The effectiveness of two methods of teaching safe falls to physiotherapy students

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Abstract

Background and Study Aim: Falls are a phenomenon which cannot be eliminated from human ontogenesis. The study aim was to verify the hypothesis that teaching safe falls to young women and men by methods that prefer playful forms of exercises is as effective as the rigorous method, on condition of high attendance at classes.

Material/Methods: The surveys included 107 physiotherapy students of the fifth semester of first degree studies. Eighty subjects were female (range 20–24 years with a mean age of 21.06 years), and 27 subjects were male (range 19–34 years with a mean age of 21.66 years). Sixty-eight female and 22 male students attended 90–100% classes (attendance 70–80%: 12 female, 5 male students). Students completed the first part of the authors' programme titled "The theory and methodology of safe falls in individuals after limb amputations and the blind". Students in group A were trained by the rigorous method, while students in group B were trained by a method that preferred playful forms of exercises. The "test of safe falls" (TSF) results were adopted as the criterion for the assessment of the effectiveness of the methods.

Results: The average TSF result in group A was 90.77±5.93 points; in group B, it was 90.44±7.13 points. These results show a more-than-good motor competence of students as pertains safe falls. The TSF run-time was 18.57±2.06 s in group A and 19.15±2.43 s in Group B. There were no statistically significant difference between the two groups in relation to both indices. As much as 44.4% of students in group B declared a need to increase the number of classes to 2–3 classes per week, compared to 31.1% students in group A, which proves that the method preferring playful forms of exercises is more attractive. A 70–80% class attendance was not a factor lowering adaptive effects.

Conclusions: Both methods are effective. Because of higher attractiveness of playful forms of exercises, one should often but cautiously apply them in teaching safe falls in order to precipitate adaptive effects and shape the habit of systematic physical training.

Key words: safe falls • rigorous method • method preferring playful forms of exercises • test of safe falls

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Background

Falls are phenomena which cannot be eliminated from human ontogenesis. Fatal falls and injuries caused by collision with the ground or vertical obstacles happen in the entire population in similar proportions, as confirmed by WHO estimates [1,2]. However, as shown by research conducted by numerous institutions [3–7] and research teams [8–14], the epidemiology of the phenomenon, its risk factors, social costs and prevention are determined by local, national or regional circumstances. Conclusions of many studies agree that as a result of a longer lifespan, falls will concern a growing number of older individuals. For example: "In England, the number

Systematic exercises in teaching of falls – specific for each type of fall, constitute a methodology in the process of teaching safe impacts with the ground and with a certain group of vertical obstacles.

"Matador" (a playful form in avoiding collision) – *A* has arms outstretched in front (one hand placed on top of the other and directed towards the centre); he takes off for a run over a section of 3-4 meters, trying to touch *B*'s chest with his hands; *B* avoids the contact, for example by shifting the left leg right to the rear, and simultaneously making a semi-turn on toes of the right leg to face the direction of *A*'s run).

Fall techniques – defined as safe collisions of the body with the ground in one of the four main directions: to the rear; to the front; to the side (right, left).

Forms of advanced fall techniques – i.e. a jump up with a turnover of 360°, immediately followed by a rear fall with a turn.

of people aged over 65 is due to rise by a third by 2025. In the same period, the number of people over 80 will double and the number of individuals over 100 will increase fourfold (…) A significant rise in falls and associated fractures is therefore likely unless specific preventative interventions (…) become widespread" [5, p. 3].

According to experts from the Chartered Society of Physiotherapy [7], the group of the highest risk of falls and injuries includes mainly:

- frail older people;
- those with long-term conditions that affect the body in physical terms, such as stroke, Parkinson's disease, arthritis, visual impairment, etc., where there isn't a quick response of their neurological and musculoskeletal systems to prevent a fall or where there is no sufficient strength to make the saving response effective;
- those with mental health issues and learning disabilities who may not appreciate danger.

So far, 400 different fall risk factors were described [13], including certain types of physical activities. High risk groups include athletes, both those who often fall in combat sports – judokas, wrestlers, hockey players, football players etc. [15] as well as those undertaking motor activities in different conditions of the natural environment [16]. Individuals practicing numerous extreme sports (i.e. climbing, le parkour, skateboarding), soldiers, policemen, firemen, stunts, etc., can also be classified into high risk groups. The representation of people taking such intensive and extremely risky physical activities in the entire population is small. Even smaller is the group of individuals after limb amputations. However, these individuals – with the exception of the disabled athletes – are characterized by a reduced physical activity, and are exposed to extensive injuries in case of losing their balance and falling down. Blind persons constitute a specific risk group. There are more than 18 million blind individuals worldwide (in Poland, 80,000), plus many more whose sight is restricted [17]. Visual disturbances are currently one of the most common causes of limitations to physical activity, and this means a lower level of physical activity, higher susceptibility to loss of balance and increased risk of injury as a result of a fall.

In relation to the risk groups mentioned in the last paragraph, the most rational recommendation of injury prevention is to teach safe falls and ways to avoid collisions (both with fixed obstacles and with objects in motion – a thrown stone, a racing motorcycle, etc.). However, teaching the blind to avoid collisions with objects in motion is a very difficult methodological challenge.

The following hypothesis was empirically proven to be true: if the methodological and educational standards are met, then sex, age, and type of body build are not factors limiting the effectiveness of safe fall learning [18]. Since the oldest subjects were 55, a justified question arises whether it is possible to teach safe falling techniques to individuals over 55. A positive answer is authorized by our own methodological experience, scientific knowledge and many other premises. Most importantly, at least four conditions have to be met, including: (1) a competent instructor; (2) patient's motivation and trust in the instructor; (3) soft floor, adapted to patient's physical ability and body build; (4) the need to use appropriate accessories, such as protectors for body parts most exposed to falls; polyurethane rehabilitation cubes, wedges, cylinders etc.

The study aim was to verify the hypothesis that teaching safe falls of young women and men by methods that prefer playful forms of exercises forms is as effective as the rigorous method, provided high attendance at classes.

Material and methods

The surveys included 107 physiotherapy students of the fifth semester of the first-degree studies in the Podhale State Vocational School of Higher Education (PSVSHE) in Nowy Targ, Poland (including 80 women and 27 men). The age range was 20–24 years in women (mean age of 21.06 years) and 19–34 in men (mean age of 21.66 years). Sixty-eight female and 22 male students attended 90–100% classes (attendance of 70–80%: 12 female, 5 male students).

In the period from October 1st, 2009 – May 30th, 2010, the students took part in the unique two-semester-long authors' programme titled "The theory and methodology of safe falls in individuals after limb amputations and the blind" (lectures 20 hours, classes 40 hours). The aim of the program is to provide knowledge as well as motor and methodological skills regarding safe falls in individuals at different degrees of motor and visual impairment. The study was conducted after completion of the first part of the programme (lectures 10 hours, classes 20 hours), with the assumption that education pertains to individuals *whose visual acuity does not exceed 3\60 or 1\20* (group A) and individuals *whose visual field is narrowed down to 20 degrees* (group B). The Polish classification of blind individuals was assumed [19]. It is therefore possible to use the methodology of teaching safe falls that was developed for use in healthy individuals, [20] with certain limitations taken into account. Students in group A were trained by the rigorous method, while students in group B were trained by a method that preferred playful forms of exercises. In most of the exercises, students in group A had their eyes covered by appropriate eye patches to simulate *visual acuity not* *exceeding 3\60 or 1\20.* Each time, the classes were started by group A students, in order to eliminate the possibility of observing the motor tasks beforehand. The students in group B (who were less 'impaired' by definition) used the eye patches occasionally (when repeating particular falling techniques in their advanced forms).

Polish classification of blind individuals [19]:

Individuals who are completely blind.

Individuals whose visual acuity does not exceed 3/60 or 1/20 (3\60 – an individual sees from the distance of 3 m of what can be seen from 60 m at normal visual acuity; 1/20 – an individual sees fingers against dark background from the distance of 2.5 m).

Individuals whose visual field is restricted to 20 degrees.

The rigorous method

The exercises were based on an empirically verified [20] system of exercising safe collisions with the ground and certain vertical obstacles.

The method preferring playful forms of exercises

A competent inclusion of motor tasks that force an unexpected fall (e.g. when A is running backwards, B – who is in a sitting position – trips up over both legs of A at the knee-level with his own leg, forcing A to make a fall to the rear) or a required fall (e.g. front fall over an obstacle with a turn over one's shoulder). Avoiding collisions is mostly based on playful forms (e.g. „matador").

Randomization

Due to the number of students, classes were held in 6 student teams of 18–20 individuals each. Every student team was randomly generated using the administrative criteria accepted in PSVSHE (one of the requirements was to include at least one male student in the student team).

Student teams were divided into groups A and B according to a formal "twin pair" principle. The first criterion was the identity of the sex within the pair, so that women and men could be proportionally distributed between groups A and B. Similarity of the results of the turnover test [21], measuring the ability to tolerate disturbances in the body balance, and the result of the test of susceptibility to bodily injuries as a result of the falls [22] were assumed as the motor competence criterion.

Evaluation of motor competence as pertains the safe falling

The "test of safe falls" (TSF) results were adopted as the criterion for the assessment of the effectiveness of the applied methods. The test was performed after the students had completed the classes programme. The TSF is described in detail in volume 4 of *Archives of Budo* [18], while visualization of the test is available in the *Safe Falls Academy* section on the ejournal's webpage (*www.archbudo.com/text.php?ids=263*).

The test comprises execution of four consequent tasks constituting a series of seven falls: (1) rear fall and rear fall with turn; (2) front fall; (3) fall to the side (left and right); (4) front fall with a turn over the shoulder (left and right).

Each task was evaluated according to an arbitrary four-point scoring scale: 25 (*excellence*); 20 (*good*); 15 (*sufficient*); 0 (*insufficient*).

Test result (total points)	Test implementation time (s)	Grade
100–95	20	*Excellence*
90–85	25	*More than good*
80–75	30	*Good*
70–65	35	*More than sufficient*
60–55	40	*Sufficient*
<55	<40	*Insufficient*

Workload intensity during the TSF

Heart rate (HR) measured (by a skilled assistant) for 10 s immediately after the test using the palpation method at the carotid artery was chosen as the criterion for the evaluation of the workload intensity during the TSF. The analysis of the empirical data was based on the heart rates in beats per minute. The following formula was used in the interpretation of HRmax in relation to age [23]: HRmax = 208 – (0.7 × age).

Data by Pollock et al. [24] were used as the basis for interpreting the workload intensity in healthy adults – Classification (%HRmax): *very light* (<35), *light* (35–54), *moderate* (55–69), *hard* (70–89), *very hard* (≥90), *maximal* (100).

For the youngest student, (19 years), HRmax was 195 bpm, while for the oldest (34 years) it was 184 bpm. Assuming the mean age of all tested students to be 21, the estimated HRmax was 193 bpm.

Evaluation of mental results

After completion of this part of the programme, a survey regarding different aspects of teaching safe falls to individuals was administered. The attractiveness criterion of a method was the rate of students' opinions stating that the number of classes per week and/or class duration should be increased.

Statistical analysis

The estimation based on empirical data took into consideration the arithmetic mean, the standard deviation, the maximum result and the minimum result. In order to determine the significance of the differences between the two means, a *t test for independent samples* was used.

Table 1. Estimates of main empirical variables.

Variable	Index	Group A (n=45)				Group B (n=45)				Group C (n=17)			
		X	SD	Min	Max	X	SD	Min	Max	X	SD	Min	Max
Age	Years	**21.51**	1.99	20	34	**21.28**	0.73	21	25	**21.58**	0.86	21	24
Height	cm	**171.51**	7.3	158	191	**170.82**	8.65	153	198	**167.82**	7.4	158	186
Weight	kg	**63.13**	10.8	43	87	**61.77**	9.18	49	86	**61.17**	11.4	45	82
TSF: total result	Points	**90.77**	5.93	75	100	**90.44**	7.13	70	100	**91.77**	6.35	80	100
TSF: run-time	s	**18.57**	2.05	14	23	**19.15**	2.06	15	24	**19.70**	1.99	17	23
TSF: workload intensity	HR_{bpm}	**161.86**	18.5	114	198	**159.60**	16.1	120	204	**160.94**	16.3	138	204

Pearson correlation coefficient was used in the studies of the correlation of pairs of empirical variables. The significance of the differences and the correlation between the empirical variables were most important for verification of the hypothesis.

Results

Thirty-four women and 11 men in both groups (A and B) attended 90–100% classes. This means that they exercised safe falls for 30–45 minutes during each of 9–10 classes (the active part of the class was shorter at the beginning). In this time, their partners documented their efforts (exercise content, scope, duration and intensity). While group A was exercising, documentation was performed by their partners from group B (in the respective twin pairs), and *vice versa*. Exercise duration and intensity in groups A and B were similar. Due to methodological differences, content and scope of numerous exercises was different in groups A and B. In case of 17 students, including 10 students in group A (6 women and 4 men) and 7 students in group B (6 women and 1 man), the attendance was 70–80%. The absence was mostly due to medical contraindications (however, in most cases hospitalization was not necessary and the students could observe the classes). This group of 17 students was included in group C for presentation of the empirical data.

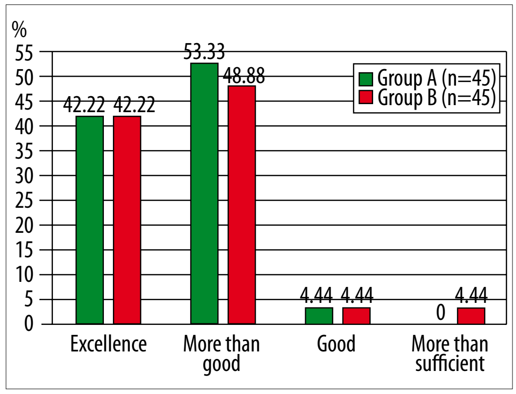

Figure 1. Structure of motor competence as pertains to safe falling in the population of physiotherapy students, based on TSF results.

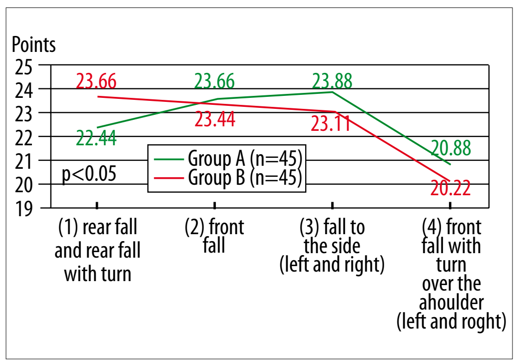

Figure 2. Qualitative differences of performance of particular TSF tasks by physiotherapy students.

No statistically significant differences in main empirical variables were observed between the groups (Table 1). This proved the correctness of randomization (similarity of results in groups A and B) and that absences in groups A and B were random (no differences between group C compared to groups A and B). It is therefore justified to further compare groups A and B only, according to the study aim.

The average TSF result in group A was 90.77±5.93 points; in group B, it was 90.44±7.13 points. These results show a more-than-good motor competence of students as pertains the safe falls. The TSF run-time was 18.57±2.06 s in group A and 19.15±2.43 s in Group B. There were no statistically significant differences between groups in relation to both indices. Therefore, both methods were equally efficient as pertains specific motor effects. This was confirmed by more detailed analyses. Evaluation of grades (or the population structure of motor competence in safe falling) is nearly identical (Figure 1). The *more than good* grade was dominant (difference in favor of group A was only 4.45%), while the rate of *excellence* and *good* grades (respectively 42.22%

Table 2. Qualitative differences of performance of particular TSF tasks by group A students (n=45).

Tasks of TSF	(1) rear fall and rear fall with turn	(2) front fall	(3) fall to the side (left and right)	(4) front fall with turn over the shoulder (left and right)
Results [points] X (SD)	**Difference between tasks [points]**			
(1) **22.44** (2.52)	–			
(2) **23.55** (2.52)	**1.11***	–		
(3) **23.88** (2.58)	**1.44***	**0.33**	–	
(4) **20.88** (3.24)	**2.44****	**2.67****	**3****	–

* p<0.05; ** p<0.01.

Table 3. Qualitative differences of performance of particular TSF tasks by group B students (n=45).

Task of TSF	(1) rear fall and rear fall with turn	(2) front fall	(3) fall to the side (left and right)	(4) front fall with turn over the shoulder (left and right)
Results [points] X (SD)	**Difference between tasks [points]**			
(1) **23.66** (2.52)	–			
(2) **23.44** (2.87)	**0.22**	–		
(3) **23.11** (3.24)	**0.55**	**0.33**	–	
(4) **20.22** (3.52)	**3.44****	**3.22****	**2.89****	–

** p<0.01.

and 4.44%) was identical in both groups. Two students in group B were graded *more than sufficient*.

Students in group B mastered the first TSF task – rear fall and rear fall with turn to a more advanced level (p<0.05) (Figure 2). The remaining differences between the groups were not statistically significant. The front fall with turn over the shoulder was the task that the students in both groups mastered the least.

Students trained by the rigorous method mastered task (1) to a significantly lower level (p<0.05) than tasks (2) and (3). Task (4) was performed at a level significantly lower (p<0.01) than the remaining TSF tasks. The largest inter-individual differentiation of results was observed for task (4) (Table 2).

Students trained by the method preferring playful forms of exercises mastered task (4) to a significantly lower level (p<0.01) than the remaining TSF tasks. (Table 3). The largest inter-individual differentiation of results was observed for tasks (3) and (4).

The average TSF run-time of less than 20 seconds at average bpm values of 161.86 in group A and 159.6 in group B (Table 1) makes the TSF a *hard intensity* workload. The borderline bpm for part of the students indicated that the workload was of *very light intensity* (<35% HRmax) for some of the students, while for other part, it was of *maximal intensity* (100% HRmax). In case of individuals whose heart rate exceeded 193 bpm there are grounds for claims that the workload was of *supramaximal intensity*. This included one male, 21-year-old student in group A (TSF 85 points, 19 s) and one female, 21-year-old student in group B (TSF 90 points, 16 s). For the oldest student (34 years), a major league hockey player, the workload was of *hard intensity* (HR 144 bpm) and lasted 17 s, with flawless performance of all TSF tasks (100 points).

Significant correlations between the values of main empirical variables were observed in group A with regard to body height and weight (r=0.792 p<0.01), which was an expected regularity and to certain variables describing the TSF results (Table 4). Run-time TSF was negatively correlated with total TSF result (in points) and with workloads of intensity (expressed in HR). Both correlations were moderate.

Only two significant correlations between the values of main empirical variables were observed in group B students. High correlations were observed for body height and weight as well as for TSF run-rime and total TSF result (Table 5).

After completion of this part of the programme, 44.4% of students in group B declared a need to increase the number of classes to 2–3 classes per week, compared to

Table 4. Correlation of values of main empirical variables in group A students (n=45).

Variable	1	2	3	4	5
1. Age	–				
2. Height	0.093	–			
3. Weight	0.226	**0.792****	–		
4. TSF: total result	0.186	0.205	0.218	–	
5. TSF: run-time	–0.106	–0.056	–0.133	**–0.437***	–
6. TSF: workload intensity	0.186	0.005	0.066	–0.023	**–0.355***

* p<0.05; ** p<0.01.

Table 5. Correlation of values of main empirical variables in group B students (n=45).

Variable	1	2	3	4	5
1. Age	–				
2. Height	–0125	–			
3. Weight	–0.170	**0.748****	–		
4. TSF: total result	–0.025	–0.109	–0.079	–	
5. TSF: run-time	–0.002	0.033	0.093	**–0.624****	–
6. TSF: workload intensity	–0.030	–0.179	–0.269	0.094	–0.207

** p<0.01.

31.1% students in group A, which proves that the method preferring playful forms of exercises is more attractive. However, the difference in the number of these declarations is not statistically significant, as shown by the result of the significance test: independent proportions (z=1.316, i.e. deviation from the normal curve is not sufficient, especially since N_1 and N_2 are sufficiently high).

Discussion

The results of the study authenticate the previously verified hypothesis [18] that if the methodological and educational standards are met, then sex, age, and type of body build are not factors limiting the effectiveness of safe fall learning. The obtained empirical data give grounds to claim that the hypothesis subject to verification in this work is also true.

Both methods employed in teaching safe falls students were effective. Although it was shown that the attendance of 70–80% did not limit the adaptation effects, this result does not justify an automatic conclusion that the second part of the hypothesis (*…as the rigorous method, on condition of high attendance at classes*) is false. In such case, it would be reasonable to reduce the number of classes in the basic safe falling course. This in turn would mean ignoring the most important adaptation effects which are by definition aimed at prevention of bodily injuries due to falls, collisions with vertical obstacles or objects in motion. A significant variance was observed between students as pertains the TSF run-time (time of test implementation): 9 s in group A, in comparison to 10 s in group B. This result shows explicitly that mastering of safe falling techniques should not be associated only with the motor effects in the narrow sense of the term, i.e. basing on the conformity of the body motions with the motor standard. Appropriate motor reaction time, or time of appropriate motor adaptation to danger situation, is also important. In our opinion, this problem is one of the most serious methodological dilemmas regarding the enhancement of the effectiveness of teaching safe falls and methods for diagnosing motor competence in this area.

The TSF-based motor competence evaluation criteria include two factors – motor effects (total points) and time of test implementation, where both of these factors show a relatively strong negative correlation. However, further modifications should put more focus towards the time factor. In the studies among PSVSHE physiotherapy students and students from other universities[18], the time of test implementation was measured with the accuracy of 1 second. At the same time, the results of studies on information processes in fencing [25] showed that the advanced fencers were faster than the novice fencers in all the studied parameters (with the use of senses of vision, touch and hearing) but the time was measured in milliseconds. Choice reactions were also shown to be two times longer than simple reactions in combat sports athletes (180–220 ms and 380–410 ms, respectively). It was also observed that the subjects' time of reaction to the same light signals varied depending on duration of different complex motor tasks with the use of tennis balls. The reaction time varied in the three successive trials (from simple to more complex): 159 ms – 195 ms – 208 ms, while the movement time was: 0–95 ms – 465 ms, respectively.

The review by Borysiuk and Waśkiewicz [25] leads to two reflections. Firstly, certain forms of physical activity – as the so-called life sports – may constitute an important element of enhancing motor security of human beings. A human having an appropriately early training and maintaining their psychophysical disposition throughout their life, is able to maintain the capability of adequate motor reactions in face of various danger situations. Secondly, measurement of the TSF run-time with the accuracy of 0.01 s seems to be a reasonable recommendation, albeit requiring empirical verification. Slowed-down motor reactions in the elderly persons, especially those with low physical activity levels, are an important factor. To date, poor positive correlation between age and time of test implementation was observed only in the oldest women and men (range 23–55 years with mean age of 35.92 years) who completed the basic course of safe falling [18]. It is therefore necessary to compensate the slowed-down motor reaction upon the loss of balance and the fall by perfect collision with the ground or a vertical obstacle. Gravity and other external forces acting on a human losing their balance and falling should be taken into account. Therefore, in the particular case, a time of 200-400 ms may decide that the collision with the ground or a vertical obstacle would not lead to any bodily injuries. This time may also significantly limit these injuries.

Comparison of the motor effects (total points and execution of four consecutive TSF tasks) in observed in individuals studied to date shows that PSVSHE students are leaders in this aspect. Most valuable comparative data were obtained in groups directly trained or strictly supervised by the same instructor (RM Kalina) [18]. The total TSF result of the Academy of Physical Education (APE) students (female and male) was 88.33 points (range 60–100 points), while the result of the University College (course UC_A) students was 85.86 points (range 65–100 points). Courses APE and UC_A were implemented in the stationary curriculum over 13 weeks, one lesson per week (45 minutes each). APE students (n=284) were aged 19–30 years (mean age of 20.9±1.16 years). UC_A students (n=29) were aged 20–23 years (mean age of 21.13±0.87 years). Therefore, age was not the factor to differentiate the compared groups but the training duration was three weeks longer in case of APE and UC_A students in comparison to PSVSHE students. However, in case of one class per week, this period was insufficient to master the front fall with turn over the shoulder (the fourth TSF task) to a more advanced degree. This method of colliding with the ground is the most complex of all safe falling techniques in terms of motor competence. The opinion of every third surveyed physiotherapy student that the number of classes per week should be increased to 2–3, and that the class duration should be extended to 90 minutes, was, to some degree, a manifestation of students' awareness of the fact that rational training is the basis of actual safe falling skills.

The analysis of the time of test implementation showed that the APE students were the fastest – in terms of the mean result (17.3 s) – to perform seven falls encompassed in four arbitrary motor tasks. However, the difference gap (10–40 s) was as large as 30 s [18]. UC_A students were nominally slower in performing the TSF (mean time of 19.34 s) than PSVSHE students in groups A and B. However, the difference gap of 18 seconds (15–33 s) is a proof of a very high interindividual diversity. This, in turn, means that many students who completed the UC_A course and many APE students may not have enough time to safely collide with the ground (in a situation of a sudden loss of balance and fall), despite their ability to reproduce the particular TSF tasks according to the motor model.

Based on the data from measurements and the exercise workloads accurately documented by students, a list of 130 means was prepared, including 11 playful forms used in group B only. The exact analysis of these means is not within the scope of this work, but it was included as the content basis in the programming of the second part of the course within a unique program "The theory and methodology of safe falls in individuals after limb amputations and the blind", as well as in the future modifications introduced to the first part (the basic course). However, it would be difficult not to arrive at the conclusion that regardless of the utility value of particular safe falling exercises and attractiveness thereof (especially of the playful forms), these means may be more widely applied in health prophylaxis. First of all, the need of frequent changes between the vertical and horizontal posture, and vice versa, combined with rotational movements (rolling the body in all directions, turning the body around) is related to the development of our body balance, stimulation of all muscles and agility. Perhaps such exercises will be effectively used in future to enhance the body's tolerance to the consequences of orthostatic manoeuvres. A very high variance in the heart rate (HR) values during the TSF (where the body position has to be changed from vertical to horizontal one seven times within a dozen or so seconds (as fast as possible) may be in part an effect of the relationships between the HR and the systolic time interval (STI) and other factors [26–29] during the orthostatic manoeuvre.

This very general discussion of the results of studies verifying the hypothesis that both methods of teaching safe falls are equally effective should not pass over the perspective of training individuals after limb amputations and the blind. Since certain psychological barriers, put up by both patients and physiotherapists, are to be expected, it should be one of the essential didactical goals that students are able to perfectly demonstrate all exercises. Previous observations of students, including students attending the earlier courses, justify the conclusion that playful forms of exercises induce strongest positive emotions and result in best commitment. These positive reactions were intensified during the course by simulating the conditions of motor behaviour of individuals with visual impairment (by covering their eyes with appropriate patches). We may therefore assume that when training individuals with either visual impairment or after limb amputations, one of the most convincing arguments given by the movement instructor (physiotherapist, PE instructor) would be the demonstration of exercises (particular motor tasks) with blinded eyes, tied arms etc.

Conclusions

Both methods are effective. Because of higher attractiveness of playful forms of exercises, one should often but cautiously apply them in teaching safe falls in order to precipitate adaptive effects and shape the habit of the systematic physical training.

Recommendations

Successive research programs regarding the issue of teaching safe falls to individuals at different age should allow for a more comprehensive evaluation of particular motor effects (motor competence as pertains safe falling) in relation to health-related fitness profiles (balance, muscular fitness, flexibility, cardio-respiratory endurance, body weight and composition), as well as to other health-related and mental effects.

The methodological competence factor should also be particularly taken into account when testing potential instructors: physiotherapy, PE or motor recreation students

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