

PHYSICAL BALANCE OF 12-13 YEAR OLD ADOLESCENTS IN LATVIA: PROBLEMS AND SOLUTIONS

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Abstract

The paper is prepared within the framework of the National science programme “Innovative solutions for social telerhabilitation in the schools of Latvia in the context of inclusive education (INOSOCTEREHI)”. The paper focuses on the adolescents’ balance disorders. Equipment for balance testing BIOSWAY was used in the case study. It showed that almost every fourth adolescent of the age 12-13 years has the total postural stability index below the norm. Only 9.4% of adolescents have normal overall balance control results. It is necessary to find ways how to reduce the identified problem within the context of inclusive education.

Keywords: *physical balance; 12-13 year old adolescents.*

Introduction

Inclusive education is a process where all pupils’ needs are provided, increasing each pupil’s participation in the learning process, culture and different communities, and reducing exclusion from education and the education acquisition process (Izglītības attīstības pamatnostādnes 2014.-2020.gadam, 2013). It is based on a humane approach where each pupil is seen as a value, as a useful and valuable unit to society, and who can offer his/her contribution to society (Tilstone & Rose, 2003).

Attention to special needs is usually paid only when a disorder has already become a burden in everyday life in schools; preventive work is not sufficiently evaluated. It is a result of several reasons. Firstly, an incongruity of teachers’ preparation and lack of knowledge on pupils’ problems. Secondly, pupils’ and their parents’ lack of understanding about the importance of issues and consequences. As a result, mutual relations, understanding, and confidence suffer, educational achievements decrease, and behaviour worsens. It can lead to learning and socialization problems in the long term.

The question of education provision for pupils with special needs is raised in Latvia: whether all the pupils and in what way can be included in a general education institution, whether a school is ready to provide favourable conditions for all pupils for qualitative education

acquisition, what pedagogical tasks are and how they should be addressed for pupils with special needs in order to socialize in modern society, become independent and active members of society, being able to make decisions. Researchers of Rezekne Academy of Technologies in collaboration with colleagues from the University of Latvia, Riga Technical University and Liepaja University are actively involved in finding solutions, including through participation in various international and national projects. One of the most important projects in this area is the National science programme “Innovative solutions for social telerehabilitation in the schools of Latvia in the context of inclusive education (INOSOCTEREHI)”. The physical balance of 12-13 year old Latvian pupils’ and its connection with the emotional and mental balance is being investigated within the framework of the project. The specific research does not deal with the group of children with congenital movement disorders. Attention is paid to the balance disorders that occur during the life due to a variety of reasons. In a school, the investigated group of pupils is considered to be practically healthy children.

Theoretical Justification

Analysis of the works of different authors (Guttmannova, Szanyi, & Cali, 2008; Jessor, 1992; Usmiani & Danilik, 1997; Youngblade & Theokas, 2006; Kraig & Bokum, 2008; Piage, 2008, et al.) shows that the adolescence period is extremely complex. Just taking a look at different (physical, emotional, social) aspects of the adolescent’s development, it is possible to make a total view of significant changes and the associated problems. The mutual interaction of the various aspects is shown in Figure 1, where ED – emotional development, SD – social development, SA – self-awareness, PD – physical development, RF – risk factors.

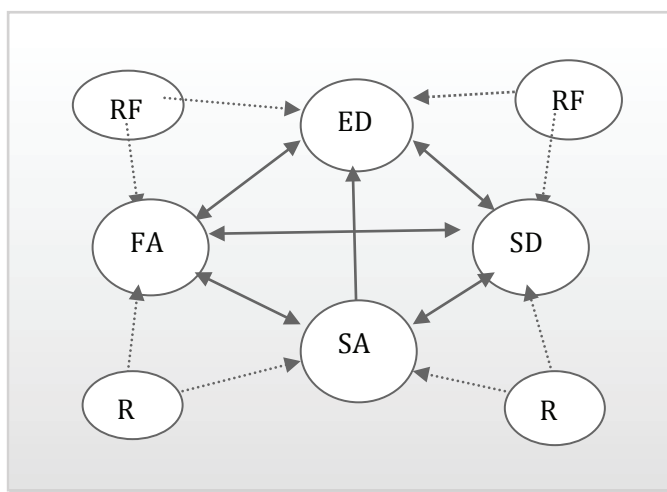


Figure 1. Connection of various development aspects characteristic to the adolescence period

Risk factors caused by genetic, social, environmental, personality and behaviour elements affect the adolescent’s lifestyle and behaviour. Emotional difficulties and behavioural problems increase, which is an important predictor of future personality’s functioning. They predict underachievement at school, difficulties in interpersonal relationships, use of addictive

substances, social isolation, inadequate self-awareness, depression, limited job skills, lack of motivation, adaptation difficulties in adulthood, criminal activity etc. (Guttmannova et al., 2008; Henderson, Dakof, Schwartz, & Liddle, 2006; Jessor, 1992; Youngblade, & Theokas, 2006; Kraig, & Bokum, 2008).

One of the most important risk factors is adolescent's health. The World Health Organization (WHO) defines health as physical, mental and social well-being. Doctors in Latvia emphasize psycho-emotional health in the prescribed WHO health concept, which is a protection factor for physical health (Ancāne, Ancāns, Miksons, & Remese, 2014).

Person's physical and mental health is seen in the context of wholeness that is influenced by several factors. One of them is the attitude to oneself that is a central component of the Self-concept. A positive Self-concept is particularly important in adolescence, which is a basis of stable identity and harmonious personality (Rutka, Ušča, Žogla, & Kriņģele, 2016). There are also studies that show a direct connection between physical health and emotional and social health (Azarbani, 2004; Barati Brojny, 2003; Talebzadeh & Jafari, 2012). Good physical and emotional health makes it possible for adolescents to successfully overcome biological, emotional, intellectual and social changes that characterize the adolescence period and inclusion into adult society (Velika, 2015). Physical, emotional and social health creates favourable conditions for the development of harmonious personality. The term includes also the physical, emotional and social balance. For example, Eurydice (2013) report emphasizes the unity of the pupils' physical and mental development and the need to improve the physical and mental balance. It contributes to both their physical health and self-reliant and self-assured behaviour in different situations, as well as gives an opportunity for children and young people to discover how to deal with negative emotions and stress constructively (Rutka, et al., 2016).

The current research in schools in Latvia (Porozovs, Porozova, & Valdemiers, 2012) suggests that adolescents and young people's health condition is negatively affected by the lack of physical activity and emotional stress. Adolescents' habits can affect both the physical balance and social and emotional balance, as the reason of poor performance may be due to the lack of adolescents' physical activities and overweight. The research carried out in 2014 on 11-14 year old adolescents found that only 18.5% of pupils (22.0% of boys and 15.3% of girls) perform a sufficient amount of physical activities (at least 60 minutes daily) (Pudule, 2015). As a result, muscles are not strengthened, which is a prerequisite to maintain the physical balance. Inactivity causes overweight, which affects balance. 24% of 13-year-old boys and 17% of girls were stated having overweight in 2014 (Pudule, 2015).

The physical balance is one of the main body functional capabilities, which provides the vertical position of a human body by carrying out a variety of motor performances, the ability to navigate in space, the ability to stabilize free movements and to respond to external stimuli (Krauksts, 2003). It belongs to the set of indicators of adolescence physical development. In turn, the emotional balance is an essential component of personal wellbeing, which is largely determined by the relationship with the surrounding world and oneself; it affects the formation of the adolescent's Self-concept and behaviour. The social balance becomes apparent in the interaction of personal and subjective wellbeing and social contacts (Diener, 1984). Regardless of the subjective needs, social contacts improve human's wellbeing (Schwarzer & Leppin, 1989). If the physical balance is bothered, it affects the emotional and social balance; there is a threat to the harmonious development. Unfortunately, on a daily basis, attention is often paid to the problem when it has become obvious and hindered the successful development; insufficient attention is paid to the preventive action. If any phase of the triangle physical-

emotional-social balance is disturbed, threats to the successful development appear in the long run.

Studies suggest that 2-8% of children and adolescents suffer from physical balance disorders (Jelsma, Geuze, Mombarg, & Smits-Engelsma, 2014; Niemensivu, Pykkoo, Wiener-Vacher, & Kentala, 2006). They can occur due to the skeletal problems. During preventive examinations in Latvia in 2014, scoliosis was found in 3.55% of cases and a variety of other posture disorders in 12,71% of children under the age of 14 (Bērnu veselība, 2015). The balance disorders may be indicated by, for example, headaches or abdominal pain, dizziness (Fong, Chung, Chow, Ma, & Tsang, 2013; Wiener-Vacher, 2001), which, according to the research, are noticed by many adolescents in Latvia (see Table 1).

Table 1. Proportion of adolescents having repeated health complaints at least once a week, 2014 (by Gobiņa, 2015)

Type of complaints	Boys (%)		Girls (%)	
	11 year-old	13 year-old	11 year-old	13 year-old
Headaches	24.1	25.1	30.3	40.0
Abdominal pain	19.0	17.0	24.1	25.7
Back pain	13.6	17.5	18.5	23.0
Dizziness	14.0	14.8	14.8	25.6

Analysis of literature (Agrawal, Carey, Della Santina, Schubert, & Minor, 2009; Greve, Cuğ, Dülgeroğlu, Brech, & Alonso, 2013; Portfors-Yeomans & Riach, 2008) suggests that the balance disorders may result due to various illnesses or trauma. Lingering disorders may cause discomfort, pain syndrome development and function restrictions, because the balance disorders cause the inadequate load on both the muscles and ligaments and joints and bones (Šmite, 2013). The balance disorders can also occur in children with primary visual impairments (Portfors-Yeomans, & Riach, 2008), overweight (Greve et al., 2013; McGraw, McClenaghan, Williams, Dickerson, & Ward, 2000; Molikova et al., 2006); very tall individuals (Lee & Lin, 2007). The case studies carried out within the framework of INOSOCTEREHI research suggest that the physical balance disorders may also occur due to emotional stress if an adolescent faces high parental expectations associated with his/her achievements on a daily basis.

There are studies (Deconinck, Savelsbergh, Clercq, & Lenoir, 2010; Zijlstra, Mancini, Chiari, & Zijlstra, 2010) suggesting that even the slight balance disorders reduce an individual's mobility and affect his/her physical activity (for example, the ability to perform daily activities decreases) and psychosocial functioning (for example, social activity reduces, which even lead to social isolation in severe cases). Consequently, the disorders become a problem of not only a child and adolescent, his/her family, medical personnel, but also of society, including educational institutions; these problems need to be solved (Ušča & Ļubkina, 2014).

Results of Pilot Study in Latvia

Object of research: physical balance of 12-13 year old adolescents.

Objective of research: to study prevalence/frequency of the balance problems in 12-13 year old adolescents' population in Latvia.

Sample of research: 300 adolescents of the age 12 to 13 years from 22 schools in Latvia. Testing with the equipment BIOSWAY took place in parallel with a survey that was

filled in by 353 parents, teachers from 6 schools in Latvia, 89 adolescents aged from 12 to 13 years from 7 schools in Latvia.

Methodology

The portable equipment for balance testing BIOSWAY was used for testing of the physical balance. The equipment captures the balance-related movements and provides an objective assessment of neuromuscular control and somatosensory operation (Ļubkina, Kaupužs, Ušča, Rižakova, & Ciukmacis, 2013).

Data acquisition methods:

- 1) physical balance testing of 12-13 year old adolescents using the equipment BIOSWAY: Postural Stability Test, Stability Limit Test, Sensory Organization Balance Test;
- 2) survey of parents;
- 3) survey of pupils on the Internet;
- 4) survey of teachers on the Internet.

The obtained data were coded and processed by the program SPSS Statistics 20.

Interpretation of Results

The results of Postural Stability Test show that nearly every fourth 12-13 year old adolescent's overall postural stability index is below normal. This indicates the need for additional examination because the postural balance characterizes the adolescent's ability to maintain the gravity center above the support area in the rest position; it is also essential for starting and stopping a movement (DeKegel et al., 2010). Additional tests were carried out.

Stability Limit Test identifies in which direction the balance control has bigger problems. The standards of Stability Limit Test of the equipment BIOSWAY determine that the total ratio is over 65. Analysis of the results reveals that the overall result is good only for 9.4% of adolescents; it is below the norm in other cases.

Sensory Organization Balance Test is designed for identification of the balance problems and determination of the Sway Index in four different positions. A variable surface (hard and soft) and visual conditions (eyes closed, eyes open) were used in order to test investment of visual, vestibular, and somatosensory functions and to determine to which extent an adolescent is able to keep his/her balance through the senses, when and which of the senses is disrupted.

Table 2. Compliance of Sensory Organization Balance Test results with the established norms

Position	Normative data	Adolescents whose results do not comply with the norm (% and cases)
on hard surface, eyes open	0.21-0.48	25% or 75
on hard surface, eyes closed	0.48-0.99	16% or 48
on soft surface, eyes open	0.38-0.71	48% or 144
on soft surface, eyes closed	1.07-2.22	21.3% or 64

The results raise concerns about the adolescents' balance. In addition, the results were confirmed by the study that was carried out parallel within the framework of INOSOTEREHI and used Eurofit for establishing the average balance parameters with the indirect method; 83 adolescents aged 11 to 14 years participated in the test: only 6 of them were able to stay on the balance rod for 1 minute with less than 10 mistakes. During testing with BIOSWAY, in 28

of these adolescents negative deviations from the average parameters were found (Kaupužs & Lāriņš, 2015).

The results of the physical balance testing with BIOSWAY were compared with the results of parents', teachers' and adolescents' surveys. The results of Spearman correlation suggest that the measurements of all tests (Postural Stability Test, Stability Limit Test, Sensory Organization Balance Test) correlates with the indicators that describe the emotional and physical balance (see Table 3).

Table 3. Correlation of the physical balance with the indicators of the emotional and physical balance

	Parents' answers	Teachers' answers	Adolescents' answers
Attention	X	X	X
Nervousness	X	X	X
Learning difficulties		X	X
Communication with peers	X		X
	Indicators of the physical balance		

The Kruskal-Wallis analysis of the results identified very significant differences ($p \leq 0,001$) in assessment of the statements characterizing the type of balance, depending on the group of respondents (parents, teachers or adolescents). Adolescents rate their physical and social balance higher than parents and teachers (see Table 4), while teachers are the ones who rate adolescents' mental balance very high.

Table 4. Differences in views on the adolescents' physical, mental and social balance

Type of balance	Respondent	p	Average value of rank
physical	Pupils	0.002	879.95
	Parents		773.75
	Teachers		807.89
mental	Pupils	0.000	625.48
	Parents		806.73
	Teachers		834.92
social	Pupils	0.000	946.81
	Parents		764.67
	Teachers		803.28

There are objective and subjective differences in pupils and teachers views on pupils' physical and emotional health, behaviour and communication. Pupils and teachers opinions tend to vary considerably in similar surveys. There is a possibility that not many adolescents have identified the state of their physical balance and its importance in the personal development. In several cases, answers of teachers and pupils do not match, which has characters of both objective (symptoms are not obvious, pupils and teachers do not pay attention to the deviations) and subjective (teachers do not know their pupils). Opinions more differ in judgements about the emotional balance. This can be explained by understanding different subjective significance

of the phenomenon: a pupil manifested signs of emotional imbalances one or several times and forgot about it or did not give it the importance, whereas teachers memorized the episodes as particularly important.

The measurements show the need for work to promote the activities in order to reduce the balance problems of pupils in schools. Testing with BIOSWAY showed indifference of a noticeable number of adolescents to the findings, perhaps in those cases where they do not feel discomfort due to the balance disorders. So, the identified balance problems are not conscious and associated with self-esteem, self-confidence and self-expression if the link with the major needs is not visible – to be important, recognized, to succeed, to belong to a personally important social group, etc. Educational work is necessary, because adolescents need to know the essence of the measurements, their health status and perspective. If the balance disorders and the potential impact on the adolescent's future development will be important to him/her, he/she will become an active and willing participant in reduction and prevention of the problem. Thus, based on the identified correlation, it will contribute to his/her emotional and social growth.

The results of INOSOCTEREHI research confirm the connection between the social, emotional and physical balance. The data are alarming and indicate the need for further interdisciplinary, coordinated research on adolescents' development, personal priorities and opportunities that would justify in detail the change of the paradigm of physical education programs and methodology; emphasis of training and continuing education of sports and class teacher should be changed as well. Considering that the aspects of the individual's biological, psychological and social development substantially change in the adolescence period, there is a need for specific support security, especially in the field of the physical, emotional and social balance that is based on the competent and coordinated operation of a school and family. There is a need for a national program to strengthen the pupils' health; paradigms in schools need to be changed – from limited opportunities of sports classes to strengthening of the whole school's operating system, working philosophy, health improvement strategies. Monitoring of pupils' health strengthening is a responsibility of a school, its collegiate management and each teacher.

Conclusions

1. The balance disorders reduce the individual's mobility, affect his/her physical activity and psychosocial activities, and form threats to the harmonious development of the personality. They are considered a problem of not only an adolescent, his/her family, medical personnel, but also of society, including educational institutions; the problem needs to be solved.
2. The acquired results are alarming: almost every fourth adolescent of the age 12-13 years has the total postural stability index below the norm. Only 9.4% of adolescents have normal overall balance control results.
3. Since the physical balance measurements correlate with the indicators describing the emotional and physical balance, the opinion that the balance problems in the adolescence period threaten the development of a harmonious personality is approved.
4. There is a need to promote the activities in order to reduce the balance problems of pupils in schools, ensure support, especially in the field of the physical, emotional and social balance that is based on the competent and coordinated operation of a school and family; paradigms need to be changed – from limited opportunities of sports classes to strengthening of the whole school's operating system, working philosophy, health improvement strategies.

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Summary

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The paper focuses on identification and reduction of the adolescents' balance disorders. Even the slight balance disorders reduce an individual's mobility and affect his/her physical activity and psychosocial functioning. Consequently, in the long term, the disorders become a problem of not only an adolescent, his/her family, medical personnel, but also of society, including educational institutions; these problems need to be solved.

Object of research: physical balance of 12-13 year old adolescents. **Objective of research:** to study prevalence/frequency of the balance problems in 12-13 year old adolescents' population in Latvia. **Sample of research:** 300 adolescents of the age 12 to 13 years from 22 schools in Latvia. Testing with the equipment BIOSWAY took place in parallel with a survey that was filled in by 353 parents, teachers from 6 schools in Latvia, 89 adolescents aged from 12 to 13 years from 7 schools in Latvia.

Methodology. The portable equipment for balance testing BIOSWAY was used for testing of the physical balance. The equipment captures the balance-related movements and provides an objective assessment of neuromuscular control and somatosensory operation (Lubkina et al., 2013). Data acquisition methods:

- 1) physical balance testing of 12-13 year old adolescents using the equipment BIOSWAY: Postural Stability Test, Stability Limit Test, Sensory Organization Balance Test;
- 2) survey of parents;
- 3) survey of pupils on the Internet;
- 4) survey of teachers on the Internet.

The obtained data were coded and processed by the program SPSS Statistics 20.

Analysis of the theoretical literature and obtained data suggests the following:

1. The acquired results are alarming: almost every fourth adolescent of the age 12-13 years has the total postural stability index below the norm. Only 9.4% of adolescents have normal overall balance control results.
2. Since the physical balance measurements correlate with the indicators describing the emotional and physical balance, the opinion that the balance problems in the adolescence period threaten the development of a harmonious personality is approved.
3. There is a need to promote the activities in order to reduce the balance problems of pupils in schools, ensure support, especially in the field of the physical, emotional and social balance that is based on the competent and coordinated operation of a school and family; paradigms need to be changed – from limited opportunities of sports classes to strengthening of the whole school's operating system, working philosophy, health improvement strategies.