years, but are often focused on distraction and include minimal education and pain management strategies (Garrett et al., 2018; Jin et al., 2016; Wiederhold et al., 2014).

What makes Reducept unique is the integration of guideline-based education and pain management techniques. These guidelines have been translated into a game training in which patients learn about pain and how to apply pain management strategies in their daily lives (Briggs & Mayor, 2013; Elabd, 2012; Moseley & Butler, 2015). The goal of Reducept is to let the patient experience that pain can be positively influenced and controlled by the way the patient perceives pain.

Pain Theory & Education

Reducept is based on the pain theory of 'Explain Pain' (Moseley & Butler, 2003). In short: our brains make pain when it evaluates that the body is in danger. Pain can be a strong emotional and subjective experience. Influencing cognitive, emotional and behavioural processes changes the pain experience. Moseley and Butler have successfully demonstrated that the knowledge that forms part of their 'Explain Pain' training can improve functioning and reduce pain scores with a reduction in pain scores over a longer period (Moseley & Butler, 2015).

The framework for the pain education in Reducept consists of the Explain Pain guidelines (Moseley & Butler, 2015) and Lauren Heathcote guidelines at the IASP World Congress on Pain 2018. In summary, the most important learning experiences in Reducept are that:

- There are many potential factors that contribute to the pain
- We're all bioplastic.
- Pain is not an accurate marker of the tissue damage
- Pain education is a treatment
- Pain is a brain expression
- Pain is a protector
- The brain becomes overprotective/sensitive

Theoretical psychological framework

Reducept is developed to offer patients both pain education and pain management skills. Since the 1970s, both behavioural and cognitive treatments have been used to control chronic pain



(Melzack & Wall, 1965). Today, they are widely used in multidisciplinary pain management (van Dessel et al., 2014). Cognitive Behavioural Therapy (CBT) is the most well-known treatment and has been proven as an effective treatment for patients with chronic pain (van Dessel et al., 2014; Morley, Eccleston, & Williams, 1999; Thorn, 2017; Thorn et al., 2018; Williams, Eccleston, & Morley, 2012). In short, CBT focuses on how cognitive, behavioural and emotional processes interact and how the patient can positively influence these processes.

The theoretical framework used to describe the psychological influence of Reducept on the patient is Integrative CGT (ICBT) (ten Broeke, & Korrelboom, 2004). ICBT theory can be seen as a 'psychological programming language' for making and testing hypotheses for emotional problems. Hypotheses described with ICBT allow other treatment methods to be tested in addition to the traditional CBT exercises, making it a valuable method to include innovative treatment methods and to test them systematically.

Although the context of VR is different from traditional psychotherapy, the idea of how change takes place is the same. Reducept is built on three different psychotherapeutic techniques, where each framework of the training is directly linked to therapeutic exercises (Fennema & Zantema, 2019). These exercises have been redesigned in the context of VR, making use of the unique properties and possibilities that VR has to offer. The immersion of VR gives us the unique opportunity to better influence the cognitions and emotions of patients with chronic pain. Being able to steer the patient experience makes it possible for patients to always achieve success in their training. Especially for patients who have had many negative treatment experiences, this is of great importance for obtaining a positive growth mindset. The theory has been substantiated for each part of the training (Fennema & Zantema, 2019).

During the design cycle, the participatory design method (PD) was used to guarantee the psychological and technical requirements with regard to both the development and the use of Reducept in the clinical and home environment (Heapy et al., 2015a, 2015b; Kuipers, Wartena, Dijkstra, Prins, & Pierie, 2013; Robertson & Simonsen, n.d.). This means that relevant stakeholders - including adults with chronic pain, therapists, doctors, nurses and game developers - are simultaneously involved in the design process. This process includes preliminary research, decision making, developing ideas for the application and testing of Reducept during and after development.



Research findings

Tests were carried out between January 2018 and June 2019 in collaboration with health care organizations in The Netherlands. During testing, patients with chronic pain were able to train with Reducept in various care settings, such as pain expertise centres, physiotherapy practices and psychology practices. Patients with chronic pain symptoms (ICD10) in the age group 18 to 90 years with a minimum average impressive intelligence were included in the study (Supplemental Information 1: WHO ICD10 International Classification of Diseases, n.d.). Exclusion criteria were complex psychiatric problems, visual disorders and patients with a reduced sense of reality, delusions and/or hallucinations. Training sessions were recorded in Unity and processed in the Unity database, after which the data was analysed in unity and excel. The total number of individual training sessions played by patients with chronic pain was 1562. In 77% of the training sessions a decrease in pain was noted. The average reduction in pain score was 8%, corrected for the distraction factor. 180 patients were asked to train in chronological order. In 104 cases patients reported a VAS pain score of >4 at the start. The average absolute decrease was 2. Players with a higher pain score noted a greater decrease in pain. The usability of Reducept scored an 8 out of 10 (Drew, Falcone, & Baccus, 2018).

Future research directions

A multi-centre RCT with the Raboud University Medical Centre, Rijnstate Hospital, Canisius Wilhelmina Hospital and the Leeuwarden Medical Centre is conducting research into the use of Reducept. In the autumn of 2019, research will be conducted at Rijnstate Rehabilitation into the use of Reducept in 60 patients with low back pain.

In September 2019, Reducept will be available as an E health training course for use in practice. Reducept will be provided with its own data analysis tool that will help both clinicians and researchers gain insight into the results that patients achieve during training with Reducept in practice. By 2020, Reducept will be accessible by mobile phone.



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