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Development of a music therapy micro-intervention for stress reduction

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ABSTRACT

Negative stress is a serious risk factor for the onset and progression of a wide range of physical illnesses and emotional problems. In the literature, an increasing examination of music therapy interventions for stress reduction over the past decade is seen, yet music therapy interventions for stress reduction have not been systematically developed and described. Moreover, there is a growing need for *micro-interventions*, which are defined as short-term interventions in which the therapist uses specific therapeutic techniques to work on a client's goals. In this study, a music therapy micro-intervention for stress reduction was developed based on both empirical and practice-based knowledge. First, the micro-intervention was described based on both findings from empirical studies ($N = 52$) focused on the effects of music therapy on stress reduction, and from a previously conducted focus group study focused on the perspectives of music therapists. Second, the Delphi technique was applied to collect feedback on the micro-intervention described, by surveying a panel of 16 music therapy experts. This procedure resulted in an improved description of the music therapy micro-intervention for stress reduction, including a receptive and an active intervention variant. Implications for clinical practice and recommendations for future research are discussed.

Introduction

The negative impact of stress can be a serious risk factor for the onset and progression of a wide range of physical and emotional problems (American Psychological Association [APA], 2017; Australian Psychological Society [APS], 2015). It is well known that music can provide relaxation and calmness, which ensures that music therapy interventions are increasingly used to reduce stress and enhance the well-being of clients across a variety of clinical populations (Agres et al., 2021; Bainbridge et al., 2020; Juslin & Västfjäll, 2008; de Witte et al., 2020). Several reviews show positive effects of music therapy interventions on stress reduction (e.g. Bradt, Dileo, Magill, & Teague, 2016; de Witte, da Silva Pinho et al., 2020; de Witte, Spruit et al., 2020; Landis-Shack, Heinz, & Bonn-Miller, 2017; Martin et al., 2018; Pelletier, 2004). However, no specific music therapy intervention for stress reduction has yet been systematically described or protocolized. From a scientific point of view, clear intervention descriptions are needed to further investigate what is effective in music therapy interventions (Hoffmann et al., 2014).

The impact of stress

In daily life, almost everyone experiences stress from time to time. In the short term, stress can lead to reduced concentration and difficulty learning new information (The American Institute of Stress, n.d.). Long-term stress can lead to psychopathology such as anxiety disorders, depression, addictions and burnout (Akin & Iskender, 2011; Pittman & Kridli, 2011; Wang, Wang, & Wang, 2019), as well as to health issues,

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such as high blood pressure, cardiovascular disease, insomnia and an increase or decrease in weight (Bally, Campbell, Chesnick, & Tranmer, 2003; Keech, Cole, Hagger, & Hamilton, 2020; Pittman & Kridli, 2011). To cope with stressors, millions of people around the world use tranquilizing medications, which are associated with numerous contraindications and negative side effects (e.g., Bandelow et al., 2015; Olfson, King, & Schoenbaum, 2015; Puetz, Youngstedt, & Herring, 2015). It is therefore important to develop and examine promising non-pharmacological interventions for the prevention and management of stress, such as experiential approaches which focus on the "here and now" while guided by a therapist through stress responses and real-time emotional regulation. Through safely structured active experiences, stress inducing situations can be co-navigated, and stress reducing strategies can be developed and/or practiced (de Witte, Bellemans, Tukker, & van Hooren, 2017; de Witte, da Silva Pinho et al., 2020).

Music therapy for stress reduction

Music therapists are specifically trained to use the unique qualities of music, also known as musical components, (e.g., melody, rhythm, tempo, dynamics, pitch) in the therapeutic relationship to work on the patient's treatment goals (Bruscia, 1987; de Witte, da Silva Pinho et al., 2020; Wheeler, 2015). During music therapy sessions, music therapists attune to the patient by adjusting the way of music-making as an *immediate response* to the client's needs (Aalbers et al., 2019; Magee, 2019). This can be related to the term "synchronization," meaning that the music therapist and the patient interact simultaneously and are regulated through time, yielding a similar expression in movement, matching pulse, rhythm, dynamics and/or melody (Aalbers et al., 2019; Bruscia, 1987; de Witte, da Silva Pinho et al., 2020; Schumacher & Calvet, 2008). For example, the music therapist may influence patients' perceived stress during musical improvisation by synchronizing with the patient's music-making, subsequently changing the musical expression by playing slower and less loudly (de Witte, da Silva Pinho et al., 2020). This specific form of patient-therapist attunement is commonly used in music therapy practice and refers to the so-called Iso Principle (e.g., Altshuler, 1948; Heiderscheit & Madson, 2015). The literature shows that the tempo and loudness are important for the experienced intensity of the music (Gabrielsson & Lindström, 2010), and music with a slow steady rhythm may provide stress reduction by altering inherent body rhythms, such as heart rate (Thaut & Hoemberg, 2014; Thaut, Kenyon, Schauer & McIntosh, 1999). Thus, the stress reducing effect of music therapy interventions can be explained by music itself as well as the continuous attunement of music by the music therapist to the individual needs of a patient.

There has been a rapid increase of research on the effects of music therapy on stress reduction. Results of a recent meta-analytic review (de Witte, da Silva Pinho et al., 2020), including 47 quantitative controlled studies, showed an overall medium-to-large effect of music therapy on stress-related outcomes (d = 0.723, [.51–0.94]). This is in line with previous reviews and meta-analyses, which show positive effects of music interventions on the reduction of stress or state-anxiety (Bradt & Dileo, 2014; Bradt, Dileo, & Shim, 2013; Bradt, Dileo, Grocke, & Magill, 2011; Bradt, Dileo, Potvin et al., 2013; Carr, Odell-Miller, & Priebe, 2013; de Witte, Spruit et al., 2020; Gold, Solli, Krüger, & Lie, 2009; Kamioka et al., 2014).

The need for music therapy micro-interventions

In music therapy literature, the term "intervention" may refer to both a specified therapeutic action and a process of intervening characterized by a structured and coherent collection of therapeutic actions (Aalbers et al., 2019; de Witte, Lindelauf et al., 2020). Music therapy interventions may thus vary from one single technique or action within a single music therapy session to therapy programs or protocols consisting of multiple therapy sessions. In the last decade, there has been a growing recognition that one-size-fits-all approaches to intervention may be suboptimal for the patient and healthcare system alike (Gauthier et al., 2017; Rush et al., 2004). Moreover, it is assumed that intervention effects are variable across patients both in magnitude and time (Cuijpers et al., 2012; Kessler et al., 2017). This argues for the need to develop more flexible and more widely applicable interventions in accordance with the patient's needs, such as micro-interventions. A music therapy micro-intervention can be regarded as a short part of a session in which the music therapist uses specific therapeutic techniques or steps to work on specific patient's goals (Hakvoort & van der Eng, 2020; Hakvoort, 2020). Despite the fact that micro-interventions are short-lived, they have been systematically described and follow a step-by-step approach based on both recent theoretical models as well as the latest scientific evidence.

The development of music therapy micro-interventions is important to music therapy practice, on the one hand because the way of intervening in micro-interventions is strongly linked to core components of music therapy, on the other hand because describing interventions helps to further develop the profession. As the level of a clients' perceived stress can differ from session to session, it is important that music therapists can respond directly to their clients' stress levels, at the time it is needed in the specific context of that moment. This fits well with the specific way of patient-therapist attunement widely used in music therapy and which can be seen as one of the main characteristics of music therapy. Therefore, short-term therapeutic interventions that align easily with the existing structure of the session or clients' musical preferences are particularly suitable. Describing micro-interventions may also stimulate transferability of valuable clinical practices which in turn may strengthen thinking about the relationship between clinical practice, theory, and research (Aigen, 1999; Smeijsters & Vink, 2006; Stige, 2015).

Purpose of the present study

In the literature, we have seen an increasing examination of music therapy for stress reduction in the last decade (de Witte, Spruit et al., 2020; de Witte, da Silva Pinho et al., 2020). In addition, there is a growing need for music therapists to be more explicit about their' tacit knowledge in order to create more transferability in the way they work on a client's stress relief (see also: de Witte, Lindelauf et al., 2020). Without these descriptions, music therapists face difficulties in reliably implementing interventions in their clinical practices and researchers can experience difficulties replicating studies (Hoffmann et al., 2014). By developing a micro-intervention in this context, we are in line with the recent developments in healthcare that emphasize the importance of short-term and flexible therapeutic interventions in general. In addition, the development of a micro-intervention is an important first step towards achieving more insight into which specific therapeutic factors lead to change, which is becoming increasingly important in the field of music therapy research (de Witte et al., 2021).

In order to provide a comprehensive analysis of music therapists' stress-reducing interventions, it is necessary to integrate the available practice-based knowledge. Published trials often demonstrate a lack of transparency in reporting detailed information on the content of the music therapy interventions (Aalbers et al., 2019; Robb, Carpenter, & Burns, 2011). This is also evident in the recent meta-analysis by de Witte, da Silva Pinho et al. (2020) in which the included studies mainly examined receptive (music listening) interventions, whereas in daily practice music therapists prefer to use active (music making) interventions to reduce their clients' stress (de Witte, Lindelauf et al., 2020). In addition, developing a music therapy micro-intervention through an iterative process aimed at integrating theory-based, evidence-based, and practice-based knowledge is consistent with how other creative arts therapy interventions have been successfully developed (e.g., Aalbers et al., 2019; Bellemans et al., 2018; Haeyen, van Hooren, Dehue, & Hutschemaekers, 2017). The main purpose of the present

study is therefore to provide a detailed description of a music therapy micro-intervention for stress reduction, which can be used directly by music therapists as well as provide a clear basis for future research.

Method

In this study, two developmental phases can be distinguished, namely, (a) describing the micro-intervention by analyzing and integrating the perspectives from both literature and clinical practice, and (b) consulting experts in the field of music therapy to reach consensus on the content and application of the micro-intervention developed. See Fig. 1 for the procedural diagram of the method of the current study.

Phase 1: the development of the micro-intervention

We used a recently developed format by Hakvoort and van der Eng (2020) to describe the micro-intervention as this was particularly designed for describing music therapy micro-interventions. The use of this format ensures a comprehensive and detailed description and encourages a grounded scientific rationale. The format consists of several sections that must be described, such as specification of the target group, treatment domains, function of music, requisites, therapeutic attitude, the scientific / theoretical foundation, and a stepwise description of the micro-intervention.

Describing the rationale

To describe a theoretical rationale for the use of the music therapy micro-intervention, we needed both to clearly understand the problem of stress as well as a framework for how music therapy leads to stress reduction. To make both the origins and consequences of stress more concrete, we searched for literature in common online databases.[2] To provide a theoretical framework on the relationship between music and stress, we mainly used the rationales of two recent meta-analytic reviews on the effects of music interventions and music therapy on stress-related outcomes (de Witte, Spruit et al., 2020; de Witte, da Silva Pinho et al., 2020). Both studies can therefore be regarded as providing key input to describing the scientific rationale for the micro-intervention. In addition, the introductory sections of the empirical studies on the effects of music interventions on stress included in the analysis of this study, were screened for additional theoretical background information.

Analyzing Intervention Descriptions based on Literature

The following step involved analyzing the *intervention descriptions* of 52 empirical studies examining the effects of music therapy interventions on stress-related outcomes to create a solid basis for the content of the micro-intervention. The majority of the studies ($n = 47$) correspond to those included in the recently performed meta-analysis by de Witte, da Silva Pinho et al. (2020). The primary aim of this earlier study was to demonstrate the overall effect of music therapy interventions on stress-related outcomes, in which a detailed analysis of the interventions examined was not taken into account. In this study, we therefore provide an in-depth analysis of particularly the *content* of the music therapy interventions examined. Five studies were initially excluded in the meta-analysis due to lack of quantitative data, however, we included them for the purpose of our study. The included studies concerned both clinical controlled trials (CCT) and randomized controlled trials (RCT) conducted in medical and mental health care settings, examining the effects of music therapy interventions on physiological and/or psychological stress-related outcomes. Only those studies in which a trained and qualified music therapist offered the intervention were selected. See De Witte, da Silva Pinho, et al. (2020) for more information about the applied search strategy and selection criteria; an overview of the characteristics of the 52 studies included in our study can be found in the Supplemental materials.

We then analyzed the extracted intervention descriptions using the coding principles of qualitative content analysis, which is frequently applied to answer questions such as what, why, and how, whereby the common patterns in the data were deduced using a consistent set of codes to organize text into identified categories of similar meanings (Cho & Lee, 2014; Moretti et al., 2011). To first gain more insights into how the initial data related to the particular sections of the format for the micro-interventions described by Hakvoort and van der Eng (2020), the open codes were grouped into "interventions and methods", "non-musical interventions", "preconditions", "instruments and genres", and "treatment goals". Open codes either identical or very similar to each other were then grouped, such as "patient chooses song", "patient selects songs" and "patient chooses music". If a code could not be merged with others, we left it separate. This axial coding step led to the categorization of codes based on their overarching similarities to property levels (Corbin & Strauss, 2008).

Integrating practice-based data

After the analysis of intervention descriptions, the next step was the examination of practice-based knowledge, as outcome studies do not always reflect clinical practice in all its facets. For this purpose, we used an existing dataset of a previous qualitative study. The aim of this particular study was to gain insights into how music therapists reduce their clients' stress, especially in people with mild intellectual disabilities. It consisted of three focus groups held in three different countries in which 13 music therapists participated (see de Witte, Lindelauf et al., 2020). The data from this study was transcribed and open coded by topic. The topic "interventions used within the music" proved particularly relevant for purposes of the present study. The open codes were extracted and then added to the initial categories that emerged from the analysis of the intervention descriptions from the literature.

Analysis of combined data

Due to the differing amounts of data, the categories consisting of either at least 4 codes from intervention descriptions from the empirical literature or at least 2 codes from the practice-based data were included as an *intervention component*. The categories formed by practice-based codes only were counted twice compared to those from the literature. Selective coding was then applied to create an integrated model in which those categories of intervention components could be linked to each other to interpret the steps of the micro-intervention (Charmaz, 2003). To minimize possible bias on the part of the researcher who analyzed the data, the entire process of data analysis was continuously monitored by two co-authors (SH and MDW) and decisions were made in consensus to ensure that the confirmability criteria were met.

Description of the micro-intervention

Based on the analyzes of the empirical literature and the qualitative data, the micro-intervention was described following Hakvoort and van der Eng (2020), consisting of a theoretical rationale, intervention goals, type of setting, treatment phase in which it can be applied, and contraindications. In order to further shape the specific intervention content, we used the integrated model of intervention components that emerged from data analysis. To establish consensus on the summarized narratives, we organized a final member check of a subgroup of the research team (MdW, AK, SvH).

[2] PubMed, PsycINFO, Web of Science, Wiley Online Library, ScienceDirect and Google Scholar

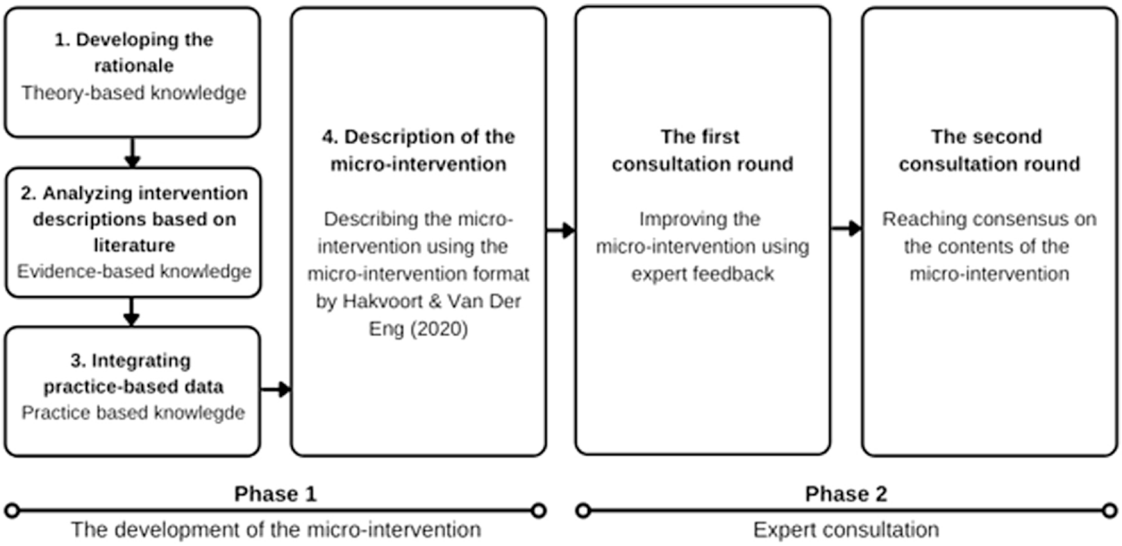

Fig. 1. Procedural diagram of the method.

Phase 2: expert consultation

In the second phase, the Delphi technique was applied in order to arrive at a group opinion by surveying a panel of experts, and to reach consensus through an iterative process of collecting feedback (Linstone & Turoff, 1975; McMillan et al., 2016; Skulmoski et al., 2007). As in other studies, we used a *modified* Delphi technique to better fit the objectives of the current study (Mullen, 2003; Wheeler et al., 2019). One of the modifications is that we did not use measures of central tendency and dispersion of the rankings by the respondents, which is usually reported in Delphi studies. Although the first consultation round collected individual rankings, the second round was sent by e-mail to check whether the adjustments made met respondents' expectations. Therefore, calculating central tendency and dispersion was not feasible in the present study (see also Wheeler et al., 2019). Another modification concerns the use of a structured questionnaire to obtain focused feedback from the respondents. Because the present study was designed to consult music therapists to strengthen the description of the micro-intervention, rather than to develop the intervention as a whole, a modified Delphi technique best suited our purposes.

Participants

Participants were sixteen music therapists and researchers in the field of music therapy. All had at least eight years of working experience as a music therapist. Six of them had already participated in one of the focus group interviews from our recent qualitative study (de Witte, Lindelauf et al., 2020). Ten participants were recruited through the international network of music therapists and researchers associated with Kenvak – a research center for arts therapies (www.kenvak.nl). Selected participants were located in four different countries, namely Belgium, Germany, the Netherlands and the United States. All participants gave informed consent and anonymity of the participants was ensured, both among the included participants and the researchers who analyzed the data.

The first consultation round

An online questionnaire[3] (available in Dutch and English) along with the described micro-intervention was sent to the experts. The questionnaire was focused on all sections of the described micro-intervention. For each topic, the level of agreement could be indicated with a four-point scale. In addition, the participants could add comments in each section, e.g. on reason of disagreements, new suggestions, and other feedback. In addition, the questionnaire included questions on the participants' professional background to gain more insights into their individual perspectives. The amount of agreement was calculated for each section. All suggestions and comments were listed in a file and analyzed by content. Then, every suggested change from the original micro-intervention description was discussed (MdW, AK, SvH) and decisions were made in consensus with each other. This procedure resulted in a renewed and improved description.

The second consultation round

For the second consultation round, the adapted version of the micro-intervention was sent again to the participants with a brief summary of the processed feedback and suggestions. They were asked to respond within two weeks if they disagreed with aspects of the new version of the micro-intervention.

Results

The first phase: the development of the micro-intervention

Describing the rationale

Identifying the problem of stress. In the short term, it is known that the negative impact of stress can lead to reduced concentration and difficulties when learning and memorizing new information (Schwabe & Wolf, 2010). As a result, working on treatment goals when the client is experiencing stress will be less effective and inefficient (de Witte, Lindelauf et al., 2020). It is therefore important to first reduce stress and tension so that the client is able to focus on the initial treatment goals. An overview of related health consequences of both long term and short term stress are described in the introduction of this study. A leaner narrative of this information is described in the format of the micro-intervention at "Specific domain that is targeted or treated" (see Table A.1 in Appendix).

Clarifying the stress-reducing effect of music interventions. Both music listening and music making/singing have been associated with a reduction of *physiological arousal* which increases during stress; this is

[3] The questionnaire can be requested from the first author.

visible in a reduction of cortisol levels or decrease in heart rate and blood pressure (e.g. Hodges, 2011; Koelsch et al., 2016; Kreutz, Murcia, & Bongard, 2012; Linnemann, Ditzen, Strahler, Doerr, & Nater, 2015; Nilsson, 2009). In addition, a large body of neuroimaging studies show that music can influence stress-related emotional states by modulating activity in brain structures, such as the *amygdala*, that are known to be involved in emotional processes (e.g. Blood & Zatorre, 2001; Hodges, 2011; Koelsch, 2015; Levitin, 2009; Moore, 2013; Zatorre, 2015). An increased dopamine activity in the mesolimbic reward brain system has been shown to be associated with feelings of happiness in response to listening to favorite/own-preferences music (e.g., Blood & Zatorre, 2001; Salimpoor et al., 2013; Salimpoor, Benovoy, Larcher, Dagher, & Zatorre, 2011; Zatorre, 2015).

Plausible explanations for the positive effects of music interventions on stress, can also be sought in psychological and behavioral oriented scientific theories. Listening to pleasant music may have a positive influence on *emotional valence*, which can be explained by the degree of attraction that an individual feels towards a specific object or event (Jäncke, 2008; Juslin & Västfjäll, 2008). Music experienced as pleasant increases the intensity of emotional valence (the felt happiness), which has a stress-reducing effect (Jiang, Rickson, & Jiang, 2016; Rohner & Miller, 1980; Sandstrom & Russo, 2010; Witvliet & Vrana, 2007). Listening to music can also provide direct *distraction* from stressful feelings or thoughts (Bernatzky, Presch, Anderson, & Panksepp, 2011; Chanda & Levitin, 2013). Research that shows the benefits of music to distract people from aversive states is supported by short-term music interventions for acute stress reduction (de Witte, Spruit et al., 2020; Fancourt, Ockelford, & Belai, 2014; Linnemann et al., 2015). Lastly, music listening or music making together with others is also related to stress relief (Juslin, Liljeström et al., 2008). This can be explained by the fact that people synchronize with each other during music activities which evokes feelings of togetherness and social cohesion during the music experience (Boer & Abubakar, 2014; Linnemann, Strahler, & Nater, 2016). This in turn may be explained by the release of the neurotransmitters endorphin and oxytocin (e.g., Dunbar, Kaskatis, MacDonald, & Barra, 2012; Freeman, 2000; Tarr, Launay, & Dunbar, 2014; Weinstein, Launay, Pearce, Dunbar, & Stewart, 2016), which are positively associated with the defensive response to stress (e.g. Amir, Brown, & Amit, 1980; Dief, Sivukhina, & Jirikowski, 2018). A short narrative of these findings is presented in the format of the micro-intervention at "Function of music during the intervention" (see Table A.1 in the Appendix).

Analysis of the interventions from literature

Some of the included studies only offered limited descriptions of the examined intervention, whereas others offered detailed and rich intervention descriptions or even intervention protocols. However, each intervention description led to one or more open codes. Intervention descriptions showed both receptive interventions ($n = 22$), such as listening to live or pre-recorded music, as well as active interventions ($n = 10$), such as improvisation, playing existing songs, and songwriting. A combination of both receptive and active interventions was found in 20 of the intervention descriptions. In addition, in 20 of the studies, a complementary intervention/technique was offered along with music therapy, such as breathing exercises, muscle relaxation, and mindfulness exercises. In 38 intervention descriptions, the specific use of music (musical instruments or singing) was reported. Singing was mentioned in most studies ($n = 28$), followed by percussion instruments ($n = 21$), guitar ($n = 15$), and piano ($n = 10$). After the open coding step, categories were formed through axial coding by similar codes being grouped.

Integration of the practice-based data

Data-analysis of the focus groups indicated that the participating music therapists mainly use many active interventions (14 interventions) and few receptive interventions (one mentioned) for stress reduction. The active interventions included musical improvisation, playing existing music, songwriting, recording own music, and singing mantras or preferred songs. In addition, data showed that the following therapeutic techniques are most often used to reduce a client's stress: synchronization, pacing, structuring, increasing and decreasing dynamics and tempo, repeating themes, simple musical structures, and using familiar instruments and songs. The first coding step resulted in 33 categories and remaining single codes.

Analysis of the combined data

The final analysis resulted in a total of 14 categories of intervention components, which we present in order of the total number of codes counted: *music based on preferences* (10), *patient chooses song* (7), *expressing emotions* (5), *recording music* (4), *patient chooses intervention* (4), *therapist chooses intervention* (4), *verbal processing of emotions* (4), *using familiar songs* (4), *music based on emotional state* (4), *accelerating tempo* (4), *keeping appropriate physical distance* (4), *simplicity in harmony* (4), *slowing down tempo* (4), and *lower register* (4). These intervention components formed input for the further design of the micro-intervention.

Description of the micro-intervention

The next step was to describe the music therapy micro-intervention in detail. Information on the theoretical background of the problem of stress and the rationale for using music interventions to lower people's stress levels were added in the format for music therapy micro-interventions (Hakvoort and van der Eng, 2020). Then, the intervention goal, the target population and field, possible contra-indications, requisites, and specification of the setting, were supplemented. In order to remain as close as possible to the results of the data analysis, we described both an *active* and a *receptive* variant of the music therapy micro-intervention. This allows music therapists to choose the variant that best suits the client's needs and possibilities at that moment.

Because the micro-intervention is specifically designed to directly reduce the client's stress, i.e., in the music therapy session itself, the intervention goal was formulated as follows: "reducing tension and stress directly in the music therapy session". We consider the micro-intervention as transdiagnostic and therefore it does not only relate to the treatment of one specific condition or disorder. However, as research shows that some client populations are more vulnerable to stress, such as people with mild intellectual disabilities or those with impaired cognitive functions (e.g., Emerson, 2003; Scott & Havercamp, 2014), we expect that the music therapy micro-intervention might be particularly suitable for these client groups. Precisely because of this broad applicability and the fact that we developed two variants, there were no contra-indications. However, clients with severe autism, severe intellectual disabilities, or clients suffering from acute psychosis are expected to have difficulty participating because of their reduced ability to be in contact with the therapist. The main prerequisites for applying the micro-intervention include a sound-isolated room (especially in clinical settings), chairs for the client(s) and music therapist, access to a sufficient selection of musical instruments (active variant), and sheet music of the client's preferred music (receptive variant). Furthermore, the micro-intervention can be applied both individually and in groups. See the Appendix for more details of the abovementioned content of the micro-intervention.

All 14 intervention components were included in one of the micro-intervention variants (see Figs. 2 and 3). However, analysis showed that the intervention components "*patient chooses the intervention*" and "*therapist chooses the intervention*" appeared to contradict each other. If the client chooses the intervention, often used to appeal to client autonomy, it means that the therapist is not able to decide to use the micro-

Active variant:

1. The music therapist chooses to use the micro-intervention when the client indicates feeling stressed or tense, or when the therapist observes stress in the client [6]. The music therapist explains the micro-intervention and its purpose in clear language. The music therapist coordinates physical proximity in such a way that both the music therapist and the client have sufficient space, that there is a comfortable distance between them and that eye contact can be made [11].
2. The client and music therapist both choose an instrument [5] by which large dynamic variations can be made, such as a djembé, drum kit, piano or guitar. If this proves difficult, the therapist can suggest a number of instruments to choose from. If the music therapist chooses to use a harmonic instrument, the harmonies should be simple [12] and preferably played in the lower register [14].
3. The music tempo and dynamics are adjusted to the current stress level of the client [9]. Before proceeding with the micro-intervention, the music therapist checks whether the intensity of the music matches the client's current level of stress. If this is not the case, the music therapist adjusts the intensity based on observations and - when possible - instructions from the client.
4. If the music matches the client's stress level, the volume and music tempo will be increased evenly, such as when releasing/discharging [3, 10]. The client has a leading role in building up the music tempo and dynamics, and also determines when the intensity has reached a peak and can be reduced again [5]. The music therapist actively guides the client in this part of the intervention and helps to evenly bring the tempo back to 60-80 bpm and the dynamics to silence [13].
5. Afterwards, the music therapist and client discuss how the client experienced any tension during the intervention and how the stress has changed after the intervention [7].
6. The improvisation can be recorded and listened to [4] to reflect better, to indicate moments of tension and relaxation more easily, or to compare the intensity and course of the intervention in different sessions.

1. ~~Music based on preferences~~, 2. ~~Client chooses song~~, 3. Expressing emotion, 4. Recording music, 5. Client chooses intervention*, 6. Therapist chooses intervention, 7. Verbal processing of emotions, 8. ~~Using familiar song~~, 9. Music based on emotional state, 10. Accelerating tempo, 11. Keeping appropriate physical distance, 12. Simplicity in harmony, 13. Slowing down tempo, 14. Lower tonal register.

Techniques that have been crossed out do not apply in this variant.

Fig. 2. The active variant of the micro-intervention.

intervention. As music therapists use the micro-intervention precisely when it is needed to lower their client's stress levels, it is not possible to have the client choose the intervention themselves. However, to encourage client autonomy in another way, instead of letting them choose the intervention, we decided to offer them the choice of the song in the receptive variant and that they could take the lead role in the active variant by building up the music tempo and dynamics.

Receptive variant:

1. The music therapist chooses to use the micro-intervention when the client indicates feeling stressed or tense, or when the music therapist observes stress in the client [6]. The music therapist explains the micro-intervention and its purpose briefly. The music therapist coordinates physical proximity in such a way that both the music therapist and the client have sufficient space, that there is a comfortable distance between them and that it is easy to make eye contact [11].
2. The client chooses a song [1, 2, 5, 8]. If this proves difficult the music therapist can suggest a few songs or let the client choose from a song book. The music therapist plays the (if necessary simplified) chords [12] of this song on guitar or piano, preferably in the lower register [14]. The client is invited to listen.
3. The music tempo and dynamics are adjusted to the client's current stress level [9]. Before proceeding with the micro-intervention, the music therapist checks whether the intensity of the music matches the client's current level of stress. If this is not the case, the music therapist adjusts the intensity based on observations and - when possible - instructions from the client.
4. The music therapist can then choose to further increase the intensity of the music [10] and then decrease it, or to let the intensity be equal to the client's stress level and then gradually decrease the tempo to 60-80 bpm and the dynamics to silence [13].
5. Afterwards, the music therapist and client discuss how the client experienced any tension during the intervention and how the stress level has changed after the intervention [7].

1. Music based on preferences, 2. Client chooses song, 3. ~~Expressing emotion~~, 4. ~~Recording music~~, 5. Client chooses intervention*, 6. Therapist chooses intervention, 7. Verbal processing of emotions, 8. Using familiar song, 9. Music based on emotional state, 10. Accelerating tempo, 11. Keeping appropriate physical distance, 12. Simplicity in harmony, 13. Slowing down tempo, 14. Lower tonal register.

Techniques that have been crossed out do not apply in this variant.

Fig. 3. The receptive variant of the micro-intervention.

The second phase: expert consultation

The first consultation round

Analysis of the experts' feedback led to significant changes in the description of the micro-intervention.[4] Based on their suggestions, we added information, i.e. "voice" as one of the main instruments, allowing the client to experience the present stress before reducing it, specifying the therapeutic role and attitude with four functional domains, and the supporting role of the group when the micro-intervention is offered to just one of the group members. A note was added on contra-indications regarding clients suffering from trauma or anxiety disorders and on the function of the concepts "synchronizing" and "containing" which are related to stress reduction.

[4] An overview of the feedback given can be requested from the first author.

The second consultation round

The second round of consultation resulted in consensus among all experts, meaning that no further changes had to be made. The final description of the micro-intervention can be found in the Appendix.

Discussion

In our study, we systematically developed a music therapy micro-intervention aimed at stress reduction based on findings from theoretical and empirical studies as well as practice-based knowledge. The micro-intervention was developed for and evaluated by music therapists for use during the music therapy session when it is necessary to lower clients' stress levels. Although the micro-intervention does not relate only to the treatment of one specific condition or disorder and can be considered as broadly applicable, the literature indicates that some

client populations may benefit more due to their higher vulnerability to stress, such as people with mild intellectual disabilities (MID) or those with impaired cognitive functions (e.g., Emerson, 2003; Scott & Havercamp, 2014). For them, an experiential approach may be more appropriate than the cognitive approach (de Witte, Lindelauf et al., 2020; Didden et al., 2016). To our knowledge, this is the first study in which a music therapy micro-intervention has been systematically developed with the aim of direct stress reduction in the music therapy session.

Strengths and limitations of the present study

The way the micro-intervention was developed has several strengths. First, the systematic and comprehensive approach, which relied on data both from empirical studies as well as from clinical practice, resulted in a well-described micro-intervention. This approach has many similarities to the "Intervention Mapping" approach, a systematic method for the development, implementation, and evaluation of health interventions by constructing programs grounded both in theory and on empirical data (Bartholomew, Parcel, Kok, & Gottlieb, 2006). However, Intervention Mapping was originally designed to create larger or longer-term intervention and treatment programs (Bartholomew-Eldridge et al., 2016), and therefore does not fully align with the concept of micro-interventions, which are short-term interventions and can even be used as stand-alone techniques in existing treatment programs (de Witte, Lindelauf et al., 2020). Second, the inclusion of data derived from controlled outcomes studies (RCTs and CCTs: $N = 52$) offered a scientifically robust foundation for the core elements of the micro-intervention. This is relevant so that the basic claims made in the present study are clear (Aalbers et al., 2019; Crooke, Smyth, & McFerran, 2016). Moreover, the included outcome studies were derived from a recently conducted meta-analytic review (de Witte, da Silva Pinho et al., 2020) in which the inclusion criteria exactly matched the aims of this study. It can also be argued that this study strengthens the overall scientific basis of music therapy for stress reduction, as the previous meta-analysis looked primarily at effects using quantitative analyses, while in this study we qualitatively analyzed the content of the intervention, thus answering the *how* music therapeutic interventions can lead to stress reduction. Third, in the second phase of this study, the micro-intervention was submitted for consultation to music therapy experts from different countries in order to reach consensus in a collaborative process. Thus, thanks to this expert evaluation, the micro-intervention does not rely solely on pre-existing data. This strengthens its generalizability and makes it more plausible that the micro-intervention can be implemented easily in clinical practice.

Some limitations need to be noted. Through the years, several theoretical models have been developed to provide insights into the influence of music on stress. One of the most widely used models of the last decade involves models rooted in biological and neurological theories, so we also used these models to provide theoretical explanations of the relationship between stress and music. These models formed the basis of two earlier meta-analytical reviews of music interventions for stress reduction (de Witte, Spruit et al., 2020; de Witte, da Silva Pinho et al., 2020). However, we are aware that the general construct of stress integrates many scientific fields, in which both environmental, psychological, and biological/physical factors are interrelated within a comprehensive framework (Aldwin, 2007; Cohen, Janicki-Deverts, & Miller, 2007). In this sense, the strength of exclusively including intervention information from controlled outcome studies can be seen as a limitation; information on the content of interventions can also be obtained from less robust designs, such as case studies or one group designs. However, the importance of analyzing intervention content that demonstrates positive effects was paramount in our study. Related to the previous, the data from this large number of outcome studies mainly showed descriptions of receptive interventions, while the practice-based data almost exclusively showed active interventions. This may indicate a gap between what is applied in clinical practice and what is investigated in robust research designs (de Witte, Lindelauf et al., 2020). However, it may also be related to the context of a specific target group, such as clients with MID, who were central in the practice-based data. Because we wanted to stay as close as possible to the initial data, this led to the development of two different variants of the micro-intervention: the active and the receptive variant (see Figs. 2 and 3).

Recommendations for future research

Clear intervention descriptions are needed to further investigate what is effective in music therapy interventions (Hoffmann et al., 2014). Future research should focus on whether the developed music therapy micro-intervention for stress reduction does lead to stress reduction during the session. However, methods that can measure the direct effects of the micro-intervention on stress-related outcomes will be needed. Previous reviews of stress measures show that many researchers emphasize the importance of measuring stress outcomes related to both physiological arousal as well as to people's subjective experiences (Scott and Havercamp, 2014; de Witte, Spruit et al., 2020; de Witte et al., 2021).

As it is still unclear *how* and *why* music therapy interventions lead to certain outcomes such as stress reduction, more research on therapeutic factors[5] is needed to further develop music therapy micro-interventions. In our micro-intervention, *music tempo* can be seen as one of the most important elements, and therefore we expect it to be an important therapeutic factor leading to stress relief. This is in line with previous research showing that music tempo can be considered one of the most significant moderators of music-related arousal and relaxation effects (e.g., Bringman, Giesecke, Thörne, & Bringman, 2009; de Witte, Spruit et al., 2020). We therefore recommend that future research includes a secondary research question that focuses on therapeutic factors, such as the tempo of the music, in order to increase knowledge not only regarding efficacy, but also regarding what contributes to these effects.

Micro-interventions also allow researchers to conduct a *micro-analysis* of specific parts of the music therapy session (Lee, 2000; Wosch & Wigram, 2007). The most important questions are: "what exactly happened and why?". Through micro-analysis, therapy processes can be better understood or clarified, for example by analyzing the musical activity, social interaction, or nonmusical behavior of a short segment of a session (Wosch & Wigram, 2007). Micro-interventions are therefore highly suitable for pinpointing specific therapeutic factors that cannot be examined when testing over a larger period of time (de Witte et al., 2021).

Implications for clinical practice

Micro-interventions lend themselves well to music therapy practice because of their flexible character and the way in which the therapist can respond to the client's needs in the moment itself. By offering a musical frame, any musical expression produced by the client can be musically encouraged and responded to in a musical dialogue (e.g., Aigen, 2005; MacDonald, Kreutz, & Mitchell, 2013; Nordoff & Robbins, 1965). Most components of our developed micro-intervention are strongly related to certain therapeutic factors of music therapy, namely "musical dialogue" and "shared musical experiences". Other important therapeutic factors concern the structuring nature of music, such as tempo. A recent review shows that it is precisely these therapeutic factors that are often associated with positive change in music therapy (de Witte et al., 2021). In addition, the content of the micro-intervention is also in line with Bruscia's (1987) principles, who developed 64 musical

[5] Therapeutic factors are those factors identified by empirical studies that lead to therapeutic change and are associated with particular outcomes (Kazdin, 2009; Elliot, 2010).

improvisation techniques based on using the unique qualities of music to establish or influence the musical dialogue with the client; these still form the basis of global music therapy education. However, the concept of the micro-intervention provides more insights into (a) the needs and abilities of certain client populations that the intervention is focused on, (b) particular outcomes, (c) specific characteristics of the intervention, and (d) the underlying theoretical models that explain the relationship between music (therapy) and the targeted outcome. By describing this information, which is mainly subconsciously understood and applied by music therapists, it may stimulate them to strengthen the transferability of their clinical work and may provide more insights into the relationship between clinical practice, theory, and research (Aigen, 1999; Smeijsters & Vink, 2006; Stige, 2015).

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.aip.2021.101872.

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