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Does live music benefits patients with brain and spinal injury?

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Abstract. – OBJECTIVE: The purpose of this study is to examine the feasibility and prospective success associated with implementing and evaluating a six-week live music intervention on an inpatient neurorehabilitation ward.

PATIENTS AND METHODS: In total 26 patients were included in this study. Out of which, 15 were patients and 11 were staff members. Staff participants completed wellbeing measures at before and after music. Patients completed an assortment of validated measures at five consecutive time points from baseline to follow-up. Staff participants experienced a minor decrease in wellbeing over time.

RESULTS: The majority of the data collected from patients illustrated positive trends, with improvements in wellbeing, pain, cognition functioning, independent functioning, and mobility. The feasibility indicates that with modifications that this project is a viable venture.

CONCLUSIONS: We found that live music appears to be promising new addition to neurorehabilitation.

Key Words:
Dilatation and curettage, Propofol, Ketamine, Remifentanil.

Introduction

Neurorehabilitation is a multi-disciplinary educational approach fostering maximum recovery for individuals with neurological conditions[1]. The demand of neurorehabilitation services continues to rise as the population ages and medical technologies advance[2].

In recent years, the application of music-based interventions in neurorehabilitation has attracted substantial attention[3]. Music-based interventions have been suggested as a cost-effective alternative to other medical treatments[4] and can comprehensively influence both psychosocial and biomedical features in a non-invasive way[5]. In daily living, music is a valued tool for emotional regulation and stress relief across all ages[6] and is used to help enhance performance on everyday tasks and activities[7,8].

The emotional and cognitive effects of music are thought to be due to the widespread bilaterally activation of various brain regions[9]. This activation incorporates frontal[10], temporal[11], parietal[12] and limbic/paralimbic brain regions[13].

The existing literature also tends to concentrate on measuring the functional progress of patients such as gait[14], rather than wellbeing and emotions. The emotional impact of music is thought to be a key modulating variable in intervention outcomes[15].

It is apparent from the literature that the types of music interventions and methods utilized are heterogeneous. There is no standardized knowledge regarding the different types of music, timing, and intensity. There is evidence indicating that live music may provide greater benefits than recorded[16]. Consequently, we aimed to explore the prospective success and impact of this type of music intervention. To comprehensively assess its impact, a broad battery of validated measures was used. The most extensively measured psychological construct within the battery is wellbeing. Both patients and staff were measured before and after the intervention for obtaining a holistic perspective of the music's impact on the ward. This study is designed firstly to identify any noticeable trends or findings in the outcome measures following the live interactive music intervention. Secondly, to examine the feasible of implementing and evaluating a live interactive music intervention within an inpatient neurorehabilitation ward.

Patients and Methods

Patients

A total of 26 participants were recruited from an inpatient neurorehabilitation ward using an

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opportunistic sampling method. Fifteen of the participants were patients (6 females, 9 males of age 65 years, age range was taken as 39-83 years), and 11 of the participants were staff members (8 females, 3 males). See Table I for demographic, diagnostic, and musicality information of the patient sample. Only patients who provided informed consent and/or valid responses to the measures were considered as eligible for this study. Two patients and 10 staff members were removed from the analysis as they did not have scores beyond baseline. One participant voluntarily dropped out of the research as the outcome measures were uncomfortable for him/her.

Study Design

This study utilized a prospective, quasi-experimental design. The quasi-independent variable was the quantity of exposure to the live interactive music, as measured by the number of sessions each participant chose to attend. The other independent variable was the separate time points at which the dependant measures were taken. The patients were monitored for 5 different time intervals: baseline or time 1 (taken before any exposure to the intervention), during the intervention or time 2 and 3 (taken immediate before and after each music session), post-music or time 4 (taken after the last music session or before the patient was discharged), and follow up or time 5 (taken seven days after the post-music measures). Time 2 (immediately before each session) and time 3 (immediately after each session) are comprised of aggregated scores from week one to six of the intervention. Staffs were only measured at time 1 and time 4, and their exposure levels were not monitored. The primary dependent variable was the wellbeing of patients' and staff participants. The secondary dependent variables for patients' were independent functioning, mobility, pain, and cognitive functioning.

Live Music Intervention

The live music was arranged over a 6 week period with a session on both Saturday and Sunday of every week, providing a maximum of 12 music sessions. The sessions took place in a group setting in the community room on the ward of 60 minutes duration. The attendance of the patients was recorded at the beginning of each music session. The music selection was varied with different musicians for each session; only one set of musicians had a repeat performance. Within each performance the musicians involved them in music games such as clapping hands and singing. The following instruments were used: harp, piano, guitar, violin cello, west African kora, harmonica, flute, melodeon and fiddle. The music genres included classical, popular, jazz, folk, and tango.

Measurements

At baseline, post music, and follow up time points the patients were measured using a battery of assessments. This battery was arranged into a standardized assessment pack for the researchers. The assessment packs were comprised of the following measures

Wellbeing

Warwick-Edinburgh Mental Wellbeing Scale [WEMWBS][17] is a positively worded 14-item assessment of well-being. Each item has 5 response categories, ranging from 1 (none of the time) to 5 (all of the time). The minimum score was 14 and the maximum score was 70.

Pictorial Depression Intensity Scale Circles [DISC][18] is a graphic rating scale of depression ranging from zero (no depression) to five (most severe depression). Each end of the scale had a pictorial representation of the depression level.

EuroQol-5 dimensions-5 levels [EQ-5D-5L][19] is an assessment of health related quality of life. It provides a single index score ranging from zero to 100 of how good or bad the patient perceived their health using a visual analogue scale (VAS), and a five-digit descriptive health state illustrating mobility, self-care, usual activity, pain, and depression/anxiety. Each descriptive health state is scored on a one (no problems) to five (extreme problems) scale.

A modified version of the World Health Organization-5 Wellbeing Index [WHO 5]. A five-item well-being measure modified to examine the immediate effects with a minimum score of zero and a maximum score of 25. Responses to the items were recorded on six-point scales, ranging from zero (strongly disagree) to five (strongly agree).

Pain

Numbered Graphic Rating Scale [NGRS]. A single-item assessment of pain. The scale on the item ranges from zero (no pain) to 10 (pain as bad as it could be) in equally spaced 1-unit increments.

Table I. Subject characteristics. The table describes frequency (percentages) of demographic and musicality variables and diagnosis in patient sample.

	Frequency	Percent
Gender		
Male	9	60
Female	6	40
Mean Age		65
Diagnosis		
CVA*	2	20
Neuropathy	1	10
Brain tumour	2	20
Spinal injury	2	20
TBI**	2	20
MS***	1	10
Enjoys music		
Yes	13	93
No	1	7
Plays instrument		
Drums	1	7
Piano	2	14
Does not play instrument	11	79
Formal music lessons		
None	12	100

*CVA = Cerebrovascular accident, **TBI = Traumatic brain injury, ***MS = Multiple Sclerosis

Cognitive Functioning

Mini Mental State Examination [MMSE][20] is a short assessment of cognitive function that includes orientation, attention, memory and language. The total score ranges from 0 to 30.

Independent Functioning

The Barthel Index [BI] [21] is a 10-item tool completed by assessors for independence in daily living. The score ranges from zero (dependent upon others) to 100 (independent functioning).

Mobility

Functional Ambulation Category [FAC][22] is a classification system used to estimate the ambulation capacity of patients.

The WHO 5 and DISC were the brief wellbeing measures administered to patients immediately after each music session. Another wellbeing measure, the faces scale, was also administered immediately before and after each music session. The Faces Scale is a visual rating scale used to measure happiness. The scale ranges from one (very unhappy) to six (very happy). Information was also collected on the patients' demographics, and musicality at baseline, and verbal feedback at post-music. The staff-participants were only required to complete the WHO 5 at baseline and post-music.

Ethical permission was obtained by the University and consent was obtained from each patient.

Results

The participants' details are tabulated below in Table I. The observed mean score for the wellbeing measures are described in Table II. As it can be seen in Table II, both the WEMWBS and WHO 5 scores gradually increased from Time 1 to Time 5. The number of music sessions attended only appeared to impact the WHO 5 scores. The number of music sessions attended had no bearing on the VAS scores. The positive trends on these wellbeing measures are reflected in the following verbal testimonies from patients:

- "The music really lifted me up. I always feel rested and active after the music."
- "The enjoyment with the calming effect."
- "I liked the sound, it was happy, people were happy and we were all having fun."
- "The music was very happy."

Table II. Mean score for the wellbeing measures at each time point (standard deviation in shown in parentheses).

Measures*	Time 1	Time 2	Time 3	Time 4	Time 5
WEMWBS	45.00 (9.11)			47.57 (7.52)	56.83 (31.48)
WHO-5	15.08 (3.59)		17.15 (5.52)	17.14 (4.44)	19.00 (4.00)
EQ-5D-5L: VAS	55.00 (14.77)			63.21 (14.08)	50.40 (31.48)
DISC	1.92 (1.17)		0.94 (0.88)	1.86 (1.10)	1.20 (1.30)
EQ-5D-5L: Depression	2.00 (0.91)			1.64 (0.74)	1.40 (0.89)
Faces Scale		4.13 (1.79)	5.22 (0.64)		

*WEMWBS is Warwick-Edinburgh Mental Wellbeing Scale; WHO-5 is World Health Organization-5 Wellbeing Index; EQ-5D-5L is EuroQol-5 dimensions-5 levels; VAS is Visual Analogue Scale; DISC is Depression Intensity Scale Circles

Discussion

The primary objectives of this investigation were to identify any noticeable trends in the outcome measures following the live music intervention, and to assess the implementing and evaluating this intervention on an inpatient neurorehabilitation ward. All patient outcome measures illustrated improvements from baseline to post-music, with the exception of the EQ-5D-5L usual activities dimension. The patients experienced increases in wellbeing, cognitive functioning, mobility, independent functioning, and reductions in pain. These findings support the existing perspective that music-based interventions can improve non-musical recovery in neurological disorders[23]. It also coincides with previous studies regarding the widespread impact of music-based interventions[5,24], and the success associated with such intervention in neurorehabilitation[25].

The intervention was easy to implement, and from feedback everyone appeared highly accepting of it. The staff, patients and their family were delighted to help contributing in the sessions, with no complains about extra un-paid workload.

Conclusions

This study demonstrated that it is possible to implement and evaluate a live music intervention. It is apparent that more feasibility studies are required in relation to refining the methodology and cost-effectiveness before a pilot investigation can be conducted, and eventually a Randomized Control Trial (RCT). The positive outcomes here and within the literature support this proposal for further research. The positive verbal feedback and encouraging outcomes suggest that music-based interventions could be a valuable new addition to the multi-disciplinary approach in neurorehabilitation wards.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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Table III. Secondary dependent variables: Mean score for secondary outcome measures at each time point (standard deviation is shown in parentheses).

Measures*	Time 1	Time 4	Time 5
NGRS	4.15 (2.97)	2.64 (2.76)	0.50 (0.84)
EQ-5D-5L: Pain	2.69 (1.11)	2.14 (1.17)	1.20 (0.45)
MMSE	23.23 (5.83)	24.36 (5.78)	21.00 (8.06)
BI	56.15 (32.92)	72.86 (29.07)	52.00 (41.77)
EQ-5D-5L: Self-care	1.92 (0.95)	1.29 (0.61)	1.00 (0.00)
EQ-5D-5L: Usual Activities	2.31 (1.18)	2.62 (1.26)	1.60 (0.89)
FAC	3.62 (1.98)	4.17 (1.98)	3.20 (2.59)
EQ-5D-5L: Mobility	3.15 (1.28)	2.17 (1.38)	2.00 (1.41)

*NGRS is Numbered Graphic Rating Scale; EQ-5D-5L is EuroQol-5 dimensions-5 levels; MMSE is Mini Mental State Examination; BI is Barthel Index; FAC is Functional Ambulation Category.

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