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The Effect of Music and Audiobook Listening on People Recovering From Stroke: The Patient's Point of View

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Abstract

Recent experimental evidence suggests that musical activities can enhance motoric, cognitive, and emotional recovery after a stroke. The authors' aim was to gain more insight about the emotional and psychological factors underlying the therapeutic effects of listening to music after a stroke, by combining both qualitative and quantitative methods. Thirty-nine patients who had suffered a stroke were interviewed about their subjective experiences when listening, on a daily basis, to either self-selected music ($n = 20$) or audiobooks ($n = 19$) during the first 2 months after the stroke. Results showed that music listening was specifically associated with better relaxation, increased motor activity, and improved mood, whereas both music and audiobook listening provided refreshing stimulation and evoked thoughts and memories about the past. These results highlight the clinical importance of providing stimulating and pleasant leisure activities after a stroke and further encourage the use of music in stroke rehabilitation.

Keywords

audiobook listening, music and medicine, music listening, rehabilitation, stroke

A stroke, caused by a brain infarction, is a dramatic illness that often leads to severe motor and cognitive deficits, as well as causes considerable emotional distress and social dysfunction. Due to the aging of the population in many developed countries, the incidence of stroke still remains high, leaving about 5 million people worldwide each year permanently disabled.[1] In most cases, the public health care system is not able to meet the rehabilitation needs of this population, which places a heavy burden on the patients and their families, who are left to cope with the disability mostly on their own. Furthermore, even in rehabilitation centers, persons with stroke typically spend a large amount of the day in their rooms, inactive, and without any interaction.[2] In their survey of 434 people who had suffered from stroke, Mayo et al[3] found that 72% of the patients lacked an important and meaningful activity to fill the day, suggesting a need for leisure activities, which could promote well-being and also potentially aid recovery. However, there is still very little research about the effects of normal everyday leisure activities on stroke recovery.

Listening to music, the radio, or other material (such as audiobooks) are common leisure activities that can provide enjoyment and mental stimulation as well as help to relax and take one's mind off the worries of everyday life. For the human brain, listening to music[4-7] or narrated stories[8-12] entails a widespread activation of temporal, prefrontal, premotor, and parietal cortical areas. These parts of the brain control many cognitive functions such as attention, semantic and syntactic processing, and memory. But music has perhaps the most significant influence of all on the emotions.

Music listening is often used to accompany our everyday actions and to regulate our mood, emotions, and attention.[13] Emotional self-regulation in particular is one of the core human abilities related to emotions, which is acknowledged as one of the most important reasons for musical engagement at any age.[14] Music can evoke vivid memories of past events[15,16] as well as induce strong emotions and mood states, which is indicated by changes in subjectively experienced emotions,[16,17] physiological reactions[18-20] (eg, heart rate, skin conductance, respiration, and hormone secretion), and behavior.[21] In recent neuroimaging studies, the act of listening to music has been

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shown to engage virtually the entire limbic/paralimbic emotion system, including the amygdala, hippocampus, nucleus accumbens, ventral tegmental area, anterior cingulate, and orbitofrontal cortex[4,5,22,23] (for a recent review, see Koelsch[24]). There is currently an increasing awareness of the social value of music with respect to its effectiveness in communicating emotions.[25-27] Also, for patients with traumatic brain injury, music therapy has been suggested to be a suitable therapeutic strategy, as it is an adequate form of emotional expression.[28-32]

Based on a hypothesis that active and regular listening to self-selected music or complex verbal material might stimulate the recovering brain and thus lead to a better recovery, we recently performed a randomized controlled trial (RCT) about the effects of music and audiobook listening on people recovering from a stroke (for details, see Särkämö et al[33]). We recruited 60 patients who had had an acute middle cerebral artery stroke, in either the left or right hemisphere, and randomly assigned them to a music listening group, an audiobook listening group, or a control group (n = 20 in each). Results showed that both music and audiobook listening enhanced the recovery of auditory sensory memory functions,[34] as indexed by changes in the magnetic mismatch negativity, which was measured with magnetoencephalography. But only music listening was found to improve cognitive recovery, especially in the domains of verbal memory and focused attention, as well as to prevent depressed and confused moods during the 6-month follow-up.[33] It is possible that these effects could be due to enhanced neuronal plasticity and stimulation provided by the music or to emotional and psychological factors related to the music listening experience. Whereas quantitative neuropsychological and neurophysiological methods can be used to study the former mechanism, a better understanding of the latter mechanism can be obtained only through phenomenological, or qualitative, research. Using the patients' own narratives as a research tool offers a unique opportunity to unravel important elements of human experience (eg, personal history, sense of self, place, and context) that can help us to better understand the patient's life during the recovery process and thereby also gain a deeper understanding and a more holistic view of the role of music in this process.

Our previous results were based on interviews with patients in the music listening group (n = 20) on how they felt the listening had contributed to their recovery during the first 3 months after the stroke.[35] For most patients, music listening was associated with better relaxation (85%), providing refreshing stimulation (65%), increasing motor activity (90%), improving mood (95%), evoking thoughts and memories (85%), and contributing positively to recovery (75%). These 6 categories were found to follow the typical time course of responding and adapting to a life crisis,[36] beginning with a brief shock phase characterized by feelings of confusion, helplessness, and chaos; proceeding to reaction and recovery phases characterized by various psychological reactions (eg, anxiety and depression); and then adjustment. However, without a comparison group, it is impossible to determine which, if any, of these positive effects are specific to music listening and which reflect the more general impact of doing pleasant leisure activities or getting therapeutic attention.

The aim of the present study was to extend our previous work by combining both qualitative and quantitative approaches. Specifically, we first analyzed and classified the narrative content of the interviews of both music (n = 20) and audiobook (n = 19) listeners qualitatively by using a phenomenological research model and then compared statistically the number of music and audio group patients whose responses fell into each of the aforementioned 6 categories. The advantage of using such a mixed design is that it allowed us to draw conclusions about the specificity of observed rehabilitation effects while retaining their phenomenological origin.

Methods

The participants were patients recruited between March 2004 and May 2006 from the Department of Neurology at the Helsinki University Central Hospital, who had been admitted to the hospital for the treatment of an acute stroke. According to the RCT protocol used in the study (for details, see Särkämo et al[33]), the patients were randomly allocated to either a music listening group, an audiobook listening group, or a control group approximately 1 week after their stroke. During the following 2 months, the music and audiobook groups listened daily (minimum of 1 hour/day) to self-selected music or audiobooks, while the control group received no listening material. Only the patients who were in the music group (n = 20, 12 women and 8 men; mean age 56.7 years) and in the audiobook group (n = 19, 10 women and 9 men; mean age 59.3 years) are included in the present study. As reported previously, there were no group differences in baseline demographical or clinical variables or in the amount of rehabilitation (ie, physical therapy, occupational therapy, speech therapy, or neuropsychological rehabilitation).[33]

The patients were interviewed by music therapists (authors A.F. and S.L.) before the intervention (1 week after the stroke) and then a second time after the intervention (2-3 months after the stroke). In the first interview, the patients were asked what kind of music they liked listening to or what kind of literature they preferred (eg, what were their favorite songs/artists/books/authors). If they could not answer, this information was obtained from their relatives, who also volunteered to help find appropriate listening material. During the 2-month intervention period, when patients listened to the material on a daily basis, the music therapist phoned or paid them a visit every week to help them with the CD players and to bring new audiobooks or music CDs. The patients were also asked to keep a log of their listening, and nurses and relatives were there to help them to do so. In the second (postintervention) interview, both groups were asked how they had experienced the listening and whether it had contributed to their recovery in some way or not.

Data of interest in the present context was collected from the audiobook (n = 19) and music (n = 20) listeners during the second interview, using open-ended phenomenological interviews. These interviews were performed individually for

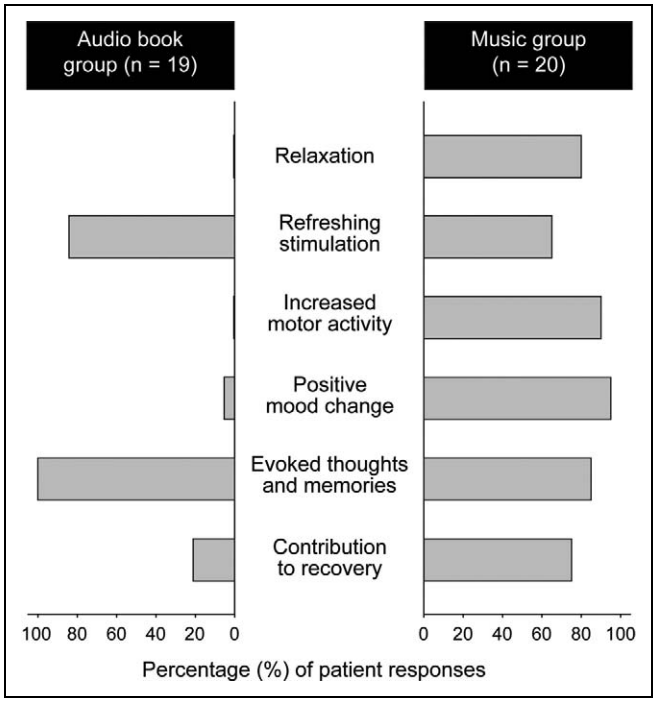

Figure 1. The subjective experience of music and audiobook listening after stroke. Data from patient interviews are summarized in 6 categories. Bars show the percentage of patients in the music listening group (left) and the audiobook listening group (right) whose responses fall into each category.

each patient after the 2-month listening period. To understand the depth and the meaningfulness of the experience, as it was actually lived during this period, the narrative data from the interviews was analyzed following the guidelines of Giorgi's phenomenological research model.[37] As a theoretical framework to understand what the patients were going through emotionally and psychologically, Cullberg's theory of crises[36] was used. In analyzing the data, the interviews were first coded and transcribed using a piece of software called Hyper Research (© 2006 ResearchWare, Inc, PO Box 1258, Randolph, MA 02368-1258). After this, each transcript was read through to get a reflective discernment of the essence of the interviews and an overall sense of the experiences of the patients. Key statements were then identified, placed together, and grouped into different meaning units (eg ''audiobooks evoked memories''). These meaning units were put under various themes (eg, ''memorizing''), which then formed distinct upper categories (eg, ''evoked thoughts and memories''). Finally, the proportion of patients in the music and audiobook groups whose responses fell into each of these upper categories was compared statistically using χ^2 tests.

Results

The patient interviews yielded a total of 523 meaning units, which were organized around 26 themes and finally formed 6 distinct categories. Figure 1 illustrates the percentage of patients in the music and audiobook groups whose responses fell within each of the 6 categories. Examples of the responses within each category are shown in Table 1.

Results showed that patients in the music group, more than the audiobook group, found that the listening helped them to relax ($\chi^2 = 25.8$, $P < .0001$), increased their motor activity ($\chi^2 = 31.8$, $P < .0001$), and improved their mood ($\chi^2 = 31.4$, $P < .0001$). Since most of the patients had deficits in attention, memory, or verbal comprehension, many of the audiobook listeners reported having difficulties concentrating on listening or following the plots of the stories. They also found the stories to be boring, funny, or exciting, but unlike the music listeners, they did not report that the listening had actually made them feel different or generally improved their mood. Also, the difference in motor activity was huge: whereas the music listeners reported often walking, doing household chores, and even dancing to the music, the audiobook listeners found that they could not move anywhere from the cassette player because they had to concentrate just on listening. Both music and audiobook group patients reported equally often that the listening had felt like refreshing stimulation ($\chi^2 = 1.0$, $P = .31$, Yates' correction) and had evoked thoughts and memories about the past ($\chi^2 = 1.4$, $P = .25$, Yates' correction). Overall, patients in the music group felt more often than those in the book group that listening had contributed positively to their recovery ($\chi^2 = 11.4$, $P < .001$).

Discussion

When we compared the patients' subjective experience of music and audiobook listening, only music listening was considered as an aid to recovery during the first 2 months after the stroke. Music listening seemed to be specifically related to better relaxation, increased motor activity, and improved mood. Both music and audiobook listening were experienced as refreshing and pleasant leisure activities that also evoked a lot of thoughts and memories. Interestingly, when talking about their mood, the audiobook listeners often remarked that they felt depressed, being aware of the stroke, whereas the music listeners typically did not note that they felt depressed but rather that music in fact elevated their mood. Thus, for people who have suffered a stroke, music may be a transitional object for feeling negative emotions safely, a space where the patient can experience those emotions, and a method for coping when there is something too painful to think about. As mentioned earlier, results from our RCT study also showed that the music listeners reported feeling less depressed and confused than the nonlisteners when they filled in the Profile of Mood States questionnaire 3 months after the stroke.[33] This result is also in line with evidence from many physiological, neuroimaging, and clinical studies showing that music listening is associated with and can lead to positive changes in arousal, emotions and mood, and motor activity.[4-7,14-24,38-41] It also lends support to the previous findings that active music therapy can reduce anxiety and depression and improve emotional adjustment and social interaction in patients who have had a stroke and those with traumatic brain injury.[42-44] Recently, music-supported therapy

Table 1. Examples of Responses From Individual Interviews

Response category	Audiobook group (n = 19)	Music group (n = 20)
Relaxation	Listening to audiobooks doesn't help me relax or calm down.	Classical music always helps me relax. When I was listening to music in the hospital, I fell asleep at once. It was great that I could relax with it.
Refreshing stimulation	It's always nice to hear a story. It was such a nice experience to just lie down and listen to an audiobook. I found the story called "Juurakon Hulda" so funny! Listening to audiobooks was so interesting that it kept me inside the whole day.	When I put the music on, I don't have to think about this stroke or other sad things all the time. Music listening was a positive experience for the whole patient room. Everyone was lying in their beds listening, even nurses started to hum along to the music. Lazy Sundays in a hospital, nothing else to do there.
Increased motor activity		With the help of music I can do the dishes and other work in my household. Without music I would have just sat down feeling miserable. At home we have tried dancing together. Rock, baby, rock like we used to! I was surprised that I could still do that.
Positive mood change	Hearing a sad story changes your mood more than reading it from a book, and you also cry more easily. Somehow I feel sad and lost although everything is alright. It is so hard to go shopping even though I can. I don't think I can go back to work in March, yet.	Music puts me in a good mood. That's why I always put Johnny Cash on, so that I don't get angry. In the middle of all the sorrow in my life, music brings me joy and can change my mood.
Evoked thoughts and memories	Audiobooks evoked so many memories. Audiobooks are so interesting. They bring back childhood memories, the landscape of your youth. I remember we used to listen to *Suomisen perhe* and other radio plays during the war. I also remember the stories that my father told.	I feel that my thoughts are coming easier with music. I remember when I was a 4-year-old boy watching the prisoners of war with my father, an empty rifle on my shoulder.
Contribution to recovery	Every stroke patient should be encouraged to be active in the recovery process so that he can feel that life goes on despite all the struggle. Afterwards he can feel that he is alive.	This is an excellent method. In the beginning, I felt so confused in the hospital. Music was like a key that unlocked me. At the hospital, I could not find words or concentrate in reading. Now I listen to music before I start reading. It helps.

has also been shown to lead to marked improvements in motor skills after a stroke.[45-48]

Music is known to have an important role in mood regulation during adolescence,[14] but recently, this topic has also been studied in older adults. In an interview study of subjects aged between 21 and 70 years, Saarikallio[49] found that music is an important means of emotional self-regulation and mental work across the age span. Crucially, music appeared to become emotionally important, especially during hardships and difficult life experiences due to its ability to comfort, co-experience, distract, and empower. This is also well in line with the experience of music listening described by the patients in this present study.

In conclusion, the results of our mixed qualitative and quantitative study show that for patients recovering from an acute stroke, music listening is experienced as a useful leisure activity that specifically helps to relax, improve mood, and increase motor activity. Overall, these results highlight the clinical importance of providing stimulating and pleasant leisure activities for people who have suffered a stroke, and in particular, they encourage the use of music for stroke rehabilitation.

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