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Therapeutic impact of music in young deaf patients with aggressive behavior disorder

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Abstract

In France metropolitan, 5 182 000 people have hearing loss (8.7% of the population), of which 4.1% are under 20 years of age. In children, hearing impairment is sought in the presence of depression, hyperactivity, impulsivity, instability accompanied by intense anger, and aggressive behavior. So far, the impact of dance and music on deaf people has been little studied. In this context, we recently initiated a project in mediated therapeutic workshops; Devoted to hearing-impaired adolescents or young adults with behavioral problems. The main objective of this project is to foster the adaptability of these young people with severe behavior problems.

Protocol: 4 volunteers with moderate to profound deafness were included in this prospective study (2 F and 2 M, aged 19.5 ± 5.0 years). These patients exhibited daily behavioral disorders with stereotypies and aggressiveness with moderate to severe intensity according to the Behavior Problems Inventory (BPI-01). These young people attended weekly sessions lasting more than 12 months at the Music / Percussion Workshop in the presence of an instructor and nurse therapist. Outcome and Discussion: No voluntary withdrawal of the project was recorded. A very strong behavioral improvement was noted in 3/4 of the cases and a slight improvement in 1/4 of the cases. This study has shown that hearing loss is compensated by various adaptive processes, in particular by multi sensorial interactivity (such as the interactivity between touch and vision) and through mirror neuronal system.

Conclusion: This study showed hearing impaired people are sensitive and receptive to the sound world and to rhythmic movement. This finding has been put to the benefit of rehabilitation through Music and Dance Therapies which has improved the behavioral disorder and blossoming of the group rehabilitation through Music and Dance Therapies of young people suffering from medium to profound deafness with severe behavior problems.

Keywords: Music therapy; Dance therapy; Deafness; Hearing impairment; Mental handicap; Autism.

1. Introduction

There are an estimated 5,182,000 hearing-impaired people in mainland France (8.7% of the population), of whom 4.1% are under the age of 20 [1]. Although not all deafness is the same in terms of severity and impact on language development, it has a lasting and profound impact on the psychological development of children and adolescents. In children, auditory deficits are sought in the presence of depression, hyperactivity, impulsivity and instability accompanied by intense anger, as well as conduct disorders manifested by opposition to educational injunctions and refusal to comply with rules [1-2]. Until now, the impact of dance and music on deaf people has been little studied. In this context, we have recently initiated a mediatized therapy workshop project dedicated to adolescents or young adults with a hearing impairment associated with other disabilities. The main aim of this project is to help these young people develop their full potential and cultural openness, as well as their ability to adapt. In this article, we present the preliminary results of our study of music and dance therapies for a group of four subjects with an average age of 19 (19.5 ± 5.0 years), and develop the neuroscientific basis for the impact of movement on the hearing impaired.

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2. Methods

Protocol: 4 volunteers with moderate to profound deafness were included in this prospective study (2 F and 2 M, aged 19.5 ± 5.0 years). These patients exhibited daily behavioral disorders with stereotypies and aggressiveness with moderate to severe intensity according to the Behavior Problems Inventory (BPI-01). These young people during 12 months attended weekly sessions weekly session of 45-60min. at the "Music / Percussion" workshop in the presence of a teacher educator and a nurse therapist.

Young people use different sound instruments, the aim being to approach the notion of rhythm. The therapist also offers them listening to world music on which they can move according to their sensitivity.

Schedule: at beginning individual accompaniment, at 3-4th week: 2 by group and 4-5th week: 3 by group and after 6th week: 4 by group. The primary outcome measures for the study consisted of Behavior Problems Inventory (BPI-01) total severity score, and Clinical Global Impression–Severity (CGI) at baseline compared to 1 year after [3-4].

3. Results

4 volunteers with moderate (1/4) to deep deafness (3/4) were included in this prospective study (2 F and 2 M, aged 19.5 ± 5.0 years) (Table 1) . These patients exhibited daily behavioral disorders with stereotypies and aggressiveness with moderate to severe intensity according to the Behavior Problems Inventory (BPI-01) (table 2).

No voluntary withdrawal of the project was recorded. A very strong behavioral improvement was noted in 3/4 of the cases and a slight improvement in 1/4 of the cases (table 2 and 3).

Table 1 Characteristics of the subjects included in the study.

	Subject #1	Subject #2	Subject #3	Subject #4
Age (years)	19	23	19	17
Sex	F	F	M	M
Handicap	Deep deafness Severe mental impairment and epilepsy	Deep deafness, Very low visual acuity Intellectual disability	moderate deafness, autism, instability	Deep deafness Cerebral palsy, in a chair
Communication	No oral language and few gestures	No oral language Communication with a few LSF gestures	No oral language. LSF gestures difficult to understand	No oral language, uses sign language in reception and expression, understands pictograms

Table 2 Behavioral monitoring of subjects during the study

	Subject #1	Subject #2	Subject #3	Subject #4
Sex	Female	Female	Male	Male
Age (Years)	19	23	19	17
Sex	F	F	M	M
Handicap	Deep deafness Severe mental impairment and epilepsy	Deep deafness, Very low visual acuity Intellectual disability	moderate deafness, autism, instability	Deep deafness Cerebral palsy, in a chair
Communication	No oral language gestures	No oral language, gestures	No oral language gestures	No oral language, gestures

Initial assessment				
BPI (severity)				
Auto-aggression	13 (11)	13(14)	17(12)	13(10)
(Hetero-aggression)	21(13)	15(8)	19(10)	5(4)
Assessment "1 year after "				
CGI-S	CGI-S: 1	CGI-S: 3	CGI-S: 1	CGI-S: 2
Global BPI				
Frequency	BPI ≈ 65% (50%)	BPI ≈ 20% (<10%)	BPI ≈ 62% (45%)	BPI ≈ 45% (50%)
(Severity)				

CGI-S: 1 = Very strong improved, CGI-S: 2 = strong improved and CGI-S: 3 = Minimally improved.

Table 3 Extract from the observation and follow-up files of subjects included in the study.

Subject	Observations	Score CGI
Subject #1	She is bathed in a festive atmosphere and seems open to the outside world. She likes and reacts immediately to movements and sounds, especially through vibrations or imitation of gestures.	1 Very Strong improvement
Subject #2	She has a particular interest in North African rhythm and music. She loves listening to music and leaves "at a glance" dancing and clapping her hands.	3 Slight improvement
Subject #3	He gets involved in the group, shows joy and interest Improved its instability.	1 Very Strong improvement
Subject #4	He takes great pleasure in all rhythm, music and movement according to his motor skills.	2 Strong improvement

4. Discussion

In France metropolitan, 5 182 000 people have hearing loss (8.7% of the population), of which 4.1% are under 20 years of age. In children, hearing impairment is sought in the presence of depression, hyperactivity, impulsivity, instability accompanied by intense anger, and aggressive behavior. So far, the impact of dance and music on deaf people has been little studied. In this context, we recently initiated a project in mediated therapeutic workshops; devoted to hearing-impaired adolescents or young adults with behavioral problems [2].

As the observations in Table 3 show, dance and music therapies have had the following beneficial effects:

- Participation in real human groups
- Reinvigorating a sense of empowerment
- Revitalizing the body's deployment and coordination in space through movement, acting on axes, globality, rhythms and slowness.

In the field of applied neuroscience, observation is a crucial step in addressing the problem posed by the behavioral disorder, which must be free of the observer's subjective effect and influence on the observed phenomenon. When dealing with hearing-impaired people displaying aggressive behavior, two main questions arise for the therapist:

- What adaptive mechanisms are put in place when hearing is impaired?
- In other words, can a hearing-impaired person derive the same therapeutic benefits from dance and music as a non-hearing-impaired person?

4.1. Adaptive Mechanisms in Hearing Loss

Multi-sensory interactions play a key role in the presence of hearing loss [5]. These include the convergence of touch, vision and hearing [6]. The organs of touch (skin) and hearing (inner ear) share the same embryonic origin (ectoderm) and physiological sensitivity to vibration [5]. On the other hand, these multi-sensory interactions enable:

- The cross-referencing of information from different sources, thus increasing the reliability of the stimulus ;
- Amplification of concordant signals at the level of the integrative layers (II/III/V/VI);
- Convergence towards integrative sensory areas, particularly gnostic areas.

Moreover, observing movement in the presence of rhythmic sound vibrations induces in the observer a desire to appropriate the same movement, most probably via the mirror neuron system [7].

4.2. The impact of movement on the hearing impaired:

The following facts have been demonstrated by electro-physiological tracings (somatosensory evoked potentials: SSEPs) [8]:

- non-synchronous" observation or imitation of the observed gesture only induces activation of the primary somesthetic area "the person looks inward".
- On the other hand, if the movement is synchronous, with the appropriation of the gesture, the somatosensory area is transiently activated, followed by the ignition of bilateral associative somatosensory areas. These areas are notably involved in emotion and motivation, and interact with the memory circuit.

The transition from observation to appropriation of the gesture is facilitated by the concordance of visual and tactile stimuli. The transition from observer to actor takes place via activation of the primary somesthetic area, which seems to preserve the sense of self during observation and imitation. Most probably, this is a key stage in the understanding of what is being observed, necessary for judgment before any action is taken in response to a request from another person.

Finally, in order to avoid suggestive effects, the impact of music was studied in mice exposed to vibrations, compared with a control group. In this context, the animals were exposed to soft music (new age music) at 50-60 dB for 21 days, 6 hours a day [9].

A significant increase in BDNF (Brain-derived neurotrophic factor) levels was observed in the thalamic and hippocampal layers, with overexpression of receptors for this neurotrophin in the limbic structure.

BDNF is a neurotrophin responsible for neuronal plasticity, in particular synaptogenesis is in cortical integrative layers. It induces hypo-activity of the hypothalamic-pituitary-adrenal axis involved in stress and depression. It also modulates the activity of the limbic system, promoting learning and regulating emotion and aggression [9].

5. Conclusion

Contrary to popular belief, deaf people are sensitive and receptive to the world of sound. In fact, the hearing deficit is compensated for by various adaptive processes, notably multi-sensory interactivity (especially touch and vision) and brain plasticity. All these adaptive processes have been put to good use in Music and Dance Therapy rehabilitation, enabling the group of young deaf people with associated disabilities to flourish.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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