The immediate and long-term effects of singing on the mood states of people with traumatic brain injury

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Abstract

Mood changes in four male participants with traumatic brain injury (TBI) were observed following their participation in a 15-session song-singing programme. An analysis of the song material was undertaken to categorise the songs according to the predominant mood they portrayed. Results showed significant differences between participants for all moods ($p<0.001$). Immediate effects were reversed where participants experienced increases in sadness, anger, fear and fatigue. Long-term effects were significant for some participants who reported increased feelings of happiness and decreased feelings of sadness, fear, confusion, tension and fatigue in the long-term. Characteristics of the songs chosen for therapy were typically representative of feelings of sadness. Findings suggest that immediate effects of song-singing intensify and provide cathartic experiences for people with TBI who may have no other space for which to express negative emotions. Long-term effects of song singing have a positive effect on mood state.

Introduction

People with traumatic brain injury (TBI) frequently experience disturbances of mood and affect, the incidences of which range from 26% to 77% in the TBI population (Bowen et al. 1998; Prigatano 1999; Schramke et al. 1998). Such disturbances present in the form of anger, restlessness, frustration, irritability, agitation, anxiety, sadness or loss of motivation (Prigatano, 1999).

Rehabilitation outcomes are maximised when patients are physically, cognitively and emotionally engaged in therapy processes, capitalising on the early neuroplastic potential of the brain (Kolb and Gibb 1999). However, mood disturbances impact negatively on patient treatment as patients become overwhelmed by the intensity of their emotions and unable to divert their attention to the tasks required in the therapy session (Beblo et al. 1999).

The idea that music could evoke mood states in people is not new, with several studies demonstrating music's potential to elevate or depress mood states in clinical and non-clinical participants (Burns 2001; Davis and Thaut 1989; Hanser and Thompson 1994; Husain et al. 2002; Iwanaga et al. 1996; Kerr et al. 2001; MacNay, 1995; Robb et al. 1995; Stratton and Zalanowski 1984; Strauser 1997; Suzuki 1998; Thaut 1989; Thaut and Davis 1993 et al. 2002; Waldon 2001; Wheeler 1985). Three studies exist concerning the effect of music on the mood states of people with neurological damage (Haneishi 2001; Magee and Davidson 2002; Nayak et al. 2000). Nayak et al. (2000) evaluated the effects of a 10-session group music programme on depression and therapy participation in people with TBI or stroke. The results of this study showed that participants in the music therapy treatment group were more involved in therapy ($p<0.01$) and more motivated to participate in their rehabilitation programmes ($p=0.06$) than the control group. Family member reports and participant self-reports showed a non-significant positive change in mood in the previous 24 hours and the previous week.

Haneishi (2001) examined the immediate effect of singing and vocal exercises on self-reported feelings of sadness/happiness of participants with Parkinson's disease. Twelve to 15 sessions of individual music therapy were provided over a four to five week period. Haneishi found that mood improved from pre- to post-session. However, levels of significance were not found due to the small sample size and small effect size.

Magee and Davidson (2002) investigated the short-term effect of treatment on mood states in a study where fourteen participants with diagnoses of multiple sclerosis, TBI and cerebral vascular accident, participated in two individual music therapy sessions. Results showed significant decreases in anxiety ($p=0.01$), hostility ($p=0.003$), and fatigue ($p=0.05$) but

not in feelings of depression-elation following treatment. Important findings of this study were that mood changes were evident in just two treatment sessions. However, Magee and Davidson argue that longer-term treatment may be necessary to affect changes in the depression-elation scale and is worthy of further inquiry.

In attempting to predict the style of music likely to evoke mood responses, seminal studies by Hevner (1935; 1936; 1937; 1939) and Rigg (1939; 1940; 1941) found certain elements of music facilitated different emotional responses. Table 1 outlines the conclusions established from these studies. Both Hevner and Rigg instigated a new way of thinking about the way music can affect people's moods.

conclusive, Maher found that the major 3rd is a happier sounding interval than the minor 3rd; the 2nd was judged as more interesting, unstable, complex and restless than the octave; and the 2nd and 7th were more displeasing than the 5th. Such findings suggest that melodic lines containing a prevalence of certain intervals would influence the overall mood of a piece of music. For example, the frequent sounding of a minor 3rd would evoke a 'sad' effect or mood state on the listener.

Songs have been shown to be more effective than instrumental music in facilitating a mood response (Gfeller et al. 1991; Stratton and Zalanowski 1994). Text (lyrics) and music combined were found to affect mood state to a greater degree than text and music in isolation.

Table 1

Early established musical parameters affecting mood states

Musical Component	Mood State Evoked
Major tonality	happy, graceful, playful moods
Minor tonality	sad, dreamy, sentimental moods
Firm rhythms	vigorous and dignified moods
Flowing rhythms	happy, graceful, dreamy and tender moods
Complex dissonant harmonies	excitement, agitation, vigour or sadness
Simple consonant harmonies	happiness, grace, serenity
Rising and falling melodic lines	no clear-cut, distinct or constant mood
Slow tempos	dignity, calmness and sadness
Fast tempos	restlessness and happiness
High pitches	sprightly and humorous moods
Low pitches	sadness, dignity and majesty
Ascending 4ths in the melody	joyful moods
Descending minor 2nds	sadness

Studies have since replicated the findings for the major-happy and minor-sad associations (Crowder 1984; Krumhansl 1997; Radocy and Boyle 1997), the fast tempo-happy and slow tempo-sad associations (Krumhansl 1997), and the dissonant harmony-sad and consonant harmony-happy associations (Blood et al. 1999; Krumhansl 1997; Radocy and Boyle 1997). However, there are conflicting findings with respect to rhythm and melodic direction. Scherer and Oshinsky (1977) recently found that complex rhythms where there are tones of different duration were found to express happiness, whereas sadness was conveyed by rhythms that were more regular. Scherer and Oshinsky (1977) and Sloboda (1992) also found that upward contours were indicative of fear and surprise and downward contours were indicative of sadness and boredom.

In 1980, Maher investigated the psychological effects of intervals. While not all the findings were

Further, text alone affected mood state to a greater degree than music alone. However, their studies did not examine the effects on mood when the lyrical material was incongruent with the musical material. For example, how would songs with lyrics portraying loss and sadness and musical elements portraying happiness affect mood. As modern popular music frequently presents with these conflicts between lyrics and music, establishing the effect of this on mood is important.

Music preference and familiarity were found to be important in facilitating mood responses. Davis and Thaut (1989) reported that participant-selected music of varying genres facilitated decreases in state anxiety and increased levels of self-reported relaxation responses. Wheeler (1985) also reported the importance of participant-familiarity with the music and added that the pre-existing moods of the participants predetermined their mood responses. People initially displaying a depressed mood became less depressed after hearing

music they liked, but remained depressed when they listened to music they did not like. In contrast, people who were initially happy became sad when they listened to music they did not like but remained happy when listening to music that they did like.

The literature highlights that there is a need to develop treatments appropriate to managing the disruptive mood states of people with TBI so their participation in rehabilitation programmes is maximised. Further, research has only examined long-term changes to the bi-polar scale of sadness-happiness (Haneishi 2001; Nayak et al. 2000) or immediate changes to mood across several mood states (Magee and Davidson 2002). Given this, an investigation into the immediate and long-term effects of music on a range of mood states on people with TBI is justified. Specifically, the study sought to answer the question: Does participation in a song-singing programme affect the immediate and long-term mood states of people with TBI? Further, the study was interested in examining whether mood changes could be linked to the moods conveyed in the musical material used in the programmes.

post-traumatic amnesia resolution and commencement of the study ranged from 2.5 months to 9.5 months (M= 5.75, SD=3.12). Participants 2 and 4 presented with some moderate cognitive impairments including poor concentration, poor impulse control and perseveration. Lesion sites for each of the four participants are listed in Table 2. Before commencing the study, the participants were oriented as to the procedures and purpose of the study and informed consent obtained.

Measures

The Visual Analog Mood Scale (VAMS) (Stern 1997) was used to assess mood states pre- and post-session. The assessment, designed specifically for people with neurological injuries, measures participants' self-reported feelings for eight mood descriptors: sad, afraid, energetic, happy, confused, angry, tired and tense. Each mood is represented by a face expressing the chosen mood descriptor which was placed at one end of a vertical line with a neutral face placed at the opposite end. The participants were required to mark along the line the degree to which they were presently experiencing that feeling. The VAMS test-retest

Table 2

Participant background information

Participant	Neurological Injuries
1	diffuse axonal injury; haemorrhages in intracerebral, frontal (including subarachnoid region), ventricular haemorrhages, petechial (bifrontal and interhemispheric regions), brainstem; midbrain and brainstem contusions
2	severe haemorrhage to right frontal and left posterior parietal lobes; and a small haemorrhage to right anterior of brain stem
3	diffuse axonal injury; bilateral frontal haemorrhage
4	severe acquired brain injury; extensive fronto-cortical contusions with haemorrhagic fluid cavity in the subcortical white matter; left frontal sheer injury; minor haemorrhagic sheer injury in right posterior of corpus callosum

Method

Participants

Four male in-patient participants (M age = 26.5, SD=2.08) from a rehabilitation hospital met the following inclusion criteria: (a) a diagnosis of traumatic brain injury; (b) were between 18 and 65 years of age; (c) less than 12 months since resolution of post-traumatic amnesia; (d) had no pre-trauma speech or language disorder. Glasgow Coma Scores on hospital admission were between 3 and 5 (M=3.5, SD=1) and length of post-traumatic amnesia ranged from 2 months to 7 months (M=4.25, SD=2.21). The period between

reliability for the normal population was .70 and content validity of the faces without verbal labels was high ($p<0.001$) (Stern et al. 1997).

Procedure

Each participant received 15 individual singing sessions undertaken over a five to eight week period. Sessions were between 40 to 50 minutes in duration, and were carried out three times a week. In some instances sessions were only carried out twice per week due to the lack of availability of some participants on occasions when sessions were scheduled.

A music therapist engaged the participant in vocal exercises, and active song-singing activities comprising three songs selected from a list of preferred songs as given by the participants. The same music selections were used for the 15 sessions to control for differences in responses related to choice of music material.

Prior to and following each session, the participants completed the VAMS and the scores calculated according to standard protocol. Results were analysed using an analysis of variance and effect size calculations. The analyses sought to determine trends in the immediate and long-term effects of sessions, trends in responsiveness to sessions (cumulative effects) and between-participant differences.

An analysis of the song material was also conducted using the musical parameters described by Hevner (1935; 1936; 1937; 1939), Rigg (1939; 1940; 1941) and Maher (1980) as a guide. Each song was evaluated as expressing one mood according to the musical parameters detailed by Hevner, Rigg and Maher.

Results

Mood scale

Table 3 outlines the results of the analysis of variance. The analyses found that there were significant differences between participants in their responses to all eight of the mood scales ($p<0.001$). Effects found between the first two and last two sessions (herein long-term effects) on feelings of happiness differed between participants with some reporting enhanced feelings of happiness while others did not ($p<0.01$).

Cumulative effects of sessions (changes in the interaction between the pre- and post-session scores over time) were evident in participants' perceived feelings of energy ($p<0.05$). Significant long term ($p<0.05$) and cumulative effects ($p<0.05$) of sessions on feelings of tension were reported.

Figure 1 reports the effect sizes calculated for each of the eight mood scales and shows that there were no statistically significant effects. However, trends indicate that long-term effects tended to be larger than immediate effects. Further, long-term effects seem to suggest that participants reported experiencing becoming happier, less afraid, less sad, less confused, less tense and more tired. Conversely, immediate effects show that scores for most emotions increased post-session. In particular, participants reported experiencing greater feelings of fear, anger, sadness and fatigue post-session.

Generally participants tended to report polarised responses which led to unusual distributions of values, and therefore an increased estimate of the standard deviation. Given this, the effect sizes reported here are likely to be an underestimation of the true effect sizes.

Song Analysis

Table 4 outlines the analysis of the musical parameters for each song and provides an overall mood categorisation.

Results indicate that eight of the twelve songs were categorised as sad. However, for two songs, the musical mood portrayed was incongruent with that of the lyrics.

Discussion

Long-term effects

The analysis of covariance and the effect sizes calculated showed that long-term, self-reported feelings of happiness increased and feelings of fear, sadness and confusion decreased. These were in the direction commensurate with the studies of Nayak et al. (2000) and Haneishi (2001) whose participants also became less sad. However, their studies chose to focus solely on the happy-sad (bi-polar) scale and not the six additional uni-polar mood scales presented in the current study. Although only trends were evident here, further investigation into the long-term changes to mood states other than happy-sad are recommended to establish whether consistent responses to this intervention exist with this population.

Theoretical underpinnings of long-term effects

One explanation for the positive long-term effect of sessions may relate to the idea that the emotions expressed in the songs were reflective of the emotional states experienced by the participants while they were participating in sessions. By engaging in the singing of these songs the participants are, in effect, singing about their own feelings, and the very act of doing so allows them to release and let go of pent up emotions – a cathartic effect. In this sense, the songs may have provided an appropriate avenue for emotional expression, which led to a long-term enhancement of positive mood states and a decrease in negative mood states.

Building on the idea of an emotional release, is the possibility that repeated singing of the same song may have enhanced the songs' power to release these emotions. Sloboda's (1991) research findings are relevant here. He found that an emotional response to a piece of music increases through repeated exposure. Consequently, repeated singing of the song might be said to have increased participants' responsiveness to it, increasing the songs' cathartic effects and in turn, enhancing mood long-term.

Table 3

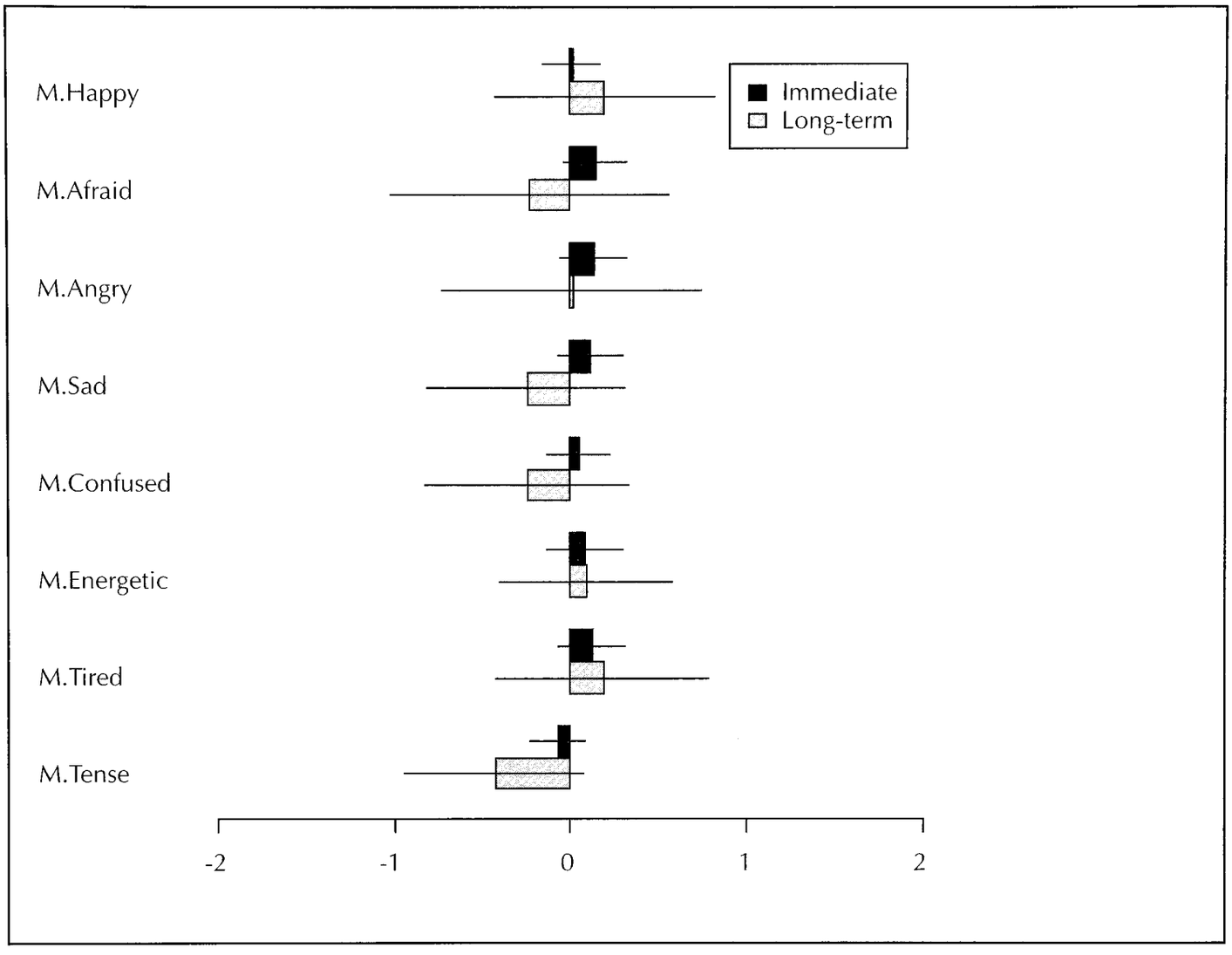
Analysis of mood scale data

		Happy		Confused	
	df	*F*	*p*	*F*	*p*
Long-term effects (session)	1	2.71	0.10	0.81	0.37
Immediate effects (time)	1	0.01	0.91	0.27	0.61
Participant differences (subject)	3	106.86	<0.001***	84.77	<0.001***
Cumulative effects (session x time)	1	1.16	0.28	0.86	0.36
Long-term effects: Participant (session x subject)	3	11.47	<0.001***	0.39	0.76
Immediate effects: Participant (time x subject)	3	0.81	0.49	1.88	0.14
Participant: Cumulative effects (session x time x subject)	3	0.18	0.91	1.18	0.32
Residuals	104				
		Afraid		**Energetic**	
Long-term effects (session)	1	0.19	0.66	0.61	0.436
Immediate effects (time)	1	1.28	0.26	0.73	0.394
Participant differences (subject)	3	59.58	<0.001***	89.41	<0.001***
Cumulative effects (session x time)	1	0.12	0.73	3.91	0.05*
Long-term effects: Participant (session x subject)	3	0.77	0.51	1.84	0.14
Immediate effects: Participant (time x subject)	3	1.60	0.19	0.34	0.79
Participant: Cumulative effects (session x time x subject)	3	0.04	0.99	3.29	<0.05*
Residuals	104				
		Angry		**Tired**	
Long-term effects (session)	1	0.01	0.93	2.01	0.16
Immediate effects (time)	1	1.13	0.29	1.22	0.27
Participant differences (subject)	3	51.96	<0.001***	66.80	<0.001***
Cumulative effects (session x time)	1	0.27	0.60	0.07	0.79
Long-term effects:Participant (session x subject)	3	0.56	0.64	1.59	0.20
Immediate effects: Participant (time x subject)	3	0.36	0.78	0.04	0.99
Participant: Cumulative effects (session x time x subject)	3	0.13	0.94	0.47	0.70
Residuals	104				
		Sad		**Tense**	
Long-term effects (session)	1	0.34	0.56	5.84	<0.05*
Immediate effects (time)	1	1.21	0.27	0.63	0.430
Participant differences (subject)	3	92.60	<0.001***	132.85	<0.001***
Cumulative effects (session x time)	1	0.001	0.99	4.74	<0.05*
Long-term effects:Participant (session x subject)	3	0.64	0.59	1.09	0.36
Immediate effects: Participant (time x subject)	3	0.97	0.41	0.39	0.76
Participant: Cumulative effects (session x time x subject)	3	1.22	0.31	1.37	0.26
Residuals	104				

Note Significance codes: *** = $p< 0.001$, ** = $p< 0.01$, * = $p< 0.05$

Figure 1

Effect sizes for the Visual Analog Mood Scale



Immediate effects

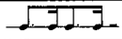
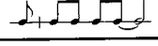
The immediate effects of sessions on mood showed participants became more afraid, more angry and more sad. These findings contradict those reported by Haneishi (2001) who found singing sessions enhanced positive mood states at the post-session. Nevertheless, only one bi-polar scale was used to assess mood in Haneishi's study whereas the present study employed eight uni-polar scales. Similarly, the results reported here do not support the findings described by Magee and Davidson (2002). In their use of a condensed version of the Profile of Moods States, immediate and statistically significant decreases in anxiety, hostility and fatigue were noted. In comparison, increases in fear, anger, sadness and fatigue were reported here, post-test. Contradictory findings between the present study and those of Haneishi, and Magee and Davidson signify the need for further investigation into the immediate effects of music on mood. Differences in findings may be attributed to which mood states are immediately influenced by treatment, the choice of intervention, the choice of musical material, and differences in participant-pathology. Further investigations into this area will build on knowledge accumulated to date in order to understand the mechanics involved here.

Theoretical underpinnings of immediate effects

The analysis of the song material provides possible explanations for these findings. As mentioned, eight of the twelve songs were characteristically expressing sadness, frustration and anticipation of fear. If the participants were also experiencing these feelings at the beginning of the session, participating in the singing of songs that matched their feelings may have intensified their experience of them. Katsch and Merle-Fishman (1985) and Austin (1998) state that singing songs gives voice to intense pain, fear and anger, and in doing so one begins to feel and express more intense emotion. Such intensification may have brought these feelings to

Table 4

Musical analysis of song material

Participant 1	***I Heard it Through the Grapevine – Creedence Clearwater Revival***	***Under the Bridge – Red Hot Chili Peppers***	***Comfortably Numb – Pink Floyd***
Tonality	Minor	Major	Minor and Major
Rhythm	Static, repetitive	Simple, firm	
Harmony	Simple, predictable	Complex, dissonant	Resolved dissonance
Intervals	Minor 3rd predominates	no predominant intervals	min 7th & 8th[1], min/maj 2nd
Melody Direction	Static	Mixed, lots of movement	Varied, often static
Tempo	Moderate	moderate	slow
Melody range	Narrow	wide	wide
Mood category	Sad, restless, agitated	Happy, agitated, (sadness/despair)	sad
Participant 2	***You're the Voice – John Farnham***	***Heavy Heart – You am I***	***Waltzing Matilda – Traditional***
Tonality	Major	Major	Major
Rhythm	 typical	Repeated quavers	Quaver rhythm
Harmony	Consonant, strong changes	Rich, resolving dissonance	Predictable consonant
Intervals	P 4th	Min 2nd	No predominant intervals
Melody Direction	Changing	downward 	Mixed, lots of movement
Tempo	Fast, lively	slow	Fast
Melody range	Wide	narrow	wide
Mood category	Happy, energetic	sad	Happy, energetic
Participant 3	***Layla – Eric Clapton***	***Bad Moon Rising – Creedence Clearwater Revival***	***Sunday Bloody Sunday – U2***
Tonality	Minor	Major	Minor
Rhythm	 predominates	 predominates	syncopated
Harmony	rich, resolving dissonances	Consonant, predictable	Simple, predictable
Intervals	major/minor 2nds	unisons	mixed
Melody Direction	Static	static	mainly descending phrases
Tempo	Moderate	moderate	slow
Melody range	Narrow	narrow	moderate
Mood category	Sad, feeling of loss	Tension, sad, agitated	Sad, frustrated
Participant 4	***Cecilia – Simon and Garfunkel***	***Knocking on Heaven's Door – Guns n' Roses***	***Better Man – Pearl Jam***
Tonality	Major	Minor	Major
Rhythm	 predominates	Crotchet, static	syncopated
Harmony	Consonant, predictable	Consonant, predictable	Simple, predictable
Intervals	Major/minor 2nds	Major/minor 2nds	minor 3rd
Melody Direction	Predominantly ascending	Static, descending	descending
Tempo	Fast	slow	slow
Melody range	Wide	narrow	narrow
Mood category	Happy* (sadness/loss)	sad	sad

* Indicates that the theme of the lyrics was incongruent with the mood category portrayed within the music, with the theme of the lyrics placed in brackets next to the mood category of the music.

a level where the participants may have become more aware of them. In doing so, they experienced an increase in these feeling states and subsequently reported these increases in the VAMS.

The extent to which the lyrical content compares with the musical parameters in their evocation of mood states may explain why singing songs had such a strong negative effect on mood at the post-session. Gfeller et al. (1991) and Stratton and Zalonowski (1994) showed that the lyrics were more influential in modifying mood states than the music. In the current study, most of the songs' lyrical themes were about sadness, loss, frustration and anticipated fear. However, the musical parameters did not always reflect these mood states. This was particularly apparent for the songs employed in participant 4's sessions where the thematic material of the lyrics portraying emotions of sadness and despair was incongruent with the musical parameters which were more expressive of happiness and excitement as evident in major harmonies and fast tempos.

One observation of the immediate effects of sessions was that as the mood states of anger, sadness and fear tended to increase from pre- to post-session, experienced feelings of tiredness also tended to increase. This might suggest that while singing intensified the feelings of the participants, experiencing these emotions was fatiguing. People feel more tired after intense emotional experiences. At the same time, given that people with TBI are prone to fatigue, it is also possible that fatigue was a consequence of actively participating in therapy rather than the product of experiencing intense emotions.

The increases in feelings of sadness, anger and fear post-session may be considered by some allied health disciplines as a negative outcome given that therapy participation relies on positive mental attitude. However, the singing sessions may have allowed clients the space to express their bad feelings. While there was no assessment made to whether they were more satisfied post-treatment, they may have had no other opportunity in their rehabilitation programme, to vent their feelings or have them acknowledged. This opportunity may have been important in stimulating the long-term increases in positive feelings and warrants further investigation.

Implications for rehabilitation

In considering the challenges experienced in rehabilitation by people with TBI, these long-term changes have important benefits for the treatment team and long-term recovery of these patients. Generally, mood disturbances impact negatively on patient treatment because patients become overwhelmed by the intensity of their feelings and emotions and are unable to divert their attention to the tasks required of them in the therapy session (Beblo et al. 1999; Code and Herrmann 2003). This lack of concentration and motivation prevent maximum participation in rehabilitation programmes. Ultimately this slows the recovery process, or even worse, limits the degree of recovery given that early intervention is necessary to maximise outcomes (Kolb and Gibb 1999). Therefore, enhanced feelings of happiness and a reduction in fear, sadness and confusion long-term, may lead to a greater potential for maximum rehabilitation recovery. Investigations into the effects of music on mood and on the degree of rehabilitation participation would add weight to this argument.

Participants also reported a long-term reduction in tension, suggesting that singing songs facilitates the release of tension. This concurs with comments by Clair (2000) and Katsch and Merle-Fishman (1985) who proclaim that the mere act of singing reduces physical tension. This has benefits for improving the rehabilitation process because increased muscle tone (muscle tension) reduces the range and flexibility of muscles, and any overall reduction in tension may allow people with TBI to more effectively participate in physiotherapy or occupational therapy treatment, thereby accelerating the rehabilitation process.

Another finding arising from this study was that the results showed a long-term increase in feelings of fatigue. Generally, fatigue negatively impacts on rehabilitation outcomes as patients are not able to sustain participation in the treatment (Prigatano 1999). It is unclear whether fatigue reported here was a direct result of singing or the result of an intense therapy programme implemented by the entire treatment team.

Limitations of the study

The small sample size in this study implies that generalising these findings is problematic. Discrepancies in the participants' use of the VAMS is likely to have resulted in an underestimation of the true effects of treatment. Obtaining sufficiently large sample sizes within the TBI population continues to present difficulties when attempting to establish treatment protocols. The small number of potential participants is confounded by the individualised nature of each TBI, a problem also recognised within other disciplines with the recent emergence of the journal Neurocase – a specialist journal focusing on case studies within neurology.

The VAMS, although designed specifically for neurologically impaired people, was too abstract for some participants in this study. Consequently,

participants scored inconsistently and with high variability. Some participants reported a consistent flat affect while others reported polarities. It is unclear whether participants found this task difficult or whether they had difficulty in identifying, describing and measuring their own mood states.

In this study, song-singing required participants sing three songs selected from a list of participant-preferred songs. Although intended to control for potential differences in the ways participants responded to different song selections, restricting the participants' programmes to three songs was in retrospect, limiting. First, participants may have become bored by singing the same three songs for the entire 15-session programme. Second, the mood states represented in the three songs may not have been appropriate for the participant during every session. It is a limitation of this study that participants may have been singing songs they were unable to relate to emotionally at that moment. A more appropriate design would be to allow participants to select the songs during each session rather than pre-determining the musical content of the programme at the commencement of the program. Future studies could attempt to link the participants' moods closely with the musical material. Perhaps participants could nominate songs they know have a unique emotional significance, and these selections become the musical content of the each session. Participants could then select the musical material that best reflects their emotional state on any particular day providing them with opportunities to reflect.

Conclusion

This study found that the mood states of participants with TBI were altered as a consequence of singing participant-selected songs although the authors acknowledge the inherent difficulties in measuring mood with this population in addition to the difficulties in proposing causal links between the songs and mood changes. Trends indicate that participants became happier and less sad, afraid and confused in the long-term suggesting that the sessions had long-term benefits. Immediate effects were reversed in that participants became more sad, more angry and more afraid post-session. Fatigue also increased to a large degree post-session. Characteristics of the music used were typically representative of feelings of sadness. The employment of these songs seemed to intensify negative mood states possibly providing cathartic experiences for the participants.

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