

RELAX-CHANGE, exploring the opportunities of tangibles in clinical mental health contexts

Design research eliciting the potential of the novel design probe RELAX-CHANGE, for people with high levels of anxiety, to add value in clinical contexts; researching the boundaries in clinical and design implications involving tangibles in mental health.

M2.1 Design Research Abroad - Industrial Design TU/e - **Veerle van Wijlen**



DPM420 Project at University / Research Institute Abroad

Justus - Liebig Universität Giessen,
Germany (department of psychotherapy
research)

7th of January 2021

Student number

0992908 / s158835

Mentor

dr Max Birk

Mentor Abroad

prof. dr Julian Rubel

Assessors

(2nd) prof. Frank Delbressine /

(3rd) prof. Stephan Wensveen

VISION & IDENTITY

In my work, I aim to empower and socially integrate people affected by mental health issues and as a result restricted to participate in everyday life—I want to enable people to be their “best self” in society. In this design research I therefore immersed myself within psychotherapy practice and research, to uncover the clinical and design perspective on supporting mental health. I addressed the opportunities, positioning and benefits of the in M1.2 created tangible probe RELAX-CHANGE—a drum to reduce anxiety (van Wijlen, 2020), related to clinical mental health contexts. Therefore, I went on a journey to the psychotherapy department in Giessen (Germany) for a research semester abroad (Appendix J - Approval Form). In the M1.2 design research I found general potential of the design probe to support relaxation and create positive relaxation effects due to its underlying psychological principles and engagement potential of specific design aspects (van Wijlen, 2020). It became clear it had potential to be used at home or within therapy (van Wijlen, 2020). However, in order to increase its supporting potential for people with elevated trait anxiety, flexibility of the multi-sensory interaction had to be improved and its potential in clinical mental health had to be researched (van Wijlen, 2020). Next to that, I wanted to enhance my expertise within designing for mental health, participatory design research, multi-disciplinary design research and conceptualization for wicked problems as part of my professional identity. Therefore, I focused on uncovering value and boundaries for tangibles in clinical mental health, through collaboration with various stakeholders in psychotherapy, and the creation of a high level prototype of the design probe RELAX-CHANGE.

Also in order to bridge the gap in understanding between psychotherapists, psychotherapy researchers and designers around the role of tangible design in (clinical) mental health. Therefore, I collaborated with prof.dr. Rubel, expert in psychotherapy research, from the psychotherapy research department at the Justus-Liebig Universität in Giessen. In collaboration with his network, and the university's outpatient center (psychotherapy day clinic) I explored the opportunities, positioning and benefits of the design probe and tangibles in general, in the psychotherapy research and practice context. I focused on 11 interviews with 3 main stakeholders: clinical psychology students (BSc/MSc), researchers, and psychotherapists. This in order to state implications for clinical experiments around design and designing tangibles in mental health contexts (as designers).

ABSTRACT

We are living in a more inclusionary world, in which differences amongst people are accepted and offer a source of inspiration to society. However, people with elevated trait anxiety, aged 18-35 years old, experience worrying and rumination, i.e. negative thinking, limiting their daily functioning and opportunity to be their ‘best self in society’ and decreases empowerment and social integration. Therefore, the high need for support in a different pathway to relaxation for this target group is addressed, within a clinical mental health context. The designed probe RELAX-CHANGE, provides a novel tangible, expressive and multi-sensory perspective on relaxation support for this target group. It supports building towards a peak of multi-sensory expressive drum play (tension) to flow into relaxation (release). This design research elicits the potential of the novel design probe to add value in clinical practice and research. In order to support anxiety patients (and beyond) in relaxation; therapists; clinical outcome research and to highlight the boundaries to future implementation of tangibles in psychotherapy. In this work the highly qualitative online evaluation method, including semi-structured interviews, with in total 11 participants in the clinical field are presented. Moreover, the development of a high level prototype of RELAX-CHANGE is highlighted to support future clinical experiments. Resulting clinical and design implications presented, contribute to supporting a larger part of the target group in relaxation and beyond; increases the intervention space for clinical practitioners / researchers; and enhances mutual understanding amongst designers, psychotherapists and researchers. In general it is found, psychotherapists and researchers are open minded towards new technologies and the design probe can even extend horizons, however individual patient's and therapist's needs have to be considered. Moreover, design qualities as ‘accessibility and flexibility’, ‘visible direct feedback’, ‘engagement and absorption potential’ and ‘playful musical approach’ have potential to add value in clinical contexts. Moreover, the probe's ‘educative and reflective’ qualities, ‘measurement’ qualities, ‘connect therapy with daily life’ quality and quality to ‘fit with the relaxation needs from therapists’ shows its potential to stretch the boundaries of the use of tangible design in mental health.



INTRODUCTION

We are living in a more inclusionary world, in which all kinds of people are accepted and offer a source of inspiration to others around. However, people in special need groups are often restricted in daily life functioning, making them unable to be their 'best self in society', feel empowered and socially integrated (Alper, Hourcade & Gilutz, 2012). Anxiety disorders are one of the most prevalent mental disorders affecting society and causes high healthcare costs. About "33.7% of the population is affected by an anxiety disorder during lifetime." (Bandelow & Michaelis, 2015, p.1). Anxiety includes a spectrum of many types as general anxiety disorder (GAD), panic disorders, social anxiety disorder (SAD) and specific phobias having their commonalities in daily life limitation (Bandelow & Michaelis, 2015). Unawareness, misunderstanding, temporal periods of anxiety and (social) performance challenges are the main problems causing daily powerless feelings (Sanchez & Kunze, 2018). To create empowerment and social integration amongst people within the anxiety spectrum, a specific problem can be addressed: the lack of relaxation in common daily life context (Borkovec & Costello, 1993). This is specially relevant for people with elevated trait anxiety, most prevalent around 18-35 years old (Bandelow & Michaelis, 2015). They experience worrying and rumination, i.e. periods of negative thinking, difficult to control (Greeson & Brantley, 2009) leading into tiredness and a decreased self-image (feeling of incompetence) which highly asks for a need of novel support in relaxation (Borkovec & Costello, 1993). One of the most effective methods for anxiety patients is cognitive-behavioral therapy (CBT). In most cases these are found to be as effective or more effective than pharmacological treatments (Cooper, 2008) and significantly more effective than other therapeutic approaches for anxiety disorders (Cooper, 2008). In CBT disturbing thoughts (cognitive), negative emotional reactions (emotional) and inflexible behavior (behavioral) are identified and addressed through i.a. relaxation training or mindfulness-based cognitive therapy (Cooper, 2008). 'Progressive muscle relaxation' procedure, part of relaxation training, is effective to reach a relaxation state but limits to just releasing physical anxiety responses and still leaves room for rumination. Methods affecting all three, cognitive, physical and emotional responses are sparse, but effective (Knaus, 2014). Therefore methods that include stimuli to directly reduce the multi-faceted anxiety responses, and so increase absorption in the relaxation task, might be a promising approach to support relaxation and prevent worrying and rumination. Moreover, relaxation training and mindfulness practice often focus on soothing pathways to relaxation (Knaus, 2014) which do not suffice for everyone to break their anxiety cycles (Knaus, 2014) and overlook the importance of expression for releasing tension (Cavasco, Kennedy, & Generally, 2005). Design potential is seen in "gamification" for mental health, serious games (Fleming et al, 2017) and therapeutic apps integrating CBT (Ferri, Sluis-Thiescheffer, Booten, & Schouten, 2016). These design interventions for clinical mental health contexts are very digitally focused, lack integration

clinical mental health contexts are very digitally focused, lack integration of expressive and tangible design qualities to support anxiety patients, overlook the opportunities of design to also support therapists or clinical psychology researchers, to bridge the gap in mutual understanding between designers and psychotherapists. Investigating current work showing potential of multi-sensory expressive tangible tools in psychotherapy practice to release tension in anxiety patients; tangible designs for therapeutic skill practice; and design research that supports creation of design-psychotherapy understanding, potential is seen for combining these.

Therefore, the opportunities, positioning and benefits of expressive multi-sensory tangible design in psychotherapy research and practice for relaxation support and beyond are researched. To at the same time make designers and clinicians benefit from a mutual body of knowledge around tangible design in psychotherapy.

In this work the opportunities of the design probe RELAX-CHANGE, that offers a novel mechanism to relaxation for people with high levels of anxiety, in psychotherapy research and practice contexts are presented. This through evaluation of 11 qualitative semi-structured interviews with clinical psychology students (BSc / MSc) (n=7), clinical psychology / psychotherapy researchers (n=3) and therapists (n=1). The first part of the interviews focuses on opportunities and positioning of RELAX-CHANGE around relaxation support in therapy practice or clinical research around relaxation, emotional/cognitive/bodily responses and task absorption. The second part shapes a more general vision towards opportunities of tangibles in general to support clinical practice and research. A 'design probe video' was used to create understanding around RELAX-CHANGE. Through a total of 1273 codes, 48 subthemes and six main themes, implications around clinical experiments involving design are found next to design implications around designing tangibles for clinical mental health contexts. Insights from the interviews elicit the potential of the design probe to add value in clinical practice & research to support a variety of patients beyond relaxation; therapists; clinical outcome research but also showed the boundaries to future implementation of tangibles in psychotherapy. In general therapists and researchers are quite open minded towards the opportunities new technologies can offer for them. Potential is found for the design probe to "open up therapist horizons", "increase therapist flexibility". The 'engagement and absorption potential' of the probe is appreciated, and should be further explored in future clinical experiments, in which the multi-sensory feedback of the design probe plays a big role. Moreover, certain design qualities as 'accessibility and flexibility', 'visible direct feedback', 'engagement and absorption potential' and 'playful musical approach' show great potential to add value in clinical contexts. Unexpectedly, the design probe's 'educative and reflective' qualities, 'measurement' qualities, quality to 'connect therapy with daily life' and quality to 'fit therapists' relaxation needs' shows potential to stretch the application boundaries of tangible design in mental health. Furthermore, 'tensions between psychology and technology' creates friction for design implementation in clinical contexts. These include 'contrasting opinions in use as homework tool', 'clash between patients' and therapists' therapy expectations, stereotypes and the introduction of "new" tools' and the challenges around 'seeking help and willingness to change'.

This work contributes the development of a high level prototype of the design probe RELAX-CHANGE for future clinical experiments involving tangible designs. Furthermore, a detailed reasoning behind the evaluation method is provided; just like clinical and design implications around tangibles in mental health, as basis for future work on support (beyond) relaxation for this target group in psychotherapy practice and research. Next to that, insights about future design research and clinical experiment directions are considered to proceed in uncovering new space for tangibles in (clinical) mental health practice and research.

RELATED WORK

In order to establish the context and approach for creating a novel perspective on the opportunities, positioning and benefits of tangible design in psychotherapy research and practice to support anxiety patients in relaxation, and potentially even beyond, this section covers three main areas. In the first area current approaches and interventions for relaxation for the target group are discussed, well-known in the field of clinical psychology and psychotherapy. Secondly, the field of playful interaction designs for clinical mental health contexts and anxiety will be introduced. Third, the area of expressive multi-sensory tangibles for clinical mental health, anxiety and creation of understanding around the value of tangible design in psychotherapy is described, showing the potential of this paper's design research.

Clinical approaches and interventions for relaxation

One of the most effective methods for anxiety patients, superior to medication, is cognitive-behavioral therapy (CBT). This is found in most cases to be significantly more effective than other therapeutic approaches for anxiety disorders (Cooper, 2008). This type of therapies shares the idea that mental disorders and psychological discomfort are maintained by maladaptive cognitions that maintain emotional distress and behavioral problems (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012). In CBT disturbing thoughts (cognitive), negative emotional reactions (emotional) and inflexible behavior (behavioral) are identified, corrected and re-structured focusing on self-monitoring and relaxation training (Greeson & Brantley, 2009). Two popular techniques in CBT to reduce anxiety and deal with anxiety responses are relaxation training ('applied relaxation') and mindfulness-based cognitive therapy (Cooper, 2008). 'Progressive muscle relaxation' supports patients tense and relax different groups of muscles (Cooper, 2008). Although, this procedure has found to be an effective manner leading to a relaxation state, it is limited to releasing just physical anxiety responses. Methods that directly reduce all three, i.e. cognitive, physical and emotional responses, to support relaxation are sparse, but effective (Knaus, 2014). Furthermore, anxiety patients still have chances to ruminate (negative thinking) or be emotionally distracted. Therefore methods that directly stimulate reduction of the multi-faceted anxiety responses, and so increase absorption in the relaxation task, might be a promising approach to support relaxation and prevent worrying and rumination. Moreover, relaxation training often offers the more soothing methods, such as breathing training, creative visualization and imaginary techniques, to distract and engage in other consuming tasks than their thought processes (Knaus, 2014). Similarly, mindfulness practice emphasizes acceptance of inner cognitive, emotional and physical states during worrying and rumination (Greeson & Brantley, 2009) to decrease anxiety patients' discomfort (Greeson & Brantley, 2009). However, these soothing and non-expressive approaches for either distraction or acceptance do not suffice for everyone to break their anxiety cycles (Knaus, 2014) and overlook the importance of expression for releasing tension. Expression is namely an important aspect to release tension in anxiety patients to combat frustrations and heavy emotions which is overlooked by these methods (Cevasco et al., 2005).

Design for clinical mental health and anxiety

Playful interaction design has tried to offer support within this widespread anxiety spectrum in clinical contexts. Potential is seen in "gamification" for mental health and serious games (Fleming et al, 2017). These make use of the quality to improve engagement potential for patients through game-based dynamics (Fleming et al, 2017). CBT-based serious games and gamification often made use of absorption in fantasy environments or positive psychology as 'level ups' to increase engagement in therapeutic programs (Fleming et al, 2017). Other examples focus on education about coping strategies, such as Above Water, a digital-tangible hybrid game about coping strategies for GAD and Panic Disorder (Wehbe et al., 2016); or Flair, a therapeutic serious game for Social Anxiety Disorder (Sanchez & Kunze, 2018). Lots of these designs are digitally focused and overlook the potential of tangible design to support anxiety reduction. One of the designs most related to offering this kind of physical support in relaxation is proposed in a paper around plant-based games to reduce anxiety (Park, Hu & Huh, 2016). As a physical, organic interface plants provided a novel way to produce emotional connectedness and mutual care to relax and reduce anxiety. This design was especially focused on physical stimulation to overcome emotional responses to anxiety, but still not covered support for all and lacked expressive qualities. Moreover, surprisingly lots of these designs focus on improving support for anxiety patients in psychotherapy practice contexts, and overlook the opportunities of design to also support therapists or clinical psychology researchers. Therefore designers should empathize with this clinical mental health context, and clinical experts should understand what design has to offer. However, there still is a gap in mutual understanding to be bridged in which designs can play a potential role. Design research done by Ferri et al. (2016) about playful cognitive therapy apps, shows design can support to bridge the gap between psychotherapists and designers. They let psychotherapists benefit from not only well designed apps but also from a shared body of design knowledge to inform the creation of therapeutic apps (Ferri et al., 2016). In the same way, opportunities, positioning and benefits of tangible design, with an expressive multi-sensory focus, has to be researched, for relaxation support in psychotherapy contexts which at the same makes clinicians benefit from design and vice versa.

Expressive multi-sensory tangibles for anxiety in clinical contexts

Tangible tools for clinical practice related to multi-sensory expression include musical instruments within musical therapy (Cevasco et al., 2005). Within musical improvisation activities, like guitar improvisation, anxiety patients decreased resistance to the therapeutic process, increased self-esteem, and released tension (Cevasco et al., 2005). This was used to encourage self-expression and improve communication (Cevasco et al., 2005) showing the importance of tangible expressive musical tools in psychotherapy practice. Moreover, research around tangibles enhancing coping skills practice around anxiety and emotional distress by Thieme et al. (2013) explored new ways to engage psychiatric patients and create mutual understanding of designing technology for mental wellbeing. Therefore, their paper introduces the design concept of the Spheres of Wellbeing, personalized artifacts to support women in learning and practice of vital therapeutic skills (Thieme et al., 2013). Investigating current work regards use of multi-sensory expressive tangible tools in psychotherapy practice for anxiety patients; tangible designs to engage patients in therapeutic skill practice; and the role of tangibles in contributing to mutual understanding of design in clinical contexts, potential is seen for design research combining these aspects.



METHODOLOGY

To explore the opportunities of the design probe, that offers a different mechanism to relaxation and releasing tensions to negative thinking for people with high levels of anxiety, in psychotherapy contexts and to research the efficacy of mental health, an iterative design research process has been applied (Appendix B, Process Visualizations). This process was centered around both background research, 11 interviews as an evaluative method, analysis, implications and prototyping the new prototype of the design probe RELAX-CHANGE.

Iterative Design Research Process

This process consisted of two phases, 1) background research and interviews, and 2) evaluation and implications, which were performed in three iterations. Parallel to the main design research around the opportunities of tangibles within psychological therapy and efficacy of mental health, the new prototype of the design probe has been developed. Below, both phases, methodologies, study instruments, analysis procedures and the development of the new prototype are explained in more detail.

Phase 1: Background Research and Interviews (iteration 1,2)

The first phase was centered around a first introduction to psychotherapy practice and research at the Justus-Liebig Universität in Giessen. Background research was done about ongoing psychotherapy research, and psychotherapy practice through visits to the psychotherapy therapy clinic. Based on this, semi-structured interviews around the opportunities, positioning and benefits of the design probe within clinical practice and research was prepared and performed. The semi-structured interviews targeted various stakeholders in the context of psychotherapy (research and practice) and were recruited based on convenience and heterogeneity. No patients in therapy were involved. 11 participants were recruited including clinical psychology students (BSc / MSc) (n=7), clinical psychology / psychotherapy researchers (n=3) and therapists (n=1). The first part of the interviews focused on opportunities and positioning of the design probe RELAX-CHANGE regards relaxation support in therapy practice and clinical research around relaxation, anxiety responses and task absorption. The second part centered around shaping general visions around opportunities of tangibles in general to support clinical practice and research. A 'design probe video' was used to create understanding of the details of RELAX-CHANGE (Appendix G, Design Probe Video). In parallel the development of the software, electronics and outside casing of the new prototype of RELAX-CHANGE was prepared including arrangements with an electrical engineering student, 3D modeler and Innovation Space.

Phase 2: Evaluation and Implications (iteration 3)

In the second phase the results from the 11 interviews were thoroughly analyzed through MAXQDA coding software and turned into a set of speculative ideas of the design probes potential for use in psychotherapy research, practice and as measurement object. These were turned into design and clinical implications. In parallel to this, the assembly of the final prototype was done.

Study Instrument 1 - RELAX-CHANGE

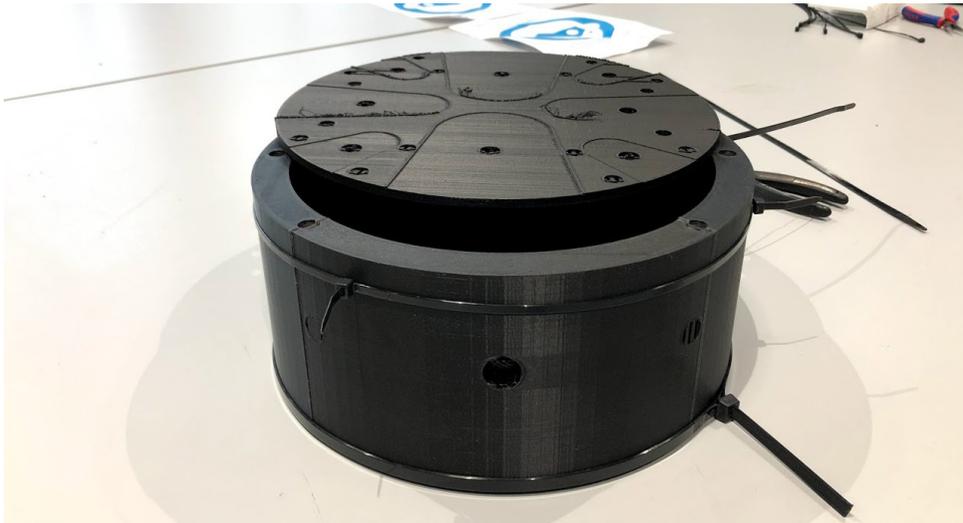
Last semester (M1.2) the design probe RELAX-CHANGE was created, a **tangible drum instrument for people with high levels of anxiety to reduce their anxiety by offering a novel pathway to relaxation and releasing tensions to negative thinking** (van Wijlen, 2020). It was aimed to design for physical, multi-sensory and expressive distraction to prevent rumination and release anxiety responses. The probe's novel underlying Tension and Release principle was evaluated to find out its potential for relaxation support for the target group. It had potential to be used at home or in therapy sessions (van Wijlen, 2020). The design in short: it has three underlying principles 1) enabling engagement in a distractive task; 2) Tension & Release, the design supports in building towards an expressive peak in drum play (tension), through multi-sensory feedback, flowing from there into relaxation (release); and 3) offer support in overcoming the multi-faceted anxiety responses through light and musical feedback in the drum. Light feedback reflects the people's play intensity showing warmer (red-ish) and colder (blue-ish) colors based on touch frequencies. Harmonic and dissonant tones in the drum, based on various major and minor scales, support in creating musical tension, and so building up tension through the probe. The M1.2 prototype was not fully functioning in terms of multi-sensory interaction and was not representative enough for clinical experiments. Since these clinical experiments are envisioned in the near future (FMP), a high level prototype of RELAX-CHANGE was developed on the side of the main design research.



Development of the new prototype

First of all the details and improvements for the new prototype were determined and evaluated in low key interaction evaluations with colleagues and friends in Giessen. This evaluation list can be found in Appendix I - Extra Prototype Material and were a basis for 2D and 3D models of the new outside casing (Appendix D - Technical Descriptions Prototype). Next to the preparations for the 3D model of the new drum instrument, software

models for the prototype's interaction and measurement modalities were made, just like improved circuit models for the electrical engineering of the prototype (Appendix D - Technical Descriptions Prototype). These functioned as the basis for the collaboration with a recruited electrical engineering student who realized the new software and electronic circuit. Together with a recruited 3D modeler and Innovation Space, the new outside casing was 3D printed in which it was focused on its 'aesthetics' through color and material choices, and 'sturdiness' through formgiving, material choice and assembly techniques to prevent difficulties and bias in future clinical experiments. Combining the software program, with the electronics and assembled casing, the final prototype was developed and software details were set together with the electrical engineering student to optimize the multi-sensory interaction and usefulness of the prototype's stored measurements.



Study Instrument 2 - Design Probe Video

Due to COVID-19, the 10 out of 11 semi-structured interviews were conducted in an online environment and 1 in a physical environment, taking COVID-19 regulations in Germany into account. In combination with the fact that the high level prototype was in parallel development and not finished by the time of the interviews, a 'design probe video' from last semester's final presentation was used to support in discussing the various aspects of the design, its underlying principles and novelty (Appendix G, Design Probe Video). This was especially relevant since the stakeholders involved had no design background, and little experience with tangible technologies in therapy practice or clinical research. Therefore, this video was used to enhance their understanding of design in general, and of this specific design probe, before they were asked to reflect on its opportunities within their field.



Semi-structured Interviews

The semi-structured interviews were centered around a qualitative approach and mostly conducted online, via Microsoft Teams or Zoom. Except for one, which took place at the university's outpatient center, with a graduated master student in clinical psychology who worked as a psychiatric nurse before and now at this clinic. This allowed a quick observation of various therapy rooms, self-reported questionnaire sets and children's therapy tools used in the clinic (Appendix C, Other Relevant Visuals). Together with the qualitative interviews, the potential opportunities, positioning and benefits of the design probe and tangibles within psychotherapy research and practice could be evaluated. Online semi-structured interviews were found an appropriate method to use because it would allow the participants, with potential discomfort due to language barriers and design-related topics, to feel comfortable while participating in open and honest discussion. While it might be discussed there are limitations in natural discussion possibilities conducting the interviews via an online environment, study instruments and discussion topics have been adapted to get most out of it. The semi-structured interview approach was based on the methodology as described by Krueger (Krueger & Casey, 2015) and was adapted to a more elaborate form fitting this research and the different types of stakeholders. Especially for the different types of researchers (within meditation, child & youth psychology and psychotherapy), semi-structured questions were more related to their specific research and the role RELAX-CHANGE could play in supporting their clinical research activities. The research was approved by the ethical board of the University of Technology in Eindhoven (Appendix K, ERB Form).

Participants

11 participants (P1 - P11) within psychotherapy research and practice were recruited. Various stakeholders in the context of psychotherapy (research and practice) were targeted and only healthy consenting adults participated. Participants could be categorized into three main groups: clinical psychology students (BSc / MSc) (n=7), clinical psychology / psychotherapy researchers (n=3) and therapists (n=1). All three researchers also had practical experience as therapists. This group of participants consisted of 6 males and 5 females and were all interviewed individually over a time period of about 4 weeks. In order to fulfill the criteria of consenting adults, each participant had to sign a consent form to either give consent to participation or not and to the extent of audio and in case needed video recording and publication of data (Appendix E). Participants were recruited based on convenience and heterogeneity with the help of prof.dr. Rubel's network. This would spark more diverse perspectives on the design opportunities of RELAX-CHANGE within this immense broad field of psychotherapy research and practice and applied relaxation in CBT treatments. Heterogeneity of the participants was especially present in differences between researchers, practitioners, master and bachelor students within clinical psychology and psychotherapy. They offered different expertise, interests, and values within different areas of clinical psychology and psychotherapy as another layer of heterogeneity within the research. Furthermore different types of researchers within clinical psychology or psychotherapy were involved. Dr. Ott, researcher within effects of meditation to specifically research the added value of the design probe over meditation practice and even similarities with different meditation practices including mindfulness. Prof. Schwenck, researcher within child and youth psychology especially related to social anxiety was recruited to research the potential of RELAX-CHANGE beyond adults with elevated trait anxiety. Finally, prof.dr. Julian Rubel, was recruited to research possibilities of the design probe within clinical experiments and usage as a measurement tool in research and practice. Exclusion criteria can be found in Appendix K - ERB Form.

Procedures

As mentioned above, procedures for the interviews were based on methodology as described by Krueger (Krueger & Casey, 2015) but tailored to online methods and the specific kind of stakeholder involved in this research. Handouts of the interviews can be found in Appendix F - Protocols. Consent forms can be found in Appendix E .

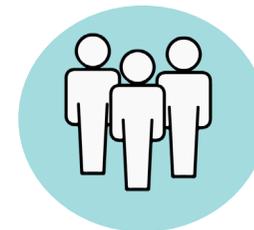
The focus of the first two iterations was on semi-structured qualitative interviews with various stakeholders in the context of psychotherapy (research and practice), consisting each of three phases. These can be described as an introduction (welcome, introduction of participants, purpose, why invited, guidelines (made clear in consent forms in front of the interviews), roles clarification) and a starting question about their work or focus within clinical psychology / psychotherapy research or practice; A 3-phase discussion in which 3 main topics were discussed using prepared open-ended and closed questions regarding 1) first impressions on the opportunities of the RELAX-CHANGE design (explained in the introduction) for relaxation, data analysis support, and more within psychotherapy research and practice; 2) values, needs and challenges in the stakeholder's preferred research or practice context (depending on field of interest); and 3) reflections on the future role of 'design' within clinical psychology and psychotherapy research and/or practice (vision shaping); and a closure (final questions, thank you and goodbye). Each interview approximately lasted for 45-60 minutes. Furthermore, due to the COVID-19 situation, participants had the opportunity to participate online via Microsoft Teams or Zoom (often used in the JLU psychology department) or in person taking the most recent rules and regulations in Giessen (Germany) into account. During the interview, the researcher functioned as both moderator and note taker, but was supported by audio recordings, for which consent was given by the participants.

Analysis

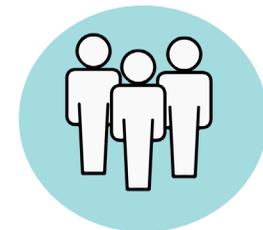
The analysis procedure consisted of a primarily qualitative analysis for all interviews which was supported by quantitative coding measures (amount of codes, subthemes and themes). The qualitative results consisted of answers of participants to the open-ended and closed-ended questions asked in the semi-structured interviews. These were obtained from audio recordings during the semi-structured interviews, only in case of participants' consent, which were transcribed into 11 transcriptions. Procedure followed when analyzing the qualitative interview data was based on thematic analysis methodology (Braun & Clarke, 2006) and Open Coding (Khandkar, 2009) and applied through usage of the coding software MAXQDA combined with Excel. This process consisted out of the following steps: familiarizing with the written data and audio data (transcribing), generating initial codes (interesting features of the data), searching for subthemes (overlapping insights in the codes), reviewing subthemes (check if subthemes work related to the abstracted codes), defining and naming main themes (specifics of each key insight), producing final report / results of all interviews combined (what does it mean, interpretation). Qualitative analysis procedures can be found in Appendix H - Thematic Analysis.



Students (BSc / MSc) (n=7)



Researchers (n=3)



Therapists (n=1)

RESULTS

Results are based on the 11 interviews with three main stakeholders in the field of clinical psychology research and psychotherapy practice. These include clinical psychology students (BSc/MSc), in other words the 'next generation' of practitioners and researchers; clinical psychology and psychotherapy researchers; and psychotherapists. Important to note here is that all of the interviewed researchers were educated as psychotherapists on the side of their research activities, influencing their perspectives, and so the results. In these interviews the stakeholder's perspectives on the opportunities of design probe RELAX-CHANGE in clinical contexts were explored and main discussions focused on opportunities of the design probe in practice or research, values/needs/challenges in psychotherapy context, and future visions on the role of design in psychotherapy.

In total 1273 codes were created and 48 subthemes resulting in six main themes. Results give insight into five subthemes around the theme of different stakeholder perspectives (i.e. educational perspectives, research and practice interests, clinical psychology / psychotherapy beliefs, practical experience, and perspective on design and approach), 24 subthemes around the theme of (tangibles) added value and opportunities (some highlighted: support in expression, drum's engagement and absorption potential, visibility and directness of feedback, or drum as specific homework tool), four subthemes around the theme of positioning of tangibles in psychotherapy (i.e. music related interventions, interventions for relaxations, (verbal) expression in therapy, and current clinical psychology research and practice), four subthemes around the theme of tension fields for design implementation (i.e. therapist's restricted innovation views, acceptance of innovation and technology, introduction of new innovation and technology, and tension between psychology and technology), eight subthemes around the theme of unexpected opportunities (some highlighted: drum for education, discussion and reflection; use for therapists themselves; and drum as objective measurement tool), and finally three subthemes around the theme of future visions in psychotherapy (i.e. future of psychotherapy, design important for the future, role of new technologies in psychotherapy). Furthermore, participant quotes and key insights can be found in Appendix H - Thematic Analysis.

#1 Different stakeholder perspectives

5 Subthemes
'educational perspectives', 'research and practice interests', 'clinical psychology / psychotherapy beliefs', 'practical experience', and 'perspective on design and approach'

141 Codes

#2 (tangibles) Added value and opportunities

24 Subthemes
some highlighted: 'support in expression, 'drum's engagement and absorption potential', 'visibility and directness of feedback', or 'drum as specific homework tool'

596 Codes

#3 Positioning of tangibles in psychotherapy

4 Subthemes
'music related interventions', 'interventions for relaxation', '(verbal) expression in therapy', and 'current clinical psychology research and practice'

44 Codes

#4 Tension fields for design implementation

4 Subthemes
'therapist's restricted innovation views', 'acceptance of innovation and technology', 'introduction of new innovation and technology', and 'tension between psychology and technology'

167 Codes

#5 Unexpected opportunities

8 Subthemes
some highlighted: 'drum for education, discussion and reflection'; 'use for therapists themselves'; and 'drum as objective measurement tool'

288 Codes

#6 Future visions in psychotherapy

3 Subthemes
'future of psychotherapy', 'design important for the future', 'role of new technologies in psychotherapy'

34 Codes

- 1** #1 Different stakeholder perspectives
Participant's interest matched with added value / positioning of the design probe stated. Interests ranged from 'trauma therapy' or 'feedback research'. Researchers brought different perspectives based on differing expertise: meditation, child&youth psychology, outcome research. Some participants had particular interest in music: "I love the idea of integrating musical therapy into the standard procedure." (P1) or psychotherapy beliefs as "the importance of flexibility." (P10)
- 2** #2 (tangibles) Added value and opportunities
'Accessibility and flexibility', 'visible direct feedback', 'engagement and absorption potential' and 'playful musical approach' are often mentioned as design probe qualities which have potential to add value in clinical contexts, "There is a very open way to program it and I mean that makes it very easy to adapt to different musical skills, preferences or even no interest patients." (P5)
- 3** #3 Positioning of tangibles in psychotherapy
Similarities with 'interventions for relaxation', 'music related interventions' and bio-information as part of well-known 'objective measurements'. The tension release principle of the design probe was compared with psychotherapy "emergency box" (P3) or "dynamic meditation"(P6) and the probe's absorption potential was compared with "deep meditation practice" (P6). However its communicative and reflective qualities were mentioned to be different and of added value.
- 4** #4 Tension fields for design implementation
Interestingly, tensions between psychology and technology were often stated. Especially with regards to 'contrasting opinions in use as homework tool'; 'clash between patients' and therapists' therapy expectations, stereotypes and the introduction of "new" tools', that's typical crazy psychotherapy stuff." (P8) and the challenges around 'seeking help and willingness to change'
- 5** #5 Unexpected opportunities
Unexpected opportunities were found. Such as, the design probe's potential for education and discussion around anxiety and mental health to address stereotypes, "Psychotherapy is really stigmatized, I am so crazy that I need to drink or something, preventing people seek help." (P11) Or to potentially play a role in 'connect therapy with daily life' or providing relaxation and support in "opening up" for therapists themselves in between therapy sessions
- 6** #6 Future visions in psychotherapy
Participants are quite open minded towards the opportunities new technologies can offer for them. They state the design probe can "open up therapist horizons" (P10), and "increase flexibility and creativity in their work" (P10) But, individual needs of patients and therapists around involving technology in therapy practice are mentioned to be considered.

Different stakeholder perspectives

Here, focus was on the different perspectives the variety of stakeholders offered on the opportunities of tangibles, and specifically related to the design probe RELAX-CHANGE, in the context of psychological therapy practice and research. These are of relevance for understanding the variety in statements about the added value, opportunities, positioning of RELAX-CHANGE in mental health and friction points in the way of implementing (tangible) design in psychotherapy research or practice in the future.

In short, participant's interest matched with added value / positioning of the design probe stated. Interests ranged from 'trauma therapy' or 'feedback research'. Researchers brought different perspectives based on differing expertise: meditation, child&youth psychology, outcome research. Some participants had particular interest in music: "*I love the idea of integrating musical therapy into the standard procedure.*" (P1) or psychotherapy beliefs as "*the importance of flexibility.*" (P10) All described results within the theme of 'different stakeholder perspectives' can be found in AppendixH - Thematic Analysis.

(tangibles) Added Value and opportunities

Here, focus was on the added value of RELAX-CHANGE in psychotherapy practice fields and with regards to researching interventions for relaxation, its role in researching other behavior or emotion related constructs and its role as measurement tool. These are of relevance to answer the research question, and so find directions and implications for tangible design within clinical contexts. The most important five subthemes are discussed, from a total of 24.

Advantages of drum's accessibility and flexibility

Participants mentioned one of the main advantages was the accessibility and flexibility of the design. 47 segments of 7 interviews highlighted this design aspect could support therapist's creativity, help reach people with anxiety even on a lower level, people without musical interest and can help therapists adapt their support through the design to different patients and over time. 3 out of 11 participants mentioned that the drum's accessibility could help therapists fit this design to anxiety patients without a particular behavioral interest, to support them in releasing tension and practicing this behavior, as stated, "When you as a therapist have the feeling that your patient could benefit from some skill in that thing and you cannot find any hobby then you can tell them to play the guitar, that's not gonna work because it's very hard, but then it could be a nice tool." (P5). The design is imagined to be intuitive to play for many people, "You don't have to be skilled umh and you don't have to start learning it, maybe that is really the difference between your thing and the existing things." (P8) And could in this way be a universal approach, even over listening to music in therapy, "For hearing music it would be very specific tastes again and it's hard to find the music that gets to people, so in this case it could be a very universal approach for people to be able to create music themselves." (P1). Furthermore, the drum's flexibility was appreciated, since it was often mentioned the design is very 'open to use' and 'allows for adapting to different musical skills and preferences'. This flexibility was discussed in two directions, openness of use and technological flexibility. One of the participants mentioned the openness in usage scenarios, that the drum can be used in a very strict manner, "the therapist does it first and the person copies it" (P5) but also in a very open way, "you take this thing (the design) from the therapist home and it's very open what they do with it." (P5). Moreover, technological flexibility was appreciated,

enabling therapists to adapt the tool to different people and over time, "There is a very open way to program it and it very easy to adapt to different musical skills or preferences." (P5)

Visibility and directness of feedback

The visibility and directness of the multi-sensory feedback, and then especially surprising the light, was appreciated as an added value of the design probe. 16 coded segments from 5 different participants mention this design aspect could add value in e.g. 'visualizing a speaking deadline' for social phobic persons, and 'support making distress visible' for both patient and therapist, and in this way 'increase patients' self-efficacy, competence and satisfaction'. As one of the participants stated, "What I like, especially is the direct feedback, you do something and you hear it and you see it. And you produce something and it is so visible! And it is so there and you will notice. And I think this is something that can increase self-efficacy because you do something and you immediately see the outcome." (P2)

Drum's engagement and absorption potential

The drum's quality to absorb people into play, deeply engage them, and in this way prevent rumination is very much appreciated, by many (7 out of 11). Its 'quality to absorb and prevent rumination is a huge benefit of the drum, "It's the attention grabbing, you can't ruminate while that, can't think about lots of other things, at least when you try it first."(P5) As the participants mention, multi-sensory feedback of the design plays a big role in engaging and absorbing patients through the design probe, which is appreciated. As dr. Ott stated, "It's very different, people they have different sensory channels for absorption...so it's good to have a multi-sensory stimulation so that everybody could take what 's significant for him." (P6) And as the therapists mentioned about the important role of the musical tones in the drum, "Anxiety is one disorder mostly based on different series of attention and these melodies are one opportunity to get the attention away, get distance." and "I think to get in touch with an anxiety related thing is maybe good to reduce the anxiety reaction to it. The more I get in touch with an unpleasant signal (dissonant tone), the less is the body reaction to it, I can habituate to it." (P10)

Support in emotional reflection, expression and communication

Participants discussed potential of the probe to support reflecting on inner emotions, for patients to 'become an expert of one's own anxiety'. As stated, "It could help when they should for example express how anxious they feel at this moment, realize how anxious they are in those specific situations." (P7). Dr. Ott interestingly describes the role and added value the design probe can potentially have for emotional reflection, "They kind of learn to regulate and express their emotions by a tool which gives them a kind of isolated playground. So they could see what kind of emotion, what is the sound of, the rhythm of my emotions and by this testing you give them a guide, guideline, how to find their own state. It's kind of like a retrospection, because you hear, does it feel like I feel? Is this my sound at the moment?" (P6)

Fields of use

The application field of the design was often discussed as going even beyond anxiety patients, as stated by several participants, "I think it would be generally good for them no matter what their specific disease is."(P3) and "Yes, so I would say there is no disease in specific who is not good to use this."(P10) A couple of the most mentioned application fields include, 'opportunities for use in children's therapy' (16 out of 52 coded segments), 'opportunities for social phobic persons' (10/52), 'opportunities for bipolar patients' (4/52) and 'opportunities for trauma therapy' (2/52). Other fields were just mentioned or suggested by one participant and not considered valid enough.

Positioning of tangibles in psychotherapy

Here, focus was on the positioning of RELAX-CHANGE in psychotherapy practice and research fields as compared to current projects, objective bio measurements and intervention tools for anxiety patients. These are of relevance to answer the research question, position the design research within clinical psychology research, and position tangible design within clinical contexts, especially in terms of added value and considering potential friction for implementing tangibles in psychotherapy.

Interventions for relaxation

Since the design probe provides a novel perspective on a pathway to relaxation, it was key to discuss similar interventions used in psychotherapy for relaxation. 2 participants recognized similarity with an intervention used especially within the borderline disorder field, called the “emergency box” (P3) which “helps them find behaviors for coping with tensions that they have, really like different ones.” (P5) Participants explained it is filled with chosen tools that could support releasing tension making “use from the senses” (P3) and can be used “on the road” (P5). Examples are, “Some have tiktaks that are really hot causing pain and that releases tension or few have hairbands and they click it all the time and that hurts as well. Small and easy kind of skills to release tension.” (P5) However, discussing the difference with the design probe, participants still see added value, because they see potential in its quality to better prevent rumination, “I mean things like snipping of the hairband that’s it’s not kind of similar, because it just takes a second and you can do it everywhere and you can still ruminate while doing it.” (P5) Furthermore, similarities were mentioned with meditation practice and mindfulness. Especially, dr. Ott stated with “dynamic meditation” focused on expressive movements; the deep absorption state that could be created through meditation but also through engagement with the drum; and with the mindful state that can be created with meditation. However, hereby added value of the drum was still mentioned by participants, especially regards to the design’s potential to support communication between therapist and patient about states of anxiety, “I think many clients in psychotherapy have a difficulty expressing what’s going on in them. Even with words. But if you have another way of describing your feelings, of soft emotions or the strong emotions, the loud, you can transform the quality of the emotion by music.” (P6).

Music related interventions

Similarities were found in the musical aspect of the design probe, the harmonic tones, but none of the participants suggested similarities of interventions using dissonant tones. Participants mentioned often similarities with using normal musical instruments, but often stated advantage of the design probe over these normal instruments because of its accessibility, as mentioned earlier. Furthermore, one of the therapists already used singing melodic lines as part of “Gestalt therapy” with depressive patients to distance from emotions, “I am also using like melodies to make lines, music lines to get also get in distance with these emotional, bad, negative load.” (P10). It has similarities in getting the focus on something else, and using music distance from emotions.

Tension fields for design implementation

Here, focus was on finding hurdles to implementation of RELAX-CHANGE in psychotherapy practice and research fields. These are of relevance to find the boundaries of the opportunities and benefits of the design probe, and in general tangibles, within, to state design implications for tangibles in mental health, and future directions for design practice.

Therapist’s restricted (innovation) views

It was pretty surprising many of the participants (8 -11, 41 codes) mentioned that therapists nowadays still have a restricted or limited view on implementing new technologies in their daily practice. As multiple of the participants stated, “Psychologists often have a very restricted view on things.” (P2) and “Because psychologists, most of them, a significant part of them barely use browsers and all that stuff. And they are usually not that interested or experienced in anything beyond.” (P5) and “Or for example your tool, I think it’s a pretty cool idea to have new ideas you know and therapists are not that creative I think.” (P7) Even regards implementing findings from research into practice. As prof. dr. Julian Rubel stated, It is difficult to tell practitioners, well but here is the research right, because they would tell you well I don’t care because I was first! I know it is working so why should I apply something that is maybe working as well? (P4). Furthermore, a surprising theme that returned with regards to restricted views was that many of the participants (6/11) discussed digital technology, and focused on this area when they were asked for technological innovation in their field or future expectations. “Therapists don’t think about the patient can look up our homework or what we discussed all the time on his phone, and the never thought about this!” (P5)

Tension between psychology and technology

In general there is tension between the field of clinical psychology and technology. 4 out of 11 participants mentioned various aspects creating friction between these two fields. Such as the design probe’s added value compared to evidence based interventions, I really don’t know if it has an added value to anything that’s out there because there are so many options already.” (P7) Furthermore, an interesting insight was that 3 out of 11 participants discussed the ‘friction between therapy expectations and new tools’. As stated by one of the participants regards a potential friction between a patient’s expectation and use of the design probe, “Yeah and then they think what am I doing here, I am talking about my anxiety and my anger and we’re gonna play a drum, what’s this?” (P5) Or as one of the participants mentioned regards the potential that the drum could confirm a negative stereotype a patient can have regarding technology in psychotherapy practice, leading to friction in usage, “maybe they are also thinking that’s typical crazy psychotherapy stuff.” (P8)

Introduction of new innovations and technology

Therefore, the introduction of new innovations and technologies was often mentioned by the participants as one of the important aspects to psychotherapy in terms of implementing the design probe. ‘Mediation in new technology is very important’, bridging the gap between the field of psychology and technology. Especially introduction to new technological tools is important to prevent increased anxiety amongst patients. Participants mentioned that a confrontation with for example the design probe could lead to more anxiety, which could on the one hand positively affect dealing with anxiety, and on the other hand could negatively affect the therapy progress. As prof. Schwenck stated, a warm-up session could be a useful introduction to the probe, “You would need to have a warm-up session where they just get to know the instrument, that they can’t make any mistake with that, do anything wrong. Maybe also leave the room, don’t feel observed, and can relax better, so that would be good.” (P11) Another important aspect to introducing new innovations and technology in psychotherapy practice is that ‘freedom of usage of the tool is important’. Participants (4/11) made very clear that therapists and patients need to be free to choose to use it or not, as stated by two of them, “Yeah it’s very understandable and on the other hand it’s very important that we let people choose that, and always have the option to do things without technology.” (P5) and “I think it should be free to choose for the patient if they want to continue to use it. I am not sure if I would, I would not force a regularity of how they have to use it. Don’t have to use it every week or so.” (P1)

Unexpected opportunities

Here, it was focused on unexpected opportunities with regards to implementation of RELAX-CHANGE in psychotherapy practice and research fields. These are of relevance to answer the research question and stretch the boundaries of the opportunities, positioning and benefits of the design probe within psychotherapy research and practice, to state design implications for tangibles in mental health beyond the obvious. Five of the eight most relevant subthemes are discussed.

Drum for education, discussion and reflection

One of the most important unexpected opportunities of the design probe was its potential to support discussion, education and reflection around design and new technologies in psychotherapy practice and research. Surprisingly, the participants (5/11) mentioned there are many stereotypes, images and stigmas present around psychotherapy, especially towards practice. As some of the participants stated, "Psychotherapy is really stigmatized, societal stigmatization and self stigmatization. I am so crazy that I need to drink or something, this prevents people from seeking help. Usually there are several years passing before they seek help and receive appropriate help." (P11) or "I think many people are maybe afraid to go to therapy because they have this image." (P3). Even the participants themselves had some stereotypes, "And it wasn't so clear to me because I always thought people who are in a closed psychiatry just must be off their minds." (P9) could potentially hold back implementation of tangibles like RELAX-CHANGE or people with anxiety reaching out for support and therapy. Next to that, the participants saw potential in the role of the design probe to break these images or make help more accessible to patients breaking the stigmas. They even stated a potential role for the design probe in education. "Maybe your tool is a good one for that, to show anxiety is normal." (P8)

Re-consider drum as objective measurement tool

One of the potential opportunities of the design probe to support as an objective measurement tool for various constructs like relaxation effects, emotional expression etc. was discussed with the participants. Participants questioned the usefulness of the design probe for data gathering, especially the added value of it compared to the dominant role of self-reported data in psychotherapy, and since objective measurements 'can be difficult to process or interpret'. As prof. dr. Rubel stated, "Objective measures, it's not a natural information, it is difficult to process, you need several theories in between from the data to the message, to the influence you want to make." (P4)

Connecting therapy with daily life

Participants mentioned an upcoming topic within psychotherapy is connecting therapy to daily life. As one of them stated regards experiencing challenges in daily life as a patient, right after walking out of therapy and the need for connecting technologies to therapy or therapists, "You think you are not sufficient anymore because in therapy everything works and then in e.g. Seltersweg nothing works and for therapists it's not that easy to, they have just one hour, and they can't reach their patients. The system right now doesn't really allow to reach them, you can obviously call them but then you usually call for organizational reasons." (P5) This demonstrates new potential for the design probe to connect therapists or what is learned in therapy with daily life and coping skills practice.

Use for therapists themselves

A final unexpected opportunity was the use of RELAX-CHANGE for therapists themselves. Various participants mentioned the difficulties of stress-management amongst therapists, as stated by one of them, "Well, I think one really important challenge, what I have already

experienced, is stress, stress, stress, stress." (P9) Moreover, dr. Ott stated that therapists have the need to calm down and open up again before starting another therapy session with a next patient. As he stated, meditation is already one of the techniques used for that, "Even psychotherapists like to meditate because they want to be very present and empathic for the clients, for the patients. And as a psychotherapist, you have these 15 minutes sessions and 10 minutes break and then the next one comes and you only have 10 minutes, and then it is a very effective technique to get calm, to get open hearted and open minded and clear." (P6) The challenges of therapists with stress management, together with the need to open up and calm down in between sessions demonstrates potential for the design probe to also provide support for therapists in relaxation and emotional reflection or expression.

Future visions in psychotherapy

Here, it was focused on determining the chances of designers and tangibles in clinical mental health contexts, how open is the mindset, what is valued in future psychotherapy research and practice and what would be the role of (tangible) design in this? These are of relevance to state clinical and design implications.

Design important for future

Participants in general share the opinion that design is going to play an important role in the future, and show openness towards implementation of new technologies in the future. Participants discussed that 'design can extend horizons' and that 'future use of technologies is important to be able to use different approaches' to create effective therapy. As one of the participants stated, "It's about being creative and by using these drums, you get more, you extend your horizon of doing it more flexible maybe." (P10) and as another participant stated, "It probably wouldn't work for everybody but that's totally fine. I think just having the second opportunity and having a different source of information would be beneficial." (P2) However as mentioned in the statement above, it's about what added value will it bring in the future to whom. Participants are super aware of the fact that using technology in psychotherapy, especially in practice will not be for everybody, not for every patient, not for every therapist, but that is how it is. As stated by one of the participants regards the fact technology does not need to be "everywhere" for some patients or therapists which is reasonable, "I think there is a group of therapists, and patients that don't want technology in therapy as well, because technology is everywhere. And that's very important, totally fine, that technology has no right to be everywhere." (P5)

Role of new technologies in psychotherapy

Various roles of new technologies in psychotherapy, especially in practice, were mentioned by the participants. Participants recognize technology is going to influence more aspects of life, so also therapy practice, "We are actually in a very high technical development at the moment, using more internet technology, human beings also develop over time, that's why there must also be a more open mind to new things." (P10) Especially a role is seen for technology to 'connect therapy with daily life' and 'to enhance the diagnosis processes', especially through digital technologies or Artificial Intelligence. As one of the participants stated regards connecting tangibles with online therapy, "Maybe it can be well integrated in online therapy." (P1) or connecting therapy with daily skill practice, "I can really imagine this could be nice as some homework which comes from the therapist, like we have something from the therapists in our daily life and then we gonna use it and kind of do something good for each other." (P5) Moreover, participants stated technology could enhance or take over the diagnosis process of symptoms in psychotherapy practice, as stated by one of them "It won't substitute therapy, cause the point of therapy is talk to a person and not to a computer. But I think especially in recognizing illnesses, ticking symptoms, I think that will be substituted by a computer or AI." (P9)

DISCUSSION

Insights from the 11 interviews are considered which elicited the potential of the design probe RELAX-CHANGE to add value in clinical practice and research to support a variety of patients (multiple disorder fields) in relaxation and more; therapists; clinical outcome research and beyond, but also showed the boundaries to future implementation of tangibles in psychotherapy. The discussion is i.a. centered around clinical implications for clinical experiments involving design. Will these future clinical experiments involving tangible design be of value for psychotherapists and researchers? And which experiment directions to proceed with? Moreover, design implications around designing tangibles for clinical mental health contexts are discussed. Which design qualities of tangibles have potential to add value in this context and to support whom? Is there a possibility for tangibles to stretch the boundaries of interventions used in therapy practice? And what are the hurdles to implementing tangibles like RELAX-CHANGE in therapy practice or research? The clinical implications are mainly based on results within the themes future visions in psychotherapy, (tangibles) added value and opportunities, positioning of tangibles in psychotherapy and unexpected opportunities. Design implications are mainly based on results within the themes of unexpected opportunities, (tangibles) added value and opportunities, tension fields for design implementation, and future visions in psychotherapy. In this way, the themes of unexpected opportunities, (tangibles) added value and opportunities and future visions in psychotherapy are most important stating final implications.

Clinical implications

Investigating the theme of future visions in psychotherapy, in general the importance of further research around tangibles in clinical contexts is found. Results within this theme demonstrated that therapists and researchers are quite open minded towards the opportunities new technologies can offer for them. It showed potential for the design probe to open up therapist horizons, "It's about being creative and by using these drums, you get more, you extend your horizon of doing it more flexible maybe." (P10); increase their flexibility in treating patients through different approaches that the design probe can bring as therapy intervention; and to connect therapy with patient's daily life practices, "I can really imagine this could be nice as some homework which comes from the therapist, like we have something from the therapists in our daily life." (P5) Considering these potential advantages of the design probe in future clinical practice, it shows the value that clinical outcome research involving the probe can add to enhance evidence around the design and so implementation of these types of design. However, participants are super aware of the individual needs of patients, and therapists. Design and new technological solutions will not work for all therapists or all patients, and technology does not need to be everywhere, meaning for some also not in therapy practice. "There is a group of therapists, and there is a group of patients that specifically don't want technology in therapy as well, because technology is everywhere, technology has no right to be everywhere." (P5) That is what needs to be kept in mind when involving design in clinical contexts and selecting participants (both patients and therapists) for future clinical experiments involving technological designs like RELAX-CHANGE. Furthermore, technological solutions will not substitute therapy since the personal aspect of it is highly valued, "because there is really this aspect you wanna talk to a person." (P9) It will rather be of value for supporting current and future psychotherapy challenges as waiting lists or patient analysis. This means psychotherapy has to safeguard its personal aspects in the future, both in research and practice when introducing new technologies to patients, and make sure it is of supporting value instead of replacement.

Investigating the themes around the design probe's opportunities and positioning, potential fields of (clinical) outcome research involving RELAX-CHANGE are found. One of the most valued qualities of the design probe within clinical contexts is its 'engagement and absorption potential', "Thinking about deeper what it does on psychological things it's the attention grabbing, you can't ruminate while that, can't think about lots of other things." (P5) The multi-sensory feedback of the design probe (light & harmonic and dissonant tones) plays a big role in engaging and absorbing patients through the design probe, which is appreciated, "People they have different sensory channels for absorption so it's good to have a multi-sensory stimulation so that everybody could take what it's significant for him." (P6) The design probe's absorption potential together with its appreciated tension and release mechanism for relaxation, "It's a different approach to create more tension, that some patients may need." (P3) shows future clinical experiments should focus on studying the efficacy of the design probe to influence the constructs of absorption as a mediation effect for relaxation as outcome, through the tension & release mechanism. Furthermore, various well-known 'interventions for relaxation' in psychotherapy practice show the need to research the effective added value of the design probe compared to these known interventions. Investigating positioning of tangibles in psychotherapy, control conditions for future comparative clinical experiments can be suggested. These include four main options: musical (group) therapy interventions, relaxation interventions (Progressive Muscle Relaxation or meditation), tension release tools (from the 'emergency box') and expression & communication therapy interventions ('crafting' or 'arts therapy interventions'). In order to spark interest within the clinical psychology and psychotherapy community, it is suggested to focus on a comparative study using 'progressive muscle relaxation', a very well known relaxation intervention from Cognitive Behavioral Therapy, as control condition. This, because of similarities in the goal of the intervention, namely relaxation, and partly similarity in the tension release mechanism for relaxation. As part of the final master project proposal it is elaborated on the prioritization of these two types of clinical experiments and the approach to comparative clinical experiments.

Design implications

Investigating the themes around opportunities and tension fields demonstrate design qualities of tangibles that can add value in the clinical mental health context; possibilities for tangibles to stretch the boundaries of interventions used in therapy practice; and hurdles to implementing tangibles like RELAX-CHANGE in therapy practice or research. In general, certain design qualities as the design probe's 'accessibility and flexibility', 'visible direct feedback', 'engagement and absorption potential' and 'playful musical approach' lead to big potential to create added value in clinical contexts. Especially the quality of the tangible design probe to be accessible for different types of patients as a way to practice coping skills around anxiety and offer relaxation was highly valued. Just like its potential to offer a universal way to get into touch with music to support even for patients without particular hobbies or interests, which are challenging for therapists. Moreover, the design probe's quality to prevent rumination through its high engagement and absorption potential because of its physicality and multi-sensory stimulation was very much appreciated in this clinical practice context. Moreover, the design probe's 'educative and reflective' qualities, 'measurement' qualities, quality to 'connect therapy with daily life' and quality to 'fit with the calm down / open up needs from therapists' shows its potential to stretch the boundaries of the use of tangible design in mental health. As mentioned in the 'Results' section, there lots of stereotypes and stigmas are present around psychotherapy, amongst patients, potential patients, within society and even amongst therapists and researchers.

The design probe could play a role in educating various stakeholders within mental health to create awareness around stereotypes, reflect on them, collaboratively discuss them and break through them. Moreover, subthemes within (tangibles) added value and opportunities as 'support in (verbal) communication', 'support in emotional expression / reflection / induction' demonstrate the potential of the design probe and tangibles like this to even support target groups beyond people with high levels of anxiety. This, since it was also discussed in the interviews that many disorders present within mental health have underlying challenges with (verbal) communication, expression / opening up, emotional reflection and emotion induction (induction of positive emotions).

Next to design qualities that have potential to add value in clinical contexts, 'tensions between psychology and technology' elicit hurdles for implementing (tangible) design in clinical contexts. These show boundaries to the design probe's potential in this specific context. One of the application fields with the most potential for the design probe is the implementation of it as a specific and flexible homework tool in CBT. However, different stakeholders have contrasting opinions about if it is implementable in psychotherapy practice. On the one hand integrating the design probe as a homework tool connected to therapy could increase 'flexibility and freedom' in use and could support patients "using it in a less shameful way" (P10), without the feeling to "be watched by a therapist" (P10). Being creative is considered a "private thing", "From this state of the arts, this frame, private also possible, why not use it at home! (P10). Furthermore, it could be considered that "therapy effects are achieved more in between therapy sessions" (P10) in which the design probe could have a supportive role in this perspective, as a way to "practicing coping skills" (P5) at home. Contrastingly, other perspectives emphasize the burden of homework aside therapy, let alone using the design probe or new technologies, "I think it is very hard for people to take their time and I encounter this is something that gets dropped at first." (P2). These contrasting opinions could hold back implementation of tangibles in psychotherapy practice as 'homework tool'. Moreover, the 'therapist's restricted (innovation) views' and challenges in reaching compliance around 'acceptance of new technologies' in therapy practice amongst therapists and patients could be a hurdle to take into account implementing the design probe in clinical practice. Furthermore, in general there is potential to be a clash between patients' and therapists' therapy expectations, like "I am talking about my anxiety and my anger and we're gonna play a drum, what's this?" (P5), stereotypes as that's typical crazy psychotherapy stuff." (P8), and the introduction of "new" tools in clinical practice which can be a big hurdle towards implementation.

Finally, future chances of designers and tangibles in clinical mental health are elicited. Especially friction between stereotypes, images, stigmas and introducing new technologies including tangibles is a questionable friction point. On the one hand these "stereotypes and images" can hold back implementation and on the other hand tangibles can be considered as supportive tools to help discussing and breaking existing negative psychotherapy images, "I think the important thing is to know anxiety is something everyone has and that's more effective if you not only say it to the people but have a cool appliance that blinks, makes sounds and can be touched." (P8) Another future challenge will be to reach the patients and get patients "willing to change" (P1). Patients have "difficulties seeking for help" (P11), applying for therapy processes or are not willing to change, "They sometimes don't want to change but you have to help them because of the boundaries that your system fits in to, it's complex." (P1) However, clinical experts seem open minded.

Limitations

One of the most notable limitations in this design research is within participant recruitment. Because of the timing of the design research that was not in line with the start of the semester in Giessen, Germany, but about 1,5 months earlier, not many researchers and therapists were available. Therefore, the recruitment had to be focused more on recruiting master and bachelor clinical psychology students instead of actual therapists. Furthermore, these students had to be recruited from the network available. The fact that hereby around seven out of 11 participants were students affected the depth of researching the opportunities, positioning and benefits of RELAX-CHANGE and tangibles within psychotherapy research and practice. Although all involved students had practical experience in psychotherapy or psychiatry practice, their knowledge level to state the added value or to discuss positioning of the design probe in-depth was limited. Moreover, since most of these recruited students were from the network of the research group, it could have biased their critical perspectives on the design probe. However, through clearly emphasizing the value of their honesty and criticality at the beginning of the interviews, this bias has been aimed to balance out. Another important limitation is the use of a 'video of the design probe' instead of participants interacting with a working prototype. This was mostly due to the online study situation because of the current Corona crisis, even more present in Germany. Because of the use of a 'design probe video' to engage the participants into the design, its underlying principle and multi-sensory interaction limited the 'experiential' quality of the probe. Therefore, the moderator had to explain some specific aspects of the design as "dissonant tones for tension and release of anxiety responses" in a bit more detail, which had potential to bias results because of the researcher's perspective brought into discussion. On the other hand, using this 'design probe video', and the questions it raised during the start of the interview, improved the depth of discussion on the added value of RELAX-CHANGE. Often, when the design's functioning or design aspects were not understood immediately, in-depth questions were asked by the participants, which made them help reflect on the value of these specific aspects, as "the direct light feedback" or "the harmonic tones used".

Future work

Considering the clinical and design implications, three main suggestions are done with regards to future design work and clinical experiments involving tangible design to support mental health.

1. Investigating and tackling the hurdles to implementation of tangibles in (clinical) mental health. Especially with regards to the explored stereotypes in this design research and the role the design probe and tangibles in general can play into this to break them or enhance mental health awareness and discussion. Including exploration of the question, how do these tangibles reach people with high levels of anxiety? When they are hesitant, ashamed, or not willing to change. This to make mental health support more accessible, through exploring tangible design probes in service design (FMP proposal).
2. Clinical experiments around efficacy of physical, expressive, multi-sensory tangibles (FMP proposal, parallel path). As described in 'clinical implications' section.
3. Designing more tangibles, especially including multi-sensory expression, for mental health support, education, discussion and reflection (future career)

CONCLUSION

Main problems related to elevated trait anxiety, due to worrying and rumination, cause disruptions in daily life functioning, decreasing their quality of life, empowerment and social integration which needs to be addressed. Therefore, the high need for support in relaxation for this target group was addressed within a clinical mental health context. Especially regards creation of a novel perspective on the opportunities, positioning and benefits of tangible design in psychotherapy research and practice to support anxiety patients (and stakeholders) in relaxation, and potentially even beyond. In this work the opportunities of the design probe RELAX-CHANGE, that offers a novel mechanism to relaxation and releasing the multiple tensions to negative thinking for people with high levels of anxiety, in psychotherapy research and practice contexts are presented. The rationale behind the evaluation method was described to state clinical implications and design implications around designing tangibles for clinical mental health contexts. 11 qualitative semi-structured interviews with three types of stakeholders within clinical psychology and psychotherapy and their analysis were described. Furthermore, the development of a high level prototype of RELAX-CHANGE was highlighted to support future clinical experiments. Therapists and researchers are open minded towards the opportunities new technologies can offer for them, to “open up therapist horizons” and “increase flexibility and creativity in their work”. But, individual needs of patients and therapists around technology in therapy practice needs to be considered. Certain design qualities as ‘accessibility and flexibility’, ‘visible direct feedback’, ‘engagement and absorption potential’ and ‘playful musical approach’ lead to big potential to create added value in clinical contexts. Moreover, the design probe’s ‘educative and reflective’ qualities, ‘measurement’ qualities, quality to ‘connect therapy with daily life’ and quality to ‘fit with therapists relaxation needs’ shows its potential to stretch the boundaries of the use of tangible design in mental health. However, hurdles for implementing (tangible) design in clinical contexts elicit potential boundaries. These include ‘contrasting opinions in use as homework tool’, ‘clash between patients’ and therapists’ therapy expectations, stereotypes and the introduction of “new” tools’ and the challenges around ‘seeking help and willingness to change’. These results allow to provide insights on a novel take on design to contribute to improved relaxation support through tangibles for this target group, reflecting on the opportunities, positioning and benefits of the design probe in psychotherapy research and practice for relaxation support and beyond; which at the same time makes designers and clinicians benefit from a mutual body of knowledge around tangible design in psychotherapy. On a higher level these clinical and design implications lead to suggestions for future design iterations and clinical experiments involving design. This to contribute to the potential to support a larger part of the target group in relaxation, even beyond patients with anxiety or relaxation, create larger space for clinical practitioners and researchers to support this target group, and create mutual understanding around the value of tangible design in psychotherapy and vice versa amongst designers and psychotherapists / psychotherapy researchers.

ACKNOWLEDGEMENTS

Special thanks to coach and mentor dr. Max Birk, for your support while I was in Giessen, your critical and useful input on my design research and offering the chances to do this research in collaboration with prof.dr. Julian Rubel at the JLU. I really look forward to proceeding with you as my coach to explore supporting mental health, during fmp and in my future career.

Moreover, special thanks to prof.dr. Julian Rubel, for your excellent coaching at the department of psychotherapy research in Giessen. For the support in participant recruitment for the interviews; for providing a clinical perspective on my design research; and for helping me to increase my psychotherapy and clinical psychology knowledge through letting me help you with your next grant application and enabling me to attend your psychotherapy research lectures. I look very much forward to work with you on potential publications to bridge the gap between the field of tangible design and psychotherapy research and practice.

Thanks to all 11 interview participants, for being so open minded to engage in a design related interview, for your enthusiasm and critical perspectives on the design probe and envisioning future design opportunities in psychotherapy practice and research. It was very insightful to have you involved.

Many thanks to Tijmen Tubbing (BSc Electrical Engineering) for your endless enthusiasm to support the realization of the software, electronics and assembly of the high level prototype. Furthermore, special thanks to David Staat (MSc Industrial Design) for supporting in the realization of the 3D models of the new prototype.

Two very important contributors to the realization of the high level prototype are Edwin van den Einden (Innovation Space) and Roel Brouwers (Equipment and Prototyping Center TU/e). Thank you both for your time to assist in realizing the 3D models, waterjet cutting of the aluminum touch pads, and assembly advice on the various materials.

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APPENDICES

Appendix A: Individual Reflection

Individual Reflection - M2.1 Research at Institute Abroad

Veerle van Wijlen - 0992908

In this project I elaborated on M1.2 and took my created tangible probe RELAX-CHANGE — a drum to reduce anxiety, on a journey to the psychotherapy department in Giessen (Germany). I researched opportunities of tangibles in the context of psychological therapy and the efficacy of mental health in collaboration with prof.dr. Rubel (psychotherapy research expert at JLU). 11 interviews were done with 3 main stakeholders: psychology students, researchers, and psychotherapists. 6 main themes were found with 48 subthemes. This in order to state implications for designing tangibles in mental health and clinical experiments around design.

The priority in my goals was development within User & Society, Technology & Realization and Math, Data & Computing with Creativity & Aesthetics unexpectedly developed on the side. Furthermore, being in Germany I highly developed my Professional and Personal Skills. Moreover, researching design opportunities in this complex clinical context, I experienced growth in Design Research Processes and Business & Entrepreneurship.

To enable people within mental health to be their 'best self' in society, I wanted to immerse myself in a psychological context and familiarize with it from a multi-stakeholder perspective. Especially since this context consists of so many sub fields (e.g. anxiety, depression, borderline etc.), stakeholders, visions and expectations that determine 'how to design for it' and 'provide the right support'. Therefore, I learned about various mental disorders; empathized with their needs & challenges and discussed the importance of psychotherapy research & practice and the role of design supporting interventions and treatments. Since design research within psychology is quite new, it was a challenge to find interview participants to discuss roles and chances for design. Therefore, I got insight into the huge variation in hesitance or openness amongst psychotherapy stakeholders (non-designers) and learned the value of networking via prof.dr. Rubel's research group. Moreover, I learned to personalize the framing, preparation and performance of the interviews within a multi-stakeholder context. I especially learned to make it fit with what clinical psychology students learned and with researcher's topics as meditation, absorption traits, and emotional expression or measurements. Within my literature based interview hand-outs (Krueger & Casey, 2015) I learned to personalize its structure and create different sections to increase flexibility in the interviews. In discussion with prof. Rubel I learned it is important in this clinical (non-design) context to start the interview very specific, focused on creating design understanding, center questions around the design probe and slowly build towards a general vision of design in mental health. Moreover, I learned to dig deeper when answers were straightforward (especially with BSc students), improvise, deal with information beyond my knowledge level and to be open to critical opinions, which were most insightful. Next to the interviews, being immersed in this clinical context also gave me many valuable insights about relevant psychotherapy research topics, therapy practice challenges, socio-cultural

related visions and values around mental health support. This out of working together with prof. Rubel on his next grant application involving linguistic & acoustic features as measurements in psychotherapy; discussions with him and phd student Mila Hall and reading books (Cooper, 2008).

Moreover, I wanted to improve my high-level prototype development skills. In order to excel as a design researcher within the field of mental health support, I felt the need to take my prototyping skills a level higher, to make my design probes fully interactive and experiential for multi-stakeholder discussions, and clinical experiments. This to prevent bias through design aesthetics or interaction limits. I worked together with an electrical engineering (EE) student, a fellow ID student and Innovation Space to realize the new prototype. Collaborating with them I improved my technical (visual) communication skills. I learned to define and discuss the feasibility by making interaction models for software programming; circuit designs for prioritization of electronics parts and calculations; and financial models for the parts budgeting (see appendices). With regards to physical prototyping, I learned to set important decisions in prototype “improvements” with regards to interaction, materials and formgiving through quick evaluations. I got the insight in how to communicate these decisions into a final prototype concept to multiple stakeholders, through 2D drawings. In collaboration with Innovation Space and a 3D modeler with regards to the casing, I learned how to approach 3D printing, aluminum cutting and assembling different materials. Moreover, the final assembly phase of the casing and electronics with the EE student was a super insightful process. I learned to discuss software detailing, measurement details to create real innovation and process information neatly for reproduction and use in experiments.

Over the years I have gained skills in qualitative analysis and little in quantitative analysis, especially in M1.2. I learned that within psychotherapy / clinical psychology research quantified results are key to make claims. Therefore, in order to make my results of value in this field (implications for tangibles, behavioral data gathering and clinical experiments), I wanted to improve my quantitative research, analysis, and modeling skills. That’s why I learned to use coding software as MAXQDA combined with Excel to quantify qualitative data to support and prioritize claims. Furthermore, from psychotherapy research lectures by prof. Rubel, I got insight into the important role of quantitative analysis and statistics in outcome evaluation and process outcome research. What surprised me about the field of clinical psychology was the immense value and use of self-reported data compared to objective measurements which highly affects the role of tangibles for objective measurements.

[898 words]

Although my experience with different design research processes for ‘wicked problems’ involving multi-stakeholder perspectives, I focused in this project on understanding and implementing research and practice related knowledge from the psychological field. Therefore, I learned about the psychological terms common in the clinical field. Through psychotherapy research lectures, discussions with prof. Rubel, books and more, I got insight into the aspects of therapy like ‘treatments’, ‘interventions’, ‘efficacy’ vs. ‘effectiveness’, ‘alliance’, ‘symptoms’, ‘predictors’, ‘feedback’, and various ‘measurements’. This, as a basis to shape my in-depth interviews, and to enable gathering design centered information in this for me ‘unknown’ field. Through interviews and visits to the clinic I dove into the

psychotherapy perspective, learned how they research the efficacy of therapy interventions and what strategies are explored to improve this, like 'linguistic features' and 'feedback'. Hereby, I learned to position my design research in this complex field. Although I was fully immersed, I learned it's important to not only center the research process around design implications, but also support the clinical field with directions for research and practice involving design. It really surprised me, even though I gained empathy in this field, I had difficulties focusing on clinical implications. In this way, I got the insight when exploring the "unexplored" in a field like psychology, it is important to not only spark interest in the design community but also in the clinical psychology community, taking their interests and stakes into account.

I also developed within Business & Entrepreneurship. Through multi-stakeholder interviews, and interdisciplinary work with clinical psychology (design research), electrical engineering (prototype), and mechanical engineering (prototype) I learned to find their conflicting interests around design for mental health. I got insight into tensions and hurdles to implementing design in psychotherapy, which was of main importance to state implications for design directions for tangibles and my future design research directions, including my fmp. For example, lots of potential was found for application of the design probe, but also friction in making tangible support accessible. In this way, I defined my fmp direction. Being immersed in this clinical context, I learned to create value propositions for design, but also for clinical experiments involving design. Especially through identifying positioning and potential competition, and turning comparative interventions as 'progressive muscle relaxation' or 'musical group therapy' into potential control conditions. Moreover, through prototype building, I learned to deal with budgeting and financial models researching its feasibility.

Furthermore, being in a non-design environment and culturally different living environment I highly developed my Professional and Personal Skills. Previously, I always had difficulties presenting research in succinct ways. Through the interviews with non-designers; meetings Max and Julian; and explaining my progress to family, friends and roommates I improved to express myself in more clarity. Moreover, managing 3 parallel activities and arranging out of another country I improved my planning and organization skills. New in this project for me were the collaborations with different engineering fields, Innovation Space and various stakeholders within the clinical psychology department. This improved my empathy and cooperating skills tremendously, and made me more flexible in designing tangible probes. Most valuable, from my experience abroad is the fact it helped me immensely with reflecting on my role as designer for mental health, what special need groups I mostly want to support, if I want to stick to clinical contexts or support psychotherapy in different ways and how mental health support can be culturally different.

From a personal perspective I mainly improved my (mental) flexibility and social skills. I learned to accept changes in social/cultural/physical environment and adapt to continuous changes due to covid-19. Being immersed in Giessen-life, watching political documentaries, discussing ongoing socially relevant topics as 'euthanasia' or 'mental health issues and support systems' with German students I enhanced my cultural awareness and empathy.

All learnings enhanced my capability to do design research within mental health, work interdisciplinary and implement multi-stakeholder perspectives. Furthermore, it supported me

finding direction for my fmp and future career striving to work at a social service design company to challenge society and create discussion around mental health through tangible design probes.

[1580 wrds]

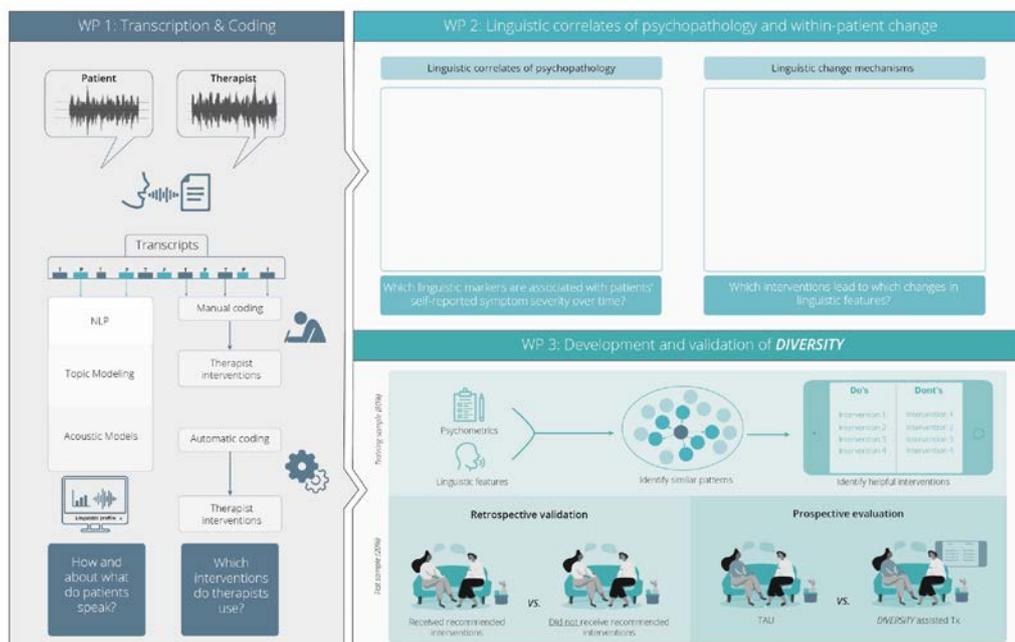
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[Extra] Reflection on experience abroad

What I could not focus on within the report itself was all the side work I have done in order to enhance my learnings regarding immersing myself in a psychological context and familiarize with it from a multi-stakeholder perspective. Therefore in short some side activities summarized:

- Visualizing the abstract for the upcoming grant application of prof.dr. Julian Rubel



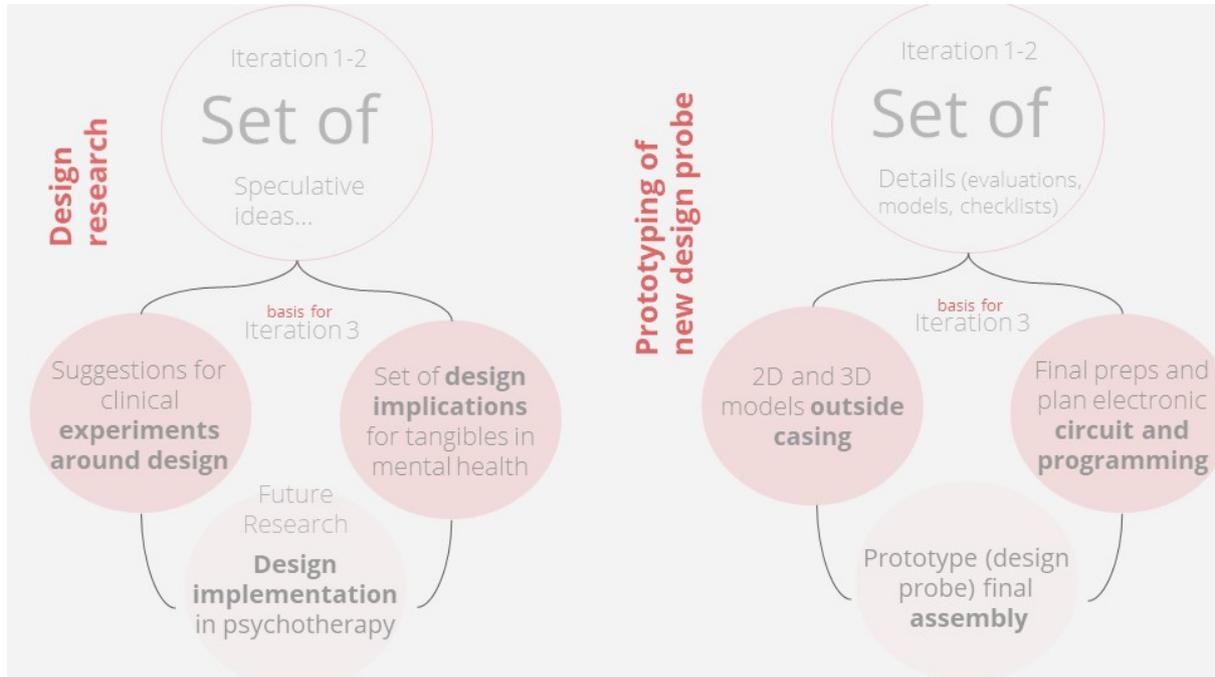
As you can see this is the almost finished version of the grant application abstract.

- Attendance to psychotherapy research lectures from prof.dr. Julian Rubel, and engagement in assignments and discussions during these lectures. Those were targeted at clinical psychology master students at the JLU
- Discussions with prof.dr. Julian Rubel about ongoing research in psychotherapy, the terms used and challenges current psychotherapy researchers experience
- Reading several chapters from the book by Cooper (2008), about Essential research findings in counselling and psychotherapy
- Observations and visits to the university's outpatient center (therapy day clinic), see Appendix C - Other Relevant Visuals

- Attending meetings with the research group from prof.dr. Rubel in which the ongoing projects were discussed and challenges highlighted
- Discussions with phd student Mila Hall about the potential role of the design probe within psychotherapy research and practice
- Quick prototype interaction evaluations with roommates and with phd student Mila Hall, especially targeted at the light functionalities, shaping, formgiving, material and color use
- And basically just working in the psychotherapy research office with phd student Mila Hall, next door to prof.dr. Rubel and having a daily interaction with them and other researchers walking around

These side activities increased my immersion within psychotherapy practice and research, supported me in understanding ongoing research, values in psychotherapy research and practice, well-known therapies and interventions, terminology and developing a language basically as basis for in depth discussions and making a first attempt to bridge the gap between the field of design and psychotherapy. Even discussing my design research with several psychology students, researchers and therapists helped me reflect on my role as designer, and helped them reflect on a broader range of future possibilities involving design. Uncovering the clinical and design perspective on supporting mental health helped me to enable translating my vision (enable people to be their "best self" in society, especially ones affected by mental issues) into design directions and clinical directions involving design. There was no better way to prepare for FMP and future career

Appendix B: Process Visualizations



Appendix figure 1 - (left) process of the paper's design research that elicits the potential of the novel design probe to add value in clinical practice and research; (right) prototyping process around the development of the high level prototype of RELAX-CHANGE

Appendix C: Other Relevant Visuals

Professional Environment Giessen, Germany - research abroad



Appendix figure 2 - JLU university building psychotherapy department



Appendix figure 3 - photos of the therapy rooms at the university's outpatient center (therapy day clinic JLU). (above) therapy setting during COVID-19 (lower) installed cameras for observation of patients in therapy.



Appendix figure 4 - children's therapy tools at the university's outpatient center (therapy day clinic JLU).

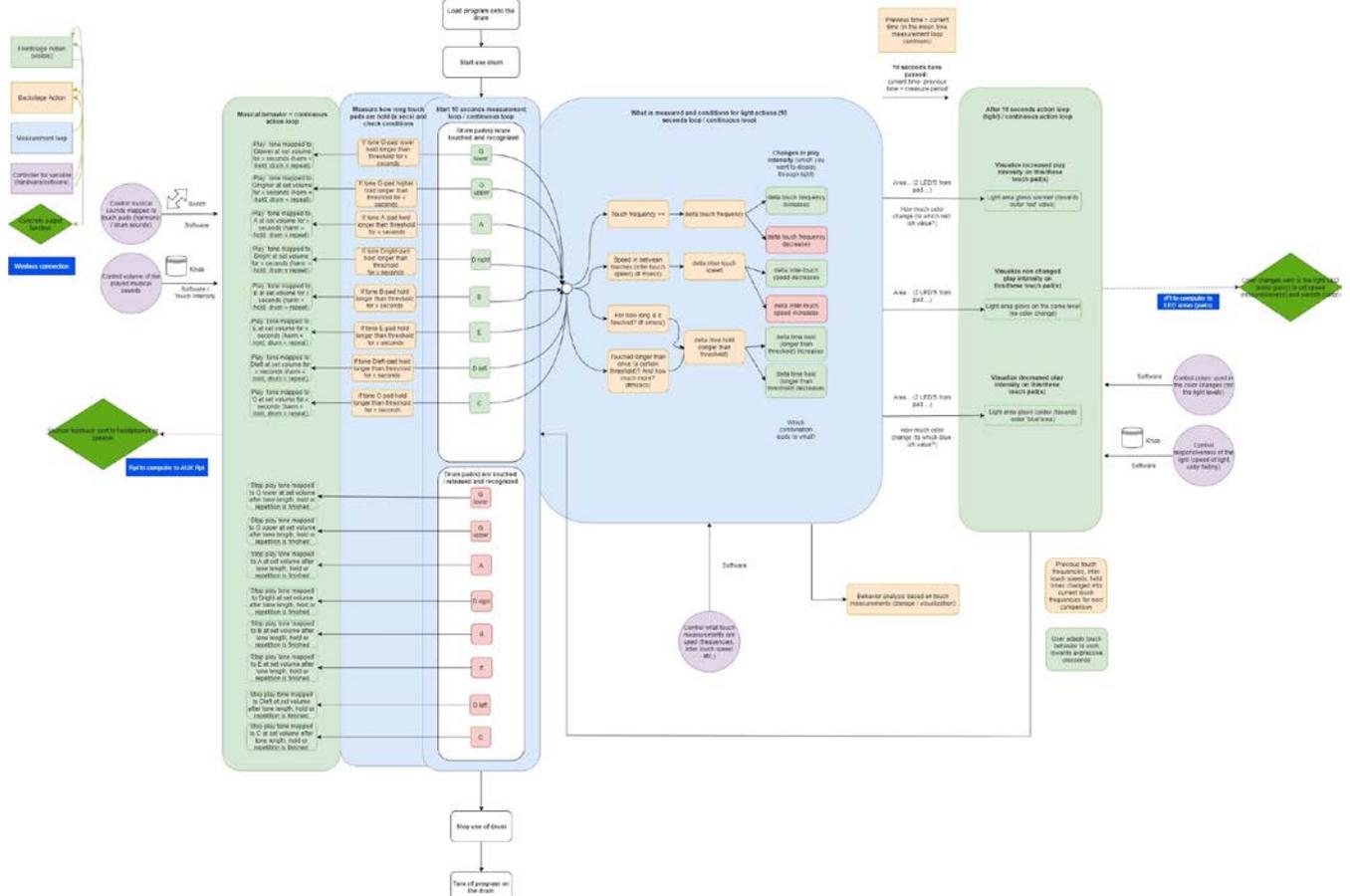


Appendix figure 5 - office setting at the department of psychotherapy research at the JLU



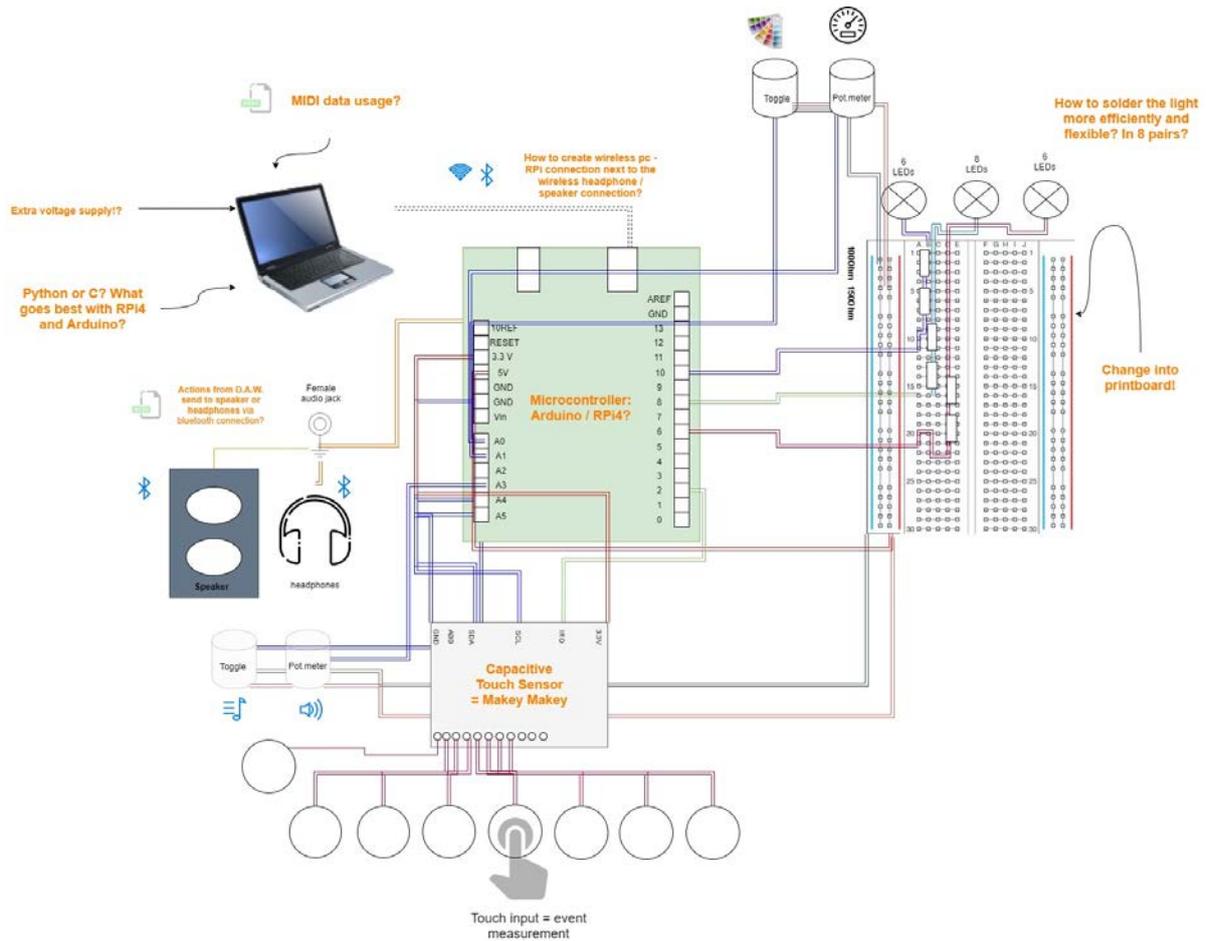
Appendix figure 6 - setup of the M1.2 prototype at student room in Giessen to evaluate some interactions with roommates.

Appendix D: Technical Descriptions Prototype Software Interaction and Measurement Model



Appendix figure 7 - suggested model for the software of the high level prototype by the designer (Veerle van Wijlen) to the hired BSc Electrical Engineering student from the TU/e.

Electronic Circuit Models



Appendix figure 8 - suggested model for the electronic circuit of the high level prototype by the designer (Veerle van Wijlen) in which decisions are highlighted (in orange) that were made in collaboration with the hired BSc Electrical Engineering student from the TU/e.

Musical Tension and Release Interaction Models

Harmonic Tension & Release (major & minor scales)

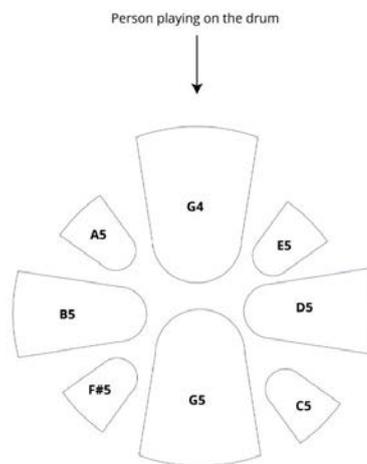
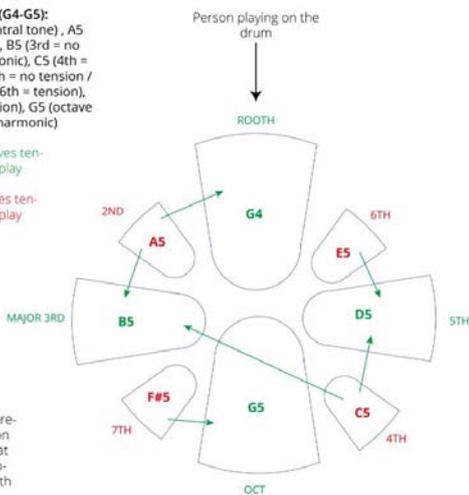
Melancholic high

G-Major Scale (G4-G5):
 G4 (root = central tone), A5 (2nd = tension), B5 (3rd = no tension / harmonic), C5 (4th = tension), D5 (5th = no tension / harmonic), E5 (6th = tension), F#5 (7th = tension), G5 (octave = no tension / harmonic)

Tone that releases tension in musical play

Tone that creates tension in musical play

Tone to play to relieve the tension after playing that tension tone (together with root tone)



Harmonic Tension & Release (drums with accents)

Rythmic / loud

Drum & Accent Scale:
4 drum tones (base / release) + 4 accents (tension)

Drum tones:
- base drum
- snare drum
- tom 1 high
- tom 2 low

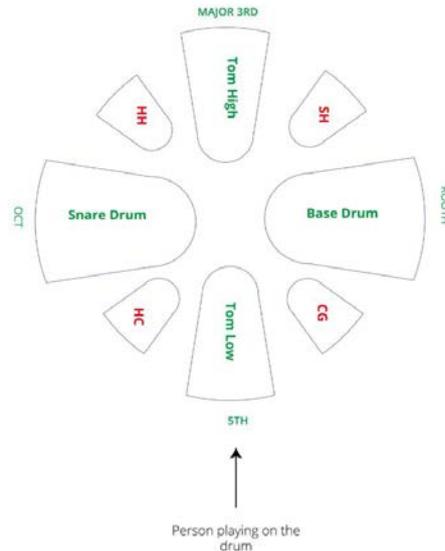
or 4 chinese toms / 4 jembes

Accent tones:
- hand clap (HC)
- (open) high hat / crash / ride (HH)
- conga (CG)
- shaker / cowbel / triangle / rimshot (SH)

Tone that releases tension in musical play

Tone that creates tension in musical play

To release tension play one of the green drum tones



Appendix figure 9 - examples of the diagrams made around the mapping of the harmonic and dissonant tones within various major and minor scales; or potentially drum tones, to optimize patients to create and release musical tension.

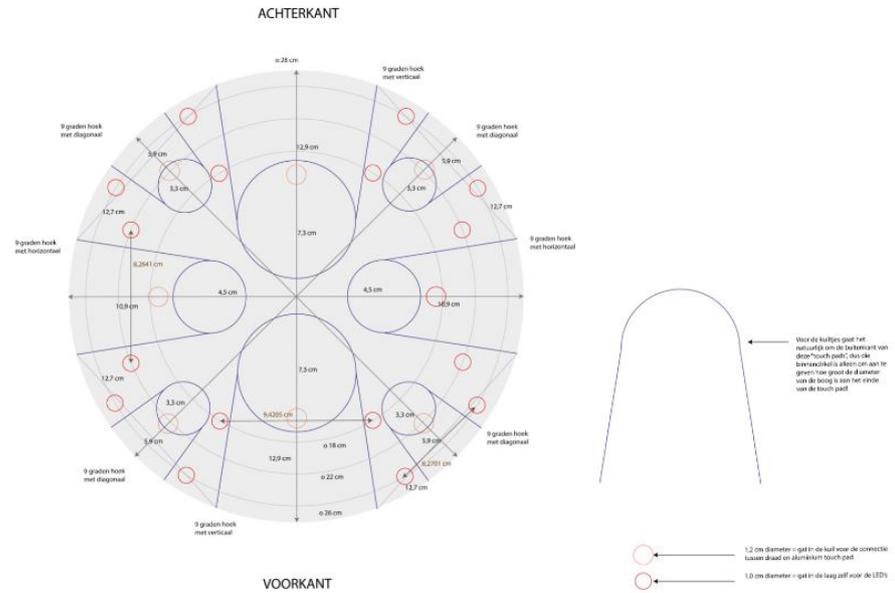
In short: musical feedback in the high level prototype supports anxiety patients to build up towards a multi-sensory expressive peak in drum play. In order to do this, not only as general principle tension & release is used, but in the musical tones provided it is also made use of harmonic musical tension and release theory (E.M., 2019). Therefore, different major and minor scales will be provided as musical sets in the prototype, that each provide 8 tones, from which 4 create dissonance (tension) and 4 create sonance (release), such as G-Major scale (G4-G5), A-Major scale (A2-A3), C-Major scale (C4-C5) or the E-Minor (E3-E4) scale. The tension and release tones are mapped in a way that it is easy for the patients to release tension (using the bigger touch pads) and are challenged to use tension tones (using the smaller touch pads). These different major and minor scales allow to express different moods and emotions, and so create flexibility to fit to different types of anxiety patients. Furthermore, the tones within the scales will be provided in different types of instruments, such as the 'steel tongue drum', a 'synthesized electrical guitar', 'classic piano' or e.g. 'bells', all to explore creativity. Next to that, another diagram has been made for mapping of tones to the drum touch pads when there is NOT made use of harmonic scales, but drum tones instead. The same principle is used, base drum tones are used to allow for release of tension and drum accents as a cow bel are used to allow for creation of tension.

References

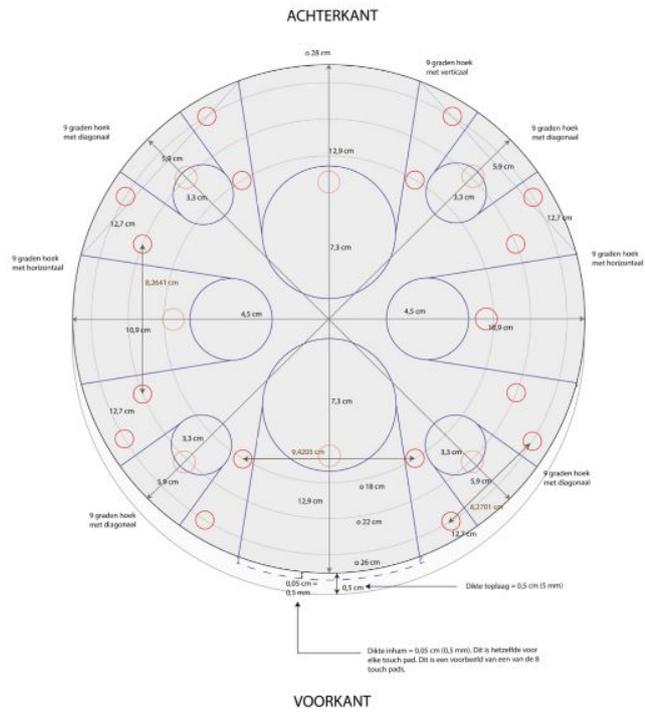
1. E, M. (2019, January 20). What is Tension and Release in Music? (and how do you create it?). Retrieved from <https://www.schoolofcomposition.com/what-is-tension-and-release-in-music/#Harmonic-Tension-and-Release>

2D Sketches Outside Casing

Top View (touch pads placing and holes LED's and touch pad - wire connections, in de indents v/d touch pads)



Side View (indents touch pads)





Appendix figure 12 - final 3D models.



Appendix figure 13 - 3D models assembled with metal touch pads.



Appendix figure 14 - 3D model assembly with software and electronics.

Software Programs

These cannot be provided yet since they are optimized around 7 aspects of measurements and interaction of the prototype.

Appendix E: Consent Forms

4 different consent forms were made to personalize the interview setup for the differences between the three researchers involved and the students. The therapists got the same consent form as the students due to similarity in topics discussed.

Students and Therapists

Consent Form

Title: Design Opportunities in the Context of Clinical Psychology

Supervisor: Max Birk, Assistant Professor, Department of Industrial Design, Eindhoven University of Technology, m.v.birk@tue.nl, +49 174 750 52 45; and Prof. Dr. Julian Rubel, Professor für Psychotherapieforschung, Justus-Liebig-Universität Giessen (Germany), Julian.Rubel@psychol.uni-giessen.de, 0641/99-26380.

Researcher(s): Veerle van Wijlen, MSc Student, Industrial Design

Purpose(s) and Objective(s) of the Research: To increase empowerment and social integration of adolescents and adults with elevated trait anxiety or depression symptoms, I investigate the opportunities of a playful, physical, expressive and multi-sensory musical drum instrument for support in relaxation (in moments of worrying and/or rumination) within the context of psychotherapy practice and research.

Procedures:

- Phase 1: Welcome and Introduction, introducing the researcher, project, design, purpose of the interview, introduction of the participant, general guidelines and setting the focus of the interview.
- Phase 2: A 3-phase discussion in which 3 main topics will be discussed around design opportunities in the context of clinical psychology and psychotherapy research and/or practice. The interview questions will involve 1) first impressions on the opportunities of the RELAX-CHANGE design (which will be explained in the introduction) for relaxation and data analysis support, within the context of psychotherapy research and/or practice; 2) values, needs and challenges in your preferred psychotherapy research or practice context (depending on your field of interest); and 3) reflections on the future role of 'design' / 'creative technological solutions' within clinical psychology and psychotherapy research and/or practice (vision shaping).
- Phase 3: A final closure including final questions, an oral summary about the insights, remarks of the participant, a thank you and goodbye.

Funded by: -

Potential Risks and Benefits: During the interview, there are minimal known or anticipated risks to you by participating in this discussion and share of knowledge. The coded qualitative data of the interview responses, will be kept on a password protected academic online platform at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially and you, as participant, will never be recognizable in publications, academic material or any other means. Quotes from the interview will be pseudonymized and screened for not being traceable to an individual. Potential benefits include design-related insights and share of expertise in the fields of design research, clinical psychology and psychotherapy research / practice, design within clinical psychology and psychotherapy and design (research) for anxiety and depression.

Confidentiality:

- Confidentiality will be maintained throughout the interview. The entire process and data will be anonymized. Data will only be presented in the aggregate and any individual comments will be anonymized prior to presentation in class or publication.
- Only the researcher will have access to the data to ensure that your confidentiality is protected.

Audio data and video data: With your permission, I would like to record audio and/or video during the interview. The audio and video data would be used to analyse important interview responses and individual comments, which can be used as input for concluding the design opportunities (general and for RELAX-CHANGE) within the context of clinical psychology and psychotherapy research and/or practice, and

in case relevant for documentation and publication of interview insights. Please indicate if I am allowed to record audio and/or video, if the material can be presented in class and in case relevant published:

	Be recorded	Presented anonymized	Used for Analysis
Audio:	Yes [] No []	Yes [] No []	Yes [] No []
	Used for Publication		
	Yes [] No []		
Video:	Be recorded	Presented anonymized	Used for Analysis
	Yes [] No []	Yes [] No []	Yes [] No []
	Used for Publication		
	Yes [] No []		

Storage of Data:

- Data (including audio and/or video recorded interview conversation and individual comments) will be stored on a secure password-protected server until 12 months after the end of the research and then destroyed.

Right to Withdraw:

- Your participation is voluntary. You may withdraw from the research project for any reason, at any time without explanation.
- Should you wish to withdraw, you may do so at any point, and we will not use your data; we will destroy all records of your data.
- Your right to withdraw data from the study will apply until the data have been aggregated (one week after study completion). After this date, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Follow up:

To obtain results from the meeting, please contact Veerle van Wijlen (v.s.v.wijlen@student.tue.nl); Max Birk (m.v.birk@tue.nl); or Julian Rubel (Julian.Rubel@psychol.uni-giessen.de).

Questions or Concerns:

- Contact the researcher(s) using the information at the top.
- This research project has been approved on ethical grounds by the Eindhoven University of Technology Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office, ethics@tue.nl, +31 40 - 247 6259.

Date, place

Signature

Appendix figure 15 - students and therapists consent form.

Researcher dr. Ott - meditation and absorption research

Consent Form

Title: Design Opportunities in the Context of Clinical Psychology / Psychotherapy

Supervisor: Max Birk, Assistant Professor, Department of Industrial Design, Eindhoven University of Technology, m.v.birk@tue.nl, +49 174 750 52 45; and Prof. Dr. Julian Rubel, Professor für Psychotherapieforschung, Justus-Liebig-Universität Giessen (Germany), Julian.Rubel@psychol.uni-giessen.de, 0641/99-26380.

Researcher(s): Veerle van Wijlen, MSc Student, Industrial Design

Purpose(s) and Objective(s) of the Research: To increase empowerment and social integration of adolescents and adults with elevated trait anxiety or depression symptoms, I investigate the opportunities of a playful, physical, expressive and multi-sensory musical drum instrument (RELAX-CHANGE) for support in relaxation (in moments of worrying and/or rumination) within the context of psychotherapy practice and research. Since this design proposes an opposed perspective on the process of relaxation, compared to mindfulness and meditation practice, specific opportunities of RELAX-CHANGE in comparison with mindfulness/meditation practice are included in this research.

Procedures:

- Phase 1: Welcome and Introduction, introducing the researcher, purpose of the interview, introduction of the participant (researcher), general guidelines, and some first introduction questions.
- Phase 2: A discussion in which topics will be discussed around 1) meditation and mindfulness (practice) in general, 2) the opportunities of RELAX-CHANGE for adding value in comparison to meditation/mindfulness practice regarding support in relaxation, raising motivation for relaxation tasks, absorption, emotional expression and emotion regulation, 3) possibilities for the contexts of use of RELAX-CHANGE compared to meditation and mindfulness practice, and 4) the future role of design in clinical psychology research and practice.
- Phase 3: A final closure including final questions, an oral summary about the insights, remarks of the participant, a thank you and goodbye.

Funded by: -

Potential Risks and Benefits: During the interview, there are minimal known or anticipated risks to you by participating in this discussion and share of knowledge. The coded qualitative data of the interview responses, will be kept on a password protected academic online platform at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially and you, as participant, will never be recognizable in publications, academic material or any other means. Quotes from the interview will be pseudonymized and screened for not being traceable to an individual. Potential benefits include design-related insights and share of expertise in the fields of design research, meditation and mindfulness research / practice, clinical psychology and psychotherapy research / practice, and the connection of design with clinical psychology.

Confidentiality:

- Confidentiality will be maintained throughout the interview. The entire process and data will be anonymized. Data will only be presented in the aggregate and any individual comments will be anonymized prior to presentation in class or publication.
- Only the researcher will have access to the data to ensure that your confidentiality is protected.

Audio data and video data: With your permission, I would like to record audio and/or video during the interview. The audio and video data would be used to analyse important interview responses and individual comments, which can be used as input for concluding the design opportunities (general and for

RELAX-CHANGE) within the context of clinical psychology and psychotherapy research and/or practice, and in case relevant for documentation and publication of interview insights. Please indicate if I am allowed to record audio and/or video, if the material can be presented in class and in case relevant published:

	Be recorded	Presented anonymized	Used for Analysis
Audio:	Yes [] No []	Yes [] No []	Yes [] No []
	Used for Publication		
	Yes [] No []		
Video:	Be recorded	Presented anonymized	Used for Analysis
	Yes [] No []	Yes [] No []	Yes [] No []
	Used for Publication		
	Yes [] No []		

Storage of Data:

- Data (including audio and/or video recorded interview conversation and individual comments) will be stored on a secure password-protected server until 12 months after the end of the research and then destroyed.

Right to Withdraw:

- Your participation is voluntary. You may withdraw from the research project for any reason, at any time without explanation.
- Should you wish to withdraw, you may do so at any point, and we will not use your data; we will destroy all records of your data.
- Your right to withdraw data from the study will apply until the data have been aggregated (one week after study completion). After this date, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Follow up:

To obtain results from the meeting, please contact Veerle van Wijlen (v.s.v.wijlen@student.tue.nl); Max Birk (m.v.birk@tue.nl); or Julian Rubel (Julian.Rubel@psychol.uni-giessen.de).

Questions or Concerns:

- Contact the researcher(s) using the information at the top.
- This research project has been approved on ethical grounds by the Eindhoven University of Technology Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office, ethics@tue.nl, +31 40 - 247 6259.

Date, place

Signature

Appendix figure 16 - dr. Ott consent form.

Researcher prof. Schwenck - clinical child & youth psychology research

Consent Form

Title: Design Opportunities in the Context of Clinical Child and Youth Psychology / Psychotherapy

Supervisor: Max Birk, Assistant Professor, Department of Industrial Design, Eindhoven University of Technology, m.v.birk@tue.nl, +49 174 750 52 45; and Prof. Dr. Julian Rubel, Professor für Psychotherapieforschung, Justus-Liebig-Universität Gießen (Germany), Julian.Rubel@psychol.uni-giessen.de, 0641/99-26380.

Researcher(s): Veerle van Wijlen, MSc Student, Industrial Design

Purpose(s) and Objective(s) of the Research: To increase empowerment and social integration of adolescents and adults with elevated trait anxiety or depression symptoms, I investigate the opportunities of a playful, physical, expressive and multi-sensory musical drum instrument for support in relaxation (in moments of worrying and/or rumination) within the context of psychotherapy practice and research. Opportunities for target groups beyond adolescents and adults, with elevated trait anxiety or depression, are also investigated. In particular it is focused on children and youth with social behavioural problems, social anxiety and communication / expressive problems.

Procedures:

Phase 1: Welcome and Introduction; introducing the researcher, the design research project, the design RELAX-CHANGE, purpose of the interview, introduction of the participant, general guidelines, and some first introduction questions.
Phase 2: A 3-phase discussion in which 3 main topics will be discussed around design opportunities in the context of clinical child and youth psychology research and/or therapy practice. The interview questions will involve 1) first impressions on the opportunities of the RELAX-CHANGE design (which will be explained in the introduction) for relaxation, emotion recognition & expression, communication and data analysis support, within the context of clinical child and youth psychology research and/or practice; 2) values, needs and challenges discussion (depending on your field of research and interest); and 3) reflections on the future role of 'design' / 'creative technological solutions' within clinical child and youth psychology research and/or practice (vision shaping).
Phase 3: A final closure including final questions, an oral summary about the insights, remarks of the participant, a thank you and goodbye.

Funded by: -

Potential Risks and Benefits: During the interview, there are minimal known or anticipated risks to you by participating in this discussion and share of knowledge. The coded qualitative data of the interview responses, will be kept on a password protected academic online platform at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially and you, as participant, will never be recognizable in publications, academic material or any other means. Quotes from the interview will be pseudonymized and screened for not being traceable to an individual. Potential benefits include design-related insights and share of expertise in the fields of design research, clinical (child & youth) psychology and psychotherapy research / practice, design within clinical (child & youth) psychology and psychotherapy and design (research) for anxiety and depression.

Confidentiality:

- Confidentiality will be maintained throughout the interview. The entire process and data will be anonymized. Data will only be presented in the aggregate and any individual comments will be anonymized prior to presentation in class or publication.
- Only the researcher will have access to the data to ensure that your confidentiality is protected.

Audio data and video data: With your permission, I would like to record audio and/or video during the interview. The audio and video data would be used to analyse important interview responses and individual comments, which can be used as input for concluding the design opportunities (general and for RELAX-CHANGE) within the context of clinical psychology and psychotherapy research and/or practice, and in case relevant for documentation and publication of interview insights. Please indicate if I am allowed to record audio and/or video, if the material can be presented in class and in case relevant published:

	Be recorded	Presented anonymized	Used for Analysis
Audio:	Yes [] No []	[Yes [] No []	[Yes [] No []

Used for Publication
Yes [] No []

	Be recorded	Presented anonymized	Used for Analysis
Video:	Yes [] No []	[Yes [] No []	[Yes [] No []

Used for Publication
Yes [] No []

Storage of Data:

- Data (including audio and/or video recorded interview conversation and individual comments) will be stored on a secure password-protected server until 12 months after the end of the research and then destroyed.

Right to Withdraw:

- Your participation is voluntary. You may withdraw from the research project for any reason, at any time without explanation.
- Should you wish to withdraw, you may do so at any point, and we will not use your data; we will destroy all records of your data.
- Your right to withdraw data from the study will apply until the data have been aggregated (one week after study completion). After this date, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Follow up:

To obtain results from the meeting, please contact Veerle van Wijlen (v.s.v.wijlen@student.tue.nl); Max Birk (m.v.birk@tue.nl); or Julian Rubel (Julian.Rubel@psychol.uni-giessen.de).

Questions or Concerns:

- Contact the researcher(s) using the information at the top.
- This research project has been approved on ethical grounds by the Eindhoven University of Technology Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office, ethics@tue.nl, +31 40 - 247 6259.

Date, place _____

Signature _____

Appendix figure 17 - prof. Schwenck consent form.

Researcher prof.dr. Rubel - psychotherapy researcher

Consent Form

Title: Design Opportunities in the Context of Clinical Psychology / Psychotherapy

Supervisor: Max Birk, Assistant Professor, Department of Industrial Design, Eindhoven University of Technology, m.v.birk@tue.nl, +49 174 750 52 45; and Prof. Dr. Julian Rubel, Professor für Psychotherapieforschung, Justus-Liebig-Universität Gießen (Germany), Julian.Rubel@psychol.uni-giessen.de, 0641/99-26380.

Researcher(s): Veerle van Wijlen, MSc Student, Industrial Design

Purpose(s) and Objective(s) of the Research: To increase empowerment and social integration of adolescents and adults with elevated trait anxiety or depression symptoms, I investigate the opportunities of a playful, physical, expressive and multi-sensory musical drum instrument for support in relaxation (in moments of worrying and/or rumination) within the context of psychotherapy practice and research.

Procedures:

Phase 1: Welcome and Introduction, introducing the researcher, purpose of the interview, introduction of the participant, general guidelines, and some first introduction questions.
Phase 2: A 5-phase discussion in which 5 main topics will be discussed around design opportunities in the context of clinical psychology and psychotherapy research and/or practice. The interview questions will involve 1) reflection on the opportunities found for the RELAX-CHANGE design for supporting psychotherapy research around relaxation mechanisms and (bio-) measurements for various constructs; 2) validation & reflection upon opportunities found for RELAX-CHANGE for relaxation support within psychotherapy practice contexts (from past 3 interviews); 3) values, needs and challenges in your psychotherapy research context; 4) general questions about psychotherapy research/practice; and 5) reflections on the future role of 'design' / 'creative technological solutions' within clinical psychology and psychotherapy research and/or practice (vision shaping).
Phase 3: A final closure including final questions, an oral summary about the insights, remarks of the participant, a thank you and goodbye.

Funded by: -

Potential Risks and Benefits: During the interview, there are minimal known or anticipated risks to you by participating in this discussion and share of knowledge. The coded qualitative data of the interview responses, will be kept on a password protected academic online platform at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially and you, as participant, will never be recognizable in publications, academic material or any other means. Quotes from the interview will be pseudonymized and screened for not being traceable to an individual. Potential benefits include design-related insights and share of expertise in the fields of design research, clinical psychology and psychotherapy research / practice, design within clinical psychology and psychotherapy and design (research) for anxiety and depression.

Confidentiality:

- Confidentiality will be maintained throughout the interview. The entire process and data will be anonymized. Data will only be presented in the aggregate and any individual comments will be anonymized prior to presentation in class or publication.
- Only the researcher will have access to the data to ensure that your confidentiality is protected.

Audio data and video data: With your permission, I would like to record audio and/or video during the interview. The audio and video data would be used to analyse important interview responses and individual comments, which can be used as input for concluding the design opportunities (general and for

RELAX-CHANGE) within the context of clinical psychology and psychotherapy research and/or practice, and in case relevant for documentation and publication of interview insights. Please indicate if I am allowed to record audio and/or video, if the material can be presented in class and in case relevant published:

	Be recorded	Presented anonymized	Used for Analysis
Audio:	Yes [] No []	[Yes [] No []	[Yes [] No []

Used for Publication
Yes [] No []

	Be recorded	Presented anonymized	Used for Analysis
Video:	Yes [] No []	[Yes [] No []	[Yes [] No []

Used for Publication
Yes [] No []

Storage of Data:

- Data (including audio and/or video recorded interview conversation and individual comments) will be stored on a secure password-protected server until 12 months after the end of the research and then destroyed.

Right to Withdraw:

- Your participation is voluntary. You may withdraw from the research project for any reason, at any time without explanation.
- Should you wish to withdraw, you may do so at any point, and we will not use your data; we will destroy all records of your data.
- Your right to withdraw data from the study will apply until the data have been aggregated (one week after study completion). After this date, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Follow up:

To obtain results from the meeting, please contact Veerle van Wijlen (v.s.v.wijlen@student.tue.nl); Max Birk (m.v.birk@tue.nl); or Julian Rubel (Julian.Rubel@psychol.uni-giessen.de).

Questions or Concerns:

- Contact the researcher(s) using the information at the top.
- This research project has been approved on ethical grounds by the Eindhoven University of Technology Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office, ethics@tue.nl, +31 40 - 247 6259.

Date, place _____

Signature _____

Appendix figure 18 - prof.dr. Rubel consent form.

Appendix F: Protocols

4 different interview hand-outs were made to personalize the interview setup for the differences between the three researchers involved, and to create a flexible hand-out for the interviews with the students to ask about research and practice opportunities/positioning and benefits (depending on their interests). For the therapists the same handout as the students was used but focus regards opportunities/positioning/benefits was on the practice related questions instead.

Students and Therapists

Upfront of the interview

1. Send out MS Teams link via e-mail
2. Send out consent form via e-mail
3. Check if they have signed consent form before the interview

Welcome & Introduction

1. Welcome and thank you for joining
2. Overview of the topic (interview and purpose of study, me: researcher, not the developer 😊 (ID TU/e), design research project, design in general, design RELAX-CHANGE and its relaxation purpose for target group)
3. Ask about participant & direction question
4. Ground Rules (I will ask questions about you and 3-4 topics around 'design opportunities in the context of clinical psychology and psychotherapy', I will ask these questions but my job is mainly to listen; it will take approximately 30-45 minutes of your time; I will audio record, therefore sent you a consent form, filled it in?, then I will start the audio recording)
5. There is no wrong or right answer, please feel entirely free to share your point of view on the topics I would like to discuss with you. Any last questions before we start?
6. First I want to know a little bit about you: as student / PhD'er, how do you see yourself within clinical psychology? do you have a preference for clinical psychology research or practice? And is there any specific field you would like to work or research in, with regards to psychotherapy (anxiety, depression, bi-polar, what's more?)

Interview Processes

Pick the questions related to research or practice preference. In case there is no preference, mainly ask questions regards the opportunities for RELAX-CHANGE within psychotherapy practice.

Opportunities/Positioning/Benefits when Research Interests

1. Opinion on the first impression of the opportunities of RELAX-CHANGE for supporting research on... (~through data analysis of touch frequencies, inter-touch speeds and/or touch patterns)
 - a. Relaxation within the psychotherapeutic context of anxiety (GAD, more) and depression? What about supporting research on relaxation in other fields including your own field of expertise?
 - a. Emotional responses, physical responses and cognitive responses to anxiety (GAD, more) and depression? What about supporting research on emotional, physical or cognitive responses to e.g. specific phobia, SAD, Musismus (related to your field of expertise)? Or

supporting research on emotion recognition? Emotion processing? Why is this needed? Compared to computers / current diagnostic instruments used?

b. Learning and unlearning of emotional responses? Prosocial emotions? (callous-unemotional traits in childhood project) Why should this be supported and how can RELAX-CHANGE add value?

c. Task absorption and engagement in a psychotherapeutic (relaxation) task? Is this something done/important in clinical psychology / psychotherapy? Why is this needed?

b. Opposed perspectives on relaxation compared to meditation and/or mindfulness, for various stakeholders (various patients in mental health, therapists, family members, researchers)? Is there a need for opposed perspectives in clinical psychology / psychotherapy research/practice?

d. Non-verbal communication methods/tools within various psychotherapy contexts as anxiety (GAD, SAD, more), depression, child psychotherapy? ? Is there support needed for that? Why? How can RELAX-CHANGE be of added value here?

c. Personalizing (psycho)therapy within the field of anxiety (GAD) and/or depression? What about other fields? Why is this needed? How could RELAX-CHANGE be of added value here?

d. Effectiveness of psychotherapy within the field of anxiety (GAD) and/or depression? What about other fields? Why is this needed? How could RELAX-CHANGE be of added value here?

e. Modeling and visualizing changes within psychotherapy within the field of anxiety (GAD) and/or depression? What about other fields? Why is this needed? How could RELAX-CHANGE be of added value here?

f. Meta-analysis of visualizing opportunities within psychotherapy research and practice (in different fields and process phases)

I myself am actually not so convinced about if this is gonna work in psychotherapy research or practice, what do you think? Or: I actually don't think this is gonna work in psychotherapy research or practice contexts, what do you think?

Opportunities/Positioning/Benefits when Practice Interests

2. Opinion on the first impression of the opportunities of RELAX-CHANGE for relaxation support in therapy practice context?

a. Regards to therapy practice within the field of anxiety disorders (GAD, more) and/or depression (how could it support, be of value). Opinion on why would this be needed?

b. Regards therapy practice within other fields of psychotherapy? Opinion on why this would be needed? How could RELAX-CHANGE be of added value?

c. Regards to opportunities in different contexts of use; different phases of therapy process (related mainly to people doing therapy for anxiety/depression, after that in other fields)

Could you describe a potential use scenario for me? If this would be a new product bought in the outpatient center and you had to use this for patients with anxiety / depression issues, can you describe me how you would use it? How and where you would apply it?

d. Regards to opportunities of RELAX-CHANGE to positively affect other constructs, besides relaxation?

e. Regards to opportunities of RELAX-CHANGE for support in data gathering through measures of touch frequency, inter-touch speeds and touch patterns (in relation to relaxation support, other support, therapist support, patient support, family support). Opinion on why this would be needed? How could RELAX-CHANGE be of added value?

I myself am actually not so convinced about if this is gonna work in psychotherapy research or practice, what do you think? Or: I actually don't think this is gonna work in psychotherapy research or practice contexts, what do you think?

Own values, needs, challenges in psychotherapy practice context?

- a. Motivation for giving therapy practice
- b. Values, needs, challenges regards to therapy practice within your own specialized psychotherapy field? What about the field of anxiety (GAD) and/or depression?
- c. Values, needs, challenges regards to psychotherapy process within your own specialized psychotherapy field? What about the field of anxiety (GAD) and/or depression?
- d. Values, needs, challenges regards the methods used within your own specialized psychotherapy field (for relaxation)? What about methods used for relaxation, within the field of anxiety (GAD) and/or depression?
- e. Values, needs, challenges regards stakeholders that are involved during psychotherapy practice in within your own specialized psychotherapy field? What about the field of anxiety (GAD) and/or depression?
- f. Values, needs, challenges regards data gathering, data usage and data visualization within your own specialized psychotherapy field? What about the field of anxiety (GAD) and/or depression?
- g. Values, needs, challenges regards other aspects of psychotherapy practice in your own specialized psychotherapy field? What about the field of anxiety (GAD) and/or depression?

Future of psychotherapy practice and design: how do you see the future role of 'design' / creative technological solutions, in psychotherapy practice?

(general vision on future opportunities of design in psychotherapy)

- a. How/ where can it support? Why?
- b. How/ where can it not support? Why?
- c. In which context(s) could it support best / most beneficial? Why?
- d. In what therapy fields could it support best / most beneficial? Why?
- e. How could it support current methods in your psychotherapy field? In field of anxiety (GAD) and/or depression? In other fields?
- f. Future role of 'design' in psychotherapy practice with regards to data gathering, data usage, data visualization?
- g. How would your ideal vision of future psychotherapy practice (within your own specialized field) look like? And for anxiety (GAD) / depression? And overall (all kinds of fields taken into account)? What would you value most? What would you most likely want to address or change?

Outro

1. Oral summary of what we talked about, found out together
2. Thank you so much for your time and good luck with the rest of your work/research
3. Make sure you will get your VP etc.

4. See you later!
5. Stop audio recording
6. Stop video calling

Researcher dr. Ott - meditation and absorption research

Upfront of the interview

1. Send out MS Teams link via e-mail (zoom)
2. Send out consent form via e-mail
3. Check if they have signed consent form before the interview

Welcome & Introduction

1. Welcome and thank you for joining
2. Ground Rules: start audio recording
3. Overview of the topic (interview and purpose of study, me: researcher, not the developer 😊 (ID TU/e), design research project, design in general, design RELAX-CHANGE and its relaxation purpose for target group)
 - Provide an opposed perspective compared to meditation/mindfulness, the more calm methods for relaxation (going for acceptance rather than expressive distraction)
4. Why I invited her and focus of the interview with you:
 - interested in finding out what RELAX-CHANGE could contribute to in psychotherapy / clinical psychology compared to the practice of meditation and mindfulness (which you have done lots of research in)
 - what would be the added value in both research and practice (in terms of relaxation (process), absorption, emotional response reduction / research / expression / opening up, physical and cognitive response reduction to worrying and rumination, negative and positive effects of both compared)
5. Ask about Ulrich, off course have looked on your site and publications, but I am curious to know from your perspective,
 - a. what are you currently doing (projects)? How did you come to work in this specific field, and research, what is your motivation for this work? What is your current main interest and why?
 - b. Always what you wanted to do? What is your background? Previous research done? Did you want to go into practice as well? Was that ever an option? Why yes/no?
6. Ask about meditation and mindfulness
 - a. From your perspective the difference between meditation and mindfulness? (for relaxation)
 - b. From your opinion, regards worrying and rumination, what is the added value of practicing meditation and/or mindfulness? (for relaxation)
 - c. From your opinion, regards worrying and rumination, what are the downfalls / shortcomings of practicing meditation and/or mindfulness? For relaxation, absorption, emotion regulation?
 - d. From your perspective, what is the role of absorption in reaching a mindful state? Or reaching relaxation?
7. Any last questions before we start / go on?

Interview Processes

Pick the questions related to his meditation research and his preference of researching constructs within.

Video explanation of RELAX-CHANGE design; target group and mental health field; relaxation support purpose; emotional, physical, cognitive response support to worrying/rumination; and data gathering opportunities (video)

- i. Opposed perspective of Tension&Release through multi-sensory expression compared to calm and accepting mindfulness and meditation
- ii. Way of reaching the mindful / relaxed state is different, more expressive and more focused on multi-sensory experience, addressing all responses to worrying and rumination

1. Opinion on the first impression of the opportunities of RELAX-CHANGE and its underlying tension&release (expressional distraction) principles for adding value to relaxation support? Compared to meditation / mindfulness?

- a. (role of such a design) in therapy practice context?
- b. In clinical psychology research regards relaxation mechanisms?

2. Opinion on the first impression of the opportunities of RELAX-CHANGE and its underlying tension&release (expressional distraction) principles for adding value to motivating yourself to practice a relaxation task? Compared to meditation / mindfulness?

- a. (role of such a design) in therapy practice context?
- b. In clinical psychology research regards relaxation mechanisms?

3. Opinion on the first impression of the opportunities of RELAX-CHANGE and its underlying tension&release (expressional distraction) principles for adding value to support in absorption? Compared to meditation / mindfulness?

- a. (role of such a design) in therapy practice context?
- b. In clinical psychology research regards absorption mechanisms?

4. Opinion on the first impression of the opportunities of RELAX-CHANGE and its underlying tension&release (expressional distraction) principles for adding value to support in emotional expression, emotion regulation, 'opening up the feelings'? Compared to meditation / mindfulness?

- a. (role of such a design) in therapy practice context?
- b. In clinical psychology research regards absorption mechanisms?

5. Opinion on the first impression of the opportunities of RELAX-CHANGE for relaxation, absorption, regulation support in different contexts of use; different phases of therapy process (related mainly to people doing therapy for anxiety/depression, after that in other fields)?

- a. how could its possibilities for use add value compared to meditation/mindfulness?

Could you describe a potential use scenario for me, where it could add value compared to meditation or mindfulness, at home / other context / therapy practice for GAD or depression? By the patient? By the therapist? Anyone else?

6. Opinion on the first impression of the opportunities of RELAX-CHANGE for support in providing objective measurements for complex constructs as emotion, cognitive or physical response through measures of touch frequency, inter-touch speeds and touch patterns
- For patients themselves?
 - For therapists to help in decision-making?
 - For clinical psychology researchers to understand changes in patient behavior, therapy progress etc.?
 - Compared to meditation and mindfulness? Can practice of meditation and mindfulness provide useful data for stakeholders? (in relation to relaxation support, other support, therapist support, patient support, family support)

7. Opinion on the first impression of the opportunities of RELAX-CHANGE for supporting research on... (~through data analysis of touch frequencies, inter-touch speeds and/or touch patterns)
- Opposed perspectives on relaxation compared to meditation and/or mindfulness, for various stakeholders (various patients in mental health, therapists, family members, researchers)? Is there a need for opposed perspectives in clinical child/youth psychology?

Own values, needs, challenges in psychotherapy practice/research context (as a student, future vision)?

- Values, needs, challenges regards research within the field of meditation and mindfulness? Where can RELAX-CHANGE contribute or jump in?

Future of your own research and design: how do you see the future role of 'design' / creative technological solutions, within your research field? And in general, within the field of clinical psychology research? (general vision on future opportunities of design in psychotherapy)

- How/ where can it support? Why?
- How/ where can it not support? Why?
- In what therapy fields could it support best / most beneficial? Why?
- In which context(s) could it support best / most beneficial? Why? (in therapy, before therapy, in-between therapy sessions, research etc.)
- How could it support current (data gathering) methods in your psychotherapy field? In field of anxiety (GAD) and/or depression? In other fields?
- Future role of 'design' in psychotherapy practice and/or research with regards to data gathering, data usage, data visualization?
- How would your ideal vision of future psychotherapy practice and/or research (within your own specialized field) look like? And for anxiety (GAD) / depression? And overall (all kinds of fields taken into account)? What would you value most in this future psychotherapy practice/research scenario? What would you most likely want to address or change?

Outro

- Oral summary of what we talked about, found out together
- Thank you so much for your time and good luck with the rest of your work/research
- Make sure you will get your VP etc.
- See you later!
- Stop audio recording
- Stop video calling

Researcher prof. Schwenck - clinical child & youth psychology research

In the interview with her the research related questions from the 'students / therapists' handout were used, and then targeted towards the target group of children and adolescents instead.

Researcher prof.dr. Rubel - psychotherapy researcher

Different about the interview with prof.dr. Rubel was the fact that after the welcome & introduction phase I started with a reflection on the interview results I had gathered so far to criticize them or confirm. The rest of the interview was similar to the research related questions from the 'students / therapists' handouts used.

Reflection Questions

1. Validate & reflect upon opportunities found of RELAX-CHANGE for supporting psychotherapy / clinical psychology research on...

a. Understanding the mechanisms of relaxation and response regulation to worrying and rumination. Opinion on what kinds of psychotherapy research fields beyond anxiety and depression?

b. Answering the question if bio-information (from RELAX-CHANGE: physical play intensity, conductivity changes) can add value compared to / next to self-reported data or therapist observations? Can RELAX-CHANGE support therapist's decision-making in a less intrusive way (because it is part of therapy, integrated)?

c. Providence of objective measurements for complex constructs as 'emotion' or 'emotional expression'? Can we make 'emotional responses' more objective, reflected by objective measurements? To understand mechanisms of change in psychotherapy? And support decision-making in psychotherapy interventions?

d. Supporting tools for the intervention of relaxation, but looking critically at the design, does it support the various stakeholders?

2. Validate & reflect upon opportunities found for RELAX-CHANGE for relaxation support within psychotherapy practice contexts....

a. Let patients get in touch with their anxiety, confronting with anxiety (being anxious to play 'ugly' / express themselves) and increasing awareness of own anxiety? (exhibit own anxiety)

b. In general support expression of emotion

i. Let patients get into certain emotional mood, get in touch with their emotions

- collaborative reflection with therapist?

- Beginning of therapy process (also as function for the hands, provide comfort in the first sessions, when patients are not sure what to do yet, or as a therapist to engage them into a task)

- Building up a relationship, building trust, starting the session with something people like to do (sth. That can be done NOT face to face)

- Later, when trust is build up, don't feel judged anymore

ii. Learn to express emotions, when people feel locked to themselves and have difficulties opening up

- learning a skill

c. As a way to prevent relapse, get back into the skills learned in therapy (emotional expression, tension build up, relaxation)

- d. As a way to increase self-efficacy through direct feedback for both patient and therapist
- e. As a way for a therapist to reflect on what is happening within the person, to make sure what the therapist observes if that is really happening, on a communication level
- f. Usage in group therapy? (with other instruments too)

- g. Other fields of use: psychosis (use of the senses), drug abuse, trauma therapy, selective mutism (communication tool, speak deadline, change over time), autism spectrum disorder (provide patients with sth. They are interested in, tech. stuff), forensic / criminal people, borderline patients (next to the emergency box), bipolar patients (prediction of what is going to happen, reach depression/manic state), as parameter of arousal (skin conductance level)
- h. Future integration:
- i. psychiatry vs. psychotherapy
- ii. open up the conversation about integrating music / innovation into psychotherapy or creative solutions into this context amongst therapists, or about breaking the classical image of psychotherapy, or how to use these kinds of tangible designs to support online therapy settings

Appendix G: Design Probe Video

<https://drive.google.com/file/d/1p7Q7r5qpsNsMcM7OrVFkj53GMOpp7VEU/view?usp=sharing>

Appendix H: Thematic Analysis (MAXQDA shots + Excel files + extra subtheme descriptions and insights)

Codebook

Overall goal: knowing what the opportunities, positioning and benefits of the drum are within clinical psychology / psychotherapy research and practice from the perspectives of different stakeholders in these 2 fields (upcoming researchers and practitioners; therapists within CBT and researchers from different fields).

1. Where do the different perspectives of the stakeholders on the drum come from?; what do they find important in therapy practice and research, and what motivates them to do it, what are their values and goals? (this determines where they think the added value of the drum could be in, determines the directions the added value of the drum can take, e.g. education / emotional expression = fully dependent on what they think is important as therapist or researcher to contribute to)
2. Actual added value of the drum; the real opportunities that the different stakeholders with their different perspectives state for the drum within therapy practice and research?
3. The positioning of the drum compared to the current support toolkit both researchers and practitioners already have?
4. Tension fields in the added value of the drum or when integrating drum in psychotherapy research and practice; in what the patient / designer wants, compared to what the therapist or researcher wants for their patients/participants; or in what the

designer wants compared to what the patient could want (e.g. objective measurements vs. privacy or control through self-reported data)?

5. Unexpected opportunities for the drum; for example on a more meta-level (e.g. as an educational or discussion object) based on observations from how the interviews went, the reactions stakeholders gave, changes in their mindsets, and my general impressions of the 'therapy practice / research field' based on their experiences?
6. Visions on the future role and possibilities for design in general, within clinical psychology / psychotherapy research and practice? What are the future chances of designers within this field? Do we walk against a never changing wall?

All Codes (Code System)

Code System	Memo	Frequency
Code System		1273
#1 - #6 = Main Themes		
#0 Aspects of Psychotherapy Research and Practice		3
Difficulties finding therapists for severe mental health cases		1
Replication key in psychotherapy research		2
#6 Future Visions Tech/Design/Innov in psychotherapy res.&prac.		0
Future of psychotherapy		0
Personal aspects of therapy important to be kept		1
Open mind towards new things		2
Design important for the future		8
Design can extend therapists horizons		1

Future use for different approach or different source is useful	2
The tool won't work for everybody, which is fine	2
Innovation won't be for every therapist	1
Role of new technologies in psychotherapy	0
Connect tangible design with online therapies	2
Technology is gonna influence all aspects of our lives	2
Artificial intelligence important role in future	2
Technology takes over diagnosis process	3
Technology won't substitute therapy	3
Technology reducing the waiting list for psychotherapy problem	1
Technology doesn't need to be everywhere	1
Drum must be worth the money for implementing in practice	2
Implementing exotic tools are a no go	1
#5 Unexpected Opportunities	0
Wanting to change & Seeking help	0

Therapy image could hold patients back going to therapy		3
It's easier to help when people want to change		4
Easier to help people who have voluntarily therapy		2
Drum as objective measurement tool		41
Data gathering most important thing in therapy		2
Self-reported data can start a dialogue		2
Self-reported data is easy to interpret		3
Hurdles to using objective measurements in psychotherapy	In practice?	3
Data for monitoring patient treatment response all self-report		1
Self-reported data gives sense of contributing and involvement		2
Active patients, taking agency, important in psychotherapy		4
Self-reported data above objective measurements in practice		4
Tension using both objective and self-reported data in practice	They can contrast each other, which makes it hard to say what to do with the patient for the therapist	4
Objective measurements difficult to process and interpret		5

Lots of factors influence therapy efficacy	1
In research hard to define what the drum measurements mean	3
Hard to implement the drum as data gathering tool	7
Connecting therapy with daily life	0
Need for connecting therapy with daily life	10
Opportunity for design to give insight in daily life patients	4
Digital technology to connect therapy to daily life	6
Drum can connect therapy with daily life	7
Drum for education, discussion and reflection	116
not much knowledge about other similar existing tools	3
difficulties reflecting on clinical interest	4
difficulties with reflecting on future self	9
questioning helps reflecting and come to specific added value	15
This interview helps reflecting on opportunities and practice	25
Interview opens up mindsets already!	19

Raising awareness about need for children's therapy & research	2
Knowledge on dealing with MH can provide social support needed	1
It's very important to educate aiming for basic MH knowledge	2
Opportunities of the drum for discussion and education	14
Challenge for this drum to create systemic change in the system	1
Stereotypes and images in psychotherapy	21
Friction stereotypes and implementing drum	4
In psychotherapy there are lots of stereotypes and images	11
Making it accessible for 'normal' peeps could break stigma	5
Opportunity for drum to break classical therapy image	1
Use in group therapy	14
Tension use in group therapy (noise/analysis)	2
Playing and sharing musical experience with others more fun	1
Group therapy to see gap subj. experience and observations	3

Opportunities use in group therapy		4
Benefits of group therapy		4
Use for therapists themselves		0
Pressure on psychology students		3
Supervision important part of psychotherapy/psychiatry practice		2
Psychotherapists also get therapy		1
Psychotherapists use meditation to be present and empathic	In-between sessions, to open up for their patients and get calm again.	3
Challenge to let work be work as therapist		8
Competitive atmosphere amongst psychologists / therapists		3
High stress and disorders amongst psychology students		4
Stress management challenge for therapists		8
Opportunity to use for therapists themselves		9
Circumstances in psychiatry and psychotherapy		11
Being in psychiatry does something with patients self-worth		2

Patients not taken seriously in psychiatry		5
Not much time for individual patient in psychiatry		4
Gap between psychotherapy research and practice		29
clinical research goes hand in hand with practice		1
Research results hard to use for practitioners		2
Research might not be representative enough for practice	This limits implementation of research results into therapy practice. Because of the standardized elements in psychotherapy research processes.	5
Practice and research have different interests/values at stake		3
Gap and tension between practice and research in psychotherapy		7
Practitioners not interested in psychotherapy research		3
Personalization to close gap psychother. research and practice		3
Personalization & prediction as extension of feedback research		4
Early treatment response to predict treatment outcome quite new		1
#4 Tension fields around drum and implementation		0

Therapists' restricted (innovation) views	41
imagining the prototype to be used in psychotherapy is hard	4
Therapist innovation view digitally focused	11
Huge potential / added value seen in digital innovation	5
Therapists afraid for new things	1
therapist views are restricted	18
Psychotherapy research and practice slow in innovation	1
Psychotherapy field innovative in use of statistical methods	1
Acceptance of innovation/technology	11
Atmosphere clinic important for overall UX/accepta.of psychther	2
Doing therapy is underestimated by patients	1
Burden to do therapy is very high	1
Both patient and therapist convinced for effective intervention	4
tools get personalized in collaboratin with the therapist	1
Integration of design highly dependent on views therapists	2

Introduction of (new) innovation and technology	0
Lack of staff and finances in psychiatry for good care	5
Money friction point for implementing drum in any context	3
Way of implementing new things in practice important for use	1
Transparency/intro around the drum tool important in practice	3
Introduction of the drum to prevent extra anxiety	2
Design considerations for implementation	13
The tool should be user friendly in size and transportability	3
Challenge to implement drum in the way you want it to be	2
Introducing new things to patients often brings hesitance	1
Freedom in usage of the tool is important	9
Introduction also very important in meditation/mindfulness	4
Mediation in new technology very important	5
Tension between psychology and technology	29

Therapy effects only justified by evidence-based psychotherapy	1
Tension between use for kids or adolescents/adults	6
Added value of drum is friction point in psychotherapy	7
Current tension and release tools easy to use and small	1
current tools for releasing tension in practice	8
current tension release tools also make use of senses	4
Drum could work disturbing and distracting in therapy	3
Additional tools are exhausting for the patient and therapist	3
Friction in therapy expectations and new tools	5
#3 Positioning of the drum	44
Anxiety and depression most researched disorders in general	3
Music related interventions	0
current musical therapy to distance from emotional responses	1
current musical group therapies	7
Acceptance and commitment therapy	1

Interventions for relaxation	0
current calming musical or verbal relaxation methods	4
Similarities with meditation practice	1
Meditation is more than relaxation or mental fitness training	3
Meditation, yoga, religion as a way to connect with HL support	1
(Verbal) Expression in therapy	0
Walking as therapy to open up and relationship building	1
current crafting in occupational therapy	3
Current clinical psychology research & practice	0
current projects and tools in psychotherapy research	17
Current bio objective measurements	2
#2 Added Value Drum & Opportunities	0
Appreciation for design research in psychotherapy	8
appreciation for design research and approach	6
Appreciation for interdisciplinary work	2

Advantages of drum's accessibility and flexibility	47
Sound possibilities drum	1
Drum also beneficial for 'normal' people with lower stress	2
It can be played intuitively	2
It can be played no matter your musical experience	3
the design support for many disorders	7
Drum universal way to get in touch with music	3
Drum easy to adapt over time for therapist	1
Drum also very open to use	7
Drum allows for adapting to different musical skills and prefs	5
Important to fit with the patient's interest, in tools and task	5
Accessibility drum helps fitting no interest patients	11
Support in expression	56
Patients want to be liked by the therapist	1
Patient honesty in the way of providing effective therapy	2
Importance of mind-body workouts	2

Importance of emotional expression skill for change	2
Using drum in (complex) skills research in psychotherapy (2)	9
"Doing something" beneficial in psychotherapy practice	4
Physicality is advantage of the drum	3
supporting expression in the beginning of therapy	4
Expression / communication support through play	23
RELAX-CHANGE as an alternative to express yourself	1
beneficial for inhibited expression and relieving tension	5
Potential effects	9
Therapy effects only justified by evidence-based psychotherapy	1
Drum most useful to support anxiety or depression	1
Harmonic tones more effective for relaxation than dissonance	4
Drum leads to relaxation	1
More effect on state anxiety than on trait anxiety	2
Support in (verbal) communication	0

Communication is important in psychotherapy	1
Freeze mechanism in children with selective mutism	1
No face-to-face communication makes talking easier in therapy	2
Opportunities for autism spectrum disorder	1
Opportunities for selective mutism	2
Frustrations in verbal expression	1
support in reaching agreements about current patient emotions	2
Support in communication and verbal expression	10
Visibility and directness of feedback	0
Opportunity showing / visualizing speaking deadline	3
direct feedback improves satisfaction and competence patient	2
support in making distress visible while talking	3
direct feedback is appreciated in terms of visibility	5
direct feedback increases self-efficacy	2
Opportunity for competence support	1

Gives comfort in first sessions	11
Tension using it in beginning of therapy	3
comfort in first therapy sessions	3
support in comfort during therapy sessions	3
support in comfort during therapy through simple tasks	2
Drum's analysis potential	27
Information needs to be usable for therapists	3
Need for intuitive objective measurements in research	1
Opportunity data gathering in showing patient differences	1
Drum data gathering support seeing gap subject exp. and observ.	7
support in assessing relaxation state in research (visibility)	2
Data to support prediction of depression/manic episodes	2
Drum data gathering useful support analyzing patient behavior	9
Support in analyzing how the patient is doing (visible b.o.dfb)	2
Drum's engagement and absorption potential	52

Importance of the absorption trait	17
High absorption trait related to deeper (better) experience	4
Variety in responses to the drum explained by absorption trait	3
Personal absorption trait determines object focus/engagement	4
Being open to new experiences also biologically dependent	3
High absorption trait means being open for new experiences	1
The different sensory channels of people determines absorption	2
Activities with opp. for 'flow' can work motivating	2
Opportunity for creating a 'flow'	2
Usage of hands important in moving attention	3
Every tone has ability to distract attention	3
Music enables to induce other states	5
Multi-sensory stimulation good to get different people engaged	And let them benefit from the deep play experience.
	1

	Due to the different sensory channels people have that drive them into absorption.	
Quality to absorb and prevent rumination huge benefit drum		17
Drum possibility for deep engagement when absorption trait high		1
Induced trance states are very emotionally rewarding		1
Support in emotional reflection		43
Emotions are really felt in the body		2
Using drum in (complex) skills research in psychotherapy (1)		9
Drum could support filtering intense emotions		1
Drum could help become expert of patient's own anxiety		3
Drum invites to give belly, heart, mind a voice		1
Music could help code emotions		5
Reflecting around drum play in collaboration with therapist		3
Reflect and regulate own emotions through isolated playground		19
Tension & Release support		0

Opportunities for borderline patients	3
Opportunity as safe, unharmful tension release tool	3
Music is magical and emperical way to decrease tension	1
drum is another way of supporting tension & release	7
Some patients may need more tension as relaxation approach	2
In touch or in distance with emotions	0
Tension between avoiding and in touch with negative responses	Through music! 4
Using drum in (complex) skills research in psychotherapy	9
Music to get in distance with emotional load/response	1
Music therapy for emotional distance to mind	6
Easy repeatable & remarkable melodies help distancing from emos	1
Drum could support exhibit your fears (confrontation)	4
Tasks which elicit fear in research	2
Opportunity in hierchy tasks for social phobia	3

Drum can evoke anxiety or fear for failing, doing it right	Performance anxiety	6
Dissonant tones to get in touch with unpleasant responses		2
Harmonic tones to avoid negative responses to anxiety		1
Music and harmonies to get in distance from bad minds		2
Support getting in emotional mood / in touch with emotions		4
Inducing emotions and states		0
Opportunity to let people "forget" about severe mental illness		2
Drum doesn't really fit in emotion regulation research		3
Harmonic tones for inducing positive feelings		3
Getting harmonic feeling to reach harmonic way of human being		1
Benefits of doing 'flow' activity on your own		3
Recognizable melodies important for changing emotional load		2
Benefits of musical approach		0
Musical or dance experience helps using the drum		1
Everyone likes/listens to music		2
Music therapy path in Ausbildung		1

Integrating music into standard psychoth. procedures	2
Completely different musical approach can cause attractiveness	3
Making music can be associated with good/positive activity	2
Music beneficial in psychotherapy practice	5
tension field with musical therapy	1
Drum friction with other musical instruments	2
More people like harmonic melodies	1
Benefits for therapists	24
Implementing drum helps therapist reflect on their therapy	1
Lack of critical reflection limits providing effective therapy	2
Critical reflection important for being a succesful therapist	2
Therapists bad in recognizing patient off track in therapy	2
Multiple opportunities to express in psychotherapy important	1
Design could help reach patients better& grant more acces	7
Therapists need creativity and flexibility for therapy effects	6

Drum gives therapists more creativity and flexibility	3
Advantages of playfulness	0
Children make use of traumatic play in trauma therapy	1
play is important aspect of therapy	6
It might be good to get adults out of adultry in psychotherapy	2
Playfulness could support adults getting out of normal thinking	4
#2/#3 Opportunities for drum	0
Drum as specific homework tool	0
The design would not be used as homework tool	2
Homework one of the things to drop first when not done	1
Taking the time for homework is hard for patients	1
For many people doing the homework is hard	2
Homework essential part of behavioral therapy	1
As homework more flexible and freedom in use	1
Doing it shamelessly as homework exercise	2

Therapy effects are more at home	3
Being creative is a private thing --> use at home	1
Opportunity for use at home	7
Drum can support as very specific homework tool	6
Implementation in psychotherapy and psychiatry	41
Design as a way to newly apply current methods	2
Many good psychotherapy pr. tools not applicable	1
Accessibility and creative setting helps using the drum	2
It makes sense to have different kinds of therapies for patient	3
Opportunities to integrate drum in entire therapy session	1
Drum will be an intervention tool / additional tool	4
Opportunities integration in psychiatry	4
Lots of challenges to face in psychiatry	1
The more options the better in psychotherapy	6

Drum is not for everyone and that's okay		9
Opportunities for future shared use		4
Opportunities for lending system around drum		2
Opportunities for public, accessible context to use it in		1
Opportunities for use in stationary settings or day clinics		2
Fields of use		0
Not lots of opportunities for psychoth. in psychosis field	Compared to medication	2
Opportunities for somatic disorders		3
Opportunities for supporting trauma therapy		2
Tension with current trauma therapy interventions		1
Studies show good results for CBT in selective mutism		1
Opportunities in occupational therapy		2
Opportunity for schizophrenia patients		1
Opportunities supporting art therapy		3

Opportunities drum for social phobic persons	10
Tension in using it for social anxiety	3
Opportunity for people with OCDs after confrontation	5
Opportunities for use in children's therapy	16
Future generation of mentally ill people	2
The need for supporting patient concentration in therapy	1
Technology can work attractive for children	2
Opportunities for bipolar patients	4
Bipolar quite reliant on medication	3
Opportunities within forensic psychotherapy	3
Not sure if the drum helps calming down in forensic context	1
Relationship building and trust	7
Opportunities to facilitate trust	3
Challenge building a patient-therapist relationship	2

The need for a relationship basis in therapy practice		2
(Clinical) Research potential		0
Selective mutism is underdiagnosed which is a problem		6
Far away from intervention level research with drum in SM field		2
Scarce research done in selective mutism field (not int. level)		3
Understudied fields in child&youth psychology		2
Research in children/adolescents less compared to adults		1
Opportunities researching effects using bio information		11
Quality of bio-feedback important for being effective indicator	For e.g. relaxation in psychotherapy studies	3
Bio information as indicator for bodily response to anxiety		2
Opportunity to use before stress/well-being related studies		3
Opportunity in research to get participants on core relaxation		1

Opportunity psychotherapy research	18
Research opportunities broader than relaxation response	2
Opportunities research effects on relaxation, arousal, states	3
Opportunities research effects for people with different traits	1
Opportunities researching differences in performance	1
Research short and long-term effects	1
Opportunities researching drum dimensionally	1
Opportunities for small intervention study	1
Studies will always allow you to know more, always beneficial	2
Research effects in clinical studies	1
Relation to music might bias research effects	1
Treatment studies (clinical) with drum gonna be difficult	2

Research only in well studied fields, with existing good tools	1	
Opportunity of prediction research support integration of drum	Through suggesting the use of the drum as an intervention in the treatment?	2
Information before treatment doesn't suffice for prediction	1	
Challenge to accept you cannot help every patient	3	
Challenge to not overanalyze people in private sphere	2	
You can unlearn negative emotions	1	
#1 Different Stakeholder Perspectives	141	
Educational perspectives	0	
Researchers' perspective	1	
Therapist perspective	2	
Leading psychoeducational programs perspective	1	
Therapy for pain perspective	2	
Group therapy or intervention perspective	3	
Bachelor knowledge perspective	6	
master's knowledge perspective	8	

interest organizational psychology	1
clinical psychology and psychotherapy research interests	12
Medicin knowledge perspective	2
experience from parents as clin.psychologists perspective	1
Research and practice interests	47
Mental healthcare interests	2
interest in anxiety disorders	7
interest in social phobia	1
interest in therapy for children and adolescents	6
interest in forensic psychotherapy	2
Interest within depression	3
Interest in somatic disorders	1
Trauma therapy interest	1
interest in a broad range of disorders	1
main interest in medicin	1
interest applying different kinds of methods in psychotherapy	2
interest in research methods	2

interest in predictions and treatment adaptation	2
interest in treatment response patterns	1
interest researching patterns of change over treatment course	1
research interest in sudden gains and losses in therapy	1
interest in feedback research	2
interest in supporting clinical decision-making	5
interest in becoming psychiatrist	2
interest in working in day clinic	4
Clin. psychology / Psychotherapy beliefs	0
Aim for being flexible and creative therapist	1
Psychotherapy practice is a rewarding job	1
In psychotherapy you learn every day	1
Way of doing therapy should be transparent	1
Behavior therapy functional and helps reaching goals straight	1
Straight and transparent therapy gives therapist good feeling	1

Reading and investigation leads to feelings of competence	1
Reading and investigation leads to therapy focus as therapist	2
Reasoning out of research	2
Connect with higher level of spirituality to deal with stress	2
Disappointed by working in psychiatry	5
Non open mindset burden for therapists	1
Psychology powerful way to influence people	2
Perspective on design and its approach	17
Optimistic towards the design	1
Not fond of digital therapy	1
interest in technology	3
interested in technical part of the design	5
Interest in design research approach	5
Musical perspective	2
Practical experience and perspectives	0
Psychiatry perspective and experience	5

Focus on pain diseases	1
Substance abuse perspective	2
Bipolar perspective	1
Psychosis perspective	3
Perspective from severe mental health problems	3
Perspective from schizophrenia	2

Codes & Quotes Book

This document contains all main themes, subthemes, codes and quotes and has about 195 pages. Therefore, a link to this handbook has been provided:

<https://drive.google.com/file/d/1p9MgAhvdDPyudykY6qvOlaE9iEHHxyoP/view?usp=sharing>

Extra Subtheme Descriptions & Insights

Different stakeholder perspectives

Here, focus was on the different perspectives the variety of stakeholders offered on the opportunities of tangibles, and specifically related to the design probe RELAX-CHANGE, in the context of psychological therapy practice and research. These are of relevance for understanding the variety in statements about the added value, opportunities, positioning of RELAX-CHANGE in mental health and friction points in the way of implementing (tangible) design in psychotherapy research or practice in the future.

Educational perspectives

The participants involved had different educational backgrounds within clinical psychology and differed in knowledge levels, influencing the depth of discussion around opportunities for tangibles and specifically RELAX-CHANGE, in clinical contexts. Because of the variety of stakeholders involved, statements stem from 'researchers perspectives', 'therapist perspectives', 'bachelor knowledge perspective', 'master knowledge perspective' with most participants interested in clinical psychology or psychotherapy (12 out of 13 related codes). More 'researcher perspectives' were involved compared to 'therapist perspectives', because of more research related stakeholders. However, the majority of the students preferred psychotherapy practice over research which balanced it out, and some even preferred a combination of both, as stated by one of the students, "*I think when you're doing clinical research or psychotherapy research this goes hand in hand with clinical practice. And I think for me personally this is the best way, it's just so related to each other.*" (P2) Moreover, more master students were involved compared to bachelor students, increasing the amount of 'master knowledge perspective' taken in the results, positively affecting depth of discussion. Furthermore, it was interesting that one of the students with a 'bachelor knowledge perspective' had actually finished her psychology bachelor degree but had switched to studying Medicine. In this way, a new 'medicine knowledge perspective' was included, which

enabled to also discuss RELAX-CHANGE's opportunities related to psychiatry practice, a field not considered before. Moreover, a student with a 'master knowledge perspective' explained that both his parents worked as therapists which enriched his knowledge, as stated, *"I know it a bit more because my parents both are clinical psychologists, so I know the stories they tell from the clinic or the job. And I want to find out if I can do it."* (P8) His parents being in this field made him doubt if he wanted to follow their footsteps, which created a more critical view towards the design, which was very surprising.

Research and practice interests

In the introduction phase of the interview participants were asked to describe their current work, projects and interests within clinical psychology and psychotherapy. It was clear the different interests played a huge role in the participant's statements about possible application areas for the design probe, research areas to involve the probe in, added value it could have, and open mindedness towards use of tangible designs or technology in future psychotherapy research or practice. Namely, often when a participant's interest was within a certain area of psychotherapy, then the added value of the design probe or positioning within practice or research was often stated with regards to their field of interest. For example, 3 participants were highly interested in 'therapy for children and adolescents', and therefore stated the added value of the design probe more towards 'advantages of playfulness in the design', positioning through 'aspects of play in current therapy', and 'opportunities for use in children's therapy' (16 out of 52 codes in 'fields of use'). Furthermore, the range of interests in aspects of clinical psychology research or psychotherapy practice showed the diversity in which tangible design can play a role in psychological therapy or contribute, from 'trauma therapy' to supporting 'feedback research'. According to the codes created this ranges from very specific interests as 'interest in forensic psychotherapy', 'interest in depression' or very broad ones as 'interest in becoming psychiatrist' or 'interest in a broad range of disorders'. Lots of participants involved had interest towards supporting people with anxiety disorders, either having 'interest in social phobia' or 'interest in anxiety disorders' in general, as stated by a therapist, *"I especially like anxiety disorders, I really like working with it."* (P10) This was closely related to the research's target group, and therefore their answers are of high value and emphasized on.

Practical experience

Discussing current and previous work done with the participants, differences in practical experience came forward, just like the importance of their experiences for shaping their attitudes towards how future psychotherapy should look like, in which disorder fields or research directions they want to make a change and how design could support them in achieving their goals. Researchers had experiences in different fields within clinical psychology, such as meditation efficacy research, research in supporting clinical decision making or within social anxiety, bringing different perspectives to the role tangibles could play in their field or beyond. Moreover, their experience with use of self-reported data and physiological data as objective measurements was important for researching the measurement potential of the design for behavioral data gathering, and what the added value of that could be, as one of the researchers stated, *"Especially with kids, they don't want to disturb you or anything, so I would additionally to subjective measures also assess objective measures like skin conductance, heart rate, respiratory sinus, arrhythmia, which can be easily done."* (P11) The fact that the therapist involved had practical experience with providing musical therapy to patients with anxiety, which was very interesting to critically

discuss the positioning of the design probe and its added value, as stated by him, *“For me harmonic music is one way to, one instrument which can be checked out to help people get in distance to rumination for example.”* (P10) Furthermore, almost every student participant had practical experience through internships done, differing from ‘psychiatry perspective’, ‘bipolar perspective’, ‘substance abuse perspective’ or ‘psychosis perspective’. These were important to enrich the student’s depth towards added value of the probe, and especially positioning based experiences in their specific internship fields.

Clinical psychology / psychotherapy beliefs

The various participants had different attitudes and beliefs within clinical psychology / psychotherapy research and practice. These values and beliefs revealed the chances of design within practice and research. An important statement made by one of the therapists, was his aim for being a flexible and creative therapist, as stated, *“I like being creative, I like being flexible, that’s my aim.”* In this way it is shown that tangible design can have the potential to fulfil his aim, and support his creativity and flexibility, which he also mentioned as one of the added value points of the design probe. Another interesting attitude of one of the researchers was that ‘in psychotherapy you learn everyday’, as stated, *“It’s also super interesting you learn so much every day.”* making the job *“rewarding”* (P11), showing design could play a role in increasing learning possibilities for researchers. On the other hand, this same researcher mentioned ‘the importance of evidence-based psychotherapy’, *“I learned that evidence-based psychotherapy is very important.”* (P11) which could be a hurdle to implement less evidence based interventions, like the design probe, into psychotherapy.

Perspective on design and approach

Participants had different perspectives with regards to technology used in psychotherapy practice, attitudes towards design and musical perspectives. These were very important in determining the open mindedness towards including technology in psychotherapy or new interventions including musical approaches. From the interviews it became clear, about 2 of the 11 participants used their ‘musical perspective’ and experience playing an instrument, attending musical group therapy, or guiding individual musical therapy to criticize the design probe and its musical elements. One of the students mentioned to be fond of integrating music as standard procedure in psychotherapy, *“I really love the idea of integrating music or musical therapy into the standard procedure.”* (P1) showing potential for more music related design in this field. Moreover, the ‘musical perspective’ of the therapist also really helped to critically discuss the role of the harmonic and dissonant tones as musical feedback, and multi-sensory element, in the tangible design probe, as stated for example, *“Maybe in terms of this tones, people want to have, I could imagine if the anxiety is there, people want to listen to good harmonic waves to avoid this bad feelings.”* (P10) Regards technological perspectives, it became some of the participants had very clear views towards technological developments in psychotherapy, influencing their view on the role of the design probe. One of the master students, stated to be not at all ‘fond of digital technology’, however one of the other participants saw huge potential in digital technology. These opposite perspectives offered critical evaluation on the physical aspect of the design, and the added value of that for the people with anxiety and in supporting psychotherapy practice.

(Tangibles) Added value and opportunities

Advantages of drum’s accessibility and flexibility

Asking the participants for the added value of the drum, the design probe, within the therapy practice fields they could imagine the design contributing in, one of the main advantages was the accessibility and flexibility of the design. 47 segments out of 7 interviews were coded, highlighting that this design aspect could support therapist's creativity, could help reach people with anxiety even on a lower level beyond therapy, reach people without musical interest and can help therapists adapt their support through the design to different patients and over time. Insights from this subtheme show that the design probe's accessibility and flexibility has potential to support a larger group within the anxiety spectrum within and outside clinical contexts. Interestingly, three out of 11 participants mentioned that the accessibility of the drum could help therapists fit this design to anxiety patients without a particular behavioral interest or hobby, to support them in releasing tension and practicing this behavior, as stated, *"When you as a therapist have the feeling that your patient could benefit from some skill in that thing and then you take a look at the patient's hobbies or any other activities and you cannot find anything and then you can tell the person you should play an instrument, like play the guitar, that's not gonna work because it's very hard, it takes a long time and probably patients are not really attracted to music or yeah you can always say do sports but then it could be a nice tool."* (P5). As another participant stated the design is imagined to be intuitive to play for many people, *"You don't have to be skilled uhm and you don't have to start learning it, you can start right away, maybe that is really the difference between your thing and the existing things."* (P8) And could in this way be a universal approach to let all different kinds of anxiety patients benefit from creating music themselves, even being an advantage over listening to music in therapy as a participant stated, *"But for hearing music it would be probably have very specific tastes again and it's hard to find the music that gets to people, so in this case it could be a very universal approach for people to be able to create music themselves."* (P1) In this way, the design has potential to help therapists in their creativity to support a wider range of anxiety patients, increasing accessible support in clinical contexts. Furthermore, it was clear the drum's flexibility was appreciated, since it was often mentioned the design is very 'open to use' and 'allows for adapting to different musical skills and preferences'. Interestingly, this flexibility was discussed by the participants in two directions, openness of use and technological flexibility. One of the participants mentioned the openness in usage scenarios, that the drum can be used in a very strict manner, *"the therapist does it first and the person copies it"* (P5) or as a stage in the treatment for social phobic persons *"to practice doing something in front of other people"* (P5) but also in a very open way, as stated *"you take this thing (the design) from the therapist home and have it there and have you therapist time at 8 to 8.30 everyday or something and it's very open what they do with it."* (P5). Moreover, the technological flexibility of the design was appreciated, to enable therapists to adapt the tool to different people and over time, when patients make progress or relapse. As one of the participants stated, *"There is a very open way to program it and I mean that makes it very easy to adapt to different musical skills or preferences."* (P5)

Visibility and directness of feedback

The visibility and directness of the multi-sensory feedback, and then especially surprising the light, was appreciated as an added value of the design probe. 16 coded segments from 5 different participants mention this design aspect could add value in e.g. 'visualizing a speaking deadline' for social phobic persons, and 'support making distress visible' for both patient and therapist, and in this way 'increase patients' self-efficacy, competence and satisfaction'. As one of the participants stated, *"What I like, especially is the direct feedback,*

you do something and you hear it and you see it. And you produce something and it is so visible! And it is so there and you will notice. And I think this is something that can increase self-efficacy because you do something and you immediately see the outcome.” (P2)

Drum’s engagement and absorption potential

The drum’s quality to absorb people into play, deeply engage them, and in this way prevent rumination is very much appreciated, by many of the participants (7 out of 11). Its ‘quality to absorb and prevent rumination is a huge benefit of the drum’ is mentioned by 5 of the 11 participants. As one of them stated, *“Thinking about deeper what it does on psychological things it’s the attention grabbing, you can’t ruminate while that, can’t think about lots of other things, at least when you try it first. When it’s always the same rhythm then you could go somewhere else in your mind but that’s very easy to change.” (P5)* in which again the technological flexibility of the design plays an important role. As the participants mention, the multi-sensory feedback of the design plays a big role in engaging and absorbing patients through the design probe, which is appreciated. As dr. Ott stated, *“It’s very different, people they have different sensory channels for absorption...for others it is more the body, they can be deeply inside their feeling states, inside their bodies, so it’s good to have a multi-sensory stimulation so that everybody could take what it’s significant for him.” (P6)* And as one of the therapists mentioned about the important role of the dissonant and harmonic tones in the drum, *“Anxiety is one disorder mostly based on different series of attention and these melodies are one opportunity, one intervention to get the attention away, get distance.” and “I think to get in touch with an anxiety related thing is maybe good to reduce the anxiety reaction to it. For example, the more I get in touch with an unpleasant signal (dissonant tone), the less is the body reaction to it, I can get it more, I can habituate to it.” (P10)*

Support in emotional reflection, expression and communication

Participants discussed the potential of the design probe to support reflecting on inner emotions (when experiencing anxiety), as a start for patients to ‘become an expert of one’s own anxiety’ to support in dealing with responses to anxiety. As stated by one of the students, *“It could help when they should for example express how anxious they feel at this moment, it could maybe help them to realize how anxious they are in those specific situations.” (P7)*. Dr. Ott interestingly describes the role and added value the design probe can potentially have for emotional reflection, *“They kind of learn to regulate and express their emotions by a tool which gives them a kind of isolated playground. So they could see what kind of emotion, what is the sound of, the rhythm of my emotions and by this testing you give them a guide, guideline, how to find their own state. It’s kind of like a retrospection, because you hear, does it feel like I feel? Is this my sound at the moment?” (P6)* He also mentioned the potential of this design probe to support in expressing emotions, which was also often mentioned immediately as one of the first thought of added values of the probe. As stated by dr. Ott, as ‘support in coding emotions’, *“For many people, and especially people in psychotherapy, if they have difficulty to express themselves this could be another way which could also be joyful and playful to have an instrument in which they kind of code how they feel.”* In this way, participants agree the design probe’s ‘advantages of playfulness’ can support anxiety patients in emotional expression, dealing with their anxiety responses. As one of them stated, *“Adults maybe need this kind of thing to get out of their normal thinking behavior.” (P8)* and *“Play is an important aspect in psychotherapy.” (P2)* Just like the support of the physicality of the drum in expression, being an important aspect in a more digital

world, as stated by a participant, *“Yeah, it’s physical, which is kind of important when the world gets more digital.”* (P5)

Fields of use

The application field of the design was often discussed as going even beyond anxiety patients, as stated by several participants, *“I think it would be generally good for them no matter what their specific disease is.”* (P3) and *“Yes, so I would say there is no disease in specific who is not good to use this.”* (P10) However, the participants mentioned a wide range of specific application fields, especially regarding use in therapy practice for different disorder types. A couple of the most mentioned application fields include, ‘opportunities for use in children’s therapy’ (16 out of 52 coded segments), ‘opportunities for social phobic persons’ (10/52), ‘opportunities for bipolar patients’ (4/52) and ‘opportunities for trauma therapy’ (2/52). Other fields were just mentioned or suggested by one participant and not considered valid enough.

Positioning of tangibles in psychotherapy

Interventions for relaxation

Since the design probe provides a novel perspective on a pathway to relaxation, it was key to discuss similar interventions used in psychotherapy for relaxation. Two of the participants recognized similarity with an intervention used especially within the borderline disorder field, called the *“emergency box”* (P3) which *“helps them find behaviors for coping with tensions that they have, really like different ones.”* (P5) Participants explained this is a box made together with the therapist, filled with chosen tools that could support releasing tension and also make *“use from the senses”* (P3). These tools can be a potential friction point for implementing designs like RELAX-CHANGE because they can be used *“on the road”* (P5), are often smaller or make use of an easier mechanism. One of them stated for example, *“Some they have like tiktaks that are really hot so they cause pain and that releases tension or they sniff things that smell like rotten eggs, or a few have hairbands and they click it all the time and that hurts as well. These are like really small and easy kind of skills to release tension.”* (P5) However, discussing the difference with the design probe, participants still see added value, because they see potential in its quality to better prevent rumination, *“I mean things like snipping of the hairband for example that’s it’s not kind of similar, it’s in the same category but it is very different because it just takes a second and you can do it everywhere and you can still ruminate while doing it.”* (P5)

Furthermore, similarities were mentioned with meditation practice and mindfulness.

Especially, dr. Ott stated similarities with *“dynamic meditation”* focused on expressive movements; the deep absorption or hypnotic state that could be created through meditation but also through engagement with the drum; just like similarities with the mindful state that can be created with meditation, just like with the drum, a more *“being in the here and now state”* still able to reflect on cognitive, bodily and emotional responses. However, hereby added value of the drum was still mentioned by participants, especially with regards to the design’s potential to support communication between therapist and patient about states of anxiety, *“I think many clients and people in psychotherapy have a difficulty in expressing what’s going on in them. Even with words, they are not able to verbalize what’s going on. But if you have another way of describing what’s going on with your feelings, of soft emotions or the strong emotions, the loud, you can kind of transform the quality of the emotion by music.”* (P6).

Music related interventions

Similarities were found in the musical aspect of the design probe, the harmonic tones, but none of the participants suggested similarities of interventions using dissonant tones. Participants mentioned often similarities with using normal musical instruments, but often stated advantage of the design probe over these normal instruments because of its accessibility, as mentioned earlier. Furthermore, one of the therapists already used singing melodic lines as part of *“Gestalt therapy”* with depressive patients to distance from emotions, *“I am also using like melodies to make lines, music lines to get also get in distance with these emotional, bad, negative load.”* (P10). It has similarities in getting the focus on something else, and using music distance from emotions.

Objective measurements

Asking participants for the opportunities of the design probe to support in data gathering of certain constructs like anxiety levels, relaxation, absorption or emotional expression it became clear this is a difficult topic, see the next section of ‘tension fields’. Lots of evidence based bio measurements are already used in psychotherapy research, which are known to work well, as stated by prof. Schwenck, *“We compare anxiety levels with measures like skin conductance, eye tracking etc.”* Furthermore, in order to work as objective measurement tool, the behavioral data must be clearly relatable to certain constructs and clearly interpretable. Participants were not that convinced if that was the case for RELAX-CHANGE, *“I don't know how much information I can get out of this and if it's enough.”* (P8) which makes it questionable to position the design probe as a potential useful measurement tool.

Tension fields for design implementation

Here, focus was on finding hurdles to implementation of RELAX-CHANGE in psychotherapy practice and research fields. These are of relevance to find the boundaries of the opportunities and benefits of the design probe, and in general tangibles, within, to state design implications for tangibles in mental health, and future directions for design practice.

Therapist's restricted (innovation) views

It was pretty surprising many of the participants (8 out of 11, with 41 segmented codes) mentioned that therapists nowadays still have a restricted or limited view on implementing new technologies in their daily practice. As multiple of the participants stated, *“Psychologists often have a very restricted view on things.”* (P2) and *“Because psychologists, most of them, a significant part of them barely use browsers and all that stuff. And they are usually not that interested or experienced in anything beyond.”* (P5) and *“Or for example your tool, I think it's a pretty cool idea to have new ideas you know and therapists are not that creative I think.”* (P7) These restricted views are not even with regards to implementing new and innovative interventions in practice, that are technology focused, but also regards implementing findings from research into practice. As prof. dr. Julian Rubel stated, *It is difficult to tell practitioners, well but here is the research right, because they would tell you well I don't care because I was first! No I did this , and I know it is working so why should I apply something that is maybe working as well? Okay you showed it in your research but...* (P4). This clearly shows there is a gap between clinical psychology research and psychotherapy practice, which is a possible restricting factor implementing innovation.

Furthermore, a surprising theme that returned with regards to restricted views was that many of the participants (6/11) discussed digital technology, and focused on this area when they were asked for technological innovation in their field or future expectations. One of the

participants stated regards the missed potential of digital technologies for therapists nowadays, *"They always take a look at what do we have and when can I talk to the patient and they never thought about, oh the patient can look up our homework or what we discussed all the time on his phone, and the never thought about this!"* (P5)

And one of the other participants stated regards current psychological research using digital technologies and the potential of it for future research, *"If you do research and that's a thing that evolved the last years, that people who take part in research get a mobile phone and at random points of time in their normal lives get a message and have to answer like 3 questions really quick really not much but over quite a time so you have samplings right out of people's lives what you couldn't do before. In that way and I think for research there are also many possibilities to do stuff with modern techniques."* (P8) These comments about the potential of digital technologies demonstrate that perceptions of innovation are still limited, and that there is potential for tangibles like the design probe to change this.

Acceptance of innovation and technology

Another potential implementation hurdle for RELAX-CHANGE mentioned by some of the participants was the dependence of integration of new technologies on the therapist's and patient's acceptance. It was interesting that 5 out of 11 participants discussed the importance of the fact that 'both patient and therapist need to be convinced for intervention to be effective'. As prof.dr. Rubel stated regards the importance of having the patient on board, *"I think it is at least unlikely that an intervention works when the patient thinks it's crap. So I think this idea of having the patient on board, making him convinced of the treatment rationale is an important thing."* (P4) Moreover, a statement by one of the therapists made the important role of collaboration between therapists and patients clear when determining the "right" intervention for a patient in therapy, *"You know I like working together, and planning together, and figure out what's working good and what's not working good, and then we use what's working good more and it's very straight, transparent and I have a good feeling out of it."* (P10) Just like one of the other participants stated regards compliance, *"Compliance is one of the most basic things you have to get before starting any kind of therapy."* (P8) These comments clearly demonstrate the importance of acceptance and compliance between patient and therapist with regards to selecting interventions in therapy, and can therefore be a challenge for RELAX-CHANGE or new technologies to play into this.

Tension between psychology and technology

An important insight from this interview is that in general there is tension between the field of clinical psychology and technology. 4 out of 11 participants mentioned various aspects of what creates friction between these two fields. Especially the added value of the design probe compared to the evidence based interventions that are already used was questioned (20 coded segments out of 29 for this subtheme). One of the participants clearly struggled defining the added value of the drum over existing tension release tools like the "emergency box" (as mentioned before), and stated, *"So I have my doubts about the added value. I see that it's more flexible than probably other things but probably when it's about finding a skill set like in the emergency suitcase or finding something which is, does the same in another way, then meditation, mindfulness, yoga, then it's less...than in people who find another behavior e.g. playing the guitar because they learned that and now they're gonna get it out of their memories and then probably getting the guitar for them or doing normal drums is more effective than these drums. But for the people where the patient doesn't find anything,*

then the drum could be a very flexible thing to do.” (P5) Or as stated by one of the other participants, “Uhm, well that’s hard for me to say right now because I mean, I really don’t know if it has an added value to anything that’s out there because there are so many options already.” (P7) These statements demonstrate there is a clear friction between what is already common and used in the field and implementation of new technologies like the probe. Furthermore, an interesting insight was that 3 out of 11 participants discussed the ‘friction between therapy expectations and new tools’. As the participants mentioned, a mismatch between either the therapist’s therapy expectations, or the patients therapy expectations and the role of a new technological tool can be a big hurdle towards implementation. As stated by one of the participants regards a potential friction between a patient’s expectation and use of the design probe, “Yeah and then they think what am I doing here, I am talking about my anxiety and my anger and we’re gonna play a drum, what’s this?” (P5) or as one of the participants mentioned regards the potential that the drum could confirm a negative stereotype a patient can have regarding technology in psychotherapy practice, leading to friction in usage, “It’s not a well-established thing, nobody knows it now, so everyone would be thinking, what the hell is he doing or? Maybe also a bit like the prejudices you have about psychotherapy, someone who wants to express his feelings through other things and there are people who don’t know much about these things, maybe they are also thinking that’s typical crazy psychotherapy stuff.” (P8)

Introduction of new innovations and technology

Therefore, the introduction of new innovations and technologies was often mentioned by the participants as one of the important aspects to psychotherapy in terms of implementing the design probe. ‘Mediation in new technology is very important’, bridging the gap between the field of psychology and technology, as one of the participants stated, “When an institution wants to make digital therapy, or use an app for depression patients they obviously need to develop or buy the app for the systems for someone, but there needs to be someone who is gonna explain the therapists how to use it, and the patients as well.” (P5) Or as dr. Ott stated, even for meditation practice introduction of the potential effects to emotions, cognitions or bodily experiences and mechanisms behind is important to prepare patients for a “new tool”, “It’s good to be prepared to know what the mind does and also that emotions play a significant role in meditation. Because the mind is driven by emotions and so you will be confronted, so it’s a lot of work. And this idea of meditation being work is maybe important to know. It’s not just sitting there and relaxing and letting go.” (P6)

Especially introduction to new technological tools is important to prevent increased anxiety amongst patients. Participants mentioned that a confrontation with for example the design probe could lead to more anxiety, which could on the one hand positively affect dealing with anxiety, and on the other hand could negatively affect the therapy progress. As prof. Schwenck stated, a warm-up session could be a useful introduction to the probe, “You would need to have a warm-up session where they just get to know the instrument, that they can’t make any mistake with that, do anything wrong. Maybe also leave the room, don’t feel observed, and can relax better, so that would be good.” (P11)

Another important aspect to introducing new innovations and technology in psychotherapy practice is that ‘freedom of usage of the tool is important’. Participants (4/11) made very clear that therapists and patients need to be free to choose to use it or not, as stated by two of them, “Yeah it’s very understandable and on the other hand it’s very important that we let people choose that, and always have the option to do things without technology.” (P5) and “I think it should be free to choose for the patient if they want to continue to use it. I am not

sure if I would, I would not force a regularity of how they have to use it. Don't have to use it every week or so." (P1)

Unexpected opportunities

Here, it was focused on unexpected opportunities with regards to implementation of RELAX-CHANGE in psychotherapy practice and research fields. These are of relevance to answer the research question and stretch the boundaries of the opportunities, positioning and benefits of the design probe within psychotherapy research and practice, to state design implications for tangibles in mental health beyond the obvious. Five of the eight most relevant subthemes are discussed.

Drum for education, discussion and reflection

One of the most important unexpected opportunities of the design probe was its potential to support discussion, education and reflection around design and new technologies in psychotherapy practice and research. Surprisingly, the participants (5/11) mentioned there are many stereotypes, images and stigmas present around psychotherapy, especially towards practice. As some of the participants stated, *"Psychotherapy is really stigmatized, we have societal stigmatization, but also self stigmatization. I am so crazy that I need to drink or something, this is very difficult and prevents people from seeking help for example. On the right time, usually there are several years passing before they seek help and receive appropriate help."* (P11) or *"I think many people are maybe afraid to go to therapy because they have this image."* (P3). Even the participants themselves had some stereotypes, as one of them stated about her prejudices before starting her internship at a psychiatry, *"And it wasn't so clear to me because I always thought people who are in a closed psychiatry just must be off their minds."* (P9) These statements demonstrate that these present stereotypes could potentially hold back implementation of tangibles like RELAX-CHANGE or people with anxiety reaching out for support and therapy. Next to that, the participants saw potential in the role of the design probe to break these images or make help more accessible to patients breaking the stigmas. They even stated a potential role for the design probe in education. As one of the participants clearly stated, *"If you go to a school and present it in a class then everyone tries it out and so then you tell them you can also use it if you have certain disorders and then maybe the pupils are thinking about I didn't hear about this at all and that is interesting and like to connect it with education about like mental health, maybe education about diseases. That's also a thing that is not enough done by now, I never learned something about mental disorders or so and there were people who had some and no one knew what it was and how to react and so and I think there is a big potential to use tools and maybe your tool is a good one for that, to show it's normal, everyone has like anxiety for example, and some have anxiety in a form that is so much that they suffer from it."* This same participant also suggested the importance of creating understanding already at an early age and the role RELAX-CHANGE could play in this, *"Yeah I think that's the important thing to know that anxiety is something everyone has and that's more effective if you don't only say it to the people but have a cool appliance that blinks and makes sounds and can be touched."* (P8)

Re-consider drum as objective measurement tool

One of the potential opportunities of the design probe to support as an objective measurement tool for various constructs like relaxation effects, emotional expression etc. was discussed with the participants. Participants questioned the usefulness of the design

probe for data gathering, especially the added value of it compared to the dominant role of self-reported data in psychotherapy practice and research. As prof.dr. Rubel stated about competing data, *"For me maybe the most picking thing that always left me a bit critical, what if the patient says I am not benefitting, I feel as bad as the start of the treatment, but these objective measures shows the patient is making progress. So how to combine these two right? And for me in the end I would always say well the prove of the putting is what the patient says (self-reported). That is what I have to work with as a therapist, so how can I and how should I use competing information potentially right?"* (P4). Furthermore, participants mentioned 'self-reported data is easy to interpret', 'can start a dialogue', and 'gives a sense of contributing and involvement' and discussed the importance of self-reporting in creating 'an active patient, taking agency', important in psychotherapy. Moreover, participants questioned the implementation of the drum as measurement tool, since objective measurements 'can be difficult to process or interpret'. As one of them stated with regards to a data gathering setting in practice, *"It is very hard to implement that actually, because only then you would actually know what it means in the session. Because I think it would be very interesting to know when the patient uses it and how the intensity varies for example, I think this is very interesting to know as a therapist because you know what's going on basically. But I think this is connected to a very difficult setting."* (P2) and as prof. dr. Rubel stated, *"Objective measures, it's not a natural information, it is difficult to process, you need several theories in between from the data to the message, to the influence you want to make."* (P4) Interestingly, these statements demonstrate this data gathering opportunity of the design probe might need re-consideration.

Connecting therapy with daily life

Participants mentioned an upcoming topic within psychotherapy is connecting therapy to daily life. As one of them stated regards experiencing challenges in daily life as a patient, right after walking out of therapy and the need for connecting technologies to therapy or therapists, *"You think you are not sufficient anymore because in therapy everything works and then in e.g. Seltersweg nothing works and for therapists it's not that easy to, they have just one hour, and they can't reach their patients. The system right now doesn't really allow to reach them, you can obviously call them but then you usually call for organizational reasons."* (P5) This demonstrates new potential for the design probe to connect therapists or what is learned in therapy with daily life and coping skills practice.

Use in group therapy

Another application area not considered before but mentioned by some of the participants to have potential to increase benefit of using the drum in psychotherapy practice is use in group therapies. As one of the participants stated, regards the benefit of group therapy to show the gap between patient's social experiences and therapist's observations of social behavior of the patient, *"For example in one of these sessions we could see the patient described it as how well they felt and felt so much integrated and felt the harmony between themselves and the other group while when seeing this patient play in the group you could see what he plays had no relation to what others played at all."* (P1). Or as one of the therapists stated regards the benefit of sharing the drum experience with others, *"So for me I could imagine it could also work in a group setting, cause it makes it more fun by sharing it with others."* (P10)

Use for therapists themselves

A final unexpected opportunity was the use of RELAX-CHANGE for therapists themselves. Various participants mentioned the difficulties of stress-management amongst therapists, as stated by one of them, *“Well, I think one really important challenge, what I have already experienced, is stress, stress, stress, stress.”* (P9) Moreover, dr. Ott stated that therapists have the need to calm down and open up again before starting another therapy session with a next patient. As he stated, meditation is already one of the techniques used for that, *“Even psychotherapists like to meditate because they want to be very present and empathic for the clients, for the patients. And as a psychotherapist, you have these 15 minutes sessions and 10 minutes break and then the next one comes and you only have 10 minutes, and then it is a very effective technique to get calm, to get open hearted and open minded and clear.”* (P6) The challenges of therapists with stress management, together with the need to open up and calm down in between sessions demonstrates potential for the design probe to also provide support for therapists in relaxation and emotional reflection or expression.

Future visions in psychotherapy

Here, it was focused on determining the chances of designers and tangibles in clinical mental health contexts, how open is the mindset, what is valued in future psychotherapy research and practice and what would be the role of (tangible) design in this? These are of relevance to state clinical and design implications.

Future of psychotherapy

The 11 different participants all differently envisioned the future of psychotherapy and then especially aspects of practice that should be preserved or changed. One aspect that the participants agreed on was the fact that the ‘personal aspects of psychotherapy should be kept’. As one of the participants stated, *“I don't think that the work of psychotherapists will be substituted by computers in general, because there is really this aspect you wanna talk to a person.”* (P9) Just like one of the other participants stated, in the future person-to-person psychotherapy will not be substituted by technology, but he emphasized it will probably be affected by technology in the future, *“It's not about we're gonna stop face to face therapy or we gonna do via video or via a bot, that's gonna come as well, but it's always about change it's about adding value with these technologies or digital technologies.”* (P5) This demonstrates that participants see a role for future technological changes in psychotherapy, but the personal aspects of therapy need to be preserved and will not soon be substituted. On the other hand there is the vision amongst participants that therapists can be more open minded towards implementation of new technologies in future psychotherapy, that there needs to be a change in attitude. As one of the therapists stated, *“For me therapists must be open minded for these new things, because of the high developing society, we need to be flexible, that's my way of thinking.”* (P10) This shows potential for the implementation of the design probe in future psychotherapy practice to increase therapist's flexibility.

Design important for the future

The participants in general share the opinion that design is going to play an important role in the future, and they show openness towards implementation of new technologies in the future. Participants discussed that ‘design can extend horizons’ and that ‘future use of technologies is important to be able to use different approaches’ to create effective therapy. As one of the participants stated, *“It's about being creative and by using these drums, you get more, you extend your horizon of doing it more flexible maybe.”* (P10) and as another participant stated, *“It probably wouldn't work for everybody but that's totally fine. I think just*

having the second opportunity and having a different source of information would be beneficial.” (P2) However as mentioned in the statement above, it’s about what added value will it bring in the future to whom. Participants are super aware of the fact that using technology in psychotherapy, especially in practice will not be for everybody, not for every patient, not for every therapist, but that is how it is. As stated by one of the participants regards the fact technology does not need to be “everywhere” for some patients or therapists which is reasonable, “I think there is a group of therapists, and there is a group of patients that specifically don't want technology in therapy as well, because technology is everywhere, so that doesn't need to be in my therapy as well. And that's very important, totally fine, that technology has no right to be everywhere.” (P5)

Role of new technologies in psychotherapy

Various roles of new technologies in psychotherapy, especially in practice, were mentioned by the participants. Participants recognize technology is going to influence more aspects of life, so also therapy practice, as stated by one of the participants, *“First of all it's going to influence all aspects of our lives, regardless if it's psychotherapy, health, stress management, also computer just in general.” (P9)* and by a therapist, *“We are actually in a very high technical development at the moment, using more internet technology, human beings are also developed over time, that's why there must also be a more open mind to new things.” (P10)* In general this demonstrates an open mindset towards the role of technology in therapy practice in the future amongst the participants. There is especially a role seen for technology to ‘connect therapy with daily life’ and ‘to enhance the diagnosis processes’, especially through digital technologies or Artificial Intelligence. As one of the participants stated regards connecting tangibles with online therapy, *“Maybe it can be well integrated in online therapy.” (P1)* or connecting therapy with daily skill practice, as stated by another participant regarding parent-child bonding, *“I can really imagine this could be nice as some homework which comes from the therapist, like we have something from the therapists in our daily life and then we gonna use it and kind of do something good for each other.” (P5)* Moreover, participants stated technology could enhance or take over the diagnosis process of symptoms in psychotherapy practice, as stated by one of them *“It doesn't mean it will substitute therapy, cause the point of therapy is going to a person, talk to a person and you don't wanna talk to a computer. But I think especially in recognizing illnesses, ticking symptoms, I think that will be substituted by a computer or AI.” (P9)*

This demonstrates roles are envisioned for technologies in psychotherapy practice, and there is potential for the design probe to play a role in connecting therapy with daily life practices and solving various challenges in therapy practice.

Appendix I: Extra Prototype Material

Outside Casing Checklist for Evaluation and Decision Making

Casing outside proportions (size)

Good, right size for sturdiness and expression. Top layer big enough to have the right expression, casing not in the way of playing.

Shape casing

Overall size is good, does not need to be smaller!

If you would make it bigger, it would be annoying to reach the pads and have a good interaction for expression.

Touch pads (size, material)

Size touch pads is fine.

Using metal is not necessarily a bad thing, it is a little bit unexpected though.

However, the material or touching the material has to give some feedback, people like to press buttons, it is somehow satisfying.

A thing to change about the touch pads could be the shininess of the material, any structure change for visual mapping as well or would that be overwhelming? But the material still has to be in contrast with the surrounding materials such as the illumination layer.

Touch pads proportions

Make the 3 different tension levels more visually clear besides the musical feedback: size, color, material structure.

G-D proportion can be exaggerated. E.g. make D smaller compared to G pad; and the G's could be made wider.

The central G's need to be placed horizontally, not vertically, to make the visual mapping clear and to fit the way your arms are positioned. How would this differ per person?

Touch pads shape

The shape of the touch pads create affordances for the direction in which they need to be touched / in which they can be touched best. The curve of the touch pads somehow creates the affordance to push at the circular top part, so not particularly using your whole hand for slamming (just your top finger part).

Touch pad in / on top of upper layer (affordance check)

Touch pads need to be layed a little bit in the top layer to create some touch feedback, create some depth underneath. This to create a more clear mapping that touch is connected with a certain output and have a confirmation on what you're doing.

Light pattern

The speed with which the light changes color is very important as confirmation on your touch and to prevent performance anxiety. It would indeed be very interesting what reactivity level suits certain people. Some would really like to be active, some would like the more slow relaxed approach. Would there be a personal ideal level of sensitivity of the light reacting to the touch interaction?

The more you interact with it, the more clear the light mapping gets. How fast would people discover the light's function and interaction?

The light heating up is very satisfying. Touching it less, making it colder can be confusing → what to do with hot-cold mapping? should there be any cold? or make these differences more explicit!

Light visibility (amount - transparency illumination layer)

Separate LED's are nice since it looks like they are connected to the different pads (localized).

Light surfaces could work as well / use smaller ones to really see they are connected to the different pads.

Light could also function for creating a more clear separation between the 3 tension levels, having color differences that belong to the 3 'kinds' of pads showing they belong together (I think we need to stick to one function for each of the feedback mechanisms).

3D Printed Case

- any sturdy construction inside?
determine with 3d modeller
- on the inside of the case hollow compartments for main microcontroller, breadboard/printboard, cap.touch sensor module
include: microcontroller, cap. touch sensor, printboard/breadboard, indents touch pads, light (surface) holes, magnet indents (body & top layer), connection holes (toggles, headphone connection, microcontroller cable connection)
- strong anti-slip bottom
could be from other material and color as body and top layer, with more density (heavier) and more structure (for grip)
- support on lap bottom
keep it played on the table for optimal expressiveness
- nicely integrated plugs and connections
see point 2
- experiential, sturdy size → bigger?
proportions of the instrument seems good!
- sturdy shaping → flat upper side
flat upper and top side, no reason to make them hollow or bowl shaped
- sturdy detachability system
 - get easy to microcontroller
 - get easy to breadboard
 - get easy to light connections
 - get easy to captouch sensor and its aluminum connections
 - get easy to toggle and knobs connections
 - detachable illumination layer
 - how to click the layers on top of each other?
- make sure when you go inside that wires cannot break! (a place to store the wires?): touch pads with little soldered wires attached to krokodillenbekjes inside body; led wires 3 krokodillenbekjes per light system inside body.
- work with magnets as attachment material for illumination layer - top layer; top layer - body; maybe body-bottom.
- make headphone jack construction able
use audio jack from the raspberry pi! or the hdmi output
- touch pads in-outside casing
inside casing but need to be able to provide touch feedback through indents
- protection of the LED's / light illumination layer

can be lasercut at uni:

https://assets.studiegids.tue.nl/fileadmin/content/Faculteit_ID/Downloads/Master%20Downloads/Labs/Lasercutter.pdf

or 3D printed at uni: <https://studiegids.tue.nl/opleidingen/graduate-school/masters-programs/industrial-design/facilities-and-regulations/facilities/labs/generic-make-labs/dsearchrapid-prototyping-lab/> → a transparent thin layer can be 3D printed as

well at TU/e: <https://www.stratasys.com/3d-printers/objet-350-500-connex3>

acrylaat wit mat or helder:

<https://www.lasersheets.eu/materiaal/acrylaat/dekkend/acrylaat-mat-wit-3-mm/>

<https://www.gamma.nl/assortiment/martens-acrylplaat-transparant-50x100-cm/p/B151770> (sanding)

maybe lasercut together with aluminum touch pads

ask mama :)

- 3D modeller

ask within the slack group! (Martijn / Matthijs)

- production 3D company

Studio Tast? (vriendenprijsje?) / gratis at TU/e d.search lab!!

<https://studiegids.tue.nl/opleidingen/graduate-school/masters-programs/industrial-design/facilities-and-regulations/facilities/labs/generic-make-labs/dsearchrapid-prototyping-lab/>

<https://www.shapeways.com/materials/multi-jet-fusion-pa12> (MJF PA12 black smooth)

- (buy own) filament material and color

advice over which one is most neat afgewerkt and most sturdy!

most suitable: ABS, Pro ABS, NylonX Polyamide, (?) ColorFabb nGen, PET, PC.

(ABS op bol.com) https://www.bol.com/nl/l/zwarte-abs-filamenten/N/24074+4274014530/filter_N/16726/

Objet Connex 350 can print non-slip materials (rubbers) for bottom layer! It can also 3D print multiple layers from different materials on top of each other!

Touchpads

- size and proportions and shape
 - bigger pads? (look at average hand sizes?)
 - other proportions from each other?
 - other shaping?
- indents for touch pads for touch feedback
- make 3 different tension levels visually clear (proportions pads exaggeration)x
- materials (non-sharp)
 - aluminum** (how to make not sharp, make indents in top layer of casing)
<https://www.inno-tec.nl/contact>
<https://www.laserparts.nl/nl/aluminium-lasersnijden/>

via Tast, dikte: 1mm: <https://www.gamma.nl/assortiment/plaat-aluminium-100x50-cm/p/B309322>

3D printen:

<https://www.shapeways.com/materials/aluminum>

- conductive 3D print material (hard to get this filament, risk)
https://www.matterhackers.com/store/l/proto-pasta-conductive-pla-1.75mm/sk/MUW33A27?rcode=GAT9HR&qclid=EAlaIqObChMl4bCJgZ6-4AIVAQlpCh2-TqslEAQYASABEgIY_vD_BwE
- thin conductive foam (1.0 mm)
- research **makey makey!** and other conductive materials that are not the usual ones (hook up to rPi by USB)
- pads connected with a little wire (soldered) and inside the body with a 'krokodillenbek' (8)
- production lasercutting CANNOT be done at university! / use company
https://assets.studiegids.tue.nl/fileadmin/content/Faculteit_ID/Downloads/Master%20Downloads/Labs/Lasercutter.pdf

Light Feedback

- more LED's? to be flexible in pattern (evaluate)
less led's (16)
- more secure way of using LED's
 - LED strips
 - LED rings
 - LED matrices (flexible)

individual separate leds

- another light pattern?
- visibility of the light
 - amount of LED's
 - transparency of the illumination layer

full brightness leds, illumination layer (try out different transparencies)

- responsiveness categories for the knob (speeds of color change)
- color mapping categories for toggle
- light system cables (3 per system) connected from printboard/micro controller to LED cables via krokodillenbekjes (max.9)
leds need to be parallel in circuit, how to divide the cables?

To do

- set all the details (from evaluations) ~
- layered prototype drawing with proportions and material use
- arrange 3D modeler
- 3D print model(s)
- lasercut files
- other orders
 - attachment materials

- materials for production
- LED's
- music box?
- hardware electronics (toggles, knobs, headphone jack, wires, microcontroller)
- get orders 3D model, laser cutting (where to produce it), E.E. guy arranged
- financial list (budgeting), including back-ups and space for mistakes
- assembly of the prototype layers

Evaluation checklist

- Casing outside proportions (size)
- Shape casing
- Touch pads size
- Touch pads proportions
- Touch pads shape
- Touch pad in / on top of upper layer (affordance check)
- Light pattern
- Light visibility (amount - transparency illumination layer)

Financial budgeting

Since the high level prototype is not yet finished, this is a preliminary budget.

Total Budget:	€ 1.000,00		
Estimated:			
	Programming		Casing & Modeling
	€ 500,00		€ 500,00
Hiring Tijmen	€ 300,00	Extra Electro Costs	€ 50,00
	€ 200,00		€ 450,00
Electronic Components	€ 150,00	Hiring 3D Modeller	€ 250,00 10 hours
	€ 50,00		€ 200,00
Equipment	€ 100,00	Materials	€ 100,00
	-€ 50,00		€ 100,00
		Production	€ 100,00
			€ 0,00
Real:			
	Programming		Casing & Modeling
	€ 500,00		€ 500,00
Hiring Tijmen	€ 300,00	Extra Electro Costs	€ 112,99
	€ 200,00		€ 387,01
Electro + Equipment	€ 272,99	Hiring 3D Modeller	€ 0,00 for free
Unforeseen costs	€ 40,00		€ 387,01
	-€ 112,99	Materials	€ 9,95
			€ 377,06
		Production	€ 0,00
			€ 377,06

Appendix figure 19 - preliminary budgeting high level prototype development.

Appendix J: Approval Form Research Institute Abroad (Giessen, Germany)

Request for Physical Mobility Plans Semester 1 20/21 - Veerle van Wijlen (M1.2)

to: mbruns@tue.nl

cc: L.Chen@tue.nl ; m.v.birk@tue.nl

Dear Miguel,

For semester 1 of 20/21 I plan to conduct a design research project at a research institute connected to the Justus-Liebig-Universität in Gießen, Germany. The university is a public research university and home to an educational facility for psycho therapists. In collaboration with Prof. Dr. Julian Rubel, and support from Dr. Max Birk, I want to proceed my M1.2 design research project, about a physical, expressive and multisensory drum tool (RELAX-CHANGE) changing the perspective on relaxation for people with high levels of anxiety. Prof. Rubel was involved in my M1.2 project. Prof. Rubel is an expert in treatment efficacy in therapy contexts (psychotherapy / clinical psychology). Possible research directions I would like to explore involve treatment efficacy related to RELAX-CHANGE; design for behavioral analysis; and/or therapist acceptance (of this type of design) in a variety of therapy contexts.

There are three main points that make me confident that this internship would help me build out competencies described below and benefit my development even under considerations of a second outbreak:

1. The facilities in Giessen are and have been operational throughout the first outbreak wave. The clinic is a teaching clinic and students will have access to the work that is conducted. Because the situation in Germany is changing as well, the exact degree of access is unclear—in the very worst situation, I would be able to watch videos of therapy sessions and discuss the observed with students and teachers.
2. Prof. Rubel would commit to working frequently with me and provide me with literature, feedback, and contacts to psycho-therapists, patients, and students. While barriers in a co-located setting would be reduced, I could participate in many of these activities over distance as well, as I have done this term.
3. The borders between Germany and the Netherlands were never closed, even not during the first outbreak. Considering that we are globally better prepared to deal with the outbreak of COVID-19 in a second wave now.

I am fully prepared for repatriation in case of a second outbreak. However, to have access to facilities and to Prof. Rubel's time, I would need to be temporarily affiliated with the institution.

Personal Competence Development and Personal Gain

Within this specified design research context there are various competencies I want to learn which are connected to specific expertise areas. Such as, preparation and execution of (quantitative) controlled experiments, incl. control conditions, regards e.g. treatment efficacy [U&S / DRP / MDC]. Related to this is, I want to acquire quantitative data analysis & user modelling skills, understanding and interpreting the data gathered in relation to the user [MDC / U&S].

I would like to improve high-level prototype development skills for “clinical studies”. Therefore, I want to get acquainted with budgeting, business considerations and prioritizing [TR / CA / BE]. Other competencies include, design for behavioral analysis (quantitative),

learning to design aesthetical interactions for engagement, that at the same time log play behavior for analysis and use in therapy contexts [MDC / TR / CA].

Furthermore, I want to immerse myself in a psychological context (observations and interviews); visit therapy sessions, familiarize with various special need groups, learn psychological approaches, terms and methods through the lense of a designer to identify design opportunities, positioning and its role in these contexts [U&S / DRP / CA / BE]. Next to that, I want to familiarize with multi-stakeholder design research processes and approaches (interviews, focus groups, co-design) to consider the diverse needs and roles of clients, clinicians, therapists and users [U&S / DRP / BE].

Potential related research possibilities include therapist acceptance in diverse therapy contexts, as one of the most important potential stakeholders in the contribution of design as supporting tools in therapy contexts [U&S / DRP / BE]. Finally, immersing myself in this cultural context will enhance my cultural awareness as a designer and support marketing myself into Germany. This, through reflection on Dutch contexts and understanding differences in, for example, dominant strategies, therapy forms and connections to therapists [U&S / BE].

Learning a selection of these competencies matches my vision of enhancing empowerment and social integration of special need groups, enabling them to add value to others around them. My goal is to create safe spaces for special need groups through design, where they can be their best self. Therapy is supposed to support individuals in need, but how can design support therapists in achieving their goals to improve therapy efficacy, enhance empowerment, and social integration in/aside therapy? The trajectory of the project matches my professional identity of user experience designer, learning various ways to evaluate user behaviors, experiences, behavior change through design, and discovering the role of design in the creation of empowering and inclusive experiences.

Appendix K: ERB Form

Ethical Review Form

(Version 27.06.2019)

This Ethical Review Form should be completed for every research study that involves human participants or personally identifiable data and should be submitted before potential participants are approached to take part in the research study.

Part 1: General Study Information

1	Project title	Design Opportunities in the Context of Psychotherapy: the potential opportunities, positioning of, and benefits of a creative and multi-sensory drum tool, that engages adolescents / adults with high levels of anxiety or depression in building towards an expressive highlight in play, for their perceived relaxation and perceived support within a multi-stakeholder therapy(-home) context.
2	Researcher	V.S. van Wijlen (Veerle)
3	Email researcher	v.s.v.wijlen@student.tue.nl
4	Supervisor(s)	Project Coach: dr. M.V. Birk
5	Faculty/department	Industrial Design
6	Research location	JLU campus (Philosophikum 1) or using secure remote collaboration tools that are supported by the TU/e and JLU (e.g. Microsoft Teams, Skype Business)
7	Research period (start/end date)	September 2020 – February 2021
8	Funding agency	/
9	[If Applicable] Study is part of an educational course with code:	DPM420 Project at uni./ research abroad
10	[If Applicable] Proposal already approved by external Ethical Review Board: Add name, date of approval, and contact details of the ERB	/
11	Short description of the research question	<p>What are the potential opportunities, positioning of, and benefits of a creative and multi-sensory drum tool, that engages adolescents / adults (18-35 years old) with elevated trait anxiety (as defined by the trait-state anxiety inventory) or depression, in building towards an expressive highlight in play for relaxation support, within the multi-stakeholder therapy(-home) context(s)?</p> <p>People with elevated trait anxiety experience expressions of worrying and rumination, meaning streams of negative thinking, either future-or past-oriented, difficult to control which causes tiredness and a decreased self-image (feeling of incompetence) which highly asks for a need of support in relaxation.</p> <p>Current methods, used in psychotherapy and simultaneously at home, to overcome moments of negative thinking, go from the principles of distraction or acceptance to either fully accept the cognitive, emotional and physical responses to worrying/rumination (not avoid, not achieve) or</p>

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to guide attention more outwards, away from the thought stream e.g. by being absorbed in a certain task, and in that way provide a distracting (or mindful) outlet for negative thinking.

However, current supportive tools and designs for relaxation making use of these distraction or acceptance principles, that are used in therapy(-home) contexts are based on applied relaxation techniques used in cognitive behavioral therapy (CBT), mindfulness or meditation. These often go from the need for comfortable, soothing, and calming experiences (such as breathing exercises, imaginary techniques or progressive muscle relaxation) but don't cover physicality, expressivity and multi-sensory musical experiences (including music engagement and mood stimulation).

However, this is important to address, given the fact that moments of physical, intense expression as outlet (almost like a work-out) are really needed to break anxiety cycles as contradiction to the more calming and soothing methods. [expressivity]

Furthermore, the response to worrying and/or rumination is multi-faceted, namely cognitive, emotional and physical which can be addressed more effectively through multi-sensory experiences [multi-sensory], helping to decrease emotional states through music engagement, decrease body tension through touch and movement and distracting from thought process through light guidance and musical play, turning attention more outwards, making use of the senses.

Physicality enables increased, accessible, opportunities for engagement in distracting consuming tasks [physicality] and so dealing with moments of worrying/rumination.

Furthermore, a physical object to perform a relaxation task with can increase the feeling of trust and reliability in the process of overcoming worrying/rumination, having something physical and sturdy to rely on [physicality].

These three uncovered aspects of expressivity, multi-sensory and physicality are turned into the design of RELAX-CHANGE: a physical, expressive and multi-sensory drum tool changing the perspective on relaxation for people with high levels of anxiety within the therapeutic context (psychotherapy).

Researching the opportunities, positioning and benefits of this new perspective on relaxation and relaxation support for people with elevated trait anxiety (and sometimes additional depression symptoms), through the design of RELAX-CHANGE, can contribute not only to the patient's well-being and quality of life. But also to the needs, challenges and values of other various stakeholders within the therapy (-home) context, within the various phases within this therapy process. Such as psychotherapy researchers, psychotherapy practitioners, psychology students and

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		<p>insurance companies in a variety of psychotherapy fields ranging from anxiety disorders, to depression, to child psychology or bipolar disorders.</p>
<p>12</p>	<p>Description of the research method</p>	<p>The study involves a combination of quantitative and qualitative research methods, with a main focus on the qualitative research methods (Mixed Methods approach). In order to explore the research question mentioned above, it will be made use of semi-structured interviews (online or in person), focus groups (primarily online) / co-evaluation sessions (primarily online) and design evaluations (online or in person) as part of a user-centered design approach and a research-through-design methodology. These primarily qualitative research methods will be conducted over 2 to 3 iterations.</p> <p>Semi-Structured Interviews The focus of the first iteration is on semi-structured interviews with various stakeholders in the context of psychotherapy (research and practice). The interviews with clinical psychology PhD's who have started their clinical training (Ausbildung); clinical psychology PhD's who have not yet started their clinical training; people who are primarily in the Ausbildung; researchers (within various areas of clinical psychology and psychotherapy); and master/bachelor students (interested in clinical psychology and psychotherapy) will consist each out of 3 phases. These can be described as an introduction (welcome, introduction of participants, purpose, why invited, guidelines (which are already made clear in the consent forms upfront of the interviews), roles clarification) and starting question about their focus within clinical psychology / psychotherapy research or practice;</p> <p>A 3-phase discussion in which 3 main topics will be discussed using prepared open-ended and closed questions regarding first impressions on the opportunities of RELAX-CHANGE for supporting research on relaxation, emotional/physical/cognitive responses, task absorption and more related psychotherapy research topics or first impressions on the opportunities of RELAX-CHANGE for relaxation support in psychotherapy practice contexts, and process phases; values, needs and challenges in their specific psychotherapy research or practice context; and reflections on the future role of 'design' / 'creative technological solutions' within clinical psychology / psychotherapy research and practice (vision shaping).</p> <p>A closure (final questions, oral summary to the participant & reactions on that, thank you and goodbye).</p> <p>Each interview will approximately last for 30-45 minutes. Furthermore, due to the COVID-19 situation, participants are provided with the opportunity to let the interviews take place in either an online video conferencing environment, fitting the needs and capabilities of the participants and with</p>

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appropriate recording possibilities, e.g. Microsoft Teams, Skype, Zoom (often used in the JLU psychology department) or in person taking the most recent rules and regulations in Giessen (Germany) regards social distancing and hygiene into account.

Focus Groups / Co-Reflection Sessions

The focus of the second iteration is on focus groups and/or co-reflection sessions. The focus group sessions and/or co-reflection sessions will consist each of an introduction (welcome, purpose, why invited, guidelines (which are already made clear in the consent forms upfront of the focus groups), roles clarification, introduction of participants);

A phase in which (video)prototypes, that show the experiential elements of the rebuild RELAX-CHANGE prototype, will be discussed using prepared open-ended questions as in a semi-structured interview. These (video) prototypes consist either of the 2nd high fidelity prototype version of RELAX-CHANGE in which the touch, sound and light modalities are all together experienceable within a group context (taking the most recent rules and regulations in Giessen (Germany) regards social distancing and hygiene into account); or of a product video showing product explanation incl. possible interactions and use contexts within the psychotherapy research and practice contexts.

In this phase various discussion topics will be touched upon after the participants have interacted with the (video)prototypes. These discussion topics include interaction based questions, multi-stakeholder UX evaluation based questions and intervention based questions (addressing the design's, design's principles and design's perspective contribution for relaxation/relaxation support and more for multiple stakeholders, in multiple anxiety-depression related psychotherapy contexts).

A closure (final questions, oral summary to the group & reactions on that, thank you and goodbye).

Each focus group/ co-reflection session will approximately last for 45-60 minutes. Furthermore, due to the COVID-19 situation, the option will be provided for online focus groups / co-reflection sessions, taking place in an online video conferencing environment fitting the needs and capabilities of the participants and with appropriate recording possibilities, e.g. Microsoft Teams, Skype or Zoom (often used in the JLU psychology department). In case COVID-19 allows to let the focus groups/co-evaluation sessions take place in person, the most recent rules and regulations in Giessen (Germany) regards social distancing and hygiene will be taken into account.

Design Evaluations

The design evaluations are mainly taking place in the first iteration, since parallel to the first semi-structured interviews a high fidelity (2nd version) of the RELAX-CHANGE

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		<p>prototype is developed. Therefore, informal feedback is needed on various aspects of the design elements, such as: prototype casing (size/proportions/materials used), multi-sensory interaction (music/light enablement), touch modalities (touch feedback/proportions/materials used) and quantitative behavioral data analysis. The design evaluation sessions will consist each of an introduction (welcome, purpose, why invited, guidelines (which are already made clear in the consent forms upfront of the focus groups), roles clarification, introduction of participants);</p> <p>A try-out, evaluation, and discussion phase in which the various aspects of the design elements, mentioned above, are tested out on the first RELAX-CHANGE prototype version and discussed with the researcher.</p> <p>A closure (final questions, oral summary to the participant & reactions on that, thank you and goodbye).</p> <p>Each evaluation session will approximately last for 15-30 minutes. Furthermore, due to the COVID-19 situation, the option will be provided for online evaluation session option, taking place in an online video conferencing environment fitting the needs and capabilities of the participants and with appropriate recording possibilities, e.g. Microsoft Teams, Skype or Zoom (often used in the JLU psychology department). In case COVID-19 allows to let the evaluation sessions take place in person, the most recent rules and regulations in Giessen (Germany) regards social distancing and hygiene will be taken into account.</p>
13	Description of the research population, exclusion criteria	<p>Semi-Structured Interviews</p> <p>The semi-structured interviews target various stakeholders in the context of psychotherapy (research and practice). This variety of stakeholders mainly includes researchers and practitioners within clinical psychology and psychotherapy departments of the JLU and its corresponding outpatient center. In more detail, the interview participants involve a selection of the following: clinical psychology PhD's who have started their clinical training (Ausbildung); clinical psychology PhD's who have not yet started their clinical training; people who are primarily in the Ausbildung; researchers (within various areas of clinical psychology and psychotherapy); and master/bachelor students (interested in clinical psychology and psychotherapy) related to the context of worrying and/or rumination (anxiety disorders, depression, and others as child psychology and bipolar disorders). So, to be clear, the semi-structured interviews will <u>not</u> involve patients currently in therapy within these mentioned psychotherapy contexts.</p> <p>For this research pertaining to design opportunities for playful, expressive, physical and multi-sensory interaction, only healthy consenting adults will participate. In order to fulfill the criteria of consenting adults, each participant has to sign a consent form to either give consent to participation</p>

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or not and to the extent of audio and video recording and publication of data.

In this specific COVID-19 situation it is especially emphasized on recruiting technology capable participants, who are able to work with video technologies.

The participants for the semi-structured interviews will be recruited based on convenience and heterogeneity. In collaboration with prof.dr. Rubel from the department of psychotherapy research at the JLU, participants will be recruited with the help of his network and the colleagues he is working closely together with. It is chosen to recruit heterogenous groups of participants, since this will spark more diverse perspectives on the design opportunities of RELAX-CHANGE within this immense broad field of psychotherapy research and practice and applied relaxation. The heterogeneity of the participants will especially be in the difference between researchers, practitioners, master and bachelor students within clinical psychology and psychotherapy. Furthermore, these participants will offer expertise within different areas of clinical psychology / psychotherapy and so create another layer of heterogeneity within the research.

Exclusion criteria:

- Participants without consent
- Participants who are not researchers or practitioners within either clinical psychology or psychotherapy
- Patients currently in any kind of mental health / social health therapy (e.g. anxiety, depression, bipolar disorders)
- Participants with severe mental states or issues
- Experts outside clinical psychology / psychotherapy
- Experts in clinical psychology / psychotherapy outside the fields of anxiety disorders, depression, and others as child psychology and bipolar disorders.

Focus Groups / Co-Reflection Sessions

The designed (video) prototypes and research target various stakeholders in the context of psychotherapy (research and practice). This variety of stakeholders mainly includes researchers, practitioners and supervisors within clinical psychology and psychotherapy departments of the JLU and its corresponding outpatient center. Other indirect stakeholders that might be involved include insurance companies, or consented family members from patients within the field of anxiety disorders, depression, child psychology and bipolar disorders or from other relevant mental health / social health groups. In more detail, the participants involve a selection of the following: clinical psychology PhD's who have started their clinical training (Ausbildung); clinical psychology PhD's who have not yet started their clinical training; people who are primarily in the Ausbildung; researchers (within various areas of clinical psychology and psychotherapy); and master/bachelor students (interested in clinical psychology and psychotherapy), insurance companies, or consented family

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members from patients within the field of anxiety disorders, depression, child psychology and bipolar disorders or from other relevant mental health / social health groups. So, to be clear, the focus groups / co-evaluation sessions will not involve patients currently in therapy within these mentioned psychotherapy contexts.

For this research pertaining to design opportunities for playful, expressive, physical and multi-sensory interaction, only healthy consenting adults will participate. In order to fulfill the criteria of consenting adults, each participant has to sign a consent form to either give consent to participation or not and to the extent of audio and video recording and publication of data.

The participants for the focus groups / co-evaluation sessions will be recruited based on convenience and heterogeneity. In collaboration with prof.dr. Rubel from the department of psychotherapy research at the JLU, participants will be recruited with the help of his network and the colleagues he is working closely together with. It is chosen to recruit heterogeneous groups of participants, since this will spark more diverse interaction amongst participants and will encourage participants to look from multiple perspectives to the presented (video) prototypes and so be better able to give valuable insights about its opportunities within this immense broad field of psychotherapy research and practice and applied relaxation. The heterogeneity of the participants will especially be in the difference between researchers, practitioners, master and bachelor students within clinical psychology and psychotherapy and the indirect stakeholders. Furthermore, these participants will offer expertise within different areas of clinical psychology / psychotherapy and so create another layer of heterogeneity within the research.

Exclusion criteria:

- Participants without consent
- Participants who are not researchers or practitioners within either clinical psychology or psychotherapy
- Patients currently in any kind of mental health / social health therapy (e.g. anxiety, depression, bipolar disorders)
- Participants with severe mental states or issues
- Experts outside clinical psychology / psychotherapy

Design Evaluations

This informal research targets the general population related to the context of worrying and/or rumination or with an interest in musical instruments.

For this research pertaining to design elements for playful, expressive, physical and multi-sensory interaction, only healthy verbally consenting adults will participate. In order to fulfill the criteria of verbally consenting adults, each participant has to verbally give consent to participation or

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		<p>not and usage of insights for designing the new high level prototype of RELAX-CHANGE.</p> <p>In this specific COVID-19 situation it is especially emphasized on recruiting technology capable participants, who are able to work with video technologies.</p> <p>The participants for the evaluation sessions will be recruited based on convenience and heterogeneity. In collaboration with friends from the psychology department at the JLU and prof.dr. Rubel from the department of psychotherapy research at the JLU, participants will be recruited with the help of their network. It is chosen to recruit heterogenous groups of participants, since this will spark more diverse perspectives on the new design elements of RELAX-CHANGE needed within this immense broad field of psychotherapy research and practice and applied relaxation. The heterogeneity of the participants will especially be in the difference between researchers, practitioners, master and bachelor students within a.o. clinical psychology and psychotherapy. Furthermore, these participants will offer expertise or interest within different areas of clinical psychology / psychotherapy and so create another layer of heterogeneity within the research.</p> <p>Exclusion criteria:</p> <ul style="list-style-type: none"> - Participants without verbal consent - Patients currently in any kind of mental health / social health therapy (e.g. anxiety, depression, bipolar disorders) - Participants with severe mental states or issues
14	Description of the measurements and/or stimuli/treatments	<p>Semi-Structured Interviews <i>Qualitative Measurements</i></p> <p>Answers of participants to the open-ended and closed-ended questions asked in the semi-structured interview after the design of RELAX-CHANGE has been explained and shown (product pictures and visualizations).</p> <p>These will be obtained from audio recordings during the semi-structured interviews, only in case of participants' consent, which will only be made accessible to the researcher for transcriptions.</p> <p>Procedure followed when analyzing the qualitative interview data will be based on note-based analysis as described by Krueger & Casey. In this procedure the moderator, in this case the researcher, will prepare written notes based on summarizing comments from all separate interviews, just as selected audio recordings. Further analysis will be done through thematic analysis methodology or the open coding methodology of the separate interview results, and after that for the overall combined results. This process consists out of the following steps: familiarizing with the data (transcribing), generating initial codes (interesting features of the data), searching for themes (overlapping themes in the codes), reviewing themes (check if themes work related to the abstracted</p>

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codes), defining and naming themes (specifics of each theme), producing final report / results (what does it mean, interpretation).

Focus Groups / Co-Reflection Sessions

Qualitative Measurements

During the phases of the focus groups / co-evaluations there will be asked for interaction based impressions, multi-stakeholder user experience evaluations and intervention based impressions (addressing the design's, design's principles and design's perspective contribution for relaxation/relaxation support and more for multiple stakeholders, in multiple anxiety-depression related psychotherapy contexts) after experiencing the (video) prototypes. Therefore, the measurements will include:

- First-hand reactions of participants to the designed (video) prototypes after experiencing the various design aspects and underlying principles
- Answers of participants to the open-ended questions asked in the semi-structured discussion phases related to the topics mentioned above

These will be obtained from audio and video recordings during the focus groups, only in case of participants' consent, which will only be made accessible to the researcher for transcriptions.

Procedure followed when analyzing the qualitative focus groups / co-evaluation sessions data will be based on note-based analysis as described by Krueger & Casey. In this procedure the moderator, in this case the researcher, will prepare written notes based on summarizing comments from all separate sessions, just as selected audio recordings. Further analysis will be done through thematic analysis methodology or the open coding methodology of the results from the separate sessions, and after that for the overall combined results. This process consists out of the following steps: familiarizing with the data (transcribing), generating initial codes (interesting features of the data), searching for themes (overlapping themes in the codes), reviewing themes (check if themes work related to the abstracted codes), defining and naming themes (specifics of each theme), producing final report / results (what does it mean, interpretation).

Design Evaluations

Qualitative Measurements

Informal feedback will be obtained about various aspects of the design elements, such as: prototype casing (size/proportions/materials used), multi-sensory interaction (music/light enablement), touch modalities (touch feedback/proportions/materials used) and quantitative behavioral data analysis.

These will be obtained from written notes made during the evaluation sessions, only in case of participants' verbal

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		<p>consent, which will only be used for the creation of an improved high fidelity prototype of RELAX-CHANGE.</p> <p>Procedure followed when analyzing the qualitative focus groups / co-evaluation sessions data will be based on note-based analysis as described by Krueger & Casey. Based on the practical analyses of the separate design evaluation sessions, design based decisions will be made for the new electronics and casing design of the RELAX-CHANGE prototype.</p>
15	Number of participants	<p>Semi-Structured Interviews 6-8 interviews with each 1 participant maximum.</p> <p>Focus Groups 2 repeated focus groups with each 6-8 different participants maximum.</p> <p>Design Evaluations 4 design evaluations with each 2 participants maximum.</p>
16	Explain why the research is socially important. What benefits and harm to society may result from the study?	<p>This design research is socially important, since:</p> <p>Individual freedoms at the core of modern democratic systems have brought improved quality of life to their citizens. These include amongst others freedom of expression, freedom of worship and freedom of fear. However, for people with elevated trait anxiety these freedoms are particularly challenging in daily life. The main problems related to anxiety, of worrying and/or rumination, causing difficulties in relaxation and a decreased self-image, cause restrictions in daily life functioning and so in being their 'best self' in society. In this way a decrease in quality of life and well-being through lack of freedom, empowerment and social integration is caused which needs to be addressed.</p> <p>Next to individual gains which can be made, additional societal benefits from increase in empowerment, and in social integration are a decrease in the high healthcare costs and burden of anxiety (and its related depression issues) in society.</p> <p>This studies in this design research provide a low-risk, mainly online and safe setting where participants voluntarily and playfully engage into discussions, interviews and evaluations about opportunities for design for anxiety and/or depression (and especially RELAX-CHANGE) in a fun, interactive and low-effort manner. In this way, they subsequently learn and share knowledge possibly improving their critical attitude towards dealing with anxiety and/or depression (mental health) on a personal and societal level.</p>
17	Provide a brief statement of the risks you expect for the participants or others involved in the research or educational activity and explain.	<p>This study involves minimal risks for the participants. Only some of the participants will be directly involved with any physical prototype (the first or new version of the RELAX-CHANGE prototype), especially the ones participating in the</p>

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<p>Take into consideration any personal data you may gather and privacy issues.</p>	<p>design evaluations and the focus groups/co-reflection sessions. However, keeping the most relevant COVID-19 regulations in Giessen (Germany) into account, the participants will always be provided with the option to participate in the online version of these studies. In this way any risks related to CE approved components are prevented. In case, participants participate in the in-person version of one of these 2 studies, being directly involved with one of the 2 prototype versions, they will be safeguarded through the use of CE approved components in both prototypes. Both the first and new version of the RELAX-CHANGE prototype will include different materials in addition to electronical devices. Such as plastics, aluminum, rubbers, and others. Moreover, we will also embed electronical devices which will be all CE certificated. In addition, we will make use of software which will be used to provide the interactive elements of the design such as the multi-sensory feedback (light & audio functions), parameter control and wireless communication. The software itself will provide various audio files mapped to the touch input, touch input measurement variables, and light output functions which will be interacted with through simple hand touch motion, and operating simple (turning) knobs. Moreover, any behavioral information related to touch inputs will singularly be used for polishing the interaction functions of the prototype. Both the first and new version of the RELAX-CHANGE prototype will be used for demonstrative and discussion purposes.</p> <p>Furthermore, the primarily used digital video conferencing environment (MS Teams, Skype or Zoom) allows participants to engage from a private, comfortable and safe environment.</p> <p>Next to this, recruitment of participants for the focus groups is done based on convenience, making use of the network of prof.dr. Rubel and from friends studying at the psychology department of the JLU in Giessen; and not based on requested or specified anxiety / depression conditions or characteristics. Anyone with severe or moderate mental health issues will be explicitly excluded from participation in any of the 3 studies within this design research. Qualitative data gathered through the participant's answers to questions and discussion comments in all 3 studies will be analyzed after the interviews / design evaluations / focus groups / co-evaluation sessions have been taken place, will be done anonymously and only used for the sake of analysis within this design research or for publication, only when consent has been given. Together with informing about the purpose, procedures and guidelines of the study and the use of consent forms upfront of participation, the risk of involving people with severe anxiety, depression or other mental health problems will be low.</p> <p>Participants in all 3 studies will not be exploited and the research plan will be fully revealed before the start of the</p>
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		<p>study. The researchers will have access to this data only with prior consent from the participants, who can decline to share their results at any moment.</p> <p>All participants will be expressly notified that they may go out of the study (online video setting / in-person setting, under strict regulations related to COVID-19) at any moment at no penalty, and the studies are set up in such a way that there is no barrier to do this.</p> <p>The stakeholder interviews, focus groups / co-evaluations and design evaluations conducted within the research-through-design approach will be focused exclusively on evaluating or discussing the opportunities of the design of RELAX-CHANGE within clinical psychology / psychotherapy research and practice, including opportunities of its user experience presented in person or through the videos, and the principles/concept behind the design. For collecting more sensitive personal information, an amendment to this proposal will be needed.</p> <p>Additionally, the tasks that will be asked from participants in the stakeholder interviews, focus groups / co-evaluations and design evaluations, in order to engage in the research and discuss about the (video)prototypes, will be such that they do not deviate from regular activities in the specified context and research.</p> <p>The coded qualitative data will be kept on a password protected academic online platform at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially and test subjects will never be recognizable in publications, academic material or any other means. Quotes from the stakeholder interviews, focus groups / co-evaluation sessions and design evaluations will be pseudonymized and screened for not being traceable to an individual.</p>
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Part 2: Checklist for Minimal Risk

		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)?		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? (e.g. will participants be deliberately falsely informed, will information be withheld from them or will they be misled)		X

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	in such a way that they are likely to object or show unease when debriefed about the study)		
5	Will the study involve discussion or collection of personal data? (e.g. name, address, phone number, email address, IP address, BSN number, location data) or will the study collect and store videos, pictures, or other identifiable data of human subjects? ¹ . Please check the FAQ's on the intranet . <u>If yes</u> : please follow the procedure . Make sure you perform a Data Protection Impact Assessment (DPIA) and make a Data Management Plan if necessary and let the data steward check it.	X (audio recordings, possible video recordings and mail addresses)	
6	Will participants be asked to discuss or report sexual experiences, religion, alcohol or drug use, or suicidal thoughts, or other topics that are highly personal or intimate?		X
7	Will participating in the research be burdensome? (e.g. requiring participants to wear a device 24/7 for several weeks, to fill in questionnaires for hours, to travel long distances to a research location, to be interviewed multiple times)?		X
8	May the research procedure cause harm or discomfort to the participant in any way? (e.g. causing pain or more than mild discomfort, stress, anxiety or by administering drinks, foods, drugs)		X
9	Will blood or other (bio)samples be obtained from participants (e.g. also external imaging of the body)?		X
10	Will financial inducement (other than reasonable expenses and compensation for time) be offered to participants?		X
11	Will the experiment involve the use of physical devices that are not 'CE' certified?		X

Important:

If you answered all questions with "no", you can skip parts 3 - 4 and go directly to part 5. Check which documents you need to enclose and continue with signature and submission.

If you answered one or more questions with "yes", please continue with parts 3 – 5.

Part 3: Study Procedures and Sample Size Justification

1	Elaborate on all boxes answered with "yes" in part 2. Describe how you safeguard any potential risk for the research participant.	<p>In Part 2, box number 5 was answered with "yes".</p> <p>The participants email address will be collected. The data is stored on a university platform. The email address will be used to share the consent forms, online meeting links and potential interview/ focus group or co-evaluation / design evaluation conclusions between participants and researchers and will not be shared with third parties.</p> <p>Regarding the collection of personal data, as mentioned in Part 1 number. 17, the qualitatively coded data will be kept on a password protected academic online platform at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially</p>
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		<p>and participants will never be recognizable in publications, academic material or any other means. In this way any risk regards collection of personal data that might lead back to any participating individual is safeguarded.</p> <p>Furthermore, audio recordings and possibly video recordings will be done during 6-8 stakeholder interviews and 2 focus groups / co-evaluation sessions. Furthermore, potentially, pictures will be made. The audio recordings, video recordings, pictures, transcripts and coded data will be kept on a password protected academic online platform at the Eindhoven University of Technology. Quotes from the design evaluations, stakeholder interviews and focus groups/co-evaluations will be pseudonymized and screened for not being traceable to an individual. Furthermore, the shots from potential video recordings or pictures will only be published when explicit consent is given in the participant's consent forms.</p> <p>Moreover, any potential risks for the participants are safeguarded by providing and discussing explicit consent forms in consultation with them via mail contact prior to the study. Participants are informed in the consent form about the collection of personal data and it is declared that some information (e.g. consent for audio & video recordings, pictures and publication) are optional to provide.</p> <p>Each participant can ask the researcher for an electronic copy of the data that she has provided or that has been measured directly at him/her. If they are dissatisfied with how data privacy is handled, they can submit a complaint to the Chief Information & Security Officer, the Privacy & Security Officer and/or the Data Protection Officer of the Eindhoven University of Technology via privacy@tue.nl or contact the Dutch Data Protection Authority.</p>
2	<p>Describe and justify the number of participants you need for this research or educational activity. Also justify the number of observations you need, taking into account the risks and benefits</p>	<p>Semi-Structured Interviews 6-8 stakeholder interviews with each 1 participants maximum, and 1 researcher asking the questions and keeping the discussion going. This to divide the load for the researcher over 6-8 different stakeholder interviews and to be able to get a more broader multi-stakeholder perspective in the research, interviewing the 6-8 stakeholders with different interests and expertise in clinical psychology / psychotherapy one-by-one, not at the same time. This may also revolve discomfort or tension for the participants and researcher during the interviews.</p> <p>Focus Groups / Co-Evaluation Sessions 2 repeated focus groups with each 6-8 different participants maximum. This to divide the load for the researcher over the 2 different groups. Moreover, in this way the participant will not be involved in too large groups and so prevent potential overload or discomfort during discussions.</p> <p>Design Evaluations 4 design evaluations with each 2 participants maximum. This to divide the load for the researcher over 4 different design evaluations and to be able to get a more deeper understanding about the design elements from participants in and around the field of clinical psychology / psychotherapy. Moreover, the design evaluations will be done one-by-one or two-by-one, and not more than 2 participants will participate at the same time. This may also revolve discomfort or tension for the participants and researcher during the evaluations.</p>

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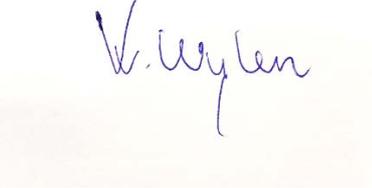
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Part 4: Data and Privacy Statement

1	Explain whether your data are completely anonymous, or if they will be de-identified (pseudonymized or anonymized) and explain how	Regarding the qualitative data, quotes from design evaluations, stakeholder interviews and focus groups/co-evaluations will be pseudonymized and screened for not being traceable to an individual.
2	Who will have access to the data?	Only the main applicants and their team will have access to the data.
3	Will you store personal information that will allow participants to be identified from their data? See <u>VSNU draft</u> .	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes, and I declare I will follow the general data protection regulation (GDPR). The collected personal data will be retained and stored for a period of five years for retrieval and research purposes. During this period, participants can ask the researchers to withdraw the data they have provided during the study from the database of the study. Participants will be informed about the personal data collected and to their to have their data deleted. Data stored will be protected by password and limited access to ensure appropriate security, including protection against unauthorized processing or accidental loss of data. A participant can ask the researchers for an electronic copy of the data that he/she has provided or that have been measured directly at him/her. If they are dissatisfied with how data privacy is handled, they can submit a complaint to the Chief Information & Security Officer, the Privacy & Security Officer and/or the Data Protection Officer of the Eindhoven University of Technology via privacy@tue.nl or contact the Dutch Data Protection Authority.
4	Will you share de-identified data (e.g., upon publication in a public repository)?	<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes, and I will inform participants about how their data will be shared, and ask consent to share their data. I will, to the best of my knowledge and ability, make sure the data do not contain information that can identify participants. No individual results will be published, as conclusions will be made from the entire cohort's data. The results of this study will be disseminated in scientific conferences and published in scientific research journals.

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Part 5: Closures and Signatures

<p>1</p>	<p>Enclosures (tick if applicable):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Informed consent form; <input type="checkbox"/> Informed consent form for other agencies when the research is conducted at a location (such as a school); <input type="checkbox"/> Text used for ads (to find participants); <input type="checkbox"/> Text used for debriefings; <input type="checkbox"/> Approval other research ethics committee; <input type="checkbox"/> Any other information which might be relevant for decision making by ERB; <input type="checkbox"/> Data Protection Impact Assessment checked by the privacy officer <input type="checkbox"/> Data Management Plan checked by a data steward 	<p>This study will use the informed consent form approved by the University (https://intranet.tue.nl/onderzoek/ethical-review/). The form is in line with the new GDPR-requirements.</p>
<p>2</p>	<p>Signature(s)</p> <p>Signature(s) of researcher(s)</p> <p>Date: 16-10-2020</p> <p>Signature research supervisor (if applicable)</p> <p>Date 16-10-2020</p>	<p>Signature student (and researcher):</p>  <p>Signature project coach (and supervisor):</p> 