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I Need to Hear Some Sounds That Recognize the Pain in Me: An Integrative Review of a Decade of Research in the Development of Active Music Therapy Outpatient Treatment in Patients With Recurrent or Chronic Pain

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Abstract

Music is widely used to reduce pain in a broad variety of clients and settings. Most studies focus on the pain-reducing effect of music-listening interventions on patients with acute pain, whereas studies investigating the effect of active therapy (ie, music making) on pain perception in patients with recurrent or chronic pain are rare. This article reviews the findings of a series of previously published studies by our work group, conducted during the past 10 years, using defined music therapy plans in the treatment of outpatients with conditions of recurrent or chronic pain. This review provides evidence that a specific music therapy concept tailored to the demands of the patient might be able to substantially reduce pain frequency and pain intensity in patients with recurrent or chronic pain. However, further studies need to investigate the nature of those beneficial effects and their specificity.

Keywords

music therapy, pain, review, active music making, treatment manuals

Introduction: Music Medicine, Music Therapy, and Pain

The treatment of pain has grown to be an important field of music medicine and music therapy. Music therapy interventions are defined as the presence of a trained music therapy professional and the appearance of a therapeutic process. Techniques can be categorized as either *active* (or *interactive*), where the client and therapist play music together, which may include vocal and instrumental techniques to produce sound or music, or *receptive*, where the client listens to music provided by the therapist (pre-recorded or played live by the therapist).

Music Listening to Reduce Pain

Most existing studies on the relationship between music and pain concentrate on music-listening interventions. The majority of these studies come from the field of research in medical or dental treatment, reporting the use of music as a therapeutic intervention during painful medical procedures or nursing interventions. For example, music is applied in pediatric patients during dental treatment[1-3] and in children undergoing intravenous cannulation[4] and venipuncture,[5,6] in children receiving an injection[7-9] or intramuscular injection,[10] or in children with cerebral palsy during acupuncture.[11] Music is also applied in pediatric[12-14] or adult[15-17] patients with burn injuries during burn dressing changes or burn debridement processes. Furthermore, listening to music may be beneficial to pediatric patients during magnetic resonance imaging[18] or to children with cancer undergoing

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lumbar puncture.[19] In adults, music is used during physical therapy,[20] during chest tube removal after open heart surgery,[21] during renal lithotripsy,[22] or in women undergoing in-office gynecological procedures.[23] Beneficial effects of listening to music are also reported in patients with cancer undergoing noxious medical procedures such as tissue biopsy or port placement or removal.[24] Furthermore, music may alter the experience of pain in patients undergoing the placement of a femoral nerve block,[25] in adolescents receiving colposcopy,[26] or in adults receiving extracorporeal shock wave lithotripsy (ESWL) treatment.[27] In addition, the pain-reducing effect of music is applied in adults receiving peripherally inserted central catheters (PICCs) and Port-A-Caths,[28] intradermal injection of normal saline solution (IV therapy),[29] or undergoing bone marrow biopsy and aspiration.[30] Music is also used to decrease pain and discomfort in patients with leg fractures.[31]

Another major field where music-listening interventions are applied is to support patients' recovery after surgery and to ease postoperative pain. Within this setting, the patient listens to music before the operation (preoperative[32-34]), during the operation (intraoperative[32,35-40]), or after the operation (postoperative[33,35,38,39,41-61]). The type of operations and patients where music listening has been applied include patients undergoing vascular and thoracic surgery[42]; patients who underwent a total knee arthroplasty[40,41] or hip or knee surgery[62]; elderly orthopedic patients[53]; patients undergoing coronary artery bypass[35]; children undergoing oral surgeries[32]; patients undergoing abdominal surgery[43,45,48]; and women undergoing gynecologic surgery,[44,49,52] intestinal surgery,[46] thyroid, parathyroid, or breast surgery.[51] Furthermore, music listening has been applied to patients who have undergone open heart surgery,[55,60] cardiac surgery,[56] nasal surgery,[59] or coronary artery bypass graft (CABG) surgery.[61] Besides those distinct surgical procedures, studies on the pre-, intra-, or postoperative effects of listening to music include surgery in general,[33,34,36,47,50,57] urologic procedures,[37] hysterectomy patients,[38,58] or day case surgery for inguinal hernia repair or varicose vein surgery,[39,54,63] where general or spinal anesthesia is applied. Several studies also report that listening to music reduces labor pain.[64-66]

While in such cases, acute pain is related to a certain clinical condition or medical procedure, music listening is used in the treatment of patients with chronic pain due to a long-term illness. For example, music listening may be beneficial to chronic osteoarthritis pain in elderly individuals[67]; patients with chronic nonmalignant pain[68] such as chronic low back pain[69]; hospitalized persons with cancer pain[70,71]; home-dwelling persons with dementia[72]; patients with advanced cancer pain[73]; or likewise long-term and life-threatening illnesses,[74] palliative care,[75] hospice patients,[76] and their caregivers. Besides the investigation in clinical settings, the pain-reducing effect of listening to music was investigated in experimental studies.[77-79]

Several reviews, systematic reviews, and/or meta-analysis summarize the current findings on these effects.[80-93] A Cochrane review on music and pain relief[88] reported that listening to music reduces pain intensity levels and opioid requirements in children or adults, but that the magnitude of these benefits reported is small and, therefore, its clinical importance remains unclear. A review of the Asian literature reports that the majority of studies included show music listening to be effective in pain relief in different situations when applied as a nursing intervention.[90] A systematic review of 42 randomized controlled trials on the effects of music interventions in perioperative settings reports that about half the studies included show pain-reducing effects.[89] Another review[93] found music to be effective in reducing anxiety and pain in children undergoing medical and dental procedures and therefore concludes that music can be considered an adjunctive therapy in clinical situations that produce pain or anxiety. Furthermore, one other review[81] shows the effectiveness of music as an adjuvant for the relief of postoperative pain. A further review distinguishes that relaxation and music are effective in reducing affective and observed pain but are less effective in reducing sensory pain or opioid intake.[80] However, studies on the use of active music therapy techniques to reduce pain in patients with recurrent or chronic pain are rare.

Making Music to Reduce Pain

While music-listening interventions in pain management aim to promote an alteration or change in mood, a sense of increased control and self-expression,[94] and a decrease in pain perception by distraction and relaxation,[74] music making might also be beneficial to patients with chronic or recurrent pain. Active music therapeutic techniques might not be as widely applicable as music-listening interventions, for these techniques only apply for patients who have the physical capability to play an instrument or sing. Additionally, they depend on the possibility and resources to use instruments in an appropriate environment. Only a few active music therapeutic approaches were developed and evaluated for the treatment of patients with recurrent or chronic pain.[95-97] Müller-Busch[95,96] found a statistically significant superiority of the experimental group in pain and pain-associated measures in a controlled study with muscle-related pain syndromes. Risch and colleagues[97] used music therapy in a group therapy setting for patients with headache. No effects could be found during the course of treatment, but a statistically significant change occurred in the analysis of follow-up data.

The authors' efforts during the past 10 years focused on the outpatient treatment of patients of different ages and with different diagnoses, who experienced recurrent or chronic pain. Addressing the standards of high-quality research designs (eg, randomized controlled trials) within the field of effectiveness research on active music therapy, our research group developed treatment manuals based on several theoretical assumptions. The manuals are based on the biopsychosocial paradigm,[98] thus chronic pain is regarded as a result of intermediating biological, social, and psychological determinants.[99] In order to structure the therapy process, all treatment manuals refer to the phase model for psychotherapy outcome, which has been empirically supported by Howard et al.[100,101] In the first phase, music therapy focuses mainly on the improvement of

Table 1. Assumed Working Factors in the Treatment of Patients With Chronic Pain.

Facets of Chronic Pain	Music Therapy Factors	Therapeutic Role of Music
Attention is focused on painful body areas, as the phylogenetic function of pain is to address harm or injury. Pain loses this function in the course of chronification but the attention remains.	Modulation of attention	Auditory stimulation in its function as a phylogenetic "early-warning system" can capture and distract attention away from the perception of pain.
Pain can be interpreted as a homeostatic emotion. Its influence on emotional experiences is well documented. A chronification is associated with increased risk of emotional disorders (eg, anxiety, depression) and lower competence in emotional decisions.	Modulation of emotion	Music has a spontaneous and fast-acting effect on emotions. Music has the capacity to elicit and modulate emotions of all valences (happiness, sadness, anxiety, anger, disgust) and intensities (including chill and thrill experiences).
The chronification of pain comes along with dysfunctional cognitions and maladaptive coping strategies (eg, catastrophizing) as well as external attribution style.	Modulation of cognition	Music can transport meaning beyond language (by aesthetic aspects and subjectively acquired associations). Music is associated with memories and can stimulate a change in awareness.
Pain leads to behavioral changes (eg, grimacing, limping, utterances, avoidance). Increased behavioral constraint is a central characteristic of chronification.	Modulation of behavior	The motor system is involuntarily stimulated by music (eg, tapping, nodding, dancing). Playing music constitutes a complex series of behaviors that involve broad parts of the body and the brain.
Chronic pain affects interpersonal relationships. Many patients avoid social contacts and communicate less with others. They perceive themselves as too caring, friendly, and permissive.	Modulation of communication	Music is part of all cultures and forms of communication. It cultivates nonverbal communication and is often seen as a "language of emotions." Active music therapy constitutes an interaction that affects interpersonal communication styles.

subjective well-being (*remoralization*), in the second phase on the reduction of symptomatic distress (*remediation*), and during the third phase of therapy on the enhancement of life functioning (*rehabilitation*). These steps (remoralization, remediation, and rehabilitation) are addressed successively and by means of specific music therapy techniques. According to Lambert,[102] a combination of common factors of psychotherapy (eg, extratherapeutic change, relationship, and expectancy) and specific music therapy factors within the concepts is considered. To explain these specific factors, a *heuristic working factor model* has been developed previously, concerning 5 domains of music therapeutic change.[103] This model assumes that change in music therapy can be achieved by the *modulation of attention* (eg, focusing on an alternative perception of the pain), the *modulation of emotion* (eg, affect toward the pain), the *modulation of cognition* (eg, absolute thinking that the pain will never stop), the *modulation of behavior* (eg, avoidance), and the *modulation of interpersonal communication* (eg, expression of pain).

In addition, the impact of these specific factors of music therapy is based on the Traue's concept of *emotional inflexibility* and *inhibited expressiveness*.[104] According to Traue, patients with chronic pain show less anger in facial expression and gestures on the one hand but report to feel more anger on the other. By focusing on their pain experience, patients become inhibited in their actions and reactions toward the environment, resulting in a perceived lack of control, affected social relations, a disturbed image of self and the body, and a diminished quantity and quality of experiences of well-being. Everyday life situations are often associated with pain or the anticipation of pain (pain state). The treatment manuals address this ''emotional inflexibility'' and ''inhibited expressiveness'' by applying different techniques (eg, increasing flexibility of musical expression by variation in musical parameters in free improvisation). Other assumed specific music therapeutic factors are the emotional and creative activation through music, the symbolic character of music, the communicative effects of music (development of a relationship by shared interactional experiences), the distracting and relaxing effects of music (eg, reduction of muscle tonicity), motor-exercising effect of making music (eg, training of body awareness), music as a facilitator of imagery, and music as a behavioral reinforcement, as described elsewhere. Table 1 provides an overview of the assumed factors of active, music therapeutic interventions working in the treatment of patients with recurrent or chronic pain.

Development of the Manuals

Our first music therapeutic treatment manual was developed and published in 2005, aiming at the treatment of adult patients with chronic nonmalignant pain.[105] The treatment plan was designed for 20 hours of treatment with one weekly session for 20 weeks. Table 2 provides an overview of the therapy phases. The treatment manual and its evaluation study were conducted in cooperation with the Department of Pain Therapy and Palliative Care Medicine of the Clinic of Anesthesiology at the University Hospital Heidelberg. The effectiveness of the treatment was tested within a clinical trial including 31 patients with chronic nonmalignant pain, which later was replicated with another sample of patients (see subsequent section).

Table 2. Music Therapeutic Treatment Manual—Chronic Nonmalignant Pain.[105]

Phase of Treatment	Music Therapeutic Aims	Music Therapy–Specific Factor	Music Therapy Techniques
Phase I: improvement in subjective well-being (about 5 hours of treatment)	Reminiscence of well-being	Musical-supported activation of resources	Receptive musical stimulation (relaxation)
Phase II: reduction in symptomatic distress (about 12 hours of treatment)	Emotional flexibilization	Musical flexibilization	Variation in musical parameters in free improvisation
	Emotional activation, working on the inhibited expressiveness	Musical-supported imagination and activation, development of alternative emotional states	Symptom improvisation, daydream improvisation (instrumental, vocal)
Phase III: enhancement of life functioning (about 3 hours of treatment)	Proving and implementing more flexible ways of behavior and experience	Proving adequate nonverbal forms of interaction	Ritualized improvisation, reality improvisation
	Generalization	Stabilization of achieved progress, preparation for the end of therapy	Musical self-portrait and treatment evaluation

Table 3. Music Therapeutic Treatment Manual—Migraine Headache in Children.[106]

Phase of Treatment	Music Therapeutic Aims	Music Therapy–Specific Factor	Music Therapy Techniques
Phase I: improvement in subjective well-being (about 4 hours of treatment)	Establishing a therapeutic relation	Establishing a therapeutic relation by playing together	Contact games Receptive musical stimulation (relaxation), fantasy
	Reminiscence of well-being Training of body awareness (eg, fatigue and exhaustion)	Musical-supported activation of resources	
		Musical feedback toward body language	Musically instructed movement, body percussion, vibrotactil stimulation
Phase II: reduction in symptomatic distress (about 5 hours of treatment)	Working on the symptoms Emotional activation, working on the inhibited expressiveness	Externalization of pain by musical expression of the symptom Musical flexibilization Musical-supported imagination and activation, development of alternative emotional states	Symptom improvisation Variation in musical parameters in free improvisation Daydream improvisation (instrumental, vocal), family symbolization through improvisation
Phase III: enhancement of life functioning (about 3 hours of treatment)	Proving and implementing more flexible ways of behavior and experience Generalization	Proving adequate nonverbal forms of interaction through play Stabilization of achieved progress, preparation for the end of therapy	Reality improvisation, role-play improvisations Musical self-portrait and treatment evaluation

The next manual was developed for the treatment of children with migraine headache.[106,107] Based on the previously formulated treatment manual, the techniques and the time course of therapy were adapted to the needs of a younger population. Table 3 provides an overview of the therapy manual. The treatment plan was designed for 15 hours of treatment with one weekly session for 3 months. The treatment plan and its evaluation study were conducted in cooperation with the clinic for child and youth psychiatry of the University Heidelberg. The treatment effectiveness was tested within a clinical trial on 58 children with migraine headache (see subsequent section).

In 2010, the therapy manual for children with migraine was adopted again for adolescents with primary headache (tension type headache and migraine) and tested within a pilot study[108] addressing 2 different dose–frequency models. Furthermore, a randomized placebo-controlled trial was conducted to investigate the specific treatment effects in comparison with a music education program in equal dose and frequency.[109] Since we focus on reporting the outcome of the studies, details on the techniques[105-111] and case reports[106,108] are published elsewhere and not presented within this article.

Studies on the Effectiveness of the Therapy Manuals

During the past years, 5 studies investigating the clinical effectiveness of the previously developed therapy manuals have been conducted. Table 4 provides an overview of these studies, their design, as well as the study aims and hypotheses.

The first study evaluated the treatment manual in a randomized controlled, 2-arm (waiting list) design where music therapy was offered to support the standard medical pain

Table 4. Overview of the Trials.

Study	Design	Aims and Hypothesis
Hillecke 2005[105]	Controlled trial, music therapy and medical pain therapy vs waiting list and medical pain therapy	To evaluate a treatment manual for adult patients with chronic nonmalignant pain; music therapy is superior to a waiting list condition
Leins 2006,[106] Oelkers-Ax et al 2008[107]	Randomized controlled trial, music therapy vs medication vs placebo medication	To evaluate a treatment manual for children with migraine, to test whether music therapy is effective in the prevention of migraine attacks; music therapy is superior to pharmacologic treatment and a medical placebo
Wormit 2008[111]	Not controlled, replication	To test the previously evaluated manual[105] in the ambulatory praxis; the previously reported results can be replicated in general practice of an outpatient department
Koenig et al 2013[108]	Not controlled, evaluation comparing 2 different dose–frequency models	Pilot study to adopt the existing manuals for adolescents with primary headache, comparison of a compact (12 hours of treatment within 1 week) vs a standard model (12 hours of treatment over 3 months, 1 weekly treatment); a different dose–frequency relation results in different outcomes
Koenig et al (under review)[109]	Randomized placebo-controlled trial, music therapy vs music therapy placebo (rhythm education program)	To investigate the specific music therapeutic factors within the treatment of patients with chronic pain; music therapy is superior to an attention placebo (rhythm pedagogic group)

therapy.[105] Patients who had chronic pain for at least 6 months with pain-related psychiatric problems (eg, interpersonal problems[110]) were included in the study. Criteria of exclusion were malignant pain, primary psychiatric disorder, and less than 18 years of age. The study was partly replicated in 2008 under uncontrolled conditions.[111] The treatment manual for children with migraine headache was evaluated in a 3-arm (music therapy vs medication vs placebo) randomized controlled trial with a total number of 58 participants.[107] Inclusion criteria were age between 8 and 12 years, initial onset of migraine at least before 1 year, and number of attacks (participants had to report an average of 2 or more migraine attacks for each of the 3 months prior to screening and for 2 months of baseline observation as part of a pain diary). Exclusion criteria were intake of prophylactic medication for migraine in a 3-month period before screening, additional nonmigraine types of headaches on more than 6 days per month, intake of analgesics on 10 or more days per month, alcohol or drug abuse, neuroleptic or antidepressive medication within 3 months before screening, and/or allergy to the ingredients of the medication given within the study.[107] A pilot study of adolescents with primary headache[108] tested an adaptation of the previously published treatment manual for children with migraine for an older population, presenting a broader spectrum of diagnosis. Within the next trial,[109] the treatment manuals for adolescents with primary headache were compared with a music therapy placebo treatment (rhythm pedagogic) investigating the specific effectiveness of the music therapeutic techniques in comparison with a bona fide treatment. Table 5 provides an overview of the populations by study.

Primary Outcomes

Despite different populations (Table 5) and designs (Table 4), the studies used similar outcome criteria related to pain assessment as well as further psychometric measures that allow for an integrative review of the results. In studies on pain, the most frequently reported measures are pain frequency (eg, days with pain per month) and pain intensity. Pain intensity is most likely being reported on a visual analog scale (VAS: 0-10). Table 6 shows the primary outcome criteria of the respective studies (pre-, postintervention, and follow-up if applicable). Pain intensity was rated for either pain during the last 4 days or acute pain within the assessment situation, both on a VAS.

The study by Hillecke[105] reported a significant pre-post treatment effect on pain intensity during the last 4 days ($P < .001$) for a total of 31 patients (including 10 patients who initially were part of the waiting list group and received music therapy later on). Furthermore, patients who received music therapy rated significantly lower pain intensity during the last 4 days than patients in the waiting list group (standardized mean difference [SMD] $= -1.04$; $P = .01$). In addition to pain intensity during the last 4 days, the study assessed acute pain intensity. A significant treatment effect was reported in pre-post comparison ($P < .001$). Music therapy was not superior to medical treatment as usual when comparing acute pain intensity (SMD $= -0.34$, $P = .09$). The replication study by Wormit[111] revealed a comparable pre-post treatment effect on pain intensity during the last 4 days in oncology patients (SMD $= -0.58$, $P = .03$) and patients with chronic pain (SMD $= -0.77$, $P < .00$). The study on music therapy in children with migraine[106,107] reports a reduction in pain intensity by responder rates (at least 50% reduction compared with baseline). Posttreatment responder rates revealed no significant differences ($P = .51$) between music therapy (5.9%), butterbur root extract (21.1%), and placebo treatment (15.8%). Follow-up responder rates were likewise not significantly different between groups ($P = .79$), with comparable responder rates in music therapy (29.4%), butterbur root extract (33.3%), and placebo treatment (22.2%). The pilot study on the music therapeutic treatment

Table 5. Population by Study.

Study/Group	n (M/F)	Mean Age, y (SD)	Diagnosis
Hillecke 2005[105]			
Music therapy + medical pain therapy	31 (10/21)	52 (11)	16 Headache, 1 facial pain, 14 back pain, 5 nervous injuries, 2 complex regional pain syndrome, 8 neuropathic pain, 3 muscle pain or arthralgia
Primary waiting list (medical pain therapy)	19 (5/14)	52 (10)	8 Headache, 6 back pain, 2 nervous injuries, 6 neuropathic pain, 3 muscle pain or arthralgia
Waiting list (later in the MT)	10 (3/7)	54 (11)	5 Headache, 5 back pain, 2 nervous injuries, 3 neuropathic pain
Experimental group (MT + medical pain therapy)	21 (7/1)	51 (11)	12 Headache, 1 facial pain, 9 back pain, 3 nervous injuries, 2 complex regional pain syndrome, 5 neuropathic pain, 3 muscle pain or arthralgia
Leins 2006,[106] Oelkers-Ax et al 2008[107]			
Music therapy	20 (17/3)	9.9 (1.4)	Migraine
Medication	19 (10/9)	10.6 (1.2)	Migraine
Placebo medication	19 (13/6)	10.6 (1.5)	Migraine
Total group	58 (40/18)	nr	Migraine
Wormit 2008[111]			
Music therapy (oncology)	20 (19/1)	53 (13)	14 Breast cancer, 2 ovarian cancer, 4 misc
Music therapy (chronic pain)	22 (18/4)	52 (12)	8 Back pain, 7 headache, 2 neuropathy, 2 myalgia or joint pain, 2 breast pain, 1 misc
Koenig et al 2013[108]			
Compact group	9 (3/7)	13.48 (2.16)	1 Episodic tension-type headache, 1 chronic tension-type headache, 3 migraine with aura, 2 migraine without aura, 2 combination headache
Standard group	10 (3/6)	13.67 (2.34)	3 Episodic tension-type headache, 2 chronic tension-type headache, 4 migraine with aura, 1 combination of headache types
Total group	19 (6/13)	13.58 (2.19)	4 Episodic tension-type headache, 3 chronic tension-type headache, 7 migraine with aura, 2 migraine without aura, 3 combination of headache types

Abbreviations: n, number; F, female; m, male; MT, music therapy; SD, standard deviation; nr, not reported; misc, miscellaneous.

Table 6. Primary Outcome Criteria: Pain Intensity (VAS 0-10), Current Pain Intensity, or Pain Intensity During the Last 4 days (VAS 0-10); Reported by Time of Assessment: Before the Intervention (pre), After the Intervention (post), and Follow-Up (fup) as Specified in Table 3.

Study/Group	n	Pre: M (SD)	Post: M (SD)	Fup: M (SD)
Current pain intensity (VAS)				
Hillecke 2005[105]				
Music therapy (WL & music therapy)	31	5.2 (2.3)	4.2 (2.3)	na
Music therapy	21	nr	4.7 (2.4)	na
Waiting list control (WL)	19	nr	5.5 (2.3)	na
Leins 2006,[106] Oelkers-Ax et al 2008[107]				
Music therapy	20/13/14	4.6 (1.5)	6.2 (2.0)	4.7 (1.8)
Medical therapy	19/18/14	4.9 (1.7)	5.4 (2.0)	4.5 (1.8)
Placebo	19/17/18	4.8 (1.5)	5.9 (2.2)	5.7 (1.8)
Koenig et al 2013[108]				
Music therapy	19	4.7 (1.8)	3.7 (1.4)	na
Pain during the last 4 days (VAS)				
Hillecke 2005[105]				
Music therapy (total)	31	6.4 (1.9)	4.9 (2.0)	na
Music therapy	21	nr	5.1 (2.0)	na
Waiting list control	19	nr	7.0 (1.6)	na
Wormit 2008[111]				
Music therapy (oncology)	17	4.8 (2.3)	3.6 (2.4)	na
Music therapy (chronic pain)	22	6.5 (2.7)	4.5 (2.4)	na

Abbreviations: nr, not reported; na, not applicable; M (SD): mean (standard deviation); VAS, visual analog scale; WL, waiting list.

manual[108] reported a statistically significant pre-post treatment effect combining both music therapy groups on acute pain intensity (SMD = −0.62, $P = .02$).

In addition to improvement in pain intensity, the studies by Oelkers-Ax et al[107] and Koenig et al[108] used headache frequency per month as an outcome criterion. Again, the study

on music therapy in children with migraine reported a reduction in pain intensity by responder rates (at least 50% reduction in attack frequency). Posttreatment responder rates showed significant differences between music therapy (70.6%), butterbur root extract (26.3%), and placebo treatment (26.3%). Follow-up responder rates revealed no significant differences ($P = .31$) between music therapy (58.8%), butterbur root extract (53.3%), and placebo treatment (33.3%). The combined groups in the study by Koenig et al revealed a small but nonsignificant effect (SMD = −0.35, $P = .14$) on headache frequency compared with baseline (mean [M] = 16.84, standard deviation [SD] = 10.5 days per month) and posttreatment measures (M = 13.72, SD = 11.27 days per month). Results of the most recent study comparing the music therapeutic treatment plan to an attention placebo in adolescents with primary headache are soon to be published.[109]

Secondary Outcomes

Compared with responder rates in the study on children with migraine, therapy success within the first study was defined by the combination of 3 instruments: the VAS for pain in the last 4 days, the pain perception scale (*Schmerzempfindungsskala* [SES][112]), and the outcome questionnaire (OQ45.2[113]). Patients had to improve on at least 1 of the chosen scales and not deteriorate on any. Variables were analyzed with the method of *clinical significance* and *reliable change*, as described elsewhere.[114,115] Group comparisons revealed significant results in the total score as well as in social role in OQ45.2. Tendencies toward positive changes were found in symptom distress (OQ45.2). Significant results were obtained in both affective pain and sensory pain by SES and interpersonal relations (OQ45.2). Analysis of clinical significance showed that more patients in the experimental group benefited from the treatment on each of the outcome criteria. Analysis of reliable change showed a tendency of superiority of the experimental group. Patients undergoing music therapy exhibited a positive change rate of 67% in contrast to only 32% in the control group. Additionally, the groups were analyzed after controlling for medication, thereby including only patients with no changes in medication intake. Data analysis revealed a statistically significant superiority of the music therapy group.

In the study by Oelkers-Ax et al,[107] psychiatric comorbidity was investigated using a semistructured diagnostic interview for mental disorders in children and adolescents (Diagnostisches Interview bei psychischen Störungen im Kindes- und Jugendalter [Kinder-DIPS]).[116] Subthreshold symptoms such as depression were measured using the German version (Depressionsinventar für Kinder und Jugendliche [DIKJ]) of the "Depression Inventory for Children and Adolescents" self-report questionnaire,[117] which is based on the Children's Depression Inventory.[118] Furthermore, 2 subscales of the stress questionnaire for children (Fragebogen zur Erhebung von Streßerleben und Streßbewältigung im Kindesalter [SSK][119]) were used to monitor self-rating of perceived stress. Parental rating for behavioral and emotional problems was investigated using the Child Behavior Checklist (CBCL[120]). In an exploratory analysis, those secondary outcomes and their interaction with group membership were included in the regression analysis relating the treatment to the reduction in the frequency of migraine attack. Neither for the baseline to posttreatment reduction nor for the baseline to follow-up reduction, a significant effect on any of the outcomes was found.

Discussion

Results of the study by Hillecke[105] indicated that music therapy is an effective adjuvant intervention for patients having chronic nonmalignant pain, doubling the effects of pharmacologic treatment (waiting list condition). Significant results were documented in pain measures and in psychological measures. Music therapy not only reduced pain but also addressed associated psychological distress in a positive way. Music therapy seems to have the potential to stabilize the social role functioning in contrast to the patients receiving only pharmacologic treatment, who on average deteriorate on this measure. Parametric analyses as well as analysis of clinical significance showed the superiority of additional music therapy in the treatment of patients having nonmalignant pain. Moreover, patients on stable medication profit more from music therapy, indicating that this might be a prospective factor for more probable success. The replication of the study by Wormit[111] provided further support for the beneficial effects of music therapy in the treatment of oncology patients and patients with chronic pain. The pain-reducing effect of music therapy seems not to be related to the dose or frequency of treatment.[108] While these studies in adults and adolescents revealed that music therapy can reduce pain intensity, the study on music therapy in the treatment of children[106,107] with migraine showed that music therapy may reduce pain intensity but is not superior compared with a pharmacologic or placebo treatment. However, music therapy seems to be superior to a pharmacologic or placebo treatment in reducing the frequency of migraine attack posttreatment and seems to be as effective as a pharmacologic treatment 6 months after the treatment. Thus, we can state that the use of music therapy in the treatment of adults with nonmalignant[105] and malignant chronic pain[111] is effective in reducing pain intensity and is superior to pharmacologic treatment as usual (waiting list condition[105]). In children with migraine[106,107] and in adolescents with primary headache,[108] music therapy can reduce pain intensity and pain frequency. In children with migraine, music therapy is not superior to a pharmacologic treatment 6 months after treatment.[107] In their latest study, Koenig et al[109] (under review) aimed to investigate the nature of these beneficial effects by testing the music therapeutic treatment manual against a placebo treatment (rhythm pedagogic program).

Future studies need to focus on the specificity of the beneficial effects of active music therapy in the treatment of patients with recurrent or chronic pain. The treatment manuals need to be tested within placebo-controlled designs,[109] addressing common and the assumed working factors (Table 1) of music

therapy. Of great interest is the adoption of the treatment manuals for different patients (eg, elderly patients with chronic pain) and for more clinical diagnoses (eg, patients with irritable bowel syndrome). Furthermore, since all studies focused on the treatment of patients within an outpatient setting, the treatment of clinical patients is a possible field to expand the research.

Music Reporting Guidelines

The treatment manuals described within the review comprise a large variety of music used within the therapeutic process. The use of music for specific interventions might be categorized as active techniques (ie, client plays on an instrument), interactive techniques (ie, co-created music of the therapist and client), and receptive techniques (ie, client listens to pre-recorded music or music played by the therapist). Most frequently music is improvised relating to specific topics (eg, pain expression, role-play) on a large variety of instruments. The music therapy rooms are equipped with a standard set of instruments. Among these are percussion instruments (eg, African djembe, kettle drum, congas), mallet instruments (eg, vibraphone, marimbaphone), a piano, a guitar, and several smaller instruments (eg, small string instruments, flutes, shakers). In most cases, the client is encouraged to choose a suitable instrument (ie, depending on the task, current mood). Details on the use of music within the specific studies are published elsewhere.[105-108,109,111]

Conclusion

Besides music-listening interventions to reduce acute pain, active music therapy, involving the client's expression through music, might be beneficial to patients with recurrent or chronic pain. Active music therapy as a form of creative psychotherapy is the therapeutic use of musical activities for patients with somatic and mental diseases. Because musical interaction is used as a means of nonverbal communication, it may be particularly effective in patients who are directly accessible through nonverbal contact and less familiar with verbal approaches. Our results provide evidence that a specific music therapy concept tailored to the demands of the patient might be able to substantially reduce pain frequency and pain intensity in patients with recurrent or chronic pain.

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