PHYSIOTHERAPEUTIC EXERCISES WITH BACKGROUND MUSIC IN A PATIENT WITH KNEE INJURY

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Abstract
Background: Music is processed by emotions physically, mentally, intuitively and analytically. There are not any references to side effects of non-invasive treatment by means of music on mentally healthy people of all ages. Background music reduces muscle tension and improves mobility and co-ordination of human body during physiotherapeutic exercises. Based on the research of C. L. Pellentier (2004), J. Collingwood (2018), D. Campbell (2008), W. E. J. Knight and N. S. Riccard (2001), we specify the following basic hypotheses, which clarify the positive impact of music during physiotherapeutic exercises: The reduction of fatigue; increased level of psychological excitement; physiological relaxation response and the improvement of motor functions.
Objective: Examine the potency of background music on the atmosphere during physiotherapeutic exercises with the patient.
Sample: A patient with knee injury.
Methods: Case study.
Results: Based on our final results, we can confirm the positive potency of background music on the patient during physiotherapeutic exercises.
Conclusion: After the final comparison of the two case reports, we have concluded that background music positively affected the selected patients with knee injury during physiotherapeutic exercises. Particularly it reduced the lumps in the limb; the values of physical functions were better than before intervention; eupnea and heart activity of the patient was calmer than before the music intervention. The frequency of breathing per minute decreased in 3.5 % and the activity of the heart in 3.2 % per minute.

Key words: Outpatient rehabilitation. Background music. Music and psyche. Rehabilitation. Knee joint.

1 Introduction

Rehabilitation outpatient care facilities deal with the diagnostics and examination of patients in the field of rehabilitation with the focus on the entire musculoskeletal system of a person. The physician and physiotherapist try to relieve the patient with musculoskeletal problems and to help them prevent surgery. In rehabilitation outpatient care center the emphasis is placed on detailed examination.
In accordance with the Ministry of Healthcare we divide the rehabilitation outpatient care center following:

- A physician with specialisation in balneology, physiatry and medical rehabilitation.
- A physiotherapist.

2 Material and technical equipment

The material and technical equipment of the rehabilitation care centre is divided [1, p. 112] into 4 groups by the Ministry of Health, in which the individual equipment is divided into smaller subgroups that accelerate and assist the patient´s treatment. In accordance with the Ministry of Health [1] we divide it into the following:

- *Basic space of rehabilitation workplace*: Care centre (15 m²), preparation room (12 m²), waiting room (8 m²), patient toilet (2 m²), staff toilet (2 m²), day room or dressing room for staff and a charlady.
- *Additional storage space and equipment*: Box for heat treatment and electro therapy (at least 4.5 m²), room for physical education (at least 6 m²), massage section with washbasin (at least 8 m² for one table), shower for patients, toilet and dressing room for patients, rest room 4 m² per one table), hydrotherapy section: bath room (at least 8 m²), room for sitting jacuzzi (at least 4.5 m²), room for hydrotherapy department (at least 8 m²).
- *Basic equipment of the rehabilitation care centre*: Examinational couch (height minimum 60 cm), washbasin, computer with equipment, desk and chair, a chair for patients, telephone, wall thermometer, hanger, storage locker for tools, manometer, thermometer and stethoscope weight and altimeter, storage locker for files, waste bin, disinfectant, furniture for waiting room (minimum 3 chairs).
- *The equipment of other sections:* They are located in the field of heat therapy and electrotherapy, a lounger, a multifunctional electro-medical device, an electrotherapy device with the application of low-frequency and medium-frequency currents, a washbasin, a device for applying heat treatment.

The aspects of outpatient care facility that have impact on the course of rehabilitation process are climate, environment and social atmosphere. **Climate** is defined as: *"(...) socio-psychological transformation that represents a longer-term socio-emotional attitude, personified attitudes and relationships, the patient´s emotional responses to the events during rehabilitation"* [2, p. 100]. The **environment** is a general term that has *"(...) a wide*

range, not only the socio-psychological aspects (...)", it also includes *"(...) architectural, hygienic, acoustic and ergonomic aspects"* [3, p. 79]. The **social atmosphere** implies wider social aspects, inner group aspects that are formed in a group or team based on the relationship to activity and relationships with other subjects in a group [4].

3 Personality of a Physiotherapist

The personality of a physiotherapist is based on his or her experience and knowledge gained in the specific area, but also in the situations that emerge from it. Currently, more and more physiotherapists work in outpatient care facilities. Often, the treatment process takes place in patient homes or in retirement homes, schools, or health centres that specialise in the problem. According to AGCAS & Graduate Prospects Ltd. [5] in these situations, the physiotherapist assumes the greater responsibility for the following:

- Working with some patients and their families for a few weeks or months.
- Post-operative complications with spine and joints.
- Rehabilitation of patients after accidents, injuries and stroke.
- Writing notes and reports on cases and collecting statistics.
- Work with healthcare professionals to exchange patient progress data.
- Communication with a wide range of colleagues and patients.

4 Knee Joint

Knee joint is the most complicated joint in the human body [6]. It consists of 6 parts: Articulated sheath, vessels and nerves, joint articulating bones, ligaments and muscles [7]. Nervous and vascular supply of the knee joint occurs in the poplitea fossa. It is the site of the main nervous and vascular supply, delimited from the lateral side of m. biceps femoris and from media side m. semimembranosus [8]. The knee joint as a supporting joint fulfils the following 2 main functions without which the body could not fully function:

- The first function helps to achieve the necessary range of movement between the tibia and the femur.
- The second function allows the optimum transmission of the potency between the body weight and muscle activity.

Thanks to both functions, the knee joint can perform extension and flexion. If the knee joint is in the flexion position, the knee is also enabled by the rotational movement of the leg to the femur and vice versa [7].

1 Knee Rehabilitation

- Preoperative mobilisation phase: Familiarisation with therapy, treatment and the preparation for patient surgery.
- Early postoperative care: Activation of normal knee joint function, swelling relief, correct position of the lower limb.
- Therapeutic physical education: Reeducation of mental and physical condition, removal of malfunction.
- Scar release: Mobilisation by stretching the skin.
- Mobilization of patella and fibula patella head passive and fibula head active.
- CMP therapy using motor splint: Passive treatment of handicaped limb joints.
- Isometric Exercises: Muscle Strength in Balance with Counter-Strength.
- Rhythmic stabilisation: "Hold and do not let to divert".
- PIR: 10 second of muscle contraction followed by relaxation.
- AGR: Use of gravitational power and body weight.
- Reduction of Nerve-Muscle Activity: Performs joint coordination through balance.
- Closed kinematic chain CKC: A chain of joints, where the last joint in conjunction with external contact, and movement limitation (bicycle, stepper).
- Open kinematic chain OKC: The last joint without fixation (swing phase of the step).

2 Physiotherapeutic Exercises with Backtround Music

Waterhouse, Hudson and Edwards [9] from the Research Institute for Sport and Exercise at John Moores University in Liverpool, have been investigating respondents riding stationary bicycle. The research sample consisted of 12 respondents who could select the music of their choice during their at least 30-minute ride on a stationary bike. After this exercise they repeated the ride, but the pace of music increased or decreased by 10 % without the respondents knew it. The authors found that heart rate and mileage were lower at a slower pace. With an accelerating pace, respondents enjoyed music and distance more than before the intervention. Although they believed that respondents´ performance was tougher at a faster pace, the research confirmed that respondents opted for a greater degree of effort, even preferred, with rapidly changing music.

Artistic and aesthetically valuable background music can be used with the patients who have been used to listening to classical music in their childhood, because *"in the emotional component of the attitude (toward music),*

the personal child´s experience with the art is reflected." [10, p. 390] These patients are **stimulated to listening to music**, which is manifested in the form of their joy, positive mood and overall mental well-being. The potency of background music has been demonstrated in the field of respondent´s behaviour, positive attitude, faster rehabilitation, faster healing, tension reduction and mental well-being [11].

In rehabilitation, some rehabilitation health centers use reproduced music as means of supporting patient exercises. These exercises are often very painful, but thanks to music, patients are active, motivated and in a better mood. This generally accelerates rehabilitation and helps the patient manage rehabilitation better. Some patients continue to recover with the help of reproduced music even after the end of rehabilitation, which makes the healing effect longer and longer [12].

3 Problem, Objectives, Sample, Methodology and Rehabilitation Plan

We define **the problem** by the following two questions:

Objective: Verify the potency of background music during physiotherapeutic exercises.

Partial objectives:

- Examine basic body functions after exercising with reproduced music during therapeutic exercise and without reproduced music during physiotherapy exercise.
- Examine the patient before and after rehabilitation and compare the results.

The sample: The patient after an injury during sport activity – a knee joint distortion

Form of obtaining information: Exercises and conversation with the client. We have added information from the medical documentation. We have obtained a survey from the client.

Method: Case report.

We examined the patient individually at home. Classical music samples were released via CD on the patient´s audio system. The patient agreed to classical music during each exercise. Exercise was 3 times a week. The first week the respondent practiced without musical intervention and 4 weeks with recorded music.

4 Description of the rehabilitation program

We implemented the rehabilitation programme for 5 weeks with a total amount of 18 rehabilitations. The rehabilitation without musical intervention was performed three times and with musical intervention 12 times. One rehabilitation lasted 45 minutes.

The patient agreed to choose classical music during exercises.

Tools: Sony cmt-sbt40d audio system, 101 songs from 5 classical music CDs.

The list of background music: Listed in the Table 1; ice, NB and FB, towel, brace.

5 Case Study of the Patient

Initials: M. M.

Diagnosis: a knee joint distortion, Lachman test positive, puncture 50 ml of blood.

Age: 23.

Sex: male.

Height: 178 cm.

Weight: 85 kg.

BMI: 27.

History: The patient is single. He did not overcome any serious illnesses, resp. serious viral diseases.

Family history: The patient lives at home with father and older brother. Mother died diagnosed with cancer 5 years ago.

Social and occupational history: He studies outside his permanent address. He has worked as a lifeguard, basketball coach for children aged 10-14 and also as a fitness coach.

Sports history: Actively plays basketball, body building and swimming since childhood.

Allergies: Negative.

Medical history: Negative.

Rehabilitation: The patient´s First Rehabilitation Experience.

Current diseases: On September 24, 2015, the patient fell and tore the outer and inner ligaments during basketball match after he jumped.

Overuse: He does not smoke, alcohol drinks occasionally, he negates addictive substances.

Now: Persistence of knee instability, MRI complete lesion ACL, indicated ACL sculpture.

Objective clinical examination: The patient agreed about the advancement of the rehabilitation, demonstrated trust, his mental condition was fine, 3 days after the operation, he had problems with walking, and the patient is using FB.

Present condition: The patient is conscious, is oriented in time and space, quiescent eupnoe, breathing: 16/min, heart action in normal: f: 74/min, axial knee position, Lachman positive.

Objective of physiotherapy:

- Educate the patient isometric exercises of the gluteal muscles, m. quadriceps femoris.
- Instruct the patient about the exercises for home therapy, scar relaxation, strengthen the muscles of the DK.
- Learn the correct stereotype of walking.

Plan of physiotherapy rehabilitation exercises: We did not use background music in first week of the patient´s plan of physiotherapy rehabilitation exercises. We used musical intervention after a week of rehabilitation and in another 4 weeks. As a source of background music, with the consent of the respondent, we selected classical music from the most famous music composers. The duration of music exceeded 6 hours and the rehabilitation lesson took 45 minutes.

On **the first day** we examined the patient, carried out an overall objective examination: from the front, side, palpation, subjective examination, reaction to the change of position, stretching maneuvers, examination of tendon-reflexes, and we started with rehabilitation.

Plan of physiotherapy: Vascular gymnastics, breathing gymnastics, drill m. quadricepsu femoris (3 months after LCA), active exercises with upper limb, active exercises with healthy lower limb, actively assisted with lower limb, reeducation of walking with German forearm crutches, post-isometric relaxation and antigravity relaxation.

On the last day of rehabilitation we recorded the values for anthropometry, goniometry and muscle test. After the first week without background music intervention, we continued with rehabilitation with the same methods, plus with music intervention.

Table 1 *The list of compositions for physiotherapeutic exercises of the patient M.M.*

Music composers	The title of compositions	Music composers	The title of compositions
Wolgang Amadeus Mozart	Overture: Magic Flute	Georg Friedrich Handel	Messiah, Pastoral Symphony
Carl Orff	Carmina burana	Wolfgang Amadeus Mozart	Turkish March
Georges Bizet	Carmen	Franz Liszt	Hungarian Fantasy For Piano
Johannes Brahm	Hungarian dance no. 5	Felix Mendelssohn Bartholdy	Wedding March
Max Bruch	Adiago	Wolfgang Amadeus Mozart	Malá nočná hudba
Samuel Barber	Adiago	Johannes Brahms	Hungarian Dance No. 1
Ludwig van Beethowen	Moonlight sonata	Piotr Iľjič Čajkovskij	Labutie jazero, valčík
Sergei Vasilievič Rachmaninov	Piano concerto no. 2	Ludwig van Beethoven	For Elise
Piotr Iľjič Čajkovskij	Spiaca krásavica	Nikolai Rimsky Korsakov	Bumblebee flight
Frédéric Chopin	Minute valse	Aram Chačaturjan	Sabre dance
Wolfgang Amadeus Mozart	Adagio	Piotr Iľjič Čajkovskij	Nutcracker, Overture
Johann Christian Bach	Orchestral suite Badinerie	Wolfgang Amadeus Mozart	Rondo
Felix Mendelson Bartholdy	Symphony no. 3	Léo Delibes	Coppelia
Gioacchino Rossini	Overture: Wiliam Tell	Richard Wagner	Rise Of The Valkyries
Edvard Grieg	Holberg Suite, Prelude. Allegro	Piotr Iľjič Čajkovskij	Swan lake, Op. 20
Giacomo Puccini	Madame Butterfly	Antonio Vivaldi	Concerto For Mandolin
Piotr Iľjič Čajkovskij	The Nutcracker Tea (Chinese dance)	Johann Sebastian Bach	Double Violin Concerto In D major
Sergei Prokofiev	Montagus and Capulets	Frédéric Chopin	Etude in C major
Paul Dukas	The Sorceres Aprentice	Alexander Borodin	Violin quartet no. 2
Jean Sibelius	Finlandia	Claude Debussy	Girl With The Flaxen Hair
Wolgang Amadeus Mozart	Overture: Figarova svadba	Alexander Borodin	Prince Igor, Polovtsian Dances
Georges Bizet	Habenera	Frédéric Chopin	Raindrop
Luigi Boccherini	String quintet, minuet	Sergej Vasilievič Rachmaninov	Paganini Rhapsody
Giuseppe Verdi	Brindisi – Drinking song	Jean Sibelius	Sibelius Karelia, Inermezzo
Piotr Iľjič Čajkovskij	Piano concerto no. 1	Ludwig van Beethoven	Violin Concerto, Rondo
Franz Schubert	Rosamende, Intermezzo	Wolfgang Amadeus Mozart	Elvira Madigan
Antonín Dvořák	String Serenade, Moderato	Nikolai Rimsky Korsakov	Scheharazade, Adiago
Nikolai Rimsky-Korsakov	Scheherazade Andantino	Johann Strauss Jr.	Persian March
Robert Schumann	Foreign Lands and People	Jacques Offenbach	Can-can
Georg Friedrich Handel	Largo	Geroges Bizet	Carman Suite, Toreadores
Antonio Vivaldi	Four seasons: Spring	Johann Sebastian Bach	Toccata
Wolgang Amadeus Mozart	Overture: Don Giovanni	Piotr Iľjič Čajkovskij	Eugen Onegin
Ludwig van Beethoven	Overture: Egmont	Felix Mendelssohn- Bartholdy	Fingals Cave
Antonín Dvořák	Symphony From the New World– Largo	Camile Saint Saens	Piano Concerto No. 2
Jospeh Haydn	Symphony No. 101, The Clock	Wolgang Amadeus Mozart	Menuetto
Johann Christian Bach	Double Violin Concerto	Pyotr Ilyich Tchaikovsky	Sugar Plum Fairy
Georges Bizet	Farandola	Frédéric Chopin	Waltz
Edvard Grieg	In the hall of the mountain king	Johann Strauss Jr.	The Bat (Die Fledermaus)
Modest Mussogrskij	Pictures from the Exhibition	Antonio Vivaldi	The Four Seasons, Autumn
Piotr Iľjič Čajkovskij	1812 Overture	Johannes Brahms	Hungarian Dance No. 6
Michail Ivanovič Glinka	Overture: Ruslan and Ľudmila	Joseph Haydn	Symphony No. 94 – Surprise
Ludwig van Beethoven	Piano Concerto No. 5	Georg Friedrich Handel	The Royals Foreworks
Andrea Mascagni	Cavalleria	Claude Debussy	Prelude a L'Ares – Faunovo popoludnie
Frédéric Chopin	So Deep The Tight	Léo Delibes	Coppelia
Piotr Iľjič Čajkovskij	Swan lake	Pyotr Ilyich Tchaikovsky	Violin Concerto, Allegro
Sergej Vasilievič Rachmaninov	Piano Concerto No. 2	Robert Schumann	Traumerei
Gioacchino Rossini	Overture: Barbier zo Sevilly	Edvard Grieg	Morning Mood
Georges Bizet	Dance Boheme	Bedřich Smetana	Moldow
Maurice Ravel	Bolero	Antonín Dvořák	Symphony from the New World
Johann Pachelbel	Canon in D major	Georg Friedrich Handel	Hallelujah Chorus

We played the song to the respondent with his agreement in the order they were recorded, with varying tempo, melody and rhythm of music. We communicated the changes with the patient, verified his feelings, his desire to exercise and his concentration.

6 Results – Evaluation of Rehabilitation Programme

Structure of Exercises:

In one 45-minute physiotherapeutic lesson, after the first week we selected music sample during physiotherapy ecercise for the patient. We have adjusted the volume according to patient´s requirements. Throughout the exercise, we observed and recorded basic human functions.

At the beginning we practiced not only muscle strength, but we also added exercises focused on coordination and endurance. We started with massage and scar relaxation, then we released patel. We have omitted the dril quadriceps because it is not recommended after LCA surgery in the first 3 months. We continued with isometric exercises, rhythmic stabilisation and PIR exercises. We added strengthening abdominal muscles, paraverterral muscles, and gluteal muscles. We continued to practice stabilised basic standing position, standing on tiptoes and heels, reeducation standing and walking.

Programme Evaluation:

The course of the entire physiotherapeutic programme with the use of background music lasted for 4 weeks – 45 min/sitting. He started after the first week of rehabilitation, when we offered him background music intervention. In the beginning we observed the patient while he was listening to classical music.

The patient was open to the possibility that classical music could be used in the process of rehabilitation, even though *"classical music in the 21st century is facing a great pressure as it is losing its position to other musical genres and styles, such as popular music, which is clearly displacing classical in the audience´s level of interest."* [13, p. 46]

After the first week of music intervention, we perceived the patient´s satisfaction with the musical demonstrations and the course of the exercise in general. We realise that these feelings were subjective, but we believe that they have acted for the regeneration and rehabilitation of a patient who communicates with us freely about his feelings. During listening to certain compositions such as Hungarian Dance, no. 5 by Johannes Brahms, the patient was a bit surprised by the pace of music, but he took it as a refreshment. When he was asked during which compositions he was exercising without knowing what composer and song he was playing, he highlighted 12 compositions, see the table 2.

Table 2 *Compositions during which patient felt the best of all during exercises*

1. Fréderic Chopin *Raindrop*	2. Fréderic Chopin *Waltz*
3. Antonín Dvořák *Symphony From the New World*	4. Bedřich Smetana *Moldow*
5. Ludwig van Beethoven *For Elise*	6. Robert Schuman *Traumerei*
7. Jean Sibelius *Finlandia*	8. Georg Handel *The Royal Fireworks*
9. Léo Debiles *Ceppelia*	10. Edward Grieg *Morning Mood*
11. Georg Handel *Hallelujah chorus*	12. Antonio Vivaldi: *Four Seasons: Autumn*

The respondent informed us continuously during which compositions he can easily concentrate on the exercise and when he is not motivated to cooperate at 100 %.

7 Output Examination – Concluding the Therapy

Table 3 *Anthropometry*

Place of measuring	**Left lower limb** (cm)	**Right lower limb** (cm)
15 cm over patella	54	55
10 cm over patella	50.5	51
Knee	41	39,5
Calf	39	41
Inguina	66.5	66.5

Goniometry:

- Left knee joint: S: 0-0-110,
- Right knee joint: S 0-0-180.

Table 4 *Muscle test*

Knee muscles	Left lower limb	Right lower limb
Flexors	4	5
Extensors	4	5

8 Discussion

The aim of the study was to evaluate the potency of background music in physiotherapy exercises in a patient diagnosed with knee distortion. As a method to achieve our objectives, we selected a case report. We observed the effect of music on the patient for four weeks. We started physiotherapy exercises with a weekly rehabilitation process without background music intervention. We considered the patient´s perception of therapy through and without background music. At baseline, we examined and scored the values for anthropometry, goniometry, and muscle strength of the knee joint. Thanks to these information, we have achieved the following results:

- After the final examination, we achieved the reduction in the swelling of the affected limb.
- Body functions after exercise with background music intervention had better measured values than after exercise without it.
- Eupnoe of the patient was calmer as well as heart action.
- The patient´s respiratory rate per minute decreased by 3.5 % and the heart rate/min. by 3.2 %.

This is in concord with Campbell´s experience [14], which describes the effects of music as follows:

- Music can regulate stress hormones,
- Helps the patient to eudure exercises for longer time,
- Affects overall performance,
- Regulates body temperature,
- Affects blood pressure and heart rate,
- Can increase endorphins,
- Alleviates body coordination, movement and muscle tone,
- And finally it affects breathing.

9 Conclusions

The results of pre-test and post-test examinations indicate that we managed to eliminate the negative potency of background music, specifically body functions such as respiratory rate and heart action. Our findings are closely related to the reduction of muscle tension, mobility and good physiological relaxation response.

The results indicate the positive benefit of background music intervention during the rehabilitation of patients after knee surgery: It helped the patient to endure exercises, regulate body temperature, positively affected heart rate, increased endorphins and affected breathing. That is why we recommend to include background music to patients with knee injury.

References

[1] Ministerstvo zdravotníctva SR. 2012. Vestník, OBZOR, s.r.o, 2012.[online]. 2012. [Cit. 2016-02-13]. http://www.health.gov.sk/?vestniky-mz-sr

[2] Průcha J., Walterová E., Mareš J. *Pedagogický slovník.* 4. vyd. Praha: Portál. 2008. ISBN 978-80-7367-416-8.

[3] Verbovská J. *Výbrané problémy aplikovanej sociálnej psychológie.* Prešov: MPC v Prešove. 2006. ISBN 8080454272.

[4] KolláriK T. *Škála sociálnej atmosféry v skupine.* Bratislava: Psycho-didaktické a didaktické testy. 1990. ISBN 80-08-018280-3.

[5] AGCAS & Graduate Prospects Ltd. Job Profiles. *Physiotherapis*. [Online]. 2014. [Cit. 2016-03-14]. https://www.prospects.ac.uk/job-profiles/physiotherapist

[6] Nýdrle M., Veselá H. *Jedna kapitola ze speciálni rehabilitace poranění kolenního kloubu*. Brno: IDVPZ, 1992. ISBN 80-7013-128-4.

[7] Čech O., Sosna A., Bartoníček J. *Poranění vazivového aparátu koleního kloubu*. Praha: Avicenum. 1986. ISBN 08-088-86.

[8] Lánik V. *Kineziológia*. Martin: Vydavateľstvo Osveta, 1990. ISBN 80-217-0136-6.

[9] Waterhouse J., Hudson P., Edwards B. Effects of music tempo upon submaximal cycling performance. *Medicine & science in sports*. Martin. 2010. ISSN 1600-0838.

[10] Strenáčiková M. Rodina a rozvoj umeleckých záujmov, schopností a zručností dieťaťa. *Wielowymiarowy obraz współczesnej rodziny*. Pułtusk: Akademia Humanistyczna im. Aleksandra Gieysztora, Wydzial pedagogiczny, 2015. 387- 400 s. ISBN 978-83-7549-244-6.

[11] Králová E. Reprodukovaná hudba ako prostriedok zmiernenia tranzitívneho obdobia. *Slovenská hudba – revue pre hudobnú kultúru. Časopis Slovenskej hudobnej únie.* Bratislava: Slovenská muzikologická asociácia. 364-376 s. ISSN 1335-2458.

[12] Vitálová Z. Úvod do muzikoterapie a jej využitie. Bratislava: Vysoká škola zdravotníctva a sociálnej práce sv. Alžbety, 2007. ISBN 978-80-89271-18-4.
[13] Strenáčiková M. Место классической музыки в средствах массовой информации Словакии в начале XXI века. *Music art XXI century – History, Theory, Practice:* Collection of scientific papers. Drogobych – Kielce – Kaunas – Almaty, Posvit: Drohobych State Ivan Franko Pedagogical University, 2016. 46-51 s. ISBN 978-617-7401-17-8.
[14] Campbell D. *Mozartov efekt*. Praha: Eminent, 2008. ISBN 978-80-7281-336-0.