

Special Article - Psychopathology in Older Adults

A Clinical Study of the Musical Effect on Anxiety and Depression in Dementia

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Received: June 15, 2015; Accepted: July 30, 2015;

Published: August 05, 2015

Abstract

Dementia is widespread among elderly people and often related to anxiety and depression. These symptoms affecting strongly dementia subject can deteriorate the quality of life and increase the risk of mortality. Consequently, it is necessary to find therapeutic methods to manage dementia. Among the several care programs, we have decided to analyze non-pharmacological interventions, precisely the music therapy. Combining the clinical psychology and the scientific literature, we have tried to explain the underlying mechanisms of « the power of music » on anxiety and depression in dementia. We hypothesize that the Musical Sound System remains relatively preserved in dementia, due to the characteristics of musical sound, and it could represent a cognitive resource. Nevertheless, the subjectivity of the patient plays an important role in therapy, as Oliver Sacks points out, and without its consideration, every intervention could be vain.

Keywords: Music therapy; Dementia; Depression; Anxiety; Subjectivity**Abbreviations**

MSS: Musical Sound System; LSS: Language Sound System; MMSE: Mini-Mental State Examination

Introduction

Depression and anxiety are widespread among elderly people [1-4]. Studies reveal that these symptoms affect not only aged people living in the community, but also those in nursing homes. In Amsterdam, 3790 people living in the community, aged between 65 and 84 years old, have been assessed and the results show that the prevalence of depression was 12.9%, generalized anxiety disorder 3.2% and mixed anxiety-depression 1.9% [5]. These results confirm previous studies [2-3]. A study focusing on the very oldest elderly, around 90 years old, demonstrated that, for 201 people assessed, the prevalence of depression was 17%, anxiety 4% and mixed anxiety-depression 8% [6]. In nursing homes, cases of depression are very significant [7]. A study based on 333 residents of 14 nursing homes reveals that Major Depression is prevalent at 8.1%, Minor Depression at 14.1% and sub-clinical depression at 24% [8].

One other common disorder affecting significant elderly people is dementia [7,9] which is often related to anxiety and depression. In the nursing home, the prevalence of dementia is very high [7,10] and we can observe that anxiety and depression are more present in people with dementia than without dementia [11,12].

In addition, these disturbing observations are aggravated by their outcomes: anxiety and depression are under-diagnosed and under-treated [1,11] and they can affect the cognitive functions, the quality of life and can cause mortality in old age [6]. Moreover, a close relation between depression and mortality have been discovered [5,13] but for anxiety the relation is less evident.

Dementia

We estimate that there are 47.5 million people with dementia

around the world and 7.7 million new cases every year [14]. Dementia is also considered to be one of the most significant diseases of our times. These results related to anxiety, depression and their consequences in elderly people with dementia lead us to analyze the different care programs aimed at managing these troubles. Therefore, we have pharmacological and non-pharmacological therapies. We will focus on non-pharmacological therapies. On the one hand, because they do not have side effects, on the other hand, because the pharmacological therapies have a limited effectiveness in dementia disease: its effects are the same as those of a placebo [15,16], the use of medicines worsen the state of health of the elderly person with dementia by increasing depressive symptoms [17,18] and even the risks of falls and fractures [19,20]. Therefore, among the non-pharmacological therapies we have chosen Music Therapy.

Music Therapy

The scientific literature reveals the positive effects of music in elderly people affected by dementia. Listening to music once a week can significantly decrease depression and anxiety. A significant effect can be observed from the first assessment and it can persist for 8 weeks after the end of the treatment [21]. Similar results have been recorded in other Music therapy treatments [22,23]. Listening to music also helps reducing hypertension [24,25], strongly related to depression and anxiety [26]. Consequently, the quality of life and the risk of mortality can be improved [27]. Music (passive or interactive) is also considered to be a pain relief: it can reduce distress, agitation and Behavioral and Psychological Symptoms of Dementia [28-30]. Further studies confirm that the musical memory is relatively preserved in dementia patients [31-33] and that the semantic and procedural memories seem to be more preserved than the episodic one [34-35].

Nevertheless, every clinical case is unique and it can contradict previous observations: for instance a pianist with dementia can

have his episodic musical memory preserved [36] and patients with significant memory deficits can show a surprising musical memory, allowing them to learn and play new songs [36-38]. Music helps not only to preserve our memories and keep it active, but it also stimulates and revives certain types of memory like the autobiographical one [39-41].

Emotions aroused by music can also be preserved in dementia [23,42-45]. Music allows the arousal and increases attention and concentration [33,39,46]. These functions can also be stimulated by the emotional arousal caused by music [28,33,41]. All these positive effects of music show a gap between the results of Mini-Mental State Examination and the preserved musical abilities [34]. Moreover, Smith [47] assumes that music can improve the scores of MMSE. This assumption is supported by the improvement of cognitive functions [28,35] like the verbal fluency and the duration of responses, after a music therapy treatment [48,49]. We can find the same results in singing therapies with elderly people affected by dementia [50,51].

Limits

The entire scientific literature reveals beneficial effects of music on anxiety, depression and cognitive functions in elderly people with dementia. However, the different types of cognitive deficits in dementia seem to follow a very singular development. The preserved and reactivated functions will be different according to the individual. Moreover, the preserved musical abilities also depend on the patient experience, for example, the musicians will have a more pronounced preservation of the musical abilities [36-38].

Nevertheless, we can observe a lack of explanation concerning the underlying mechanisms of the effects of music on anxiety and depression in elderly people with dementia. In fact, the only explanations that we can find so far are principally based on the effects or behaviors [40]. Therefore, some studies have been conducted to understand the mechanisms of these improvements, but they remain confined to a specific topic. For example, a relation has been found between the anxiety and the improvement in the autobiographical memory, but these data can be interpreted in different ways [39,40]. At the same time, the underlying mechanisms of this process are very little known [35,46] and the clinical aspect is very often neglected. Consequently, it is inevitable to observe an evident lack of explanation and clinical application in the studies carried out so far.

Our article has the aim to develop an explanation about « the power of music » on anxiety and depression in dementia by combining a clinical case and the scientific literature.

The Clinical Case of Henry

Our case is taken from the documentary « Alive Inside » [52], which is about Henry, an elderly man affected by dementia in a wheelchair, who has been living in a nursing home for 10 years. Henry «did fun, love, singing and dancing in every occasion», as his daughter describes him. Unfortunately, since the diagnosis of dementia, he became isolated, huddled up, finger crossed, apathetic, mute, with little eye contact, almost non-responsive and having difficulties in answering simple questions, like “What is your name?”.

For two years, the nurse tried to communicate with Henry, but without success. However, one day, by listening to some songs chosen

according to his own preferences, he «lighted up immediately» [52]. He animated, moving his arms, dancing and singing. What is more, this effect continued even after the music stopped. His attentional abilities seemed more efficient and we can observe more eye contact and an improvement in his linguistic abilities, stimulating the verbal communication. Afterwards, Henry was able to answer to easy yes-no questions. Gradually the questions asked to Henry to become more complex and open. He managed to remember his favorite singer, saying: «Hum I guess Cab Calloway» and other autobiographical memories reappeared. When he was asked «What does Music do for you»? He answered « It gives me the feeling of love, romance, I figure right now the world needs to come into music, singing; you’ve got beautiful music here... Beautiful, Lovely. I feel Band of Love of Dreams! ».

The Music shows a very significant clinical effect on Henry. Clinically, we observe a sudden improvement of attention, a better language expression and comprehension and a general improvement of communication – abilities strongly affected before. Moreover, emotions were present and they could be put into words. Finally, Henry could use again some aspects of his memory. This clinical case confirms the scientific literature previously analyzed and shows that music perception increases the attentional, emotional, mnemonic and linguistic abilities of elderly people affected by dementia. Consequently, what are the mechanisms of music on anxiety and depression? The first clinical observations, we can make is that Henry seems more receptive to music rather than to language. The difference between these two functions seems linked to the characteristics of sound and their perception. Therefore, we will see that the different characteristics of musical and language sounds with their respective cognitive system play an important role in dementia.

Music vs. Language

We are born in a sound environment characterized by three distinct categories: language, music and noises [53]. Two of these sound categories will forge two main mental structures based on different sound characteristics: the Language Sound System and the Musical Sound System [54]. Starting from rich and continuous acoustic variations of the sound environment, these mental structures will be useful to extract some distinct units aimed to create stable mental representations, which are necessary to the recognition, learning, use of language and music. Thus, they are two systems based on a mental framework of learned sound categories [54].

Therefore, Henry’s clinical case seems to reveal certain dissociation between language and music perception. Neuropsychology presents many arguments in favor of the dissociation between language and music. Some brain injuries have shown that language and music are quite distinct. Aphasic patients can preserve their musical abilities, as well as music patients can preserve their language abilities [54-60]. This dissociation led I. Peretz to hypothesize a specificity and autonomy of MSS [61]. Therefore can this specificity and autonomy allow a preservation of the MSS in dementia?

Language Sound System

Language and music share some features: pitch, rhythm, melody and timbre as well [54]. However, the main feature of language is that it is based on phonemes, so on timbre contrasts. Now we would like

to analyze the different aspects of speech sounds. Everybody has a different rhythm, pitch, melody, etc... And we can discover inter- and intra-individual variations: the pronunciation of a word is different in two individuals; but also a word will not be pronounced in the same way twice by the same person. Emotions can modify pronunciation as well [54]. Consequently, the sound stability of language is not a physical phenomenon, but a representational one. The mental framework of language allows the subject to distinguish, in the sonic waves of voice, phonemes related to their representations of words in order to seize the meaning.

The language analysis through a spectrogram reveals these characteristics: when we pronounce a sentence, the gaps between spoken words do not necessarily correspond to the intervals present in the recording [54,62].

The learned sound categories are at the base of the language comprehension and the following experience can demonstrate it: in English the phonemes /r/ and /l/ constitute two distinct sounds, while on the contrary in Japanese they are indistinguishable, because they are not part of the native language and they correspond to the same mental representation of the /l/ sound [63].

Besides, a great attention is required in order to identify, in the voice, the mental representations proper to language. Likewise, the cognitive functions play a very important role, permitting us to have access to the sound representation and to the meaning of a spoken word. Without these central functions, the subject will perceive only the timbre of the voice. Therefore, we understand that the speech language perception is not sufficient in itself and that cognitive function such as attention, memory or semantic are necessary [53].

Referring to Henry, we apprehend that inter and intra - individual variations, the lack of sound stability in language and a great request for attention associated with a poor access to cognitive functions weaken the LSS in dementia. Especially in the Alzheimer disease, this weakness is due to a significant deficit of the left hemisphere [64] and to an important deterioration of the level of attention and of the cognitive functions.

Musical Sound System

Musical and language sounds have different characteristics. We hypothesize that these differences play an important role in dementia, permitting to the MSS to be a cognitive resource.

Music is the art of organizing sounds and bases his organization on stable pitch intervals [54]. Therefore, this musical organization would allow a greater perceptive clarity, facilitating the treatment and categorization of musical sounds. This assumption is reinforced by the fact that musical perception arises very early, it forms the auditory system in utero, already showing its effects [64]: the fetus shows a high sensibility to music at a very early stage [64-66] and it has even a form of musical memory [64]. This sensibility continues in the newborns and in childhood [67,68]. One of the differences in language can be immediately detected. The newborn perceive music directly, contrary to language, which is mediated by the symbolic and external concepts, and it is the voice, namely the timbre, that the newborn will encounter first, not the meaning. The access to the meaning will be possible later, following a long learning process. Therefore, since intra-uterine life, music perception remains the same, consolidating the MSS.

Music shows also a great stability. The analysis of musical sounds, carried out through a spectrogram, show that the intervals and pitch that we can perceive in a song correspond exactly to those of recorded ones. Therefore, the stability is not only physical, but also mental. In fact, sounds and their perceptions are very similar to mental representations and can preserve highly specific aspects of musical extracts [61]. This assumption has been demonstrated by singing some songs [69-70]. Moreover, the mental stability of music can be easily detected. A song can be recognized even if some of its characteristics, like instruments (timbre) or tempos have been modified [54-61].

Thus, music, through its organization, clarity, early perception, mental and physical stability tends to make the MSS robust enough to resist to the neurogenerative disease.

The Power of Music

Musical memory

Because of his reduced attentional abilities [71,72] and impaired cognitive functions, the dementia patient perceives and comprehends the environment with difficulty, sinking into a confusional state. The perceived threatening surrounding [25] creates social withdrawal, anxiety and depression. As we have previously explained, these symptoms can be reduced with the help of music and the case of Henry helps us to understand the reason why. His memory, language and ability to communicate seemed completely inactive, almost destroyed. Nevertheless, music proved the opposite, showing that these functions were still available but just inaccessible by the language. In Henry's case, the power of music can be explained by the preservation of musical perception and recognition.

In fact, Neuropsychology reveals the existence of a specific musical memory; its identity is stressed in the C.N case, which shows that a loss of memory following an injury could be limited to the musical memory [73]. It is a system of perceptive representations and, in order to recognize music, it is based on information regarding shape and structure, rather than meaning. Therefore, musical recognition is still possible in dementia [34,74,75], thanks to the preserved musical perception and musical representations.

The attention

Henry's case shows also that music has an impact on the attentional abilities, supporting the assumptions of the scientific literature [33,39,46]. The differences between the MSS and LSS seem to be able to explain this phenomenon. In fact, the musical clarity and stability would request less attention, compared to language. What is more, the access to cognitive functions, like the semantic one, is not necessary to appreciate and recognize a song. Music would allow also to focus the attention on the extract listened, hiding the noises interpreted as threatening by the dementia patient. This concentration would therefore stimulate and increase the remaining attentional abilities, without, however, consuming them. As we see in Henry's case, this increase will also be beneficial to other cognitive functions, allowing a better perception of sounds coming from the environment and the language. In fact, after listening to music, Henry was able to answer to closed-ended questions, which became more and more complex. Similarly, we can find such effects during the Auditory Perception Training [76], with a transfer of competences from music to language [62,77].

Emotions

Henry's emotions seem preserved. Neuropsychology with Peretz and Gagnon [78] present the clinical case of I.R, who is able to interpret emotions transmitted by music, but cannot recognize the song that is being played. Therefore, music has its own, emotional system [79], which would be preserved in dementia, as shown by Henry. Emotions are highly stimulated by music and the emotional recognition is faster than the musical one. Musical perception and emotions can stimulate the memory and evoke recollections [41,80]. Moreover, a strong emotional value and especially its comfort dimension allow reducing anxiety and permitting a better learning, but also a better remembering ability, increasing the memorial abilities of the dementia patient [40]. Finally, comfort would stimulate and increase attention improving the mnemonic capacity [35]. Associations between the different memories, emotions and representations would allow activating a sufficient mnemonic threshold aimed at recalling memories. Unfortunately, due to a lack of study, this supposition cannot be confirmed [40].

In dementia, the power of music on anxiety and depression can be understood through the characteristics of musical sounds and the preservation of the MSS. Moreover, contrary to language, musical perception can be sufficient to the musical recognition, so that the use of cognitive functions is not necessary. This is important in dementia, since the cognitive functions are altered. Therefore, music would stimulate simultaneously perception, musical memory, emotions and attention in the subjects affected by dementia. This general arousal would gradually encourage the attentional abilities of the subject, improving the other cognitive functions. Because of it, the dementia patient will be able to understand and distinguish better his or her environment. The temporary release from a confusional state, the sensation of comfort and the increased communication would reduce anxiety and depression in the dementia patient. However, clinical studies reveal another interesting point concerning the reduction of anxiety and depression. This has been explained by Oliver Sacks [80], and refers to the subjectivity and the ability of music to evoke the identity of elderly dementia patients. In fact, as we have seen, the subject's history and experience related to music prove to be powerful for therapies. The following section will approach the subjectivity [81,82] and identity of the subject from the Freudian psychoanalytical perspective, so dear to Oliver Sacks [83].

In addition to neuropsychological and cognitive elements emphasized previously, we consider it also relevant to complete this analysis with the information coming from dynamic psychology. For a long time, music has been used regularly as a traditional method of taking care of people suffering from a complex relationship to reality and the environment. Its usage can be found in Ancient Greece [84], in the African therapeutic ritual N'doep as well as in the haitian voodoo and in the Brazilian Candomblé [85]. The experience of the clinician confirms the anthropological observation. Since Freud pointed out the language framework of the symptom, we know that the interpretation allows to eradicate the repression and to put a neurotic symptom aside, but it remains most often incapable in the face of dementia and delirium. Music, used in particular conditions, allows to put on hold a process of desubjectivisation, therefore the question that arises is: what are the "qualities" of music, which are not present in speech, allowing a subject who has broken away with

the symbolic pact of language, to renew it, even if only momentarily?

Since the middle of the last century, the effects of music observed in care programs oriented to a psycho-dynamic approach have been the subjects of scientific researches. The work of some anglo-saxon authors [86-89] was the first that, starting from an experimental approach, treated the relation between music listening and its primary effects. Contextually with this movement, some French researchers developed the psychology of music with an experimental and/or clinical orientation, which is rich in teaching [90-95]. Here, the sound and musical production of the patient is at the center of all questions raised, especially in terms of sound improvisation, interpreted as a form of free association, which should be analyzed within the dynamics of transference [96].

We would like to introduce now the notion of "invocatory drive". The invocatory drive, whose object is the voice, has the aim to make it heard. "Invocare" in Latin means "to address". However, this is a central matter within the demential symptomatology where we find either:

- 1) People with dementia who continually cry out as if they were trying to make them self heard and as if their request was not received;
- 2) Patients who remain completely in the background and no longer seem to be able to take into consideration a possible call for help. No call can be launched nor received.

Nevertheless, the experiences carried out in music therapy demonstrate that dementia patients, thanks to a psychomusical therapy, can open themselves to the environment and establish a relationship with others.

Consequently, the question is as follows: what's in the music allows the dementia patient to place himself again in the circuit of the invocatory drive? In order to answer to this question it is necessary first to put forward a psychodynamic hypothesis describing the birth of the psychic subject.

In 1895 [97], Freud described the birth of the subject in the following way: originally, the infant lost a part of himself, which was amputated after the expulsion from the state of suffering, which causes the rupture of the homeostatic equilibrium. This expression takes the form of a cry, which is not yet a call, but only an attempt to keep the painful experience away. The cry is not useless since it draws the environment's attention, which will put into action a specific reaction aimed to alleviate the pain.

The cry of the newborn cannot be considered initially as a call. This is the first attempt to express the condition of suffering that permeates the human child. This cry will represent a call only in a second step, following the response given by the maternal environment where the child's desires will be fulfilled [98]. The circuit of the invocatory drive consists in "becoming a voice" to contact the other in order to have a voiced response in return. According to the illuminating formula of M.Poizat, this sound manifestation, defined as a "pure cry" ("cri pur"), will become a "cry for" ("cri pour") [99]. In this situation we find, on the one hand, an emitter who does not recognize himself as such (the newborn) and on the other hand, the receiver (the maternal environment). This latter will become an emitter as well: taken by an impulse of "interpretative violence" [100] the mother interprets the

cry as a supposed word uttered by the infant who from his birth is considered a supposed speaking subject.

We can now describe the genesis of the three stages of the invocatory drive circuit as follows:

1) Being Heard: This mythical moment would correspond to the expression of the cry. At this point, the subject does not exist yet. This active position will be perceived only after the encounter with the other, which will transform what is heard, the vocal manifestation of the infant, into an address. The maternal environment will try with all its strength to find a call in the infant's address.

2) Hearing: this second moment corresponds to the environment appearance, which responds to the cry. Consequently, the newborn is confronted with the response of the other.

3) Making oneself Heard: this third moment represents the coming-into-being subject, which becomes a voice, trying to be heard from the other in order to obtain a response. This stage refers to the subjective position where the subject forms a non-deaf other, likely to hear him. Caught by the language, the subject who had been called by the sound will become "invocant". In this turn of events, he will conquer his own voice, he will, in the words of Lacan, "be heard" [101-104].

During the dementia process this dynamic disappears. The dementia patient does not seem able to interpret the words and calls that people address to him. He gradually loses himself the ability to address to the other. In certain conditions, music allows the patient to regain this ability again, as confirmed by Henry's case. How to understand this? Music communicates with us without assigning us a place. When I listen to music, it comes to me without communicating with me anything other than the existence, thanks to the music, of a non-intrusive alterity with which I am in contact. Music is certainly a language (since it is based on a very structured organization), but it is untranslatable - instead of a language -, thus implying that its aim is not the meaning. Consequently, we hypothesize that where the speech is no longer accessible to dementia suffers, music can establish a connection again. The dementia patient is invoked by the music, submitted to him by the caregiver, and not convoked as it occurs with language. At this point, he can choose to respond by moving towards the sound emission, which "supposes him" without imposing on him. This notion of supposition is extremely important, because it is at the center of the clinical intervention for dementia patients. In fact, what permits the caregiver to be able to insist in his treatment with dementia patients whose responses are regularly absent? This is due to the supposition that in the dementia patient, beyond the massive symptoms, there is a subjective activity, which can be reached. Music is the right means to contact this activity, circumventing the neurological and cognitive deficits and allowing the subjective activity to extend itself and grow as much as possible.

Acknowledgment

Special thanks to Thomas Lee Patrick D'Agui and Simona Mondino who, with their professionalism and accuracy, made this translation possible.

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