Original Article

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Degree of interest in horse-back riding therapy interventions for patients with neurocognitive disorders: a quantitative analysis of literature in online scientific databases

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Authors' Contribution: A – Study Design, B – Data Collection, C – Statistical Analysis, D – Manuscript Preparation, E – Funds Collection

Abstract

Introduction: Since ancient times, scholars points out effectiveness of horseback riding not only for utilitarian use, but also as form of therapy for less healthy part of society. Enlightenment age scholars started to make treaties about use of such therapy and this trend is now developing not only for physical disabilities, but also for mentally ill patients. The purpose of this study is to determine trends of interest in horseback riding therapy interventions among different groups of neurocognitive disorders among different populations of people and its comparison to prevalence of such disorders. *Material and methods:* Web of Science, Pubmed and Scopus databased were screened using filter with algorithm of "horseback therapy" , "horse back therapy", "hippotherapy" and "equine therapy". Results were screened for appropriateness and relevance, then based on this end-filtering, papers were grouped regarding specificity of neurocognitive aspect of disorders. *Results:* 595 entries in Web of Science, 516 entries in Scopus and 123 results in Pubmed. Overall, 272 entries were subtracted. *Conclusions:* This analysis shows that most interest in such kind of therapy is focused on neurological disorders, especially with ones with cerebral palsy. There is no correlation between prevalence of selected disorders and amount of related papers.

Keywords: horse back therapy, developmental disorders, neurology, bibliometric

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INTRODUCTION

As we can read in text of ancient scholars, they understand that horse riding could be used not only for utilitarian purposes, but also as form of therapy. Horses company mankind since development of first civilizations. At the beginning, they did not ride on horseback, but use horse for agriculture and for battle purposes, but in form of chariots. Later on, humans developed riding on horseback and developed saddle. It indicates, that riding on the horse back is more demanding task, not only to the ability to tame the animal and train it to obey orders, but also more physically demanding to. It requires certain balance and coordination skills, but also formidable endurance and lower limb strength. Necessity to have those skill and motor competences was transposed to an assumption, that people with special needs could benefit from horseback riding, therefore, it enhanced their development [1].

Re-inventing of such idea took place after renaissance era, when scholars read texts from ancient scholars and propagate their ideas in new ways. Enlightenment era and already invented by that time printing machine made scholar thesis and monographies more popular and faster to publish. Scholars from different parts of the world started to develop methodology and justification of horseback riding therapy for different groups of people with different kind of disabilities. Those works led to establishing places, where horseback riding serves as means of education and therapy . It was not yet systemized as it means today. All methods were based on authoritarian knowledge and scientific journals were not available yet [2] . At the same time, physical education were developing not only for military purposes, but also for common people. In the modern times, after industrial revolution, horses stopped to be main drive for industry and steam engines and after them petrol-based engines were developed. More and more, horses started to be treated as an entertainment or left for agriculture. Beside those purposes, more establishment were created and alongside with development of regular, common education and special needs education, those animals started to serve as significant role for human development . After second world war, cars started to be a standard means of transport and tractors were used for agriculture, so horses were left for luxury entertainment and therapy only. By that time, physical culture science established its place among interdisciplinary field between health and social science. Horseback riding started to be formally seen as part of physical education and therapy for youngsters. With a development of this therapy, not only children, but also adults with mental disorders could benefits from that kind of therapy [3].

Horseback therapy is a field administered by psychologists, pedagogist, sensory integration therapist and physiotherapist with additional skills of handling a horse for purpose of conducting therapy. Horseback riding is often part of institutional special needs education in western world countries or part of non-governmental projects of association for disabled people [4]. Other part is private sector for people who cannot get into such projects.

Horseback therapy is complex intervention. Besides motor improvement due to being on horseback, it serves also social and mental purposes when sole riding is mixed with more demanding mental task as horse stops by rider-therapist in special point for i.e. learning colours etc [5].

In the special needs education, many people with different mental, cognitive or learning disorders occur. Cerebral palsy, Autism, Down's syndrome, people with learning disabilities based on their genetic or idiopathic bases – they all could benefit from such kind of therapy. More demandable intervention also covers adults – mostly with neurodegenerative and mental [6].

The main connective aspect of all presented disorders are neurocognitive dysfunctions of such people. Because of either developmental or acquired disfunction to a neural system, somatic representation of a body in the one's brain. Even in the spectrum of normal range of intelligence, there may be disturbance in their perception of body alignment and body control [7]. Horse riding therapy could be beneficial in improving body control and enhancing motor capabilities of individuals. Those improvements could lead to improvement of cognitive functions, which framed horse riding therapy as complex, multidimensional therapy for people with neurological disorders.

In the developed countries of western world, there is disturbing increase of births of children with developmental disabilities, especially autism [8]. This trend could not be explained in single factor as a cause of such phenomena, therefore there is no effective way for countering emerging of such disorder among new-borns. The only way of handling this situation is to establish proper

facilities of support with effective therapies, which minimize depth of disabilities in the later life or to improve its quality [9].

But the trends, which group is in the most interest of scientist and how many papers towards different mental disorder people group is unknown. Some systematic review involving specific groups were held, but none of them determine trends and proportion of interest among different kinds of mental disorders.

The purpose of this study is to determine trends of interest in horseback riding therapy interventions among different groups of neurocognitive disorders among different populations of people and its comparison to prevalence of such disorders.

METHODS

Three most common databases were screened in search for desirable entries – Web of Science (All databases), Scopus and Pubmed. This choice was justified in previous works, where authors have proven that there could be significant differences between results in this databases [10-12]. Search for results was divided into three stages:

Stage 1

Advanced options of in search engine were used in all databases. Due to maximize possibility of finding all related papers by the title, four phrases were used "horseback riding therapy", "horse back riding therapy", "hippotherapy" and "equine therapy" put into appropriate algorithm:

Web of Science:
TI = (horseback therapy OR horse back therapy OR hippotherapy OR equine therapy)
Scopus:
(TITLE (horseback AND riding AND therapy) OR TITLE (horse AND back AND riding AND therapy) OR TITLE (hippotherapy))
Pubmed:
((horseback riding therapy[Title]) OR (horse back riding therapy[Title]) OR (hippotherapy[Title]) OR (equine therapy[Title]))

Stage 2

After obtaining primal results, related papers will be selected regarding to referring as therapy interventions for specific groups of patients. All records will be merged, removing duplicates in order to obtain one database of related papers. The results will be analysed by country and year of publication. Inclusion criteria are relativeness to horseback therapy with real horses, excluding intervention with artificial, virtual or mechanical devices imitating movement on saddle. Both therapeutic intervention and reviews of such therapy will be included. Papers, which solely focused on describing what is horseback therapy will be excluded.

Stage 3

After filtering for relevant papers, all records will be analysed by title or when it is inconclusive about experimental group, abstract was read to determine, which group of patient was involved. Number of categories and subcategories will emerge naturally in the process of classification. Base method is to determine main class of neurocognitive disorders and then put specific disorders as subcategories. Additional step will require to check for duplicates among screened databases and remove repeated records. After that, all acquired records will be put through search engines again to check for country affiliation of first author and release date. This could not be done automatically because databases differs with articles and proper extraction could not be obtained with free exporting and analytic tools. Last part was searching for prevalence as mean of percentage occurrence of births though population[13-19]. Numbers were extracted by average from epidemiology articles and databases, just to show trends, not to give detailed information about each disorder included in this analysis, because it far exceed main purpose of this study.

Presenting results will be put into quantitative matter, so no further statistical analysis was involved. This design was based on previously accepted paper about bibliometric analysis of judo related papers [20].

RESULTS

Initial results of search engine shows 595 entries in Web of Science, 516 entries in Scopus and 123 results in Pubmed. After filtering results by the author due to its relativeness, 181 entries were left for Web of Science, 179 entries for Scopus and 92 entries for Pubmed. Comparing to Web of Science, duplicates from Scopus and Pubmed were removed, leaving 76 unique entries from Scopus and 15 from Pubmed. Overall, 272 entries were subtracted.

In the beginning of stage 3, papers were analysed and put to following categories:

- Developmental – this category involves genetical dysfunctions which lead to neurocognitive impairment from the beginning of life, although some of them may occur later, such as autism, adhd (attention deficit/hyperactive disorder) or intellectual disabilities.
- Neurology – in this category papers involving cerebrovascular-based disorders as cerebral palsy or stroke, neurodegenerative disorders of different origin and damage to peripheral nervous system (spinal cord injuries).
- Psychology – this category involves mainly psychiatric and psychological disorders of adults and children, but also traumatic disorders of soldiers.
- Review – systematic and non-systematic reviews of interventions regarding horseback therapy.
- Other – orthopaedic (musculoskeletal) disorders and geriatric patients, which could not be classified in previous categories but also have burden of neurocognitive disturbances due to primal illness.

The most papers were included in neurology category – 134 out of 272 which is 49,2% of all papers. Moreover, 87 out of 134 is refereeing to cerebral palsy as target of intervention, which is around 32% of all papers. Developmental category involves 19% of papers with most interest in autism. Psychology category involves 15% of papers with main interest of children-related disorders. Non-systematic reviews far exceed systematic ones in presented records and there is 7% of papers regarding others category, which quite even spit to geriatric and orthopaedic section (figure 1).

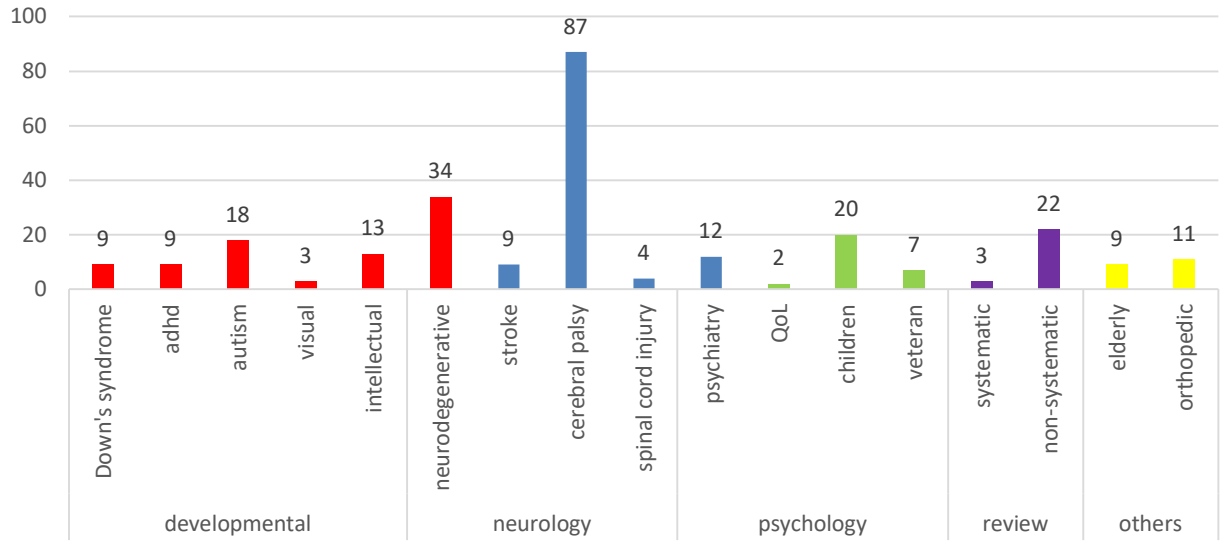

Figure 1. Quantitative analysis of papers put into specific categories and subcategories.

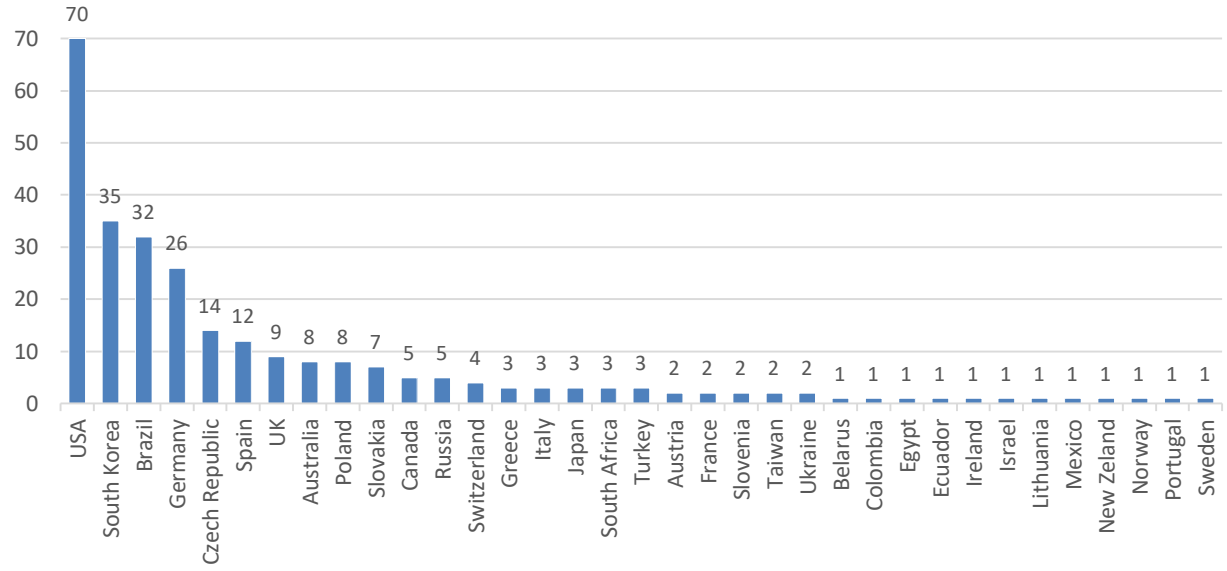

Figure 2. Distribution of papers by a country affiliation of first author.

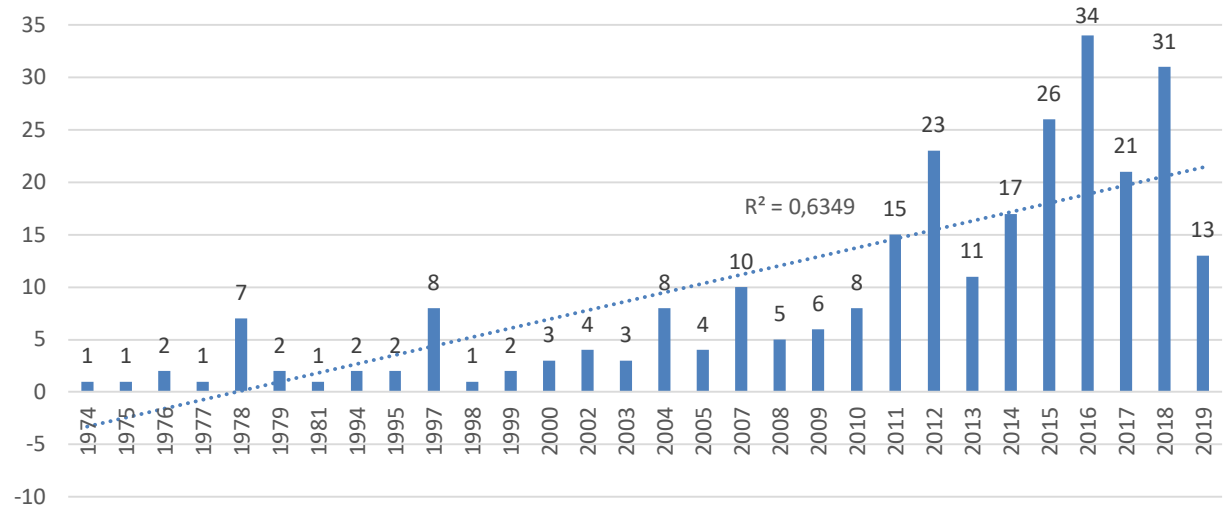

Figure 3. Distribution of papers by year of publication.

Analysis of papers by a country affiliation of first author reveals dominance of papers form United States (70). Similar number of paper were published in the second and third place, which belongs to South Korea and Brazil (respectively 35 and 32). After the records from Germany (26) there is progressive decrease of number of papers by a country to the point where there is only single record for specific country. But those 30 countries have 40% of all records (Figure 2).

Regarding number of publications, first peak was at 1978, when numbers rise up to 7, then for almost 20 year there were reduction in numbers up to 1997 when again it goes up to 8. After that more papers started to emerge in databases, up to 34 in 2016. There is no straight linear progression in number of papers years. Rather than gradual progression there are also drops after 2010s. There is incomplete amount of papers in 2019 as access date in the 16.06.2019.

According to prevalence of disorders in selected categories, there is no correlation between number of papers regarding specific category and occurrences of such disorders for selected number of births. The highest disproportion were observed among number of papers regarding cerebral palsy and PTSD (post-traumatic stress disorder) prevalence in veteran group. Among 12 categories, half of them are underrated and second half is overrated in a manner of interests of scientists (Figure 4).

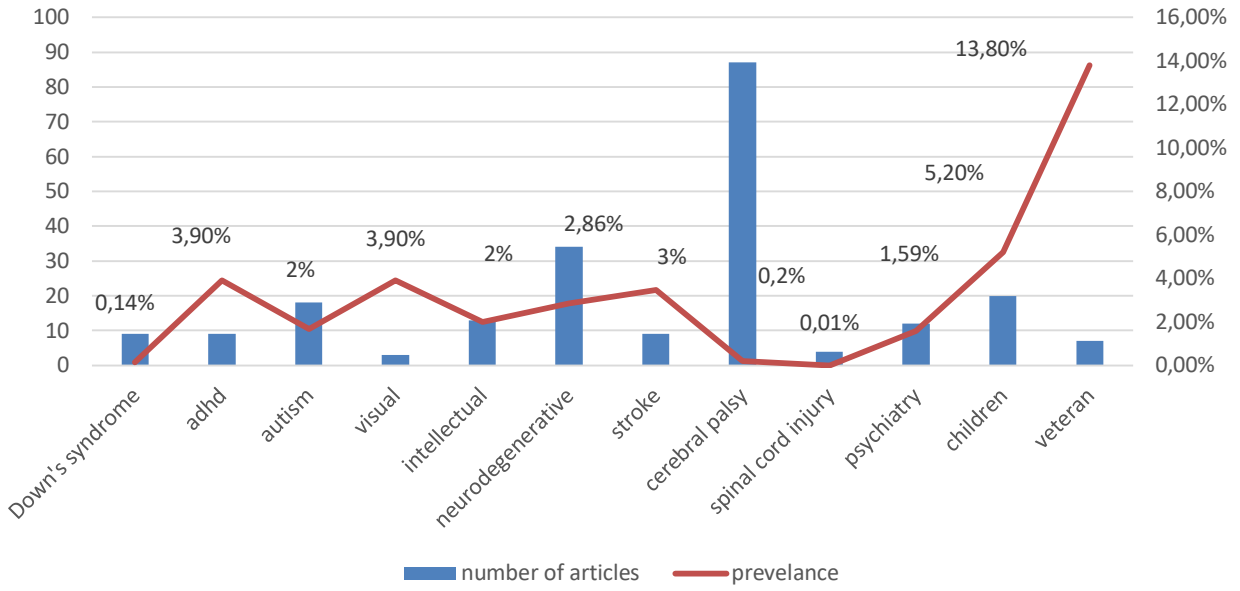

Figure 4. Number of papers in specific categories in relation to its average prevalence.

DISCUSSION

Starting from the methodology of this study, it was proven important to use those three most known databases. Each of them contain unique entries, which allows to have wider spectrum of distribution of data in this topic. This also shown, that there is lack of unification of collection and indexation capabilities and criteria among selected databases. Scientist should avoid limiting themselves to only one while performing bibliometric analysis, where the aim is to show trends or distribution of selected topic among scientist, as assumption could be burdened with considerable bias [12].

Another bias that needs to be pointed out, is that this study limit is selected databases papers. There are many journals, mostly in native language besides English, which are not indexed in any of selected databases. It is not possible for narrow team of scientist to access all databases in all countries to get the whole picture of distribution of papers referring to selected topic. Perhaps in some Asian countries with long tradition of horseback riding, there are papers related to therapy, which we cannot have access by means of such databases, or some manuals for example in Mongolian. In the future, with development of search engine and AI capabilities as translator it could be possible to perform such analysis with more sophisticated computational method from all accessible data from all internet databases [21].

During analysis of selected papers, category with most entries were neurology. In this category, the most interest among all lies in cerebral palsy. It is not an aim of this study to judge justification of this trend or degree of effectiveness of such therapy for this group. Cerebral palsy was extracted as separate because of its specificity. There is no developmental disorder, as it is not necessarily from the beginning of life. Haemorrhage could occur even couple of months after birth. This of course affects development, but it is nothing pre-determined by genetics. Alongside with development of medicine, more children could be saved and also life of people with cerebral palsy is longer. Even if the prevalence of this disorder is not high, group of people with such disorder is increasing each year, because morbidity is decreasing. Similar pathophysiology could be observed in the stroke patients, as main factor also lies in the cerebrovascular incidence [22]. Also there is increased number of patients with such disorder, but only about 10% of amount of papers are about post stroke patient in comparison to cerebral palsy. This phenomena may have explanation in the difficulties to handle by therapist grown-up person in comparison to a child. Considerable amount of patient also could be observed in neurodegenerative disorders category, which mainly include papers about multiple

sclerosis. They are grown-up people, but to a certain degree of development of such disorders, they could move by themselves, so this also may explain higher interest than stroke patients.

In the developmental category, there is justified interest in the autism-related interventions as the one of the fastest increasing in prevalence among all disorders. In the psychology category, children and psychiatry also dominates, which proves alarming trend of increased amount of disorders among youngsters. The strongest underrated interest is in the visual-related disabilities. The main factor about such phenomena might be the effectiveness of such intervention or rather assumption, that in the field of neurocognitive disorders, the main feat of horseback therapy lies in improving motor functions. When specific disorders have mostly cognition disorder but more motor capabilities, there are less studied than conditions, where there could be both improvement of motor and psychological functioning. This could lead to assumption, that besides introduction hippotherapy as complementary one, its main focus lies in improvement of motor functioning [23], perhaps with motivational and slightly developmental in a pedagogical way referring to one's psychic.

It is worthy to point out, that interventions also include elderly people and with orthopaedic conditions, which do not fit neurology or developmental category only, but have neurocognitive aspect in some manner of their own. Putting differences in the psychosomatic categories specified here aside, main feat of hippotherapy is strong proprioception stimuli, which is proven to be more effective for motor development than simple visual feedback [24].

Regarding to distribution by a country, it is not surprising, that papers form USA dominates. All databases have their origin there and whole scientific system included in this analysis is in so-called western world. But interested aspect is presented in the second place, which is South Korea. It could be connected to their strong connections to USA, but there is separate category in Web of Science database called KCI-Korean Journal Database. Also Russia have similar separate category, but this does not contribute to similar number of papers. Nevertheless, efforts about indexing native papers in most prominent databases could be beneficial, but it is mostly connected to scientific evaluation of researchers in specific countries. Global trend is to evaluate their efforts regarding Web of Science indexed papers or Scopus, but there may be regions where such indexation is not so important or researchers could not afford publishing in better indexed journals. This could explain bias of this study which were discussed above. Third place belongs to Brazil, where it is seemingly strong emphasis of papers indexed in selected databases. Special place belongs to Czech Republic, where this is small country, without significant economy in a scale of Europe, but second only to Germany among European countries.

Without any knowledge about the number of publication in specific years, first thing that comes to mind, is that number of papers will increase gradually. But this is not the case. From 1978, there are some peaks where there were increased number of papers regarding selected topic, and for some years there where sudden drop. The reason my simply lie in the time of intervention, where collecting results could not be so progressively acquired, computed and transfer into publication. Different regression trends computation shows from linear regression of $R^2 = 0.624$ to exponential $R^2 = 0.782$, that there are additional factors which could not be gasped in this analysis due to lack of data.

The biggest prevalence is PTSD among veterans [15]. But that fact did not correspond to number of interventions. Probably number of potential patients are smaller than in other groups, so prevalence could not be seen as proper determinant of amount of papers referring to specific disorders.

Interesting part is review category. There were only 3 systematic reviews and up to 22 non-systematic reviews. This may indicate, that this kind of therapy have its own specificity, which could not be easily classified and compare to another by its outcome, in addition to lack of motor testing of fitness level, related to horseback raiding, as it is commonly used in physical education [25,26].

For the last part, analysis of prevalence regarding to interest in paper is not perfectly analysed because of enormous number of data which we could not have access to. Presented trends were computed by WHO and CDC or extracted from specific papers. The perfect relation would be analysis by a country and occurrences of specific disorders in those countries. The main assumption could be, that proportion of intervention among different groups could be dependent on possibilities of possible outcome of such therapies for them.

CONCLUSIONS

Most of papers are related to neurological disorders, with special interest in cerebral palsy and the main beneficial factor from such kind of therapy lies in improvement of motor control rather that all other psychological factors. Analysed material shows dominance of USA originated papers, but we must included bias due to indexation criteria. There is not strict gradual increase in number of papers by following years, but most of papers were published after 2015. There is no correlation between prevalence of disorders and amount of papers referring to selected disorders. Perhaps possibility of beneficial influence determines interest in investigating therapy for specific categories.

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