DEVELOPMENT OF YOUNG PEOPLE'S STEADINESS OF ATTENTION AND CONCENTRATION IN THE LEARNING PROCESS OF PLAYING PERCUSSSION INSTRUMENTS

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Abstract
When playing percussion instruments, the main activity is done with the help of motion or motorics, and, in order to perform the movements, developed steadiness of attention and focusing are necessary.
The aim of the research is to study and test the development of steadiness of attention and ability to concentrate when learning to play percussion instruments.
During a final COG testing (Vienna test system) the differences identified between the experimental group and control group are of statistical significance with a probability of 99%, t=4.13, p<0.01, therefore it can be concluded that the results of steadiness of attention and focusing abilities have improved statistically significantly for the members of the experimental group.
Lasting and regular playing of percussion instruments as well as doing coordination exercises for playing percussion instruments devised by the authors for 6 months efficiently develops young people's steadiness of attention and ability to concentrate.
Key words: *focused and steady attention, playing percussion instruments, young people*

Introduction

When playing music, not only such specific musical abilities as an ear for music, imagination, memory and sense of rhythm, are used and developed, but the process also enhances such general abilities as the volume of thinking, originality, flexibility, focusing of attention, switching, separation, memory and psycho-physiological movement abilities like prowess, stamina, movement coordination, reaction speed, agility of arms, legs, and fingers.

Musical performances involve thinking, feeling and acting. The idea expressed by Gieseking (1964, p. 92) was *"...technical abilities must be developed in the head, not fingers"* can be applied to playing percussion instruments.

Klöppel (2003) has discovered that the process of learning to play music means learning on three levels, that is, learning to think, feel and act or, in other words, learning on a cognitive, affective and motoric level. Kinaesthetic factors (for instance, speed, force, agility, stamina and coordination) cannot be separated from the mind that gives directions to the movements.

Every intellectual activity fosters the development of intellectual abilities. Scientific research encourages conducting classes in which intellectual abilities are unbound and developed through self-expression and creative activities. While doing movement exercises, it is possible to not only loosen up, feel and get to know one's body, gain aesthetic experiences and develop abilities, but also to activate psychic processes and stimulate specific activities of the brain hemispheres. Thus, the brain is more activated and learning in general reaches a higher quality (Geiger, 1998; Wiemeyer, 2000; Klöppel, 2003; Schachl, 2005).

Altenmüller, Gruhn and Parlitz (1999) have discovered that learning to play music efficiently improves the activity of both brain hemispheres and develops abilities. In his research work, Jank (2005) has confirmed that the following types of musical activities – singing and playing of an instrument – are the most efficient means for developing abilities.

While making music, many areas of the brain work simultaneously including those of perception, attention, movement, sense of rhythm, coordination, hearing, thinking, memory, simultaneous activity of emotions. The previous scientific research results prove that musicians in comparison with non-musicians have different levels of domination of the brain hemispheres. Musicians have a significant *Planum temporale* asymmetry that is oriented to the left hand side. It is connected with an increased communication between the brain hemispheres that are created by fast motoric movements of both hands (Schlaug & Gaab, 2003).

Contrary to the traditional viewpoint stating that the primary function of the cerebellum is to ensure movement coordination, the latest research has shown that its activities influence both linguistic and cognitive functions, and this encourages us to think that the improvement in movement coordination might result in improvement of cognitive functions (Vicari & Menghini, 2008). This is a highly significant conclusion of the research, which allows assuming that a teacher may not only help to develop young people's sensorimotor coordination, but also their overall abilities (attention, perception, memory and thinking) through purposeful learning to play percussion instruments.

The Nature of Attention and Its Specifics in Music Pedagogy

In pedagogy, researchers define attention as an ability to concentrate awareness; the activity of cognition operative orienting in changing environmental conditions and achieving of purposeful aims depends upon it. In psychology, attention is seen as a universal psychic phenomenon, a psychic function for concentrating awareness. Attention fosters perception; it can be intentional and purposefully directed towards an object or unintentional, spontaneous or post-intentional. Depending on the personal qualities, age, general and special abilities and other factors different people have different levels of steadiness of attention as well as different capacities of the number

of objects that they can keep in the focus of their attention. There is no specific or predefined product to be analysed as a separate subject that is produced as a result of concentrating attention as is the case with such processes as motivation - willingness, mnemic process – remembering. Attention only influences the results of the very process to which it is added. Attention is not a simple regulatory process of the psyche; it is like a mediator participating in other processes. Its various states can be felt as a tension, strain, interest, surprise, activity, etc. (Нуркова & Березанская, 2007).

In order to understand the nature of attention, it is important to establish its neurobiological foundation. Hearing is a very important constituent of the learning process as it helps to perceive information. Sound waves are first and foremost air pressure waves that create vibrations of the ear drum and ossicles. Then the vibrations are transmitted through the oval window and add pressure to perilymph and endolymph. In the place where the vibrations are at their maximum, a nervous impulse is generated. The basic principles of the impulse perception and transmission processes are similar to all organs of sense: receptors transform external impulses into electric signals, which are then transmitted through several stations to processing centres in the brain. It is important to add that we are not speaking about one-way movement – the higher centres are also involved in the reception and selection of information. The switching place (*thalamus*) and reticular formation (*formatio reticularis*) ensuring attention and emotionality have been accentuated. Overall alertness, readiness to perceive and learn (tonic activity) is first transmitted in the lower parts of the reticular formation. Based on that, thalamus takes care of the selective attention that can only be achieved by cooperating with the areas it is responsible for, especially the prefrontal cortex that is the 'decision taker' receiving the results of the comparison from the remaining parts of the brain. Simultaneously, it receives feedback about the emotional meanings from the limbic system. The parts of the limbic system, for example, a specific nucleus – *hippocampus* – perform important tasks in storing the perceived information. Attention depends on the body condition – alertness, expectations, experience and context. Feelings play an important role. The reticular formation gives an important biological base, and it closely cooperates with the thalamus and prefrontal cortex. Being interconnected with the thalamus, prefrontal cortex and the entire limbic system display the cooperation between perception, attention and emotions throughout any intellectual processes (Schachl, 2005).

Shadrikov (Шадриков, 2004) has discovered the essence and structure of the human abilities and has analysed their development through the actions. The scientist thinks that every psychic process – senses, perception, memory, conception, imagination, thinking, attention – may be seen as ability. He sets the following criteria for the productivity of the attention:

- Speed of the attention switching: the minimum time necessary to switch attention from one object to another or from one action to another;
- Broadness of the attention disposition: the number of object or action types that are within the focus zone at a singular time;
- Attention quality criteria:
    - placement errors;
    - switching errors;
    - intensity;
- Attention steadiness criteria:

- length of the attention focusing on one object;
- steadiness of attention (Шадриков, 2004).

Steadiness of attention and focusing are important preconditions for fast and efficient learning processes of playing percussion instruments, and they are necessary for gaining faster achievements working with difficult tasks.

"Focusing is an especially intense form of attention, and it is a critical condition for success. Focusing is an active, purposeful psychic process that is led by the willpower and awareness and that is not relaxed during a certain period of time" (Bastian, 2000, 345).

Focusing means thinking *here and now*. To focus means to pay attention to one particular thing. The aim of attention in every situation is to keep the thinking processes within the framework of here and now: *"The ability to purposefully focus attention to information essential for understanding and performing a task is very important, and it influences the individual level of attainments significantly"* (Klöppel, 2003, 54).

The musicians' attention is special for the selective nature of perception. When performing, musicians need to choose the part of the environment to which the attention shoud be paid; at the same time, musicians must ignore anything that might encourage them to do something in a wrong way. The focusing of attention on visible and audible things is one of the most important abilities that musicians must develop in order to learn a piece of music or read music sheets (Reed, 1988).

The limited possibilities to focus attention while listening and performing music and the use of only one channel of attention in one unit of time gives birth too many questions:

- How can one follow a polyphonic piece of music?
- Does the impression of sound totality form first and is later divided into separate lines of music or does attention jump from one line of music to another at a speed of lightning and later unifying them into a complete line with the help of some short-term thinking?

The capacity of music perception is connected with various musical elements – the pitch, chords, rhythm – that first need to be separated from one another by focusing attention to each of them separately. The preciseness of the perception of polyphonic music depends on the musical knowledge and listener's experience. Klöppel (2003) recommends starting the attention training with the help of two musical voices: the trainee must quickly switch focus from one voice to the other; later, a piece of music with three voices should be chosen, and beginning with four voices one should take harmony as the basis.

When playing percussion instruments, attention problems may often occur if several different rhythms are listened to or played together; the said is especially true when the processes of playing requires coordination of arms and legs on a drum set that consists of a bass drum, a floor tom, several toms of various sizes and cymbals. Therefore, it is advisable to learn or to listen to only one rhythm at first, then follow with the next one and only then combine them together by playing with both arms and legs simultaneously.

A clear perception of polyphonic music and several rhythms as well as various elements of music largely depends on listening experiences and musical knowledge. Attention as such does not ensure perception which is why people without musical education will perceive few mistakes in intonation, rhythm, harmony, etc. while listening to music even if they concentrate really hard; still, they will not be able to make comparisons. Attention is not only linked to perception but also thinking (Klöppel, 2003).

This is why the learning process needs to be comprehensive. When information is perceived, all incoming data are analysed and compared to the existing knowledge. People depend on their prior experience; therefore, they become subjective when evaluating something new. Attention depends not only on our prior information and attitude, but also on the state of the brain largely directed by the reticular information (Schachl, 2005).

The Role of Attention in Playing Percussion Instruments

According to Dahl (2006), it is important to meet the following goals when learning to play percussion instruments:

- Achieve freedom when playing music in various tempi and dynamics;
- Produce an even sound simultaneously with both hands on one and the same instrument when giving musical performances;
- Master the peculiarities of acoustics in order to anticipate the sound from the instrument and adjust a stroke before the stroke is placed;
- Place the strokes on the instrument in the right time and place;
- Plan movements ahead in order to place emphasis;
- Be physically relaxed in order to have free movements and not to feel exhausted during musical performances.

In order to produce the necessary sounds, a person learns to harmonize largely a multitude of many separate movements that in most cases require the movements of both hands, several fingers and both feet at the same time; these are irregular movements and therefore set high cognitive requirements as well as crave focused and undivided attention. The organisation of the movements mostly depends on the impulses coming from the central nervous system ensuring conscious coordination of the skeletal muscles (Klöppel, 2003).

Musicians must keep attention on the necessary objects and sounds, yet they must feel truly free at the same time. *"When practicing, one and the same musical material is being repeated for several times until the rhythmic figure is no longer paid attention to. This way attention may be focused on other means of musical expression though attention remains the musical basis of which the person is partly aware and which has been partly fixed in the sub-consciousness"* (Clynes & Walker, 1982, 212). The drummer feels music by using both the inner and outer focus and thus does not pay attention to the rhythm only: the rhythm becomes a partially natural element.

The higher level of attention the musician has during the learning process, the more elements are going to be perceived: separate voices, various rhythms, dynamics, quality of commonly made music, form of the musical piece, and musical interpretation. While

learning to play percussion instruments, it is important to pay attention to the feeling of correct performance of hand and leg movements, bodily postures and breathing.

During the process of learning to play musical instruments, it is necessary to have a focused and steady attention in order to master a number of technical elements; however, when making the moves, musicians must gradually reach the level at which the movements become automatic and do not need to be paid direct attention. These way musicians will be able to pay more attention to the interpretation of music.

The Method and Sample

In order to be able to assess the level of development of young people's reaction speed during the learning processes, S11 test form of the *COG Test* (Cognitron, COG) from the Vienna Test System was used (S11 form includes 60 tasks that are divided into 6 groups with different levels of difficulty; there is no time limit).

The *COG Test* was used to assess young people's ability to concentrate direct attention and keep it steady. The test consists of tasks requiring respondents to compare various abstract figures of different complexity made up of lines and decide if they are identical. The respondents are required to do the task as fast and precise as possible. The speed and accuracy are being assessed while the tasks are done.

27 young people aged 15–27 of both sexes took part in the study; the average age of the respondents was 20 years. Prior to the commencement of the study, all participants were informed about the aim of the study, procedure and content; their participation was voluntary.

In the initial stage of the pedagogical experiment, the skill assessment was done in three respondent groups:

1) participants of the experimental group: people with basic musical education who started to learn to play percussion instruments under the guidance of the author of the research on top of their education (n=9);
2) 'benchmark' control group: people who have been playing percussion instruments for five or more years (n=9);
3) control group: people who have never been learning to play any musical instruments (n=9).

Results

A. The initial assessment of young people's skills

After analysing the results that were obtained during the initial testing and that cover all results from the COG test in the three respondent groups (shown in Table 1), it becomes evident that the indicators showing the ability to focus attention and the ability to keep it steady do not differ significantly in either of the groups. Thus, for example, the average indicator of the basic variable of the COG test "The average length of the correct rejective reactions in seconds" in the experimental group equals $M_{experim.gr.=}2.39\pm0.20$ sec. and in the benchmark group – $M_{benchm.\ gr.}=2.69\pm0.53$ sec., whereas in the control group – $M_{contr.gr.=}2.14\pm0.44$ sec. No statistically significant

difference between the average group indicators was identified in other test variables (see Table). This shows that during the initial or first testing the members of the three groups had similar abilities in focusing attention and keeping it steady.

Table 1. Results of initial testing with the COG test in three respondent groups: descriptive statistics

Parameters	*Statistical data*	*Group of respondents*		
		Experimental group (n=9)	*Benchmark group (n=9)*	*Control group (n=9)*
Average time (in seconds) of correct rejective reactions in the COG test (I)	Average	2.39	2.69	2.14
	Standard deviation	0.20	0.53	0.44
	Min value	2.02	2.05	1.57
	Max value	2.69	3.7	2.84
The number of correct affirmative reactions in the COG test (I)	Average	23.00	23.33	22.33
	Standard deviation	0.87	1.12	1.00
	Min value	22	21	21
	Max value	24	24	24
The number of correct rejective reactions in the COG test (I)	Average	34.78	34.78	34.11
	Standard deviation	1.30	0.97	1.05
	Min value	33	33	33
	Max value	36	36	36

To enhance the processes of mastering the playing of percussion instruments, seven coordination exercises with a growing level of difficulty were devised. The aim of the exercises was to develop young people's general and specific skills in an integrated way. The content of exercises:

a) development of focusing, steadying, dividing, and switching attention;
b) development of thinking speed, logics, and flexibility;
c) development of speed reaction;
d) development of successive and simultaneous perception; memory trainings;
e) development of anticipation skills – intellectual prognosis; improvement of sensorimotor coordination;
f) development of hand and leg movements, mimics, fine movement precision, control, independence;
g) development of the sense of rhythm, pulse, pace, polymetre;
h) improvement of techniques for playing percussion instruments;
i) development of self-discipline, willpower, and perseverance.

B. Repeated assessment of young people's skills

Respondents from only two groups were involved in the repeated assessment of skills. The members of the experimental group were

- nine people with basic musical education, who were learning to play percussion instruments under the supervision of the authors of the

research for six months (once a week for 45 minutes and doing the exercises that were devised by the authors);
- nine members of the control group that had never learned to play any musical instrument.

The results of the repeated testing were analysed in several stages and from several aspects. To assess the dynamics of changes in the young people's skill levels, the results from the initial and the repeated tests were compared by using the T-test (T-test: *Paired Samples Test*). The average arithmetic indicators of paired samples were compared. The results of both groups were analysed in order to assess the dynamics of the skill development when the exercises devised by the authors were regularly used in the learning processes and practice of playing percussion instruments.

To draw valid conclusions, it was important not only to identify whether there are statistically significant differences between the initial and repeated results within each group, but also whether there are statistically significant differences between the group assessments. That is, it was crucial to find out whether the difference between the group results after the initial and repeated testing were statistically significant. Thus, the difference for every variable and every respondent in the repeated and initial testing was calculated (the result of Testing II – the result of Testing I); afterwards, the calculated differences were summed up and indicators of the descriptive statistics were obtained for both groups. Only the basic variable indicators of the tests were included into the analysis. To identify the differences between the results of the initial and repeated testing in the experimental and control group, the analysis of parametrical statistics was used: the T-test was applied to compare the average arithmetic indicators of independent samples (T-test: *Independent Samples Test*). The calculation was performed using the statistical analysis software SPSS.

Comparison of the Results from the Initial and Repeated Testing

At first, the differences in the experimental group were analysed by comparing the average results of the initial and repeated testing in the sample. It may be seen that during the repeated testing the members of the experimental group have improved the result of the basic variable in the COG test for an average of 0.31 sec, meaning that the ability to take a decision has improved in comparison with the initial testing. The differences found are of statistical significance with a probability of 99%, $t=4.13$, $p<0.01$, therefore it can be concluded that for the members of the experimental group the results of steadiness of attention and focussing abilities have statistically significantly improved. The changes are explicitly shown in Figure 1.

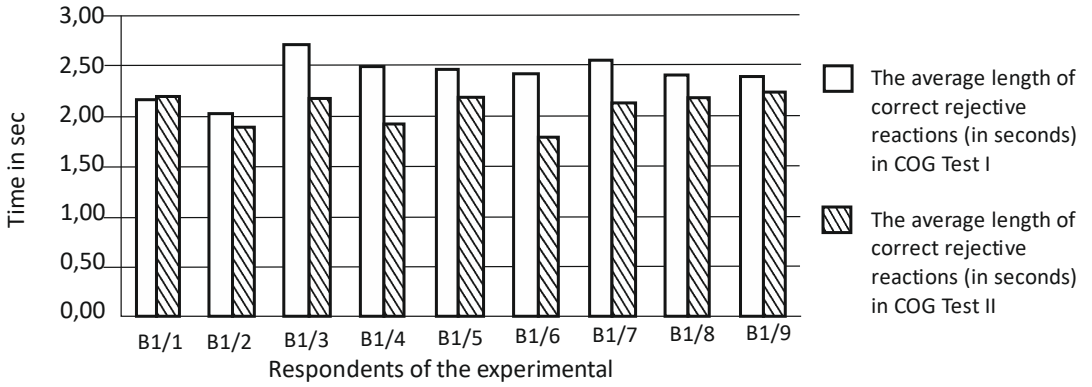

Figure 1. Comparison of the results from the COG test in the initial and repeated testing in the experimental group

As it may be seen, the basic variable has improved for eight out of nine respondents in the experimental group, and in five out of eight cases the changes are considerable.

When the differences in the results obtained during the initial and repeated testing in both groups were compared, it was established that there are statistically significant differences in the COG test. "The average length of correct rejective reactions (in seconds)": in the experimental group the difference between the repeated and initial testing (II-I) equals 0.31 sec, whereas in the control group – 0.04 sec; the difference is statistically significant ($t=-2.08$, $p<0.05$). This proves that the attention concentrating ability has statistically significantly improved in the experimental group with a probability of 95% in comparison with the control group. The differences between the average indicators in the experimental and control group obtained in the initial and repeated testing are shown in Figure 2.

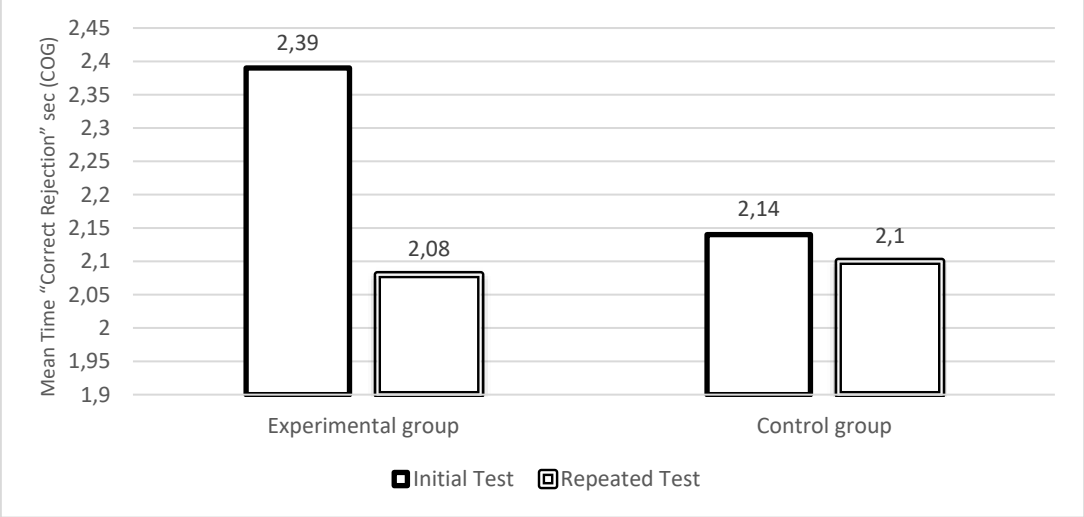

Figure 2. Average results of the basic variable in the COG test 'The average length of correct rejective reactions in seconds' in the initial and repeated testing in the experimental and control group

Conclusions and Discussion

1. After studying scientific literature, the essence of the concept of attention, the role of the steadiness of attention and the ability to concentrate in the learning process have been clarified. Important conclusions for learning to play percussion instruments were drawn:
    - Concentration helps to draw attention purposefully to specific musical elements and aspects during musical performances;
    - When playing an instrument, the desired level to achieve is automatic movements not requiring direct attention so that it can be focused on the artistic aspects;
    - While learning to play percussion instruments, perception is not only connected with attention but thinking as well, and they are influenced by musical knowledge and experience.
2. After summarising the results of the research, we may conclude that the indicators of the attention focusing ability and the ability to keep attention steady have statistically significantly improved for the members of the experimental group.
3. When comparing the changes in the results in the experimental and control group, we concluded that in comparison with the control group the ability to focus attention has improved to a greater extent (probability – 95%) in the experimental group which proves that regular practice and application of percussion instrument coordination exercises devised by the authors efficiently develop young people's attention.
4. When teaching to play percussion instruments, the teacher should take into account young musicians' individual features as well as their abilities and musical experience so that the development of speed reaction would proceed more successfully; these are pre-conditions for expressing the young person's personality and musical abilities.

The aim of the future research work is to apply the system of the coordination exercises, that has been developed by the authors to see whether regular practice improves the operation of cognitive and psychic functions and can be used efficiently for improving the learning skills and academic achievements of those pupils, who do not learn to play percussion instruments, or play other instruments, or sing.

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