The Effect of Music on Patients with Disorders of Consciousness

Ms Teresa Grimm, MA

Scientia

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Disorders of consciousness may arise from a wide range of incidents, diseases and conditions, including traumatic brain injury, infection and tumours. With her collaborators, **Ms Teresa Grimm** at the Department of Music in Carl von Ossietzky University, Germany, is exploring the existing literature and delivering novel findings on the effect of exposure to music for patients who are living with a condition which results in a loss of consciousness.

The Consciousness Controversy

The term 'disorders of consciousness' (DoC) incorporates a plethora of conditions, including minimally conscious state in which patients have partial preservation of conscious awareness, unresponsive wakefulness syndrome (formerly called 'vegetative state') and coma, where the patient exhibits neither wakefulness nor awareness.

There are various conflicting and controversial opinions about the conscious state and what treatments and provisions should be offered to patients and the families of patients who are living with a disorder of consciousness.

At its most extreme, the opinion of some clinicians and scientists of patients who are living with conditions which cause a loss of or decrease in consciousness, is that the individuals are no longer human beings. From this perspective, consciousness is what defines humanity.

Ms Teresa Grimm, at the Department of Music in Carl von Ossietzky University, Germany, takes a different stance. She argues that the treatment of patients with DoC must follow scientifically rigorous and empirical methods aiming to create a dignified environment and restoring their 'personhood'.

In support of her beliefs, Ms Grimm argues that the brains of babies are not fully developed at birth, and following the more extreme beliefs would lead to the conclusion that babies are not human until their levels of awareness and consciousness are fully developed. With a clear focus on the rights of patients to be treated in a way which may improve their quality of life, humanity and personhood, Ms Grimm and her colleagues are now investigating the role that music may play in this.

Ms Grimm further counters the consciousness confers humanity argument by defining the myriad of occasions when all humans are not fully conscious based on the definition of consciousness as being aware and wakeful. First, during some stages of sleep individuals are not conscious of their surroundings, and we have all experienced times where our mind wanders or goes blank, and these are both examples of reduced



consciousness. Furthermore, activities that we do automatically, such as driving a car or conducting some other routine action, occur without the need for full conscious thought.

Disorders of Consciousness and Music

By the nature of their condition, patients with DoC are unable to engage in verbal communication, but given the effect of music on both the cortical and subcortical regions of the brain, Ms Grimm proposes that an intervention approach based on the patient's historical music preferences may be used to effectively induce an emotional response. In the case of people with DoC, the preferred songs can be delivered by close relatives or friends.

Importantly, music that we have listened to in our younger years is



maintained in a specific section of our memory known as 'autobiographical memory'. Furthermore, music is well known to produce a reminiscence response in the majority of individuals.

Music Therapy and Quality of Life

In addition to selecting music which may stimulate autobiographical memory, music therapy can be used in which a music therapist develops a personal relationship and contact with the patient. Therapists adapt their approach and methods to align with the patient's response, which may be extremely subtle. The music therapists are highly attentive to the patient's response, and match their musical choices to the patient's physiological signs, such as breathing rate, which is used as a measure of the patient's level of stimulation.

This approach focuses on the patient's quality of life. Ms Grimm and her collaborators believe that we need to drive a shift of our focus from the argument of what makes a person human, to a more empathetic focus on asking what the person needs. Music therapy can also be used as a diagnostic instrument for consciousness. Dr Wendy Magee and her colleagues developed an assessment which is called MATADOC (Music Therapy Assessment Tool for Awareness in Disorders of Consciousness).

A Systematic Review of Musical Interventions in Disorders of Consciousness

Ms Grimm and colleagues conducted a systematic review of the existing research pertaining to the use of musical interventions for patients with DoC. A systematic review is a rigorous, structured approach used to assess the outcomes of research studies. Effectively, a systematic review collates studies, defines study biases, and ultimately attempts to draw a combined conclusion from the body of evidence.

Study Inclusion Criteria and Data

The researchers identified 22 studies published between 1900 and 2017 which reported the findings from a variety of musical interventions on a total patient cohort of 329 individuals with DoC. The ages of the patients ranged from 5 to 91 years, and the causes, where noted, covered a range of initiating conditions, such as injury and infection. Where details of the patients' conditions were provided in the 22 studies, they broadly fell into the categories of unresponsive wakefulness syndrome (44%), coma (20%) and minimally conscious state (19%), with approximately 16% of patients remaining unclassified.

Music Interventions

In the studies reviewed, the patients were exposed to either recorded or live music, with live music largely delivered in the form of a music therapy intervention. The researchers defined the interventions as being based on music having a meaningful biographical association for the patient, music forming the basis of the relationship between the patient and the therapist, or both.

The varied nature of the 22 studies led the researchers to conclude there was no apparent commonality in terms of the structure or properties of the musical interventions delivered to patients. Given the nature of the conditions that the patients suffered from, interaction and responses were, predictably, extremely limited.



Study Quality and Rigour

The researchers assessed the potential bias of the studies by assigning scores for a number of key points about each study, including the method, design, and relevance to the review questions. The studies were then categorised into high, medium and low risk of bias groups. Of the 22 studies, only four had a low risk of bias, with the others either being medium or high risk.

The quality of the methods used was variable, with only three of the studies being randomised controlled trials in which control groups using healthy participants were included. The high level of bias observed was largely attributed to the lack of blinding in the studies. Blinding refers to the process of participants and researchers being prevented from knowing certain information that may somehow influence them and therefore, influence the results of a study. Of course, in some circumstances, blinding is next to impossible to ensure.

Results and Conclusions of the Review

Ms Grimm and her colleagues noted that the studies, while admittedly lacking in some areas, did frequently exhibit robust patient responses to the musical interventions. The patient responses occurred at both the behavioural and physiological level, with the recorded behavioural changes including body movement (directed towards the source), reduced agitation, changes in facial expression and visual fixation, changes to breathing patterns and the production of sounds. From a physiological perspective, the researchers noted that the studies report variations in heart rate, blood pressure, breathing rate and oxygen saturation, all of which appear to be observed with a high level of consistency. Furthermore, in some studies, changes to both functional and metabolic brain activity were observed.

Given the variations in music type – biographical and nonbiographical – and the range of responses recorded in these studies which did show potentially positive indicators, the researchers recommended that both in-depth qualitative



studies and well-controlled quantitative studies are needed to determine the longer-term effects of music intervention in patients living with DoC.

A Qualitative Study – Interviewing Music Therapists

Ms Grimm and her colleagues conducted an interview-based study in which eleven trained music therapists working with patients living with a range of DoC participated.

In evaluation of the responses, the researchers concluded that therapists use a wide range of different strategies, all largely focused on the aims of the therapy. The therapists further explained that they respond and alter therapy by changing their singing or playing in response to even slight responses by the patient, such as changes to breathing. Some of the therapists found it not appropriate to turn on the radio in a patient's room and leave the room. The patients may be overstimulated. When the patient showed visual fixation or even eye contact, the therapists evaluated this as a sign of consciousness. It was found that in cases where the noted response was capable of being repeated, would therapists report efficacy of an intervention.

A Quantitative Study and the Future

Ms Grimm and colleagues have also undertaken a quantitative intervention study, which is still to be concluded. In this study, Ms Grimm is liaising with family members to determine patients' preferred musical choices and she is working directly with patients with DoC to introduce the musical intervention.

While the outcomes of this study are yet to be published, Ms Grimm highlights the ongoing challenges of this type of research, where the patient conditions vary across the spectrum of consciousness disorders, and their individual musical likes also vary, making the process complex. Nonetheless, findings will undoubtedly represent another important stride forward in the complex, challenging arena of improving care for patients with disorders of consciousness.



Meet the researcher

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Following the completion of her degree in cognitive linguistics, Ms Teresa Grimm undertook a series of internships in hospitals, where she specialised in neurological rehabilitation. Working with patients with disorders of consciousness (DoC) stirred Ms Grimm's interest in determining if the reactions to music that she had observed in these patients was incidental or repeatable and systematic. Ms Grimm then secured a PhD placement to conduct this work within the Department of Music at Carl von Ossietzky University. Having conducted a systematic review, a qualitative interview study with music therapists, and a quantitative study of patients with DoC, Ms Grimm has finalised the work for her PhD and is currently awaiting her viva voce.

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FURTHER READING

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