reducept

Whitepaper

Reducept is new virtual reality training
that supports chronic pain management

Reducept

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Introduction

Virtual Reality (VR) is an effective (Indovina et al., 2018) and safe (Tashjian et al., 2017) complimentary pain management therapy. Studies have confirmed the effectiveness of interventions (Austin and Siddall, 2019; Indovina et al., 2018; Chirico et al., 2016). VR has passed through the hype cycle and will continue to exist in the treatment of pain. By stimulating the visual, auditory and proprioceptive senses, VR provides patients with the ability to manage chronic pain through distraction, focus-shift and/or to increase their skills to modulate the processing of pain sensations. All of these mechanisms have been evaluated by Pourmand et al. (2018) in nine studies (published from 2013-2017).

The difference in the sustainable effect of pain reduction through Virtual Reality lies in software design (Ahmadpour et al., 2019). Research has shown that the effectiveness of VR analysis interventions varies greatly by the degree to which the patient trains by using the emotional brain. Reducept teaches patients about pain through virtualization of their own bodies, but to be truly effective, patients use cognitive techniques in a playful way to train the brain themselves. This makes Reducept unique in this context.

In the Netherlands, over 18% of the population experiences moderate to severe pain that continues for more than 3 months (Bala, 2011). In adult Europeans, 19% of the population suffers from chronic pain, which seriously affects social and working life quality (Dezutter, Dewitte, Thauvoye, & Vanhooren, 2017; Leadley et al., 2014; O'Brien & Breivik, 2012; Reid et al., 2011). The negative effects of chronic pain manifest themselves as, for example, a reduction in the quality of life, the inability to perform certain movements, restrictions in daily activities, social isolation, depression and helplessness (Eisenberg, O'Brien et al., 2013; Outcalt et al., 2015; Reid et al., 2011). 46% of Dutch chronic pain patients indicate that their pain problem is not being treated adequately. Of those patients with a VAS pain score (Visual Analogue Scale) of 5 or higher, 78% experience their treatment as inadequate (Bekkering et al., 2011). The incidence of recurring chronic pain is increased in this group of patients, along with the amount of time spent in the clinical setting (Outcalt et al., 2015; Reid et al., 2011).

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

What makes Reducept unique is the integration of policy guidelines-based education and pain management techniques. These guidelines have been translated into game-based training by which patients learn about pain and about how to apply pain management strategies in their daily lives (Briggs & Mayor, 2013; Elabd, 2012; Moseley & Butler, 2015).
The aim of Reducept is to enable patients to experience that pain can be influenced and managed in a positive way by changing the way they think about pain.

Pain theory & Education

Reducept is based, among other things, on the 'Explain Pain' Theory (Moseley & Butler, 2003). In short: our brains ‘create’ pain when they perceive that our body is in danger. Pain can be a strong emotional and subjective experience – and by influencing related cognitive, emotional and behavioural processes, the pain experience can change. Moseley and Butler have successfully demonstrated that the knowledge that forms part of their 'Explain Pain' education can improve functioning and reduce pain scores with a reduction in pain scores that is sustained over a longer period (Moseley & Butler, 2015).

Pain formation in Reducept is based on the 'Explain Pain' guidelines (Moseley & Butler, 2015) and on the guidelines by Lauren Heathcade 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 pain
- We are all bioplastic
- Pain is not an accurate marker of tissue damage
- Pain education is a form of treatment
- Pain is a brain expression
- Pain is a protector
- The brain becomes over-excitable/sensitive

Theoretical Psychological Framework

Reducept was developed to offer patients both pain education and pain management skills. Since the 1970s, both behavioural and cognitive approaches have been used to manage chronic pain (Melzack & Wall, 1965). Nowadays, these methods are widely used within multidisciplinary pain management (van Dessel et al., 2014). Cognitive behavioural therapy (CBT) is the most widely known treatment and this has been proven to be 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 a patient can positively influence these processes.

The theoretical framework that is used to describe the psychological effect of Reducept on the patient is integrative CGT (ICBT) (ten Broeke, & Korrelboom, 2004). ICBT theory can be seen as being a 'psychological programming language' to create and to test hypotheses for emotional problems. Hypotheses described in ICBT also allow other treatment methods apart from traditional CBT exercises to be tested, making it a valuable method to be incorporated and systematically test innovative treatment methods.

Although the context of VR differs 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 training is directly linked to therapeutic exercises (Fennema & Zantema, 2019). These exercises have been redesigned in the context of VR, using the unique features and opportunities that VR has to offer. The immersion of VR gives us the unique ability to better influence the cognitions and emotions of patients with chronic pain. Being able to direct the patient's 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. Every aspect of the training is theoretically substantiated (Fennema & Zantema, 2019).

During the design cycle, the Participatory Design (PD) method is used to guarantee psychological and technical requirements regarding both the development and the use of Reducept in clinical and home settings (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, physicians, nurses and game developers-are concurrently involved in the design process. This process includes research, decision-making, development of ideas for the application and for testing of Reducept during and after the development process.

Research findings

In collaboration with healthcare centres in the Netherlands, tests were conducted between January 2018 and June 2019. During this testing period, patients with chronic pain could train with Reducept in different care settings such as specialist centres, physiotherapy practices and psychology practices. Patients with chronic pain symptoms (ICD10), in

the 18 to 90 age range and of noted minimum average intelligence were enrolled 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 impaired reality perception, delusion and/or hallucinations. Training sessions were recorded and processed in the Unity database, after which the data was analysed in Unity and Excel.

The total number of individual training session games played by patients with chronic pain was 4562. A decrease in pain was noted in 77% of the training sessions. The average decrease in pain score was 8%, corrected for the continuity factor. 180 patients were asked to play the complete training program in chronological order. 104 patients indicated a starting VAS pain score of > 4. The average absolute decrease was 2. Players with a higher pain score noted a greater pain decrease here. User-friendliness of Reducept scored 8 out of 10 (Drew, Falcone, & Baccus, 2018).

Future research directions

In a multicentre RCT together with the Radboud University Medical Centre, Rijnstate Hospital, Canisius Wilhelmina Hospital and the Leeuwarden Medical Centre, research is being done about the implementation of Reducept. In September 2019, research is being done at Rijnstate Rehabilitation into the use of Reducept in 60 patients with lower back pain.

As from September 2019, Reducept is available as E-Health training for use in practice settings or for home use. Reducept comes complete with its own data analysis tool to help both clinicians and researchers gain insight into the results that patients are achieving during Reducept training, both in practice settings and at home.

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