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Case Report

Sustained Effect of Neurocreative Music Therapy on Upper Limb Abilities, Spasticity, Selective Control and Quality of Life in Cerebral Palsy: A Case Report

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Abstract

This case report, presents the sustained effect of Neurocreative Music Therapy (NCMT) which a unique music therapy approach on the upper limb in an individual with cerebral palsy (CP). Our case is a 19-year-old individual with hemiparetic CP and she was included in the 8-week NCMT application program. Before the application, a phenomenological interview was conducted in accordance with the principle of the NCMT approach, which prioritizes the needs and pleasures of the individual. Before and immediately after the 8-week NCMT application, the patient's spasticity was assessed with the Modified Ashwort Scale, selective motor control with the Selective Control of the Upper Extremity Scale, upper limb abilities in daily activities with the ABILHAND-Kids, and quality of life with the Pediatric Quality of Life Inventory CP Module 3.0. As a result of the assessments, an individual-specific music therapy program was planned and implemented. The outcome measurements made immediately after the NCMT application was repeated in the 4th and 8th weeks following the end of the application. According to the results of the scales, it was observed that spasticity decreased, selective motor control increased, upper limb abilities improved, and quality of life increased. The obtained improvements were generally maintained in the 4th week following the end of the therapy. It was observed that there was a decrease in the sustainability of the effect in the 8th week following the end of the therapy in other measurement parameters other than quality of life. As a result, we concluded that NCMT is an effective approach in the rehabilitation of individuals with CP and that its effects may be transferred to the post-rehabilitation period.

Key words: *Cerebral palsy, Music therapy, Upper extremity*

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Introduction

Cerebral palsy (CP) is a comprehensive term that refers to a group of non-progressive neurodevelopmental disorders that occur as a result of damage to the immature brain (1). One of the most important factors affecting daily living activities in individuals with CP, especially in the hemiparetic group, is upper extremity dysfunction (2). New technologies and interventions are constantly being developed to improve the quality of life of individuals with CP and to increase the efficacy and safety of existing treatments (3). Music therapy has also been a preferred and effective practice in the rehabilitation process of individuals with CP (4-6). In this study; Neurocreative Music Therapy (NCMT) approach developed by Torun that is a holistic music therapy approach was applied (7). The aim of this case report is to investigate the sustained effect of the NCMT approach on upper limb abilities, spasticity, selective control and quality of life in Cerebral Palsy (CP).

Case

In this report, a 19-year-old case diagnosed with left side hemiparetic CP is presented. The clinical type of the case is spastic, according to the Gross Motor Function Classification System it is level 1; can gait without restriction. According to the Manual Ability Classification System it is level 2; can hold and use objects, there is a decrease in the speed and quality of success. Upper extremity spasticity measurement of the patient was made according to the Modified Ashworth Scale (MAS). Forearm flexors, forearm pronators, wrist flexors, finger flexors, thumb adductors and total spasticity values were calculated. According to MAS, she has a spasticity of 3 in the forearm pronators and wrist flexors. The spasticity severity, which is 3 according to MAS, is expressed as 4 in the scoring due to the value 1+ in MAS. Selective Control of the Upper Extremity Scale (SCUES) was used to evaluate the selective motor control of the upper extremity of the patient. According to SCUES, there was a decrease in selective control in the forearm, wrist and fingers on the hemiparetic side; there was additional movement of other joints and the trunk. To assess the upper extremity skills during daily activities, Abilhand Kids which is a valid and reliable scale for CP (8), was used and to assess the quality of life, Pediatric Quality of Life Inventory CP Module 3.0 (PedsQL) was used. The NCMT approach, which is a unique music therapy approach, was planned for the case. NCMT, developed by Torun, is defined as “a holistic music therapy approach that addresses music-brain interactions within the framework of functional brain network

organization, evaluates the individual's health needs from a neurophenomenological perspective, and eclectic approach, focusing on improving the individual's quality of life." (7). Within the framework of this approach, it was aimed to evaluate the individual's feelings and subjective perception while experiencing her current neurological problem, and a phenomenological interview was conducted before the music therapy application in order to see the individual not only from the "outside" but also from the "inside". The details of this interview are given in Table 1.

adopts the use of relational and/or behavioral active music therapy methods and techniques with a creative and

Table 1. Phenomenological interview content.

Interview items for metaphorical perception	**X_1**	**X_2**
My left hand is like …X_1… to me; because …X_2…	cotton	it seems soft and tiny to me
Using my left hand is like …X_1… for me because …X_2…	success	my self-confidence increases
	X_1	
The most common thing I experience when using my left hand is that; …X_1…	cramping of my fingers	
The most interesting thing I have experienced with my left hand is that; …X_1…	when I try to use it, it stiffens and I cannot use it	
The thing I'm most curious about about my left hand is; …X_1…	what would be easier in my life if I could use my hands?	
The best thing I do with both hands is that; …X_1…	play volleyball	
The most difficult thing I do with my hands is that …X_1…	applying eyeliner	
I can describe the problem with my hand/arm as a "…X_1…"	disease	

NCMT sessions were applied for 30 minutes, 2 days a week for 8 weeks. During the application period and the follow-up period at the end of the application, she did not receive any additional treatment other than routine physiotherapy. In the NCMT sessions, a program specific to the individual, based on the needs and tastes of the individual, was created in the light of phenomenological interviews and other clinical measurements. The NCMT approach proceeded with the stages of getting acquainted-warming up (1), getting acquainted with the instruments-determining musical preferences (2), regulation-creating positive emotion (3), and creating an individualized eclectic music therapy practice (4). According to this program, techniques such as instrument playing exercises, sonification, musical motor imagery, and rhythmic auditory stimulation were used to develop creative motor behaviors. After 8 weeks of NCMT application, the patient's MAS, SCUES, ABILHAND Kids, and PedsQL measurements were made. To assess the sustained effect of NCMT, these measurements were repeated at 4th and 8th week after the end of NCMT application and the scores were recorded. According to these measurements, it was seen that the case's total upper extremity MAS score decreased from 12 to 9, thus the tone was regulated. Immediately after the 8-week NCMT application, forearm flexors, forearm pronators, wrist flexors MAS score decreased, and while these results in spasticity were maintained in the 4th week following the end of the application, only the effect in wrist flexors was preserved in the 8th week. The case's SCUES score increased from 7 to 10, thus improving upper extremity selective control. It was observed that the improvement in selective control was partially preserved in the 4th week and was better than pre-NCMT in the 8th week, but there was a decrease in selective control compared to the post-NCMT score-1. Her ABILHAND-Kids score improved from 33 to 38, thus her upper limb skills improved. According to ABILHAND-Kids scores, the development of upper limb skills was observed to follow a decreasing tend over time in the 4th and 8th weeks measurements after the end of NCMT application. Her PedsQL score dropped from 39 to 31, thus her quality of life improved. It was observed that the improvement in quality of life continued to increase following the NCMT approach (Table 2).

Table 2. Scale results of the case before and after the NCMT approach.

		Pre-NCMT score	**Post-NCMT score-1**	**Post-NCMT score-2** 4th week following NCMT	**Post-NCMT score-3** 8th week following NCMT
MAS score	forearm flexors	2	1	1	2
	forearm pronators	4	3	3	4
	wrist flexors	4	3	3	3
	finger flexors	1	1	1	1
	thumb adductors	1	1	1	1
	Total	12	9	9	11
SCUES score total		7	10	9	8
ABILHAND-Kids score		33	38	37	34
PedsQL CP 3.0 score		39	31	26	27

Discussion

It is stated that the effectiveness of rehabilitation for children with hemiparetic CP depends on the intensity and timing of the treatment, the extent to which the improvements are transferred to the patients' daily lives, and the child's ability to maintain attention during the session (9). Music therapy was included in a recent review examining current developments in intervention approaches for individuals with CP, and it was reported that neurological music therapy applied together with physiotherapy was effective in improving motor functions in CP rehabilitation (3). Consistent with this, it was observed that upper extremity spasticity was regulated, selective control increased, upper limb abilities improved, and quality of life increased in our patient at the completion of the 8-week NCMT intervention period. Moreover, these effects were still maintained at 1 month after the end of therapy, while there was a decrease in the sustainability of the effect in some parameters at 2 months. We relate the regulation result in spasticity after NCMT in our case to the systematic review by

Criekinge et al., which emphasized that music, which causes strong changes in brain activity, can cause differences in muscle tone because spasticity is the result of a lesion in the cortex or brainstem, and addresses the effect of music on hypertonus in neurological diseases (10). It has been shown that motor learning-based therapeutic approaches, which have variable and specific applications aimed at individual targets, are the most effective approaches in improving selective motor control (11). The improvement we achieved in selective control after NCMT in our case is consistent with the literature. We attribute the interesting fact that the improvement in quality of life after the NCMT approach continues to increase even after the therapy has ended to the fact that the NCMT approach sees the individual from the inside, as in the phenomenological interview, and has components that are compatible with the multidimensional structure of quality of life.

The long-term continuty of functionality gained from upper extremity therapies on CP is not often evaluated; however, some evidence suggests that gains in functionality may persist for at least 6–12 months after therapy in children with hemiparetic CP (12, 13). A study investigating the effects of neurologic music therapy on the functionality of children with CP observed significant improvements in motor function in the group receiving music therapy and revealed that all these improvements continued 4 months after the therapy. (6). Considering the results in our case, it is seen that similar developments were obtained with the literature during the 4-month follow-up period. This result motivates us to evaluate the long-term effects of our intervention more reliably in randomized controlled trials with a sufficient number of participants.

Conclusion

According to the results obtained in our case, we saw that NCMT meets the needs of the individual and is effective in achieving the goals. The NCMT approach can stand out as an effective approach in the rehabilitation of individuals with CP with its unique, individually structured and enriched content. Future studies should be planned with a large sample size and in a way that long-term effects can be observed specifically for CP, and the effectiveness of the NCMT approach should be investigated in other neurological diseases.

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