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SPEECH PRODUCTION, MUSIC THERAPY AND CEREBRAL PALSY¹

Abstract: This paper deals with the analysis of music therapy interventions focused on the development of speech production in individuals with cerebral palsy (CP). The paper summarizes the results of theoretical analysis of the development of communication for persons with CP from the perspective of special education, speech therapy and music therapy intervention. The research methodology was based on qualitative design with a combination of content analysis and interpretive approach to case studies. The aim of the research was to determine the relationship between the level of speech production of people with CP and goals of music therapy intervention, its methods and procedures and musical materials used in music therapy practice. The research sample consisted of 10 individuals with CP and different levels of speech production. Data collection was based on an in-depth case analysis of available data from documents, video and audio recordings, music therapy products and interviews with music therapists. The research results have identified four stages of music therapy intervention (pre-verbal, semantic, phonological and stadium of complex linguistic phenomena). In each stage typical goals, methods and tools were described.

Key words: Cerebral palsy, music therapy, speech, communication development.

Introduction

Communication development is a very important area of educational, rehabilitation and therapeutic interventions in persons with cerebral palsy (CP). There are also specific methods and procedures for communication development for people with CP. One of them is music therapy, the benefits of which are proven for people with mild to severe CP, even in the cases that do not respond to the most common

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stimuli (Nordoff, Robbins 1997). Music therapy praxis in this area is, however, faced with many challenges that will be presented and discussed in this paper.

This introductory chapter contains theoretical background obtained from the analysis of scientific literature and research findings in the field of special education, speech therapy and music therapy, as these areas are closely related to the theme of this paper. The following chapters are devoted to research methodology, results and their potential applications in practice.

Communication development in special education and in speech therapy

Communication development is one of the key aims of various professionals working with persons with CP. An emphasis is being placed on communication development in the field of education as shown in analysis of educational programs and domestic (Kantor 2013) as well as international literature and research (Bigge et al. 2010). Roughly three-quarters of children with cerebral palsy have some degree of speech impairment varying from light impairments of articulation to complete inability to articulate (Lechta 2011). Therapeutic strategies for developmental dysarthria that ranks among the leading causes of communication disorders in individuals with CP exist (Neubauer 2005).

When CP is combined with severe mental retardation Augmentative and Alternative Communication (AAC) is one of important training interventions since people with severe functional disabilities are not usually able to learn functional verbal communication. However, even AAC has its limitations in individuals with severe CP. For this group, standardised systems such as VOKS or pictograms that have proven to be beneficial in students with autistic spectrum disorders (Knapcová 2006) are often not applicable due to their limited ability to select a communication symbol, difficulty in identifying communication needs, social or contextual inappropriateness of AAC (Johnston et al. 2004), etc.

In order to understand the process of communication development in persons with severe CP it is necessary to focus not only on the form of symbols that compensate the speech but also on the context of communication, individual needs, the interaction process and its progress, metacommunicational skills, cognitive processes of both communication partners and the possibilities of interdisciplinary cooperation in the development of AAC means (Hourcade et al. 2004). For this group, global communications systems created according to individual needs and abilities of each person are effective, using all the available facial, gestural, vocal and other symbolic and non-symbolic links to the communication content. Vocal activity is an important component of AAC for people with CP. Specific communication meanings may be assigned to some sounds or vocals, individuals may use their own neologisms for naming certain objects, other people and situations, they may also use vocal approximation of words (eg. a substitution of words with their initial syllables, and the use of remote sound form of the word), etc. For this

reason it is useful to support the voice and speech production in persons with CP, although in most cases they are not expected to develop enough to communicate verbally in an effective way.

Specific procedures must be applied in persons with CP who are not capable of symbolic or intentional communication (Bigge et al. 2010). These procedures relate to interpretations of (potentially recoverable) communication signals, to increasing the need to interact with the communication partner, to methods of analysis of communication context (Downing 2008) etc. Effective communication development for persons with severe CP cannot be separated from their everyday experiences, the possibility of implementation of the interventions in the natural communication context and with natural communication partners.

Development of communication in music therapy

In music therapy the communication development is also emphasised (McFerran, Rickson 2007). Music therapy is used for communication development mainly in persons with severe CP. From different perspectives, most of traditional music therapy concerns communication, e.g. Creative Music Therapy, Free Improvisation, Orff music therapy and others.

With regard to music therapy praxis communication procedures may be divided into two main groups: (1) psychotherapeutic / interaction-oriented procedures and (2) functional / training procedures.

Psychotherapeutic and interaction-oriented procedures are typical for music therapy intervention since they are based on a traditional and most common approach to music therapy as a specific school of psychotherapy (Pejřimovská, Zeleiová 2011). The main method here is musical improvisation in a clinical context, which is used to establish a therapeutic relationship, initiating communication responses, training and restructuring interaction patterns, processing trauma which inhibit the interaction etc. Overviews of improvisation techniques are offered by various authors (Nordoff, Robbins 1997; Bruscia 1987; Wigram 2004).

In persons with severe CP these techniques are considered essential: empathic improvisational techniques aimed at initiating contact (e.g. synchronisation, mirroring, empathic improvisation), structuring techniques that enable integrating spontaneous reactions with the therapist's improvisation (e.g. the rhythmic grounding, shaping and framing) and elicitation techniques that encourage their active participation in a joint improvisation (making space or interjecting). Regarding the therapeutic form, programs of family music therapy that take place in the natural interaction context are useful for the development of communication.

The aim of **functional / training models** is usually the development of speech production, the use of AAC systems or specific training in communication skills. Although we can find specific musical models belonging to the field of functional therapy, e.g. Melodic-intonation therapy, music therapy methods are usually applied

as a supplement to speech therapy or special education intervention. An example is the modification of musical training of AAC:

- Music may be used as an incentive to initiate communication (in some persons with CP musical activity evokes a strong need to communicate with others, a need to communicate what will be sung in the next song, which song follows etc.).
- Commenting musical activities or songs using AAC.
- Replacement part of the text with a symbol or a gesture (e.g. songs with the “question – answer” structure).
- Song selection with AAC (e.g. in the form of lyric books with visualized symbols of AAC).

Other examples are rhythmic training, variations of simple compositional techniques for working with songs (Baker, Wigram 2005), practising simple rhymes (songs), notation activities (Alvin 1978), response to the incentives in the song and action songs (Hanser 1987), musical games (Bean, Oldfield 2001) and so on. These activities may, after appropriate modification respecting individual functional level, be a means for the development of communication skills. Training procedures usually require more structured therapeutic session and more directive approach of the therapist. Vocal activities with space for adding words and phrases may be used (Thaut 2005) while the phrases may be put in a simple rhythmic and melodic structure, etc. Music is in all these cases used as a powerful motivational tool.

Although it is possible to encounter different examples of music therapy training activities and procedures aimed at developing communication in persons with CP, music therapists still miss a comprehensive theory in this area. The investigation which results are described in the following chapters aims to help in developing such a theory.

Research methodology

The purpose of the research was to determine the specifics of the relationship between different speech production functionality of people with CP and music therapy intervention. The terms ‘speech’ and ‘speech production’ are used here for any speech ability of people with severe CP even in cases when they are not able to efficiently communicate with others. The relationship between music therapy objectives, methods, approaches and characteristics of music material and level of speech production in people with CP was observed. One of the expected results of the research is the possibility to use the findings to create a research-based concept for the development of speech production that might enrich the quality and systematisation of music therapy practice in people with special needs.

The research questions posed for the purposes of clarifying the objectives of the study may be found below:

1. What music therapy intervention objectives related to speech production commonly occur in people with CP?
2. What music therapy methods and approaches focused on the development of speech production are used in people with CP?
3. What kind of music (and other) material is being used for the development of speech production in people with CP?

The research study is based on a qualitative-interpretative analysis of case studies of persons with CP. The aim of the interpretative approach to case studies is to interpret the cases according to known theories (Ženka, Kofroň 2012). Therefore, this paper does not examine the efficacy of therapeutic intervention; rather, it focuses on the way in which music therapy intervention is delivered. The results have been interpreted on the basis of known theories. The qualitative design was chosen due to the need of in-depth data analysis and the need to observe the process dynamics and the development of relationships between respective phenomena and the specifics of the target group (Hendl 2008).

The **research sample** comprised of individuals with CP with impaired communication ability (a diagnosed developmental dysarthria) and their music therapists. Only those individuals with CP were included who had been involved in music therapy intervention (individual or group type) for an adequately long time (at least one academic year).

Retrospectively, the level of functional ability (especially in speech production) was assessed in detail from medical histories of individuals with CP creating an important context for the realisation of music therapy. Non-standardised records and assessments in music therapists' documentation and medical histories of individuals with CP were used for this purpose.

Children and young people were preferred for this study since the possibilities of improvement of speech production in people with CP decreases with age. In order to ensure an adequately in-depth data, an inclusion criterion had been set of a minimum of one academic year (about 10 months) of involvement in music therapy intervention. 10 individuals with CP aged 4-16 years with even distribution of gender and various level of functional ability were included.

The following inclusion criteria were set for the music therapist sample:

- to ensure adequate experience, a criterion of a minimum of 2 years of praxis with individuals with CP was set;
- a post-graduate degree in music therapy or shorter music therapy courses in combination with a graduate degree in special pedagogics (logopedics).

The aim was to acquire a sample of music therapists with varying theoretical background and adequate practical experience. The research sample had been created using purposive selective sampling based on personal contacts of the author through a long-term involvement in the Music Therapy Association of the Czech Republic as well as his research of the practice of Czech music therapists.

In this study, the efficacy of therapeutic intervention of the respective music therapists had not been examined as would be in an intervention type of study since it is not directly related to the research aims. Four music therapists were included in the sample. The number reflects availability of music therapists fulfilling all inclusion criteria who would also be willing to participate in the research.

The data collection methods were based on case-type processing of available relevant data about music therapy intervention in people with CP. The data comprised interviews with music therapists, processing of various documentation (individual music therapy plans, history, professional examinations, etc.), available video-recordings of some meetings or their segments and original materials used in the music therapy process (e.g. songs composed for the individual with CP, lyric books).

At the beginning of each interview the music therapists were informed of its purpose and ethical principles of the research binding to the researcher and interview time frame and other conditions were agreed. The music therapists were asked to talk about the case of the individual with CP in their care. During the interviews, the therapists also mentioned other cases that were also analysed. The aim was to capture the course of the intervention process and its development in time including the changes in the therapeutic process occurring due to an improvement in functional ability of individuals with CP.

In the documentation information about the functional state of the respective person in the area of communication, cognitive abilities, preferences, etc. had been targeted. Short fragments of video-recordings were also included in order to understand better the praxis of music therapists. The acquired data was transcribed into textual and visual form; key fragments of music recordings were put into notes.

Data analysis used the interpretative approach to case studies (Ženka, Kofroň 2012) and inductive content analysis that created categories for description of particular areas (objectives, methods, materials and level of functionality). The aim of content analysis was to identify data relating to the following:

- Objectives of the music therapy process. Objectives related to speech production were isolated and analysed separately.
- Musical therapy methods and procedures relating to the development of speech production. The data material included the description of the nature and course of individual activities.
- Specifics of musical materials used for music therapy intervention (lyrics, musical quality of improvisations, songs, etc.).
- Level of functionality, especially in the area of communication and speech production (qualitative as well as quantitative aspects).

For each case an analysis of the relationships between objectives of music therapy process, level of the development of speech and communication abilities, music therapy methods and procedures, and the quality of musical expression were conducted. These analyses were compared in different stages of the development of

therapeutic process. Finally, four basic stages of music therapy process were identified. For each stage typical music therapy methods, specifics of musical material, objectives of therapy and possible level of speech development were described. The results of the analysis are presented below.

Data analysis and findings

Four stages of music therapy intervention dependent on the level of speech production in people with CP were identified based on data analysis. Each stage has its own typical methods, aims and means of intervention. Mutual relationships are shown in tables in this chapter. The respective stages may not be easily separated in practice; practice resembles more a continuum of unfolding musical activities that react to the level of ability of the individual with CP at the time.

Intervention stage I: pre-verbal stage

Tab. 1: Characteristics of intervention stage I

Level of speech production	Pre-verbal stage. Emphasis is being placed on analysis and development of paralinguistic characteristics of speech expression (see Tab. 2).
Intervention Aim:	To stimulate speech expression and voice experimentation. To support and develop any form of speech production in an individual with CP (on the level of paralinguistic speech characteristics).
Methods:	Speech stimulation: experimentation with simple musical instruments and receptive stimulation using music reflecting the current emotional state of the individual with CP, interesting sounds, simple melodies, etc. The support and development of speech production and imitation: improvisation methods with simple vocal motives or vocalisations, mirroring techniques of the individual's reactions, etc. stimulation of new speech patterns is realised by modification of musical aspects of vocalisation (see below).
Means:	The music material is based on vocal improvisations (with possible instrumental accompaniment). In music material analysis the musical qualities of speech are important (see Tab. 2).

Source: own research.

In this stage, great emphasis is being placed on musical aspects of speech as compared to the following stages that focus more on word and its semantic meaning. For this reason, the way music therapists and people with CP operate with basic tone qualities (timbre, dynamics, duration and pitch) and musical expressive means (rhythm and melody) in their mutual vocal interaction was analysed in the video-recordings. Modulation of speech expression in people with CP is possible using:

- Timbre – experimenting with new sounds, vocals, syllables.
- Dynamics – changing the volume of vocal improvisation.
- Duration – prolonging or shortening sounds during vocal improvisation.
- Pitch – varying the frequency of tones and experimenting with simple melodies.
- Rhythm – changing the accentuation of sounds and vocal expressions over time, repeating syllables, etc.
- Melody and harmony – some students are not capable of verbal communication but have the ability to sing simple melodies. Harmony in the improvisation may also be developed, e.g. by using simple pitch simultaneities.

Each vocal expression contains at least some of the mentioned qualities as shown in Tab. 2 that captures some milestones of speech development in infants in their first year of life. The musical qualities of speech expression is also called paralinguistic element of speech. The stimulation of these aspects of speech is especially important in intervention with people in pre-verbal stage. It is important that music therapists learn to hear these qualities in the vocal expressions of individuals with CP and be able to react musically.

Tab. 2: The relationship between the development of speech expression and musical qualities of speech

Pre-verbal stages of speech development	Speech expression	Musical expression
Trimester I	Cries with an emotional tone, smiles when others smile, coos and makes pleasant sounds...	Timbre, melody, imitation
Trimester II	Babbles in a speech-like way and uses many different sounds, including sounds that begin with p, b, and m. Production of pre-phonemes.	Broadening the range of sounds and their combinations, tone duration and dynamics
Trimester III	Imitates babbles, using conscious auditory and visual control, physiologic echolaly: imitating syllables, melodies, pitch and rhythm of speech	Rhythm, phrasing

Trimester IV	Speech comprehension by motor expressions, more physiologic echolalies, babbling, first meaningful monosyllabic or multisyllabic words	Meaningful structure and its reproduction, non-musical content and themes
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Source: own research.

Intervention stage II – semantic stage

The transition from pre-verbal stage into the stage when sounds, syllables and words receive semantic meaning is a great step forward for the child as well as in the realisation of intervention.

Tab. 3: Characteristics of intervention stage II

Level of speech production	Second year of life. In this phase the child starts to effectively use simple words to communicate wishes, feelings and requests.
Intervention aim:	Increase in active vocabulary (learning new words, with many being onomatopoeic), focusing speech production on communication (the words used acquire semantic meaning), making connections between heard expressions and concrete observations and similar occurrences, creating simple sentences containing 2-3 words.
Methods:	Interpretative methods (singing) with improvisation segments. Typical technique of leaving space in the song for words the individual with CP is able to articulate or sing is used.
Means:	Songs with onomatopoeic and simple words and pictures of the song content (some music therapists use a lyric book with onomatopoeias and respective songs). Onomatopoeias such as animal sounds are included in many children’s songs. Music therapists use them in between verses in the form of simple improvisatory interplays or introductions to the following verse. The songs may even be used with different lyrics, e.g. a song about animal sounds may be easily sung with vehicle types or any objects that make sounds.

Source: own research.

Music therapy intervention usually respects the language developmental patterns; music therapists start with simple sounds even though the language development of an individual with CP may not reflect the usual developmental stages in the same order. Consultation with clinical speech therapist is useful in this stage.

Intervention stage III – phonological stage

Tab. 4: Characteristics of intervention stage III

Level of speech production	A child's third year and beyond when communication develops: the child learns to accomplish his/her goals using speech. Grammar improves. Logical terms are developing.
Intervention aim:	To develop the ability to combine articulated syllables and words into sentences. To enhance the ability of speech automatisation. To stimulate the phonemic differentiation by associating sounds with their sources. To begin understanding some grammar patterns. To support the speech abilities of people with CP and their comprehension of the context of communication situations.
Methods:	Learning (interpretation) whole simple songs. It might be combined with visual materials such as pictures and photographs in book form and with discussions about the song lyrics and about the visual materials, respecting the developmental level of the individual with CP.
Means:	Music material that enhances using common speech. At the beginning, these are simple nursery rhymes and songs (e.g. rhymes for people with dysphasia) and the individuals are learning whole phrases or sentences instead of isolated words. The process later enables learning whole songs. Picture 1 shows an example of nursery rhymes for children with dysphasia set to music.

Source: own research.

Pic. 1 Notation of the song ‘Máme nový dům’

Máme nový dům
 hudba: autor neznámý
 text: Jitka Tučková

Bum, bum, bum, má - me no - vý dům.

Intervention stage IV. – stage of more complex language phenomena

Following the phase of learning song lyrics in the cases of some individuals with mild or moderate functional impairment music therapists were able to set aims related to comprehension and use of more complex language phenomena, such as words of foreign origin, idioms, metaphors, common phrases, etc. In this phase, besides intervention, also pragmatic side of communication related to the comprehension of various communication situations and motives and the ability to apply the knowledge in those situations was becoming important.

Tab. 5: Characteristics of intervention stage IV

Level of speech production	This stage is better characterised using aims rather than developmental age.
Intervention aim:	Learning, deepening and perfecting the word content and grammar forms. Increasing vocabulary using more complex language phenomena, e.g. words of foreign origin, idioms, metaphors and common phrases. Pragmatic side of communication: comprehension of various communication situations and motives and the ability to apply the knowledge in those situations
Methods:	Mostly verbal methods using music material: a) explaining passages from song lyrics, b) commenting and discussing various communication situations that occur in the songs, real situations within or outside the music therapy setting, etc.

Level of speech production	This stage is better characterised using aims rather than developmental age.
Means:	Music materials in this stage make use of various genres and poetry set to music. In the data set there were also some specific songs for working with idioms, metaphors and words with multiple meanings. These materials are rather rare in music therapy praxis although there are authors in the Czech Republic whose work is mostly based on play on words and above mentioned language phenomena (e.g. Michal Nesvadba or Jiří Žáček).

Source: own research.

Discussion

The research results were presented in the previous chapter. The level of speech production was categorised into four stages based on music therapy intervention: pre-verbal, semantic, phonological and a stage of complex language phenomena. Aims, methods and means of music therapy intervention were identified in each stage. This preliminary work clearly shows that music therapy intervention may be used in people with CP with different levels of speech production. Music therapy's unique potential, however, lies in people with severe CP since the expressions in pre-verbal stage are closely linked to musical aspects (basic tone qualities and musical expressive means, see Tab. 3).

It may be assumed that these findings may be applied to people with other diagnoses characterised by impaired communication abilities, e.g. mental retardation, dysphasia, various genetic syndromes and others. In this study cerebral palsy had been chosen since in the Czech Republic these individuals are often in the care of music therapists; the application of the findings, however, does not need to be limited to individuals with the diagnosis. The results may be useful for special pedagogues and clinical speech therapists to enrich the current methodology for cerebral palsy, especially if these professionals are willing to further broaden their education to include musical and music therapy specialisation in the form of short courses.

Research limitations are mainly related to the sample size. There are few practising music therapists who systematically focus on the development of speech production and whose work could be analysed. It is likely, however, that support of this area of music therapy intervention will increase the number of practising music therapists and thus also possibilities for data collection. Including subjects from more countries may also be considered but comparison may be difficult due to language differences.

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MUZYKOTERAPIA A ZDOLNOŚĆ MOWY U OSÓB Z PORAŻENIEM MÓZGOWYM

Streszczenie: W niniejszej pracy poddano analizie działanie muzykoterapii na rozwój mowy u osób z porażeniem mózgowym. Artykuł podsumowuje wyniki analizy teoretycznej rozwoju zdolności komunikacji u tych osób z punktu widzenia nauczania specjalnego, logopedii i muzykoterapii. Metodologia badania została oparta na metodzie jakościowej, łączącej analizę treści i interpretację studium przypadku. Celem badania było ustalenie związku pomiędzy poziomem zdolności mowy u osób z porażeniem mózgowym a działaniem muzykoterapii: założonymi przez nią celami, metodami, planem działania i zastosowanym materiałem muzycznym. W próbie badawczej wzięło udział 10 osób z porażeniem mózgowym o różnym stopniu zdolności mowy. Zgromadzenie danych poprzedzone było dogłębną analizą treści zawartych w dostępnej dokumentacji, nagraniach dźwiękowych, nagraniach wideo, utworach stosowanych w muzykoterapii oraz rozmowach z muzykoterapeutami. W wyniku badania rozrózniono cztery etapy występujące podczas trwania muzykoterapii (prewerbalny, semantyczny, fonologiczny oraz etap złożonych konstrukcji lingwistycznych). W przypadku każdego z tych etapów opisane zostały jego standardowe cele, metody i narzędzia.

Słowa kluczowe: porażenie mózgoe, muzykoterapia, mowa, rozwój umiejętności komunikacyjnych.

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