ORIGINAL ARTICLE – CLINICAL ONCOLOGY

Cancer patients and music: (prospective) results from a survey to evaluate potential complementary treatment approaches

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Abstract

Purpose Many cancer patients (PTS) suffer from somatic or non-somatic symptoms. Studies have shown positive effects of music intervention (MI) on aspects of quality of life or symptom management.

Methods Since there are poor data available about patient's needs regarding the use of MI as an adjunct to cancer treatment, $n = 548$ tumor PTS were polled anonymously at the outpatient department of the University Hospital Mannheim Tumor Center using a self-designed questionnaire. Univariate and multivariate analyses were performed.

Results 486 data sets were eligible for analysis. 240 of the PTS were male and median age was 63 years. 38% had metastatic disease. 81% ($n = 386$) were currently receiving anti-tumor treatment. The majority of the PTS stated to have somatic symptoms. However, some of the PTS reported non-somatic symptoms like anxiety, loneliness, and depression. $N = 187$ (40%) of the PTS reported interest in complementary MI. In the univariate and multivariate analyses, especially PTS with non-somatic complaints and PTS, actively playing or making music showed significantly more interest in complementary MI, hoping for a relaxing therapeutic effect. PTS who play instruments would prefer more active forms of MI.

Conclusion 40% of PTS reported interest in additional MI during cancer treatment. PTS with non-somatic symptoms as well as patients affine to music might benefit from the use of MI potentially reducing their symptom burden. The inconsistent and heterogeneous data from randomized trials underline the importance of systematic research approaches with more relevant and standardized endpoints.

Keywords Music intervention · Complementary · Cancer patients · Symptom distress

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Introduction

The use of music to improve physical and/or mental health goes back to antiquity (American Music Therapy Association 2017). Music therapy is a rather young profession; yet, the awareness of potential benefits of music therapy is growing both from a clinical and an academic perspective. Music therapists use different musical interventions such as playing instruments or singing, music-based imagination techniques, or listening to music or sound (Richardson et al. 2008; Bradt et al. 2011). In contrast to music therapy which requires a therapist and may involve the patients themselves as an active part of the concept, music medicine is defined as listening to music or different sounds without guidance by a therapist (Bradt et al. 2011; Gold et al. 2011; Yinger and Gooding 2014).

Cancer patients frequently suffer from symptoms such as fatigue, reduced performance status, nausea, loss of appetite,

anxiety, or depression as part of their illness or due to the side effects of antineoplastic therapy. Several studies and a systematic review using Cochrane methodology indicated that music interventions may have beneficial effects on various symptoms such as anxiety, pain, mood, and quality of life in cancer patients (Richardson et al. 2008; Bradt et al. 2011). In view of the potential benefits, research on music intervention is still limited in the field of oncology. Moreover, music therapy has not been implemented in the treatment concept of early stages of cancer and is rather used in patients in later or end-stage treatment situations.

The pathophysiological mechanisms of the positive music-therapeutic effects on somatic and non-somatic symptoms are not completely understood. Among other mechanisms, a depressant effect on the sympathetic nervous system leading to decreasing catecholamine level is suggested (Gillen et al. 2008; Nilsson 2009; Nakayama et al. 2009). It has also been reported that music stimulates the brain`s reward center releasing dopamine, a neurotransmitter for the perception of positive feelings and happiness (Salimpoor et al. 2011).

The aim of this study was to determine patients' interest in music-based interventions as well as the requirements for any kind of music therapy as part of anti-cancer treatment in an oncological outpatient department.

Methods

Patients with different tumor diseases were anonymously polled at the outpatient unit of the University Hospital Mannheim Tumor Center, University of Heidelberg, using a self-created questionnaire (see supplementary material). The questionnaire was designed using understandable language for the questions and clearly specified options for response. For some items, the additional opportunity to answer freely was available. Patients who were not able to give informed consent due to psychiatric or neurologic symptoms as well as patients not speaking the German language and patients younger than 18 years were excluded from the study. Main focus of the study was the assessment of the interest for accompanying therapeutic offers on the subject of sound and music as well as the importance of music in the everyday lives of the patients. Patients were asked about their affinity to music and if they actively made/make music (e.g., play an instrument in an ensemble or sing) or prefer to use more passive types of music reception, e.g., listening to music only. Moreover, patients were asked what kind of beneficial effects music actually evoked and they were polled on their expectations from complementary music interventions. In addition, the mental health status was assessed using a ten-level visual analog scale (1 = poor, 10 = excellent). Furthermore, the overall symptom distress, sociodemographic

data, as well as details regarding the malignant disease were recorded. The study was approved by the local ethic committee (Medizinische Ethik-Kommission II, University of Heidelberg).

The descriptive analysis of the data was done using Microsoft Excel, and the univariate and multivariate analysis were performed by SAS. For the calculation of one-sided significances, the T test or the Chi-square test was used. If the criteria for the Chi-square test were not met, the two-sided significance was determined using Fisher's exact test. The significance level was set at 0.05. The multivariate analysis was carried out by logistic regression (step-wise procedure).

Results

Return rate of evaluable questionnaires and patient's characteristics

Overall, $n = 548$ consecutive patients were interviewed anonymously in the first quarter 2018 at the outpatient department of the University Hospital Mannheim Tumor Center, University of Heidelberg. Because of missing plausibility or data, $n = 62$ questionnaires (11%) had to be excluded from the analysis. Thus, a total of $n = 486$ questionnaires are evaluable for analysis. From these, single items with missing data entries were also censored from analysis. The patient's characteristics are shown in Table 1.

Symptom distress

$N = 65$ patients (13%) suffered from nausea/vomiting, $n = 129$ (26%) from pain, and $n = 90$ (18%) reported anorexia. Many patients reported fatigue ($n = 289$, 60%) or decreased performance status ($n = 304$, 63%). In terms of non-somatic complaints, $n = 69$ (14%) of the patients reported anxiety, $n = 50$ (10%) depression, $n = 47$ (9.7%) sadness, and $n = 25$ (5.1%) loneliness (Table 2). A median of two symptoms was reported by the patients. However, $n = 104$ patients (21%) had four or more symptoms simultaneously (min = 0, max = 8).

Mental health

Based on the ten-level visual analog scale, the emotional state of the patients was recorded. Here, $n = 26$ patients (5.5%) reported rather poor mental health (scale values 1–3), $n = 247$ (52%) moderate mental health (scale values 4–7), and $n = 198$ patients (42%) good mental health (scale values 8–10, median 7, min 1, max 10; Fig. 1).

Table 1 Patients' characteristics (cumulative numbers may differ due to missing data entries)

Characteristic	Patients (n)	Percentage (%)
Sex		
Female	242	50
Male	240	50
Median age (range)		
Marital status	63 (18–90)	
Married /marriage-like relationship	343	72
Single/divorced/widowed	137	29
Tumor stage		
Non metastatic	290	62
Metastatic	179	38
School education		
Matriculation standard	200	41
Secondary school	273	56
Other	8	1.7
None	5	1
Working		
No	313	65
Yes	167	35
Cause of presentation in clinic		
Aftercare	88	19
Tumor therapy	386	81
Tumor diagnosis		
Breast cancer	54	13
Gastrointestinal cancer	97	23
Lung cancer	32	7.5
Urogenital cancer	33	7.7
Other solid cancer	30	7
Leukemia	62	15
Myelodysplastic syndrome/myelo-proliferative neoplasia	43	10
Lymphoma	60	14

Importance of music in everyday life of patients

$N = 317$ (66%) of the patients stated to listen to music regularly (a median of 2 h a day). Most of the patients preferred listening to music on the radio ($n = 397$, 82%). However, other media such as television ($n = 148$, 30%), smartphones and tablets ($n = 122$, 25%), MP3 players ($n = 54$, 11%), or media not further specified ($n = 39$; 8.0%) were also mentioned (Fig. 2). More than 60% of the patients reported listening to music while doing housework or driving, 15% listened to music at work, 10% during sports, and 11% during chemotherapy. The preferred music genres varied widely, with trends to German "Schlager" music, classical and rock or pop music. 28% of the patients stated that they listened to all kinds of music.

$N = 77$ patients (16%) actively played a musical instrument. $N = 64$ (13%) patients indicated currently not to play a musical instrument, but indicated interest in learning one. $N = 102$ patients (21%) reported to sing regularly, and $n = 31$ patients (6.4%) were currently not singing, but would like to do so (Fig. 3). It cannot be answered, if some of the patients not actively making music have done this in former times and actually are hindered by the tumor disease.

Interest in complementary music-based interventions

Overall, $n = 187$ (40%) of the patients reported interest in complementary music therapy offers as part of the oncologic treatment concept. Eleven percent of the patients ($n = 60$) reported that they already listened to music during chemotherapy or waiting time, and $n = 228$ (55%) would do so if offered to them. $N = 148$ (30%) were interested in sound therapy, $n = 85$ (18%) would prefer singing as a form of music intervention, and $n = 55$ (11%) would like to play music in an ensemble.

Subjective effects of music and expectations from music intervention

Most patients ($n = 297$, 61%) reported that music interventions should be encouraging, and about half of the patients sought distraction or relaxation ($n = 245$, 50% and $n = 243$, 50%, respectively). The expectations from music interventions compared adequately to the effects already experienced with music ($n = 322$ encouraging, $n = 258$ distracting, $n = 245$ relaxing). However, while a total of $n = 60$ patients (12%) indicated that music interventions should reduce anxiety, only $n = 25$ patients (5.1%) reported this as an effect experienced when listening to music.

Table 2 Symptom distress

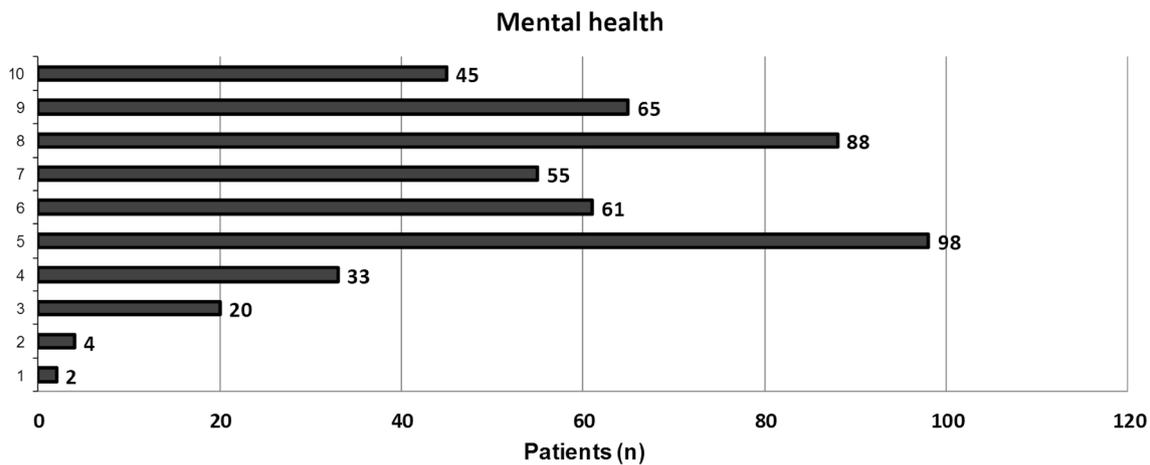| Symptom	Nausea/vomiting	Pain	Loss of appetite	Tiredness	Loss of performance	Anxiety	Depression	Sadness	Loneliness
Patients (n)	65	129	90	289	304	69	50	47	25
%	13	27	19	60	63	14	10	9.7	5.1

Mental health

Fig. 1 Mental health of the patients. Based on the ten-level visual analog scale, the emotional state of the patients was recorded. (1 = poor; 10 = excellent)
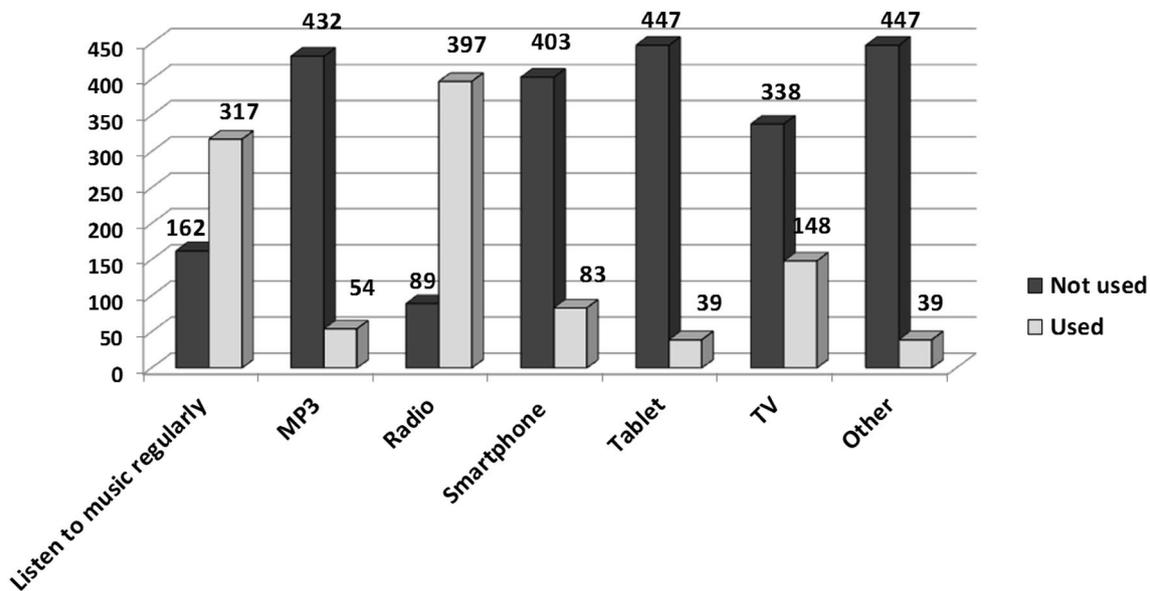

Fig. 2 Use of media for listening music

Univariate and multivariate analyses

To show correlations between patient characteristics, relevance of music, experienced effects of music, and the expectation of complementary music interventions, we performed univariate and multivariate analyses.

First, the subgroup of patients who reported to listen to music during chemotherapy or waiting time was analyzed ($n = 53$). These were especially younger patients (median age 53 vs. 64 years; $p < 0.01$) and patients with the diagnoses of "gastrointestinal tumors" and "breast cancer" ($p = 0.01$). Patients with anxiety and loneliness were also significantly more likely to listen to music during therapy ($p = 0.06$ and $p = 0.01$, respectively). Patients who reported to sing or to play a musical instrument were much more likely to listen to music during chemotherapy or to bridge the waiting time ($p = 0.04$ and $p < 0.01$, respectively). The interest in complementary music interventions was also significantly higher in the group of patients that were listening to music during chemotherapy ($p < 0.01$). Most of these patients preferred active forms of music therapy, such as singing alone or playing alone or in an ensemble ($p = 0.01$, $p = 0.07$ and $p < 0.01$, respectively). The results of the univariate analysis are depicted in Table 3.
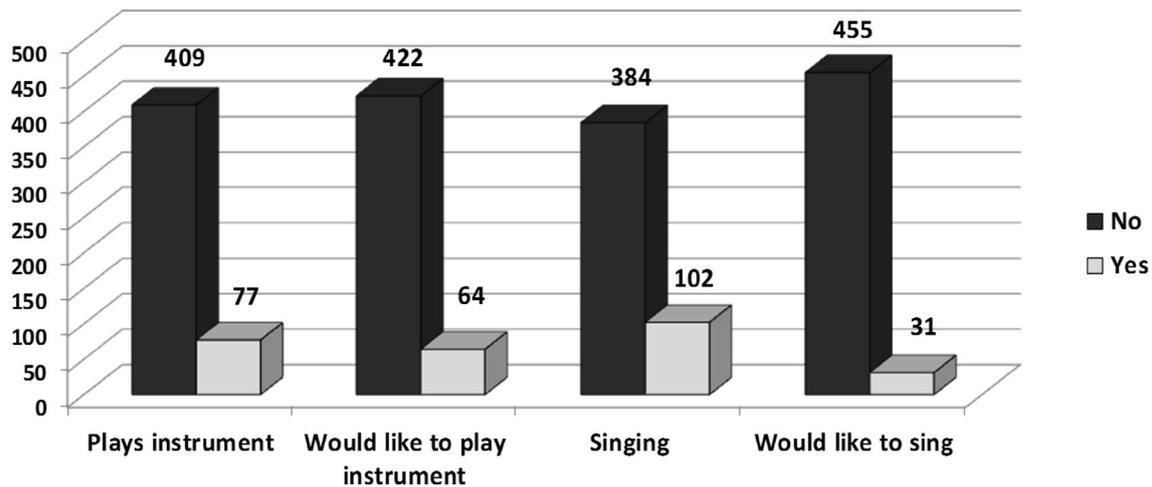
Fig. 3 Patients playing instruments or singing

Table 3 Univariate analysis—"patients listening to music during therapy/waiting time"

Parameter	T test/Chi^2/Fisher's
Age (younger patients < 66 years)	$p < 0.0001$
Breast/GI cancer	$p = 0.0134$
Loneliness	$p = 0.0141$
Patients singing	$p = 0.0413$
Patients playing instruments	$p = 0.0002$
Interested in music interventions	$p < 0.0001$
Music intervention: singing alone	$p = 0.0066$
Music intervention: playing music in a group	$p < 0.0001$

Using logistic regression, several independent significant factors could be identified to characterize this subgroup. Especially younger patients (cut-off at median, i.e., 66 years), patients with less physical distress, patients suffering from loneliness, patients playing an instrument, and those hoping music therapy had a relaxing effect significantly more often listened to music during therapy or to bridge the waiting time. The data from the logistic regression are depicted in Table 4.

As a second step, we analyzed the subgroup of patients who had indicated an interest in complementary music therapy ($n = 187$, 40%). In the univariate analysis, neither demographic data, nor tumor entity or the stage of malignant disease was significant parameters. Interestingly, patients in the aftercare showed more interest in complementary music interventions ($p < 0.01$). Likewise, patients with non-somatic complaints such as loneliness, anxiety, depression, and sadness showed significantly greater interest in complementary music therapy ($p = 0.03$, $p < 0.01$, $p = 0.01$ and $p = 0.04$, respectively), while both the number as well as the type of somatic complaints played no role. Patients who generally show an interest in music (regularly listening to music, playing instruments or singing) were more likely to take part in music-based therapeutic offerings ($p < 0.01$, $p = 0.01$ and $p < 0.01$, respectively). If patients could decide about the type of music-based treatment, they preferred to actively make music alone or in a group ($p < 0.01$, respectively) or take part in sound therapy ($p < 0.01$).

For details on the univariate analysis, see Table 5.

With regard to the multivariate analysis, the model revealed four independent factors: the presence of at least one non-somatic symptom (loneliness, anxiety, depression or sadness), presence of musicality (to sing or make music), the wish to play music together in an ensemble as type of music-based treatment as well as the hope for a relaxing effect through music therapy. The logistic regression data are reported in Table 6.

Table 4 Multivariate analysis— "patients listening to music during therapy/waiting time"

Parameter	Estimate	Standard error	Wald Chi^2	Pr > Chi^2
Age	− 0.0451	0.0110	1,67,693	< 0.0001
Somatic symptoms	− 12,518	0.3930	1,01,441	0.0014
Loneliness	11,306	0.6155	33,745	0.0662
Playing instrument	12,273	0.3651	1,13,010	0.0008
Hoping for relaxing effect	15,801	0.3926	1,61,983	< 0.0001

Table 5 Univariate analysis—"patients interested in music intervention"

Parameter	T test/Chi^2/Fisher's
Aftercare	$p = 0.0075$
Anxiety	$p = 0.0006$
Loneliness	$p = 0.0259$
Depression	$p = 0.0081$
Sadness	$p = 0.0366$
Patients listening to music	$p < 0.0001$
Patients playing instruments	$p = 0.0019$
Music intervention: playing music alone	$p = 0.0033$
Music intervention: playing music in a group	$p < 0.0001$

Discussion

Our study revealed significant interest of cancer patients in music interventions. Some of them are already musically active and would prefer such offers as part of their oncological therapeutic concept; some would rather take part in passive musical interventions.

Data published so far suggest beneficial effects of music interventions on various symptoms of cancer patients (Richardson et al. 2008; Bradt et al. 2011). Music intervention thus may meet expectations of the polled cancer patients in the current study, hoping for reduction of anxiety and for other positive effects like relaxation or distraction. Music therapy as well as music medicine both are considered approaches to improve symptom distress and quality of life. The published evidence, however, does not allow to judge which kind of intervention should be preferred for an individual patient. The latest Cochrane review published in 2016 analyzed the effects of music therapy (23 studies) as well as music medicine (29 studies) on physical and psychological outcomes of about 3.700 cancer patients (Bradt et al. 2011). The results suggest that music interventions had moderate-to-large effects on anxiety, moderate effects on depression, and large effects on pain and mild-to-moderate effects on fatigue. Music interventions were reported to improve vital parameters. Compared to music medicine, music therapy led to improved quality of life of the cancer patients. However, there was no difference between both types of music interventions

in terms of improvement of anxiety, depression, or mental well-being.

More than 30% of the polled patients in the current analysis were interested in using passive music interventions. As a complementary treatment offer, different types of passive music interventions may be provided, including listening to selected music. The question, however, who should be in charge of choosing the type of music (i.e., the therapist or the patient himself) has not been investigated thus far. Referring to the data of a randomized-controlled trial published in 2016, it could be thinkable that therapist-selected music genre may lead to larger efficacy of the music intervention. Trappe et al. analyzed the neurophysiological effects of three different music styles on cortisol levels, heart rate, and blood pressure. Sixty subjects were randomly assigned to three groups listening to music from Mozart, Strauss, and ABBA for 25 min in a resting and comfort position. In comparison, another 60 subjects were assigned to a control group resting in silence for the same time period. The results showed a marked decrease of blood pressure and heart rate in the intervention groups listening to Mozart or Strauss. The strongest effect was reported for Mozart Symphony No. 40 in g minor. There was no correlation between the usually preferred music genre and the study results which implies an independent relaxing effect of classical music. As there was a clear stratification of the participants regarding age and gender, demographic data should have no significant influence on the study results (Trappe and Voit 2016). Nevertheless, further studies on the subject of music genres used for music interventions are needed to answer this question precise.

Contrarily another yet small study suggests that it may be irrelevant which kind of complementary intervention was conducted as long as it had a relaxing effect. Arruda et al. investigated the impact of listening to music or poetry (both pre-selected by researcher) on the pain level, depression, and hope of cancer patients ($n = 65$), compared to standard care (Arruda et al. 2016). The interventions were performed over a period of 3 months. Both music and poetry significantly improved pain levels as assessed by visual analog scale as well as depression using Beck depression inventory (Richter et al. 1998).

The results of the current analysis suggest that some patients would prefer more active forms of music intervention, especially if they were musically active themselves.

Table 6 Multivariate analysis—"Patients interested in music intervention"

Parameter	Estimate	Standard error	Wald Chi^2	Pr > Chi^2
Non-somatic symptoms	0.6745	0.2385	79,972	0.0047
Patients playing instrument or singing	14,806	0.4320	1,17,479	0.0006
Music intervention: playing music in a group	17,075	0.2606	4,29,310	< 0.0001
Hoping for relaxing effect	0.8846	0.2143	1,70,405	< 0.0001

Taking part in music ensembles using easily playable instruments, singing in a choir or learning a new instrument could be possible alternative treatment approaches also for cancer patients not actively making music. However, it is conceivable that these patients should be accompanied by professional music therapists. A three-armed study from 2017, including patients undergoing stem cell or bone marrow transplantation ($n = 39$), investigated the effects on therapy-related symptoms, vital signs, and anxiety comparing patient-selected music using a large music database, art therapy, and standard care (Mische et al. 2017). No significant differences between groups could be detected; the fact of a missing professional art or music therapist in the intervention groups was discussed as a possible cause for the negative study results, leaving the patients alone with their feelings or emotions provoked by the music or the created arts. In contrast, the results of the Cochrane review showed no superiority of music therapy on music medicine regarding the effects on anxiety, depression, and mood. As a matter of fact, there may be no need for a music therapist, but any kind of guidance during and after the music intervention right up to active discussion of the experiences could be important. It is conceivable that this guidance could be provided by a musician, followed by the discussion of the experienced effects of the music intervention the group itself. More randomized trials on active forms of music interventions would be helpful as a guidance to develop standard music interventions that could be implemented in tumor centers.

Despite the fact that several randomized trials have been conducted, at this time, it is difficult to draw a firm conclusion. Methodological weakness, sample size calculation, or the kind of musical interventions applied as well as their durations made comparison of the study results and transfer to clinical routine very difficult. Passive musical interventions were chosen in most trials, maybe as a matter of practicability.

Nevertheless, the measurable effects of music interventions found in literature compare adequately with the data of the current study. Especially patients with non-somatic symptoms like anxiety and depression seem to be susceptible for music interventions. This underlines how important appropriate assessments of non-somatic complaints of cancer patients are independent of their stage of disease.

Notably, in the current analysis, patients in the aftercare were even more interested in complementary music interventions. This may imply that outpatient care of cancer patients, after the primary anti-cancer treatment is completed, should be more multidimensional. The benefit for those patients could especially be emphasized by longer, ongoing music interventions in contrast to the rather short intervention periods of the cited randomized trials.

Conclusion

For a large proportion of the patients in our study, music is a companion in everyday life. 16% of patients play an instrument and 21% sing regularly. Patients making music and those with non-somatic complaints expect benefits from complementary music-based intervention and sound therapy. The inconsistent and heterogeneous data even from randomized trials demonstrate a research gap for music interventions as complementary offers for cancer patients. There seems to be no consent which endpoints could be relevant for the patients and what kind of instruments physicians should utilize to assess them correctly. Larger phase III trials are missing but urgently needed to delimit qualitative as well as methodical aspects for possible therapy concepts. Within such studies, a first implementation of music interventions in daily routine could be acquired, funded either by public means or by grants from non-profit cancer associations. Cooperation with musicians, music teachers, and music schools could be the first step to provide the needed personnel to carry out the music interventions. However, the data from our study will be the basis for complementary music interventions at our cancer center.

Compliance with ethical standards

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