SPEED OF PSYCHOMOTOR REACTIONS OF PUPILS OF THE VOCATIONAL REHABILITATION TRAINING CENTRE

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Abstract

The aim of the research is to assess the change of psychomotor reactions of persons having intellectual disorders by applying individual programmes for development of physical abilities. 12 individuals with mild intellectual disorders and 13 individuals with moderate intellectual disorders who attend the vocational rehabilitation training centre participated in the research. The research was carried out on the ground of linear experiment methods. Assessment of the psychomotor reactions speed was carried out using hardware and software Ergos II Work Simulator. After the first assessment, individual programmes for development of physical abilities have been designed and applied; the main aim of the programmes was to develop psychomotor reactions of people with intellectual disorders by applying physical exercises.

Key words: *psychomotor reactions, intellectual disorder, programme for development of physical abilities, rehabilitation, Ergos II Work Simulator.*

Introduction

Aiming to integrate the disabled into society, the socialisation of the disabled, i.e. participation of the disabled not only in societal but also in occupational activities, is a very important factor. Occupational skills are among the most important preconditions for successful socialisation of people with developmental disorders (Radzevičienė, 2003; Radzevičienė & Jurevičienė, 2008). Social integration of the disabled is inseparable from occupational rehabilitation; it is one of the major and most important priorities of social policy in Lithuania. Occupational rehabilitation of the disabled is a means to involve them into the labour market. Development of physical abilities is one of the fields of occupational rehabilitation of the disabled. Individual's participation in occupational activities depends on the functioning of physical abilities and psychic characteristics; when aiming at high quality labour performance, it is important to develop both physical and psychic characteristics.

According to The International Classification of Diseases (2008), an intellectual disorder is a condition of retarded or unfinished mental development when skills are disordered, manifested in the course of development and determine the common level of intellect, i.e. cognitive, linguistic, motor and social abilities. Persons having intellectual disorders differ from their able contemporaries by their physical and motor characteristics.

Even though development of movements of many of these people is retarded, however, this is more impacted by the cognition factors, difficulties in focusing attention and understanding rather than physiological or movement disorders (Krebs, 2004; Skernevičius et al., 2011). Mal-dexterity and weak balance of people with intellectual disorders may make impact on their abilities to excellently perform various tasks on movements. People with intellectual disorders are less able to spontaneously estimate changed conditions for performance of tasks on movements. Major aspects of performance of a task on movement are the focusing of attention when it is indicated how to carry out a task, and the ability to remember and respond to a given hint – the imitation of a movement. Therefore, aiming to improve exactness of a movement, they need support in understanding and memorising major information related to a movement (Skernevičius et al., 2011).

"Psychomotor reaction is a complex conditional motor reflex which is determined by the functional condition of cerebral hemispheres." (Dadelienė, 2006, p. 200) *Speed of psychomotor reaction depends on complexity of a task and physical, psychic condition of man, also on man's inborn features.* (Muckus, 2006; Baumgartner et al., 2007; Skurvydas et al., 2007) Speed of psychomotor reaction may change due to many factors. This is influenced by various diseases, illnesses, tiredness, change of emotional condition. Also, it changes during age phases: when growing it increases and when aging it decreases. Much significance on psychomotor reaction is borne development of genetic adaptation. Physical activity also has much impact on speed of reaction, i.e. the more a person is physically active, the more this reaction increases (Skurvydas, 2008).

It has been estimated that an intellectual disorder is not an unchanging, fixed condition. Cognition, psychomotor skills and proper behaviour are changing phenomena and it is possible to achieve much higher results than expected if purposefully and actively stimulating them (Skernevičius et al., 2011). All this prompts paying attention to psychomotor peculiarities of people with intellectual disorders and possibilities for their development because this would ease their participation in occupational activities, where high significance is given to the technique of performance.

The aim

To assess the change of psychomotor reactions of people with intellectual disorders applying individual programmes for development of physical abilities.

The object

The change of psychomotor reactions of intellectually disordered pupils of the vocational rehabilitation training centre

Objectives

1. To assess the change of psychomotor reactions of people with mild intellectual disorders.

2. To assess the change of psychomotor reactions of people with moderate intellectual disorders.

3. To assess and compare changes of psychomotor reactions after the rehabilitation (experiment).

Research methods

1. Assessment of speed of psychomotor reactions using software of *Ergos II Work Simulator*.

2. Linear experiment (implementation of rehabilitation program).

3. Analysis of statistical mathematical data (SPSS 19.0; Microsoft Excel 2007)

Research participants

25 pupils (12 female and 13 male) of the vocational rehabilitation centre, including 12 surveyed who had mild and 13 who had moderate intellectual disorders accompanied by other health disorders, participated in the research (Table 1). The average age of the surveyed was 19.6 years.

Table 1. Special educational needs of the surveyed

Special educational needs	Finishers (constructors) N = 10	Hotel staff N = 15
Mild intellectual disorder and other health disorders (visual impairment, heart disease, asthma)	6	6
Moderate intellectual disorder and other health disorders (visual impairment, behavioural and emotional disorders, epilepsy, heart disease, motor development disorders, children's cerebra; palsy)	4	9

Organisation of the research and methods

The research has been carried out following the *methods of a linear experiment*. These methods allow estimating the changes during a certain period of time; provide more possibilities to investigate changes ("from" – "to") than other surveys (Venclovienė, 2010). The research has been carried using hardware and software *Ergos II Work Simulator* (version of 2011) which consists of 3 devices. One of them is designed to estimate psychomotor reactions. This device is used to assess physical occupational abilities and their level defining is a person being surveyed meets the necessary physical requirements posed. This is facilitated by software according to analysis of occupational requirements along with common physical characteristics of a surveyed. The system is fully related to occupational and physical performance (Boadella, Sluiter, & Frins-Dresen, 2003; Baker, 2012)

The research was organised in three stages: *Stage 1* deals with formation of groups and assessment of their psychomotor reactions using hardware and software *Ergos II Work Simulator*; *Stage 2* deals with designing of individual programmes for development of physical characteristics and their implementation; Stage *3* deals with repeated assessment of psychomotor reactions using *Ergos II Work Simulator*.

During the assessment of speed of psychomotor reactions, 4 tests have been carried out: *Reaching, Forward height*; *Standing Bending; Handling Dexterity, Left hand; Handling Dexterity, Right hand.*

The work simulator *Ergos II* compares the results of tests (psychomotor reactions) not requiring force with standards of Methods-Time-Measurement (MTM). Snellen (2010) indicates the following MTM standards:
- 0–70 per cent below competitive;
- 71–80 per cent at the entry level;
- 81–100 per cent competitive;
- over 100 per cent above competitive.

With regard to the results of the first stage, individual rehabilitation programmes for development of physical abilities have been designed; their major set objectives were the following: to apply physical exercises intended for development of balance, coordination, speed of psychomotor reactions; to develop fine motor skills aiming to avoid undergone difficulties at work; to develop observation, attentiveness, coordinated actions and positive responsive actions by physical exercises, working in team and individually; to develop coordinated performance of both hand encouraging various manipulations using hand. Experimental rehabilitation program was applied during 6 month, twice a week under the supervision of physical therapist.

Analysis of the research data has been performed employing the statistical package SPSS (Statistical Package for Social Sciences 19.0). Percentage, rates, average and standard

deviation have been calculated. As the data is not divided according to the normal distribution, for comparison of differences of the indices before and after in the group of the surveyed *Wilcoxon* criterion was employed. The differences were considered as reliable is the probability bias was less than 0.05. To estimate the correlation among indices, *Pearson* correlation coefficient was counted and its statistical significance was estimated (Pukėnas, 2005).

Research results

Changes in surveyed results are analysed according to comparisons of means of psychomotor reactions speed with the estimated criteria before and after the rehabilitation. Also, standard deviation (SD) and statistical significance according to Wilcoxon range criterion are estimated.

Figure 1 presents the mean of psychomotor reactions speed test results of people having mild intellectual disorders before and after the rehabilitation. The mean of psychomotor reactions speed test results is compared to the estimated competitive level (competitive – 81–100 per cent). Having analysed the obtained results, we notice that results of all performed tests were much better after the rehabilitation than before it. Even though results of these tests increased, however, means of surveyed reactions speed did not meet the estimated competitive level. After the rehabilitation, means of tests (reaction to the irritant reaching forward (T1), dexterity of the left hand (T3) corresponded to the level below competitive (0–70 per cent) like before the rehabilitation. Means of the test results on the reaction to an irritant constantly bending (T2), dexterity of the right hand (T4) after the rehabilitation met the entry level (71-80 proc.). It is noticed that changes in speed of psychomotor reactions are even. After the rehabilitation, difference between the mean of results of the test on reaction to the irritant reaching forward (T1) and the estimated criterion decreased by 11.7 per cent; difference of the mean of results of the test on reaction to an irritant constantly bending (T2) increased by 10.9 per cent; and difference of results on dexterity tests of the left hand (T3) and right hand (T4) increased by 13.1 per cent and 7.6 percent. It is observed that difference of the mean of the test on dexterity of the right hand (T4) and the estimated criterion decreased less than in other tests (7.6 per cent).
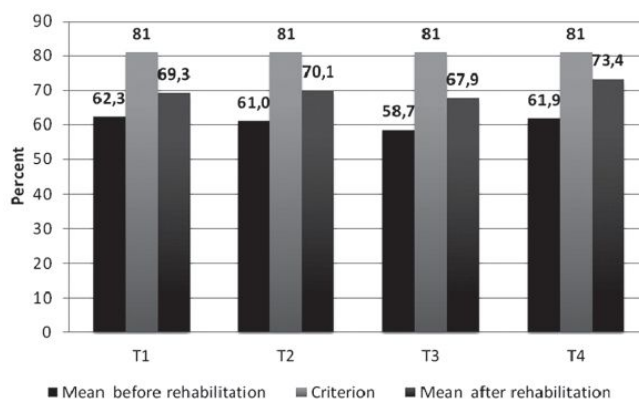
Figure 1. Changes in speed of psychnomotor reaction of people having mild intellectual disorders (T1 – Reaching, Forward Height; T2 – Standing Bending; T3 – Handling Dexterity, Left Hand; T4 – Handling Dexterity, Right Hand), %
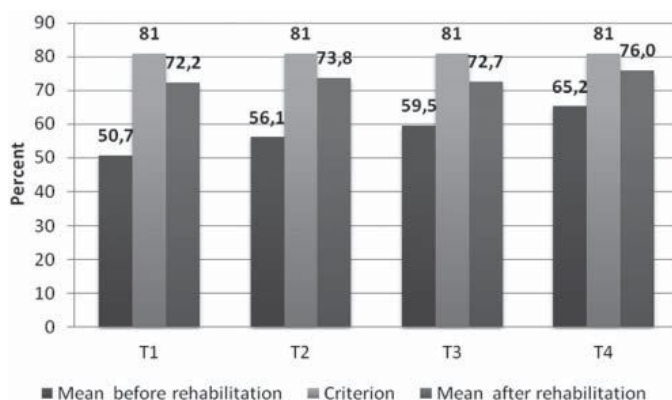
Table 2 presents standard deviation and statistical significance using *Wilcoxon* range criterion data on testing psychomotor reactions speed. Having analysed obtained data applying *Wilcoxon* range criterion, we noticed that results of dexterity of both hands changed statistically significantly (pz=-2.937, p=0.003, r=-0.847); handling dexterity, right hand

(z=-2.609, p=0.009, r=-0.753). Regarding standard deviation, we notice that results of performing these tests were different before and after the rehabilitation; this shows that each person's results were individual.

Table 2. Standard deviation (SD) and statistical significance (p) of tests of psychomotor reactions speed of people having mild intellectual disorders

Tests	SD before rehabilitation	SD after rehabilitation	Statistically significant (p<0.05)
T1 Reaching, Forward Height	21.3	14.4	Statistically insignificant change (p>0.05)
T2 Standing Bending	21.7	19.1	
T3 Handling Dexterity, Left Hand	10.5	12.9	z= -2.937 p=0.003
T4 Handling Dexterity, Right Hand	10.5	14.9	z= -2.609 p=0.009

Figure 2 presents the mean of results of tests on psychomotor reactions of people with moderate intellectual disorders before and after rehabilitation. The mean of results of speed of psychomotor reactions is also compared to the estimated competitive level (competitive – 81–100 per cent). Having analysed the obtained data, we notice that results of all carried out tests after the rehabilitation were much higher than before the rehabilitation. Even though results of these tests increased, nevertheless, means of the surveyed reactions both before and after the rehabilitation do not meet the estimated competitive level of the MTM standard (81–100 per cent). However, we notice that they improved much better than those of people who have mild intellectual disorders. After the rehabilitation, the speed of psychomotor reactions corresponded to the entry level (71–80 per cent). The difference between the mean of results of the test on reaction to an irritator reaching forward (T1) and the estimated criterion decreased until 8.8 per cent, the difference between the mean of results of the test on reaction to an irritator constantly bending (T2) decreased by 7.2 per cent, and the difference between the results of tests on dexterity of the left hand (T3) and right hand (T4) decreased by 8.3 per cent and 5 per cent. It is noticed that means of all tests results before the rehabilitation and after it are distributed evenly; the best psychomotor reactions speed was of the right hand (T4) during the test on dexterity. Also, this change was notices when analysing changes of psychomotor reactions of people having mild intellectual disorders. This may be predetermined by functionality of the dominant hand (right).

Figure 2. Changes in speed of psychnomotor reaction of people having moderate intellectual disorders, (T1 – Reaching, Forward Height; T2 – Standing Bending; T3 – Handling Dexterity, Left Hand; T4 – Handling Dexterity, Right Hand), %

Table 3 presents standard deviation and statistical significance using *Wilcoxon* range criterion data on testing psychomotor reactions speed. Having analysed obtained data applying *Wilcoxon* range criterion, we noticed that changes of psychomotor reactions speed or people having moderate intellectual disordere changed statistically significantly (p<0.05). Regarding standard deviation, it is noticed that surveyed results of carried out tests before and after rehabilitation were different; this shows that results of each person were individual, like in the case of people having mild intellectual disorders.

Table 3. Standard deviation (SD) and statistical significance (p) of tests of psychomotor reactions speed of people having moderate intellectual disorders

Tests	SD before rehabilitation	SD after rehabilitation	Statistically significant (p<0.05)
T1 Reaching, Forward Height	17.8	18.9	z= -2.867, p=0.004 r=-0.795
T2 Standing Bending	18.9	18.9	z= -2.934, p=0.003 r=-0.814
T3 Handling Dexterity, Left Hand	14.7	15.7	z= -3.182, p=0.001 r=-0.882
T4 Handling Dexterity, Right Hand	15.8	14.0	z= -3.112, p=0.002 r=-0.863

To sum up changes in speed of psychomotor reactions, Pearson correlation coefficient was counted; it revealed a strong correlation relation between tests on reaction to an irritant constantly bending and reaction to an irritant reaching forward (r=0.88), dexterity of the left (r=0.83) and right (r=0.77) hands. The correlation is statistically significant because in all cases it is p<0.05. Analysis of these relations helps to reveal that during the reaction to an irritant constantly bending (methods of test performance) all additional tests covering the remaining 3 tests: reaction to an irritant reaching forward, dexterity of the left and right hands, are involved.

Conclusions

1. Results of people's with mild intellectual disorders psychomotor reactions improved, however, they did not meet the estimated competitive level. Like before the rehabilitation, after the rehabilitation means of tests on reaction to an irritant reaching forward, dexterity of the left hand corresponded to the below competitive level, and means of results of tests on reactions to an irritant constantly bending and dexterity of the right hand after the rehabilitation corresponded to the entry level. Results of tests on dexterity of both hands changed statistically significantly (p<0.05): Handling Dexterity, Left Hand; Handling Dexterity, Right Hand.

2. Results of people's with moderate intellectual disorders psychomotor reactions improved, however, means of surveyed reactions speed did not correspond to the estimated competitive level both before the rehabilitation and after it. After the rehabilitation, speed of psychomotor reactions increased up to the entry level (71–80 per cent). All assessed changes of speed of psychomotor reactions changes statistically significantly (p< 0.05).

3. Assessed psychomotor reactions of people having mild intellectual disorders before the rehabilitation were better than those of people having moderate intellectual disorders. However, after the rehabilitation, psychomotor reactions of people having moderate intellectual disorders increased more in comparison to those of people having mild intellectual disorders. This reveals that psychomotor reactions can and must be developed together will all physical characteristics, especially for mentally disabled people, aiming that their integration into the

labour market would be of a higher quality; because improved psychomotor reactions also improve manipulations with various things, exactness and quality of movements which are inseparable from other activities in occupational performance.

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Summary

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Development of physical abilities is one of fields of vocational rehabilitation of the disabled. Individual's participation on occupational activities depends on functioning of physical abilities and psychic characteristics; aiming at high quality occupational performance, it is important to develop both physical and psychic characteristics. Cognition, psychomotor skills and proper behaviour of people

having intellectual disorders are changing phenomena; by purposefully and actively stimulating them it is possible to achieve higher results than sometimes is expected. All this encourage paying attention to peculiarities of psychomotor skills of people having intellectual disorders as well as to possibilities to develop them because this would make participate in occupational activities, where depend on technique of movements' performance, easier.

The aim of the research is to assess the change of psychomotor reactions of people having intellectual disorders applying individual programmes for development of physical abilities. 12 surveyed who had mild and 13 who had moderate intellectual disorders attending the vocational rehabilitation centre participated in the research. The research was carried out using hardware and software *Ergos II Work Simulator* (the version of) consisting of 3 devices. One of them is dedicated to assessment of psychomotor reactions. During the assessment of speed of psychomotor reactions, 4 tests have been carried out: *Reaching, Forward Height*; *Standing Bending; Handling Dexterity, Left Hand; Handling Dexterity, Right Hand*. The *Ergos II Work Simulator* compares the results of tests (psychomotor reactions) not requiring force with standards of Methods-Time-Measurement (MTM). With regard to the results of the first stage, individual programmes for development of physical abilities have been designed. The research part deals with the changes of speed of surveyed psychomotor reactions before and after the rehabilitation. The statistical analysis (descriptive rates, means, standard deviation, *Wilcoxon* criterion, *Pearson* correlation coefficient) of results has been performed.

After the rehabilitation, speed of the surveyed psychomotor reactions increased; however, it did not meet the estimated competitive level (MTM – 81–100 per cent). Results of psychomotor reaction of people having mild intellectual disorders corresponded to the *below competitive* (0–70 per cent) level (reaction to an irritant reaching forward, dexterity of the left hand), and means of the results of reaction to an irritant constantly bending and dexterity of the right hand after the rehabilitation met the *entry level* (71–80 per cent). Results of tests on dexterity of both hands changes statistically significantly (p *entry level* (71–80 per cent). All assessed changes in psychomotor reactions speed shifted statistically significantly (p< 0.05).

Before the rehabilitation, assessed psychomotor reactions of people having mild intellectual disorders were better than those of people having moderate intellectual disorders. *However, after the rehabilitation, psychomotor reactions of people having moderate intellectual disorders increased more in comparison to those of people having mild intellectual disorders.* This reveals that psychomotor reactions can and must be developed together will all physical characteristics, especially for mentally disabled people, aiming that their integration into the labour market would be of a higher quality; because improved psychomotor reactions also improve manipulations with various things, exactness and quality of movements which are inseparable from other activities in occupational performance.