Non-apparatus safe falls preparations test (N-ASFPT) – validation procedure

Roman Maciej Kalina

Faculty of Physiotherapy, Department of Health Promotion & Research Methodology, Academy of Physical Education, Katowice, Poland

Abstract

Background & Study Aim: The fall is a phenomenon whose severity is similar in dimension to every human being. N-ASFPT is the next stage of improving and the modification of the author's injury prevention system based on the teaching safe falls and avoiding collisions. The aim of the paper is non-test apparatus test which enables the comprehensive evaluation of motor abilities significantly supportive learning safe falls and increasing the effectiveness of shock absorption of the body colliding with the ground or vertical obstacle and then return to the stand-alone vertical posture.

Material & Methods: Validation is based on the following criteria: appropriateness (relevance): (1) criterion oriented validity – concurrent validity and predictive validity; (2) content validity; (3) construct validity; reliability on the formula 'test-retest' (with 1 week interval). Examined 34 people aged from 22 to 25 years.

Results: The safe falls preparations (SFP) saved four-digit code meets the criteria both the accurate diagnosis of the phenomenon (concurrent validity), as well as effects prognosis of safe falls education (predictive validity). The order of execution of test tasks is a kind of representation of the order of started "shock absorbers" first the falling body then colliding parts of the ground and then the muscles the most involved during the arising (content validity). This aspect is evidence that the measuring instrument is connected with the theoretical base – theory of safe falls (construct validity). High reliability of N-ASFPT shows the coefficients of correlated variables r = 0.828 to 1.000 during the 'test-retest' procedure.

Conclusions: N-ASFPT as the accurate and reliable tool of the measurement the potential shock absorption of the fall and the independent return for the vertical posture, may be, along with the STBIDF test, widely used in the diagnosis of susceptibility to injuries during the fall and predicting the effects of safe falls education.

Key words: voiding collisions · body balance disturbation tolerance skills · fall prevention · injuries prevention · susceptibility the body injuries during the fall

Author's address: Roman Maciej Kalina, Department of Health Promotion & Research Methodology, Academy of Physical Education, Mikołowska Street 72A, 40-065 Katowice, Poland; e-mail: kom.kalina@op.pl

INTRODUCTIONS

The fall is a phenomenon which severity is similar to each human being. The gravity law does not change depending on the age of person affected, sex or any other reason. It is, however, indisputable that people, who are properly prepared, are able to collide safety with the ground regardless of their age, sex, nationality, race, etc., hardness or slipperiness of the ground, or other circumstances (visibility, force or external forces which caused the fall, condition of the body including the influence of drugs, etc.).

The results show that sex, age and type of body build are not a factor preventing or significantly limiting the learning process of how to safely control the body during sudden balance loss, fall and collision with the ground [1]. However, people, who can safely fall and collide with the obstacles and, moreover, have physical fitness, have a better chance for effective protection of their own body during collision with the ground or vertical obstacle in numerous difficult situations.

Common circumstances of each fall involve four distinguishable events:
• balance loss,
• time elapsing from the moment of balance loss to collision with the ground or vertical obstacle,
• body part colliding with the ground (obstacle),
• the effects of the collision and accompanying circumstances (e.g. quality of the ground or vertical obstacle, condition of the body).

Among the circumstances related to balance loss, three categories of reasons can be mentioned: (CFR 1) includes the imbalance caused by the external force acting on the man, who has no influence on it (the examples of such circumstances involve e.g. a person in a moving bus, tram or other vehicle that suddenly stops); (CFR 2) a force disrupting the balance of a man is a motor activity performed on a relatively stable surface (the complexity of the movement, motor experience, current physical predisposition, the degree of concentration on the task, anxiety, etc.); (CFR 3) includes the cumulative effects of any external force(s) and internal factors concerning a person performing an action (e.g. walking on slippery surfaces, a sumo bout) [2].

A person with higher body balance disturbation tolerance skills (BBDTS) can maintain balance in circumstances, which may be even extreme for others. Moreover, if the circumstances are extreme and the fall is inevitable, it is a person with higher BBDTS

level who has larger chances to fall in the optimal place (e.g. avoiding an object or a rock lying on the ground) because such person can extend the time from initiating imbalance to its loss. In such situations natural or trained BBDTS is significantly enhanced by muscle strength, agility, flexibility and perception.

As the human body due to balance loss may fall forwards, backwards, right, left or in intermediate directions (e.g. diagonally forwards and to the right), the direction of falling body determines in the highest degree which part will collide as the first (or the only one) with the ground or vertical obstacle. An improperly prepared person will sustain injury or body scathe (i.e. temporary or permanent disturbances of tissue functions or structure), which do not only affect body parts the closest to the direction of the balance loss. Usually, a person loosing balance e.g. diagonally forwards and to the right, or diagonally backwards and to the left sustains injuries to the wrists or elbows of both arms. A person prepared for such events is able to not only to protect the body parts first colliding with the ground or the obstacles, but also to collide with those body parts, which will absorb the collision in the best way in a given circumstances. It follows from controlling the body in accordance with programme of action adopted in a very short time. It is usually the effect of involuntary action which is possible due to experience obtained during relevant training.

The test presented in this article constitutes the next step of improvement and modification of the original system preventing body injuries based on teaching safe falling techniques and avoiding collisions [1,3]. An important component of this system includes the method to evaluate susceptibility of injuries during the fall [4].

The aim of this paper is the non-apparatus test which enables comprehensive assessment of motor skills significantly supporting the process of learning of safe falling and increasing the effectiveness of cushioning the collision of the body with the ground or vertical obstacle and afterwards independent return to vertical posture.

It is due to the objective of this paper why the 'Results' part has been written in a different manner than in a standard paper. In this paper, 'Results' comprises not only a set of perceptual sentence and corresponding tables (figures) but also contains assumptions and detailed discussion (intermediate goals) and hypothesis adequate to the particular stages of validation

procedure (same way as during the validation procedure STBIDF [4] and "Rotational Test" [2]).

MATERIAL AND METHODS

STBIDF procedure extended to include non-apparatus safe falls preparations test (N-ASFPT)

Instructions for patients/client and evaluation

"Hold out your hands and do deep squat" (therapist's hands are set in pronation, while patient's/client's hands are in supination (cf. figure 1, 2). If the angle between tights and shins is smaller than 90° (acute angle) during the squat and tested person is able to perform the task easily i.e. does not excessively support himself on the therapist's hands (3 points in subjective scale from 1 to 3 points), there are not contraindications to perform STBIDF. If during the squat the angle amounts to 90° or more (obtuse angle), or supporting on therapist's hands is assessed in three-point scale, or both events occur, STBIDF should be performed in a simplified version.

Figure 3.   Figure 4.

Non-apparatus safe falls preparations test (N-ASFPT)

Whatever version of STBIDF (simplified or standard) has a patient/client performed, he should be offered N-ASFPT.

Figure 1.   Figure 2.

Figure 5.   Figure 6.

A simplified version of STBIDF

Each of three motor tasks "on the command GO as quick as possible lie down on your back" [4] involves tested person to lie down on a platform of 45 cm or related height (e.g. on a pile of mats, typical couch or bed). Figure 3, 4 present the second task STBIDF. During third task STBIDF jumping down is replaced with standing on one's toes. Evaluation of a simplified version of STBIDF does not change in relation to "hands" or "head". In the "STBIDF worksheet" near the variable "hips" in each task one should write "1", whereas in the third task near the variable "legs" "2". In such situation the score of STBIDF amounts to 5 points if the control of hands and head is flawless. This value of STBIDF indicator shows high susceptibility to injuries during the fall (indicator value ranges from 4 to 8 points [4]).

The test involves four motor tasks. Tasks 1, 2, 3 are performed during 3 seconds. After the order "ready" a therapist starts counting "101-102-103", while a patient/client immediately starts to perform given trial. Raw result (repetitions of the exercises or "0") should be noted in N-ASFPT sheet (Table 1).

Task 1 (*squats*) – starting position: patient/client stands with legs astride and his arms are raised in front (Figure 5); for each repetition, the patient/client performs a deep squat (Figure 6) and then returns to the starting position (have patients/client perform as many repetitions as possible in 3 seconds).

Task 2 (press-ups)

Basic version – starting position: patient/client kneeling on the mat, hands shoulder width apart and fully

extend the arms (Figure 7), lower the body until the elbows reach 90° (Figure 8); and then returns to the starting position with the arms fully extended (have patients/client perform as many repetitions as possible in 3 seconds).

Figure 7.

Figure 8.

Version for ambitious – starting position: patient/client lie on the mat, hands shoulder width apart and fully extend the arms (Figure 9), lower the body until the elbows reach 90°, the feet are not to be held (Figure 10); and then returns to the starting position with the arms fully extended (have patients/client perform as many repetitions as possible in 3 seconds).

Figure 9.

Figure 10.

Task 3 (*specific sit up*) – patient/client lying on the back with knees a lightly bent (obtuse angle), heels on the floor, and arms crossed over his chest, head and shoulders off the floor, and hold (Figure 11); for each repetition, the patient/client performs a sit up, and touches the thighs arms (Figure 12) and then returns to the starting position (have patients/client perform as many repetitions as possible in 3 seconds; the feet are not to be held; if during sit up a patient/

client slightly rises the heels in the initial phase of the exercise, the raw result amounts to 1 point regardless of repetitions made; if a patient/client rises heels and keeps them above the ground until touching tights with the arms, the result is 0 points.

Figure 11.

Figure 12.

Task 4 – non-apparatus flexibility test (the manual of test in [5]); raw result is actually an equivalent, whereas "general level of flexibility" based on "raw results" is corrected to "SFP profile". For the measurement method see Figures 13-15.

Figures 13. Example of measured flexibility (results below the determined line) [5]

Figures 14. Initiation of detailed measurement (from dactylion III to determined line) [5]

Figures 15. Continuation of the detailed measurement (in this example the raw score '0.5–' indicates the relatively high level of flexibility) [5]

Table 1. Sheet documenting the result of N-ASFPT and demonstration method of determination of SFP profile.

Purpose of diagnosis	Task	Raw result	Safe falls preparations profile (SFP)			
			insufficient	low	optimal	high
			points			
			0	1	2	3*
Ability to cushion the collision:	lower limbs	squats	4				X
	upper limbs	(2) press-ups	0	X			
Ability to restore the vertical posture:	the strength of the abdominal muscles	(3) SFP sit up	2<		X		
	flexibility	(4) non-apparatus flexibility test**	1.1–			X	

* 3 points "SFP Profile" is an equivalent of ≥3 repetitions
** «General level of flexibility» (in parentheses) corrected to «SFP Profile»: *insufficient* (insufficient and very low); *low* (low); *optimal* (average); *high* (high and very high)
< he slightly raised heels during sit up

MATERIAL

On the one hand, research material is the knowledge presented in papers cited herein, on the other, it is a new experience of the author obtained during educational and research activities conducted from 2011.

Personal

During 'test-retest' procedure examined 34 physiotherapy students (20 female, 14 male). Validation criteria fulfilled 28 persons (17 female, 11 male), aged from 22 to 25 years (average 23.25 , ±0.52).

RESULTS

Appropriateness N-ASFPT

Arguments justifying both the structure and content of the test as well as the sense of including it in the system preventing body injuries caused by a fall is based on five premises:

1. in order to increase motor safety of the person who has consented to perform STBIDF, it is enough that STBIDF procedure is preceded by a squat, performed holding a therapist for his hands (if the test criteria are not fulfilled, STBIDF is modified);

N–ASFPT validation

Validation is based on the following criteria: **appropriateness** (relevance) (1) c*riterion oriented validity – concurrent validity and predictive validity;* (2) *content validity*; (3) *construct validity*; **reliability** on the formula 'test-retest' (with 1 week interval). People participating in "test-retest" procedure directly before performing N-ASFPT have secretly declared their motivation for exercises (on a scale from 1 to 10).

Statistical analysis

The estimation of empirical variables (arithmetic mean, sample standard deviation, etc.), measure of skewness (g_1) and measure of kurtosis (g_2). Hypothesis testing (significance test – independent correlation coefficients). Correlation coefficient between pairs of specified variables.

2. regardless of the STBIDF result, arrangement of simple exercises (most of them are evaluated within 3 seconds because this is approximately as long as the fall lasts from the balance loss and collision with the ground to immediate rising) may provide general data on motor and energy capabilities to cushion collision of the body with the ground or vertical obstacle and independent return to vertical posture;

3. empirical data entitles to make a statement that individual, optimal muscle strength of legs, arms and abdomen as well as flexibility are the conditions to effectively cushion collisions and returning to vertical posture;

4. non-apparatus form of such test leads to the fact that it may be commonly used in self-assessment of the phenomena measured by it;

5. as the extremely positive result of both STBIDF and a test or tests measuring safe falling ability is possible, the result of test defined in this manner will complement possible result of collision with the ground or vertical obstacle.

Study results confirm that ability of safe falling (verified by specific tests or its components) correlates with muscle strength of legs, arms and abdomen, flexibility and coordination [6-8]. Natural absorbers of falling body (tremors of the body) include in many conditions legs' muscles at first, than arms (provided that they are used as shock absorbers). Jaskólski and Nowacki [9] emphasize that muscle tensions easily change influenced by cortical signals or spinal reflexes, and tensed muscles during the fall result in flexibility of the body and allow for the adoption of the most favourable arrangement of its parts throughout the duration of action of an external force. A person, ability to tense appropriate muscles and set joint system at the proper angle and at the certain direction of falling body can be achieved through specialized training. The authors of the *theory of safe falls* relate the exemplification of those phenomena to jumping down from height. Nevertheless, this example is representative for a wide class of fall not preceded by jumping down.

Jumping from height is cushioned in the best way by extensors of lower limbs if the bending angle in knee and hip joints is accurate [9]. When a trained person loses balance in any direction and maintains contact with the ground only with one leg in this moment, there are still chances to cushion the fall. The

movements of body parts should be adjusted accordingly, including possibly slow bending of the support leg at the right angle in knee and hip joint, pulling the chin to the torso and finishing the fall with gentle rolling on the back (so-called "cradle"). The use of arms is not necessary. On the contrary, leaning on arm (arms) before touching the ground with the buttocks should be avoided. If the dynamics of loosing balance forwards or to the side is large, it is hard to control the fall so that it would end with "cradle". Effective cushioning of the body falling forwards can be transformed into e.g. collision of the right side with the ground. One should make a half turn in this direction and perform the above-mentioned actions on the support (left) leg. To protect the head, cushioning of the fall should end with relevant strike with the ground with straight right arm just before the collision of the right part of the torso and the outer part of right leg (protecting the knee – see video in section: ArchBudo Academy under link Rotational Test (http://www.archbudo.com/text.php?ids=351). Arms are, however, basic shock absorbers of the collision with vertical obstacle (see video in section: ArchBudo Academy under link Collision with wall (http://www.archbudo.com/text.php?ids=100267 [10]) or with the ground if it is impossible to transform forward imbalance into *rear fall* or *fall to the side*.

The importance of physical fitness to the falling person is even more important because 40% of older people who have fallen, although not injured, are not able to stand up alone [11]. Long wait for help while lying on the ground or floor, causing a number of complications (hypothermia, pneumonia etc.). One of the main factors that increase mortality after the fall is being in a horizontal posture for at least 1 hour [12]. Physical fitness is, moreover, a basic prerequisite for effective avoiding of collisions.

Therefore, there are no methodological grounds to accept the result of one of the recommended physical fitness test as an accurate frame of reference (external criterion) and to correlate with N-ASFPT results (the prerequisite to apply *test by test* method in the process of *oriented validity* determination). There are no grounds to use the sum of points from N-ASFPT tasks as a general indicator of *safe falls preparations* (SFP). SFP profile should be analysed "task after task", what should not hamper the formulation of synthetic evaluation.

SFP profile presented graphically in table 1 can be depicted with the following code: **3-0-1-2**. Verbal interpretation (synthetic evaluation): *high ability to*

cushion the collision of the lower limbs with the ground, insufficient ability to cushion the collision of the upper limbs with the ground or vertical obstacle; ability to return to vertical posture is facilitated by optimal flexibility, because insufficient muscle strength of upper limbs is only partially compensated by low strength of abdomen muscles.

It is slightly different in case of separating energetic component of N-ASFPT. The sum of points of first three tasks is a simple indicator of estimating energetic capabilities (ESFP) in the context of cushioning body during fall, collision and independent return to vertical posture. ESFP indicator ranges from 0 to 9 points. It amounts to 4 points in discussed example (Table 1). Therefore, energetic potential estimated in this manner (44% of the maximal indicator value) is not precise enough in didactic sense. Accurate training individualization is possible on the basis of accurate and reliable diagnosis preceding the exercises. ESFP indicator is useful for mathematical calculations, when results of larger populations are analysed and which aim at gaining more general knowledge about given population and not about an individual person. This involves some elements of validation procedure of the test or correlations with subsequent (gradual and final) educational effects.

Homogeneous codes, especially extreme ones such as: **0-0-0-0** and **3-3-3-3**, are easy to interpret (unambiguity of *concurrent validity*). Formulating recommendations and determining accurate predictions

regarding motor and energetic abilities to cushion colliding body with the ground or vertical posture as well as independent return to vertical posture (assumption 2 is fulfilled) are not difficult in such situations. **0-0-0-0** code should increase the acceptance of both the necessity to undertake regular health-related training based on exercises strengthening the muscles, improving flexibility and balance as well as to support the gait effectiveness with a walking stick (*predictive validity*).

This step of N-ASFPT validation procedure, in my opinion, provides sufficient argumentation to consider it not only as the evidence of *criterion oriented validity* but also *content validity*. The task order is the kind of representation of the order of starting "shock absorbers", first of falling body, then its parts colliding with the ground and muscles engaged during returning to vertical posture (*content validity*). This proves that measuring tool is related to the theoretical basis. The actual theoretical construct (theoretical variable) is *the theory of safe falls* [9] (*construct validity*).

Reliability N-ASFPT

Twenty-eight of 34 tested people were qualified to 'test-retest' procedure due to differences in N-ASFPT results; especially those who declared change in motivation during research after 1 week. This included 8 people, but in two cases change in motivation was not correlated with change of the result. This means that the underestimation of this methodological procedure would result in lowering correlation research results

Table 2. Estimation of motivation and N-ASFPT task result, and correlation of pairs of relevant results of 28 students participating in 'test-retest' procedure.

Statistical variables	Motivation [points in 1-10 scale]		Tasks N-ASFPT [points in 0-3 scale]							
			(1) squats		(2) press-ups		(3) SFP sit up		(4) non-apparatus flexibility test	
	A	B	A	B	A	B	A	B	A	B
X̄	3.57	3.54	3	3	2.39	2.39	2.36	2.54	2.96	2.96
±	1.35	1.37	0	0	0.96	0.02	0.83	0.79	0.19	0.19
min	1	1	3	3	0	1	1	1	2	2
max	7	7	3	3	3	3	3	3	3	3
g_1	−0.02	0.20			−1.18	−0.90	−0.78	−1.33	−5.29	−5.29
g_2	0.84	0.86			−0.15	−1.22	−1.06	0.03	28	28
r 'test-retest'	0.971				0.959		0.828		1.000	
R^2 'test-retest'	94%				92%		69%		100%	

Table 3. The distribution of SFP and ESFP profiles of 28 students participating in 'test-retest' procedure.

Profiles		First research		After 1 week	
ESFP [Σ points tasks 1,2,3]	SFP	N	%	N	%
9 (A n = 11 B n = 14)	3-3-3-3	10	35.7	13	46.4
	3-3-3-2	1	3.6	1	3.6
8 (A n = 4 B n = 1)	3-3-2-3	3	10.7	0	0
	3-2-3-3	1	3.6	1	3.6
7 (A n = 9 B n = 10)	3-3-1-3	5	17.8	5	17.8
	3-1-3-3	4	14.3	5	17.8
6 (A n = 3 B n = 3)	3-2-1-3	1	3.6	0	0
	3-1-2-3	2	7.1	3	10.7
5 (A n = 1 B n = 0)	3-0-2-3	1	3.6	0	0
r (R²)	SFP	0.972 (94%)			
	ESFP	0.953 (91%)			

Table 4. "Migration of SFP profiles" (arrows) in 7 of 28 students participating in 'test-retest' procedure.

First research		Relation	After 1 week	
N	Profiles SFP		Profiles SFP	N
10	3-3-3-3		3-3-3-3	13
1	3-3-3-2		3-3-3-2	1
3	3-3-2-3			
1	3-2-3-3		3-2-3-3	1
5	3-3-1-3		3-3-1-3	5
4	3-1-3-3		3-1-3-3	5
1	3-2-1-3			
2	3-1-2-3		3-1-2-3	3
1	3-0-2-3			

at least by 18%. The actual decrease in the value of determination coefficients (R²) listed in table 2 is similar to motivation (by 21%). However, in case of task two the value decreased by 79%, task three by 49%. The highest differences of average results of estimated motivation and particular N-ASFPT tasks do not exceed 5%.

Correlation coefficients from 0.828 to 1 included in 'test-retest' procedure prove that test meets reliability criteria of such research tools (Table 2 and 3). This is confirmed by analysis of "migration of SFP profiles" (Table 4). Compatibility of the profiles can be observed in 75% cases. Others revealed the tendency to slight shift towards higher values (17%) and 4%

shift towards lower values. Changing the configuration of profile from 3-2-1-3 to 3-1-2-3 (maintaining the same point value) applies to 4%.

DISCUSSION

The structure, content and evaluation system of N-ASFPT exemplify breaking the paradigm of measurement and interpretation of physical fitness [13-22]. Some theorists of human motor skills indicate more and more boldly, especially during conference discussions, the limitations of this paradigm. To put it simply, the paradigm is based on the simple premise – a person is a sum of motoric and somatic factors. Consequently, analytical measurement methods of physical fitness are widely accepted. The truthfulness of those statements is confirmed by the book of A. Ashok entitled "Test Your Physical Fitness" [17]", in which the author juxtaposed 156 tests and certainly did not exhaust even the half available in scientific journals and books, particularly local and published in national languages.

Such statements do not negate either the legitimacy or usability of any physical fitness tests. I would like to emphasize the limitations of the paradigm of measurement and interpretation of physical tests. None of 156 tests would be useful as substitute of any task in N-ASFPT, even though the similarities of motoric nature are considerable. No test fulfils adopted assumptions.

A critic of N-ASFPT may reasonably conclude that it is also an analytic test. Refuting this charge would be easy, if we follow the assumptions of the test and justifications on the basis of pragmatics and theory of safe falls. In certain circumstances, a person can fall down several times, and not necessarily backwards. Therefore, four tasks are imitating the course of action. First task emphasizes the cushioning function of the lower limbs, second – of upper limbs (being main shock absorbers during collisions with vertical obstacles), while third and fourth task are supposed to answer the question whether the return to vertical posture does not exceed motor and energetic abilities of a given person.

For clarity of reasoning I would like to emphasize that N-ASFPT does not claim (metaphorically speaking because the creator of the test may claim something) replacing recommended analytic tests such as e.g. EUROFIT [15] or other tests recommended for use of health-related training (e.g. [23]). On the contrary, the aims of those tests and N-ASFPT are divergent. Recommended tests of motor skills (regardless of their credibility) provide answers to elementary questions whether: a person is capable of very fast moves (muscle contractions) for several seconds; a person can use certain muscle strength for several seconds; a person can continue the effort with similar effectiveness for several minutes, etc. Only some tests last for a shorter time than 3 seconds, e.g. medicine ball throw, vertical jump test, standing broad jump.

It is impossible not to appreciate the diagnostic and prognostic value of these tests. Stanislaw Sterkowicz et al. [6] associated the results of such tests with BSDST results, which consist of three groups (the first group assigned with G1 symbol [6] is constituted by safe fall technique). Evaluation criteria are also presented in the *Archives of Budo* [24]. Regardless of whether we focus the attention only on this part of the test or on two others as well (G2 and G3), the conclusion is clear. Success (i.e. higher scores) of BSDST is correlated with balance test results and standing broad jump as well as results of flexibility test, abdomen muscle strength test and spatial orientation test. Interpretation based on BSDST results or physical fitness test results reflects specific feedback. People, who are higher assessed based on BSDST results, can be described as those with better balance, larger strength of legs and abdomen muscles, better flexibility and spatial orientation compared to sample population. On the other hand, we could determine that people with such motor and energetic predispositions, who are provided with the same educational conditions, have a chance to learn safe fall techniques at the higher level as well as develop their defensive predispositions. In contrast, high score of BSDST entitles to the following conclusions. Firstly, such person may be attributed with the above-mentioned predispositions without a need to use all physical fitness tests. Secondly, safe fall technique and self-defence exercises significantly stimulate physical fitness.

This does not indicate that there is no need to measure physical fitness before starting to learn safe falls. On the contrary, an accurate SFP profile (its determination lasts several dozens of seconds, including the breaks between the tasks) or results of tests of strength of particular muscle groups, flexibility and coordination abilities providing information to improve educational process. I experience this during almost all exercises, while teaching students how to do front fall and front fall with turn over the shoulder. If the test results indicates optimal muscle strength of arms and abdomen, and flexibility and a student is committing elementary errors, the reason does not lie on the side of physical fitness.

Usually the problem has mental grounds – fear of injuries (even though exercises are done on soft ground); unpleasant experiences from the past related to the fall and/or collision with the obstacle; disbelief in own capabilities; fear of humiliating oneself; belief that acquisition of this skill requires some special predispositions, etc. The most difficult what can happen is accumulation of those fears and objectively real deficiencies in motor coordination. In such situations didactic experience (the need of individualization, correct and convincing demonstration of exercises), psychological knowledge and experience in teaching and learning new motor activities gain special importance. Such values of a teacher should be supplemented with great responsibility to ensure motor safety, especially when stimulating the most difficult situations. For example, the need to protect a person who has ability to fall safely and loses balance in the crowd, while panicking deepened with the need to move quickly on slippery surfaces. Such stimulations are possible only with well-prepared people and if their bodies are most of all protected by specialized helmet (Figure 16).
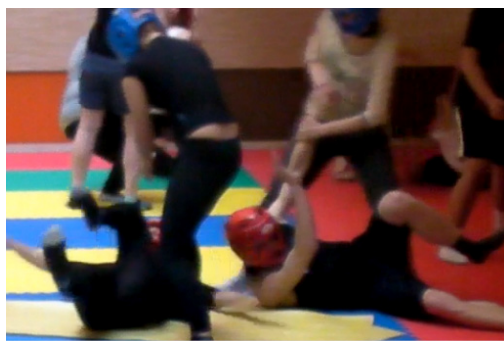

Figure 16. Part of lesson of safe falls – a person, who suddenly lost balance in the crowd exposed to this type of event, is protected from falling (foto: B. Gąsienica-Walczak)

The effectiveness of such education is well illustrated by reliable descriptions of three situations involving students who participated in two-semester course of safe falling – *Michael (23 years old) doing repair work standing on a ladder, in result of own error fell off with a ladder in the back, with the concrete ground immediately made a rear fall with turn; Bartholomew (21 years old) walking pedestrian crossing (previously found that the street is empty) when suddenly, car run into the stripes, bumped with the huge force made consecutively two rear fall with turn on asphalt (doctors were surprised that on the Bartholomew's body found no injuries and no evidence of a collision with the car); Agnes (24 years old)* *has travelled by bus when the driver stopped suddenly, an old man (about 190 cm, more than 100 kg) standing next to her fell in front of with huge force, Agnes grabbed his arm and gently slides him to the floor of the bus unharmed* [4, p. 214].

The society has no choice. The newest report of the Institute For Health Metrics and Evaluation "The Global Burden of Disease: Generating Evidence" [25] leaves no doubt. In aging society fall has become one of the main reasons of disability-adjusted life years as well as years of life lost as a result of both premature death and disability from the nineties to 2010. Teaching safe falling techniques is the most effective method to prevent from body injuries caused by fall and reduction of deaths due to falls. Learning should be started as soon as possible in the life of every human being and then attractively included in constant health-related training [26, 27].

Effectiveness of safe fall teaching by promotion of sports, which involve learning of safe falling techniques is limited by deaths and injuries which are not related to such exercises but to rivalry. Accidents leading to death or serious injuries during training and judo sports combat have been registered from the log time [28-32]. It is, therefore, justified to categorize judo and other combat sports as extreme sports [33]. There are no factual and psychological grounds to categorize safe fall as extreme forms of physical activity [33].

CONCLUSIONS

N-ASFPT as the accurate and reliable tool of the measurement the potential shock absorption of the fall and the independent return for the vertical posture, may be, along with the STBIDF test, widely used in the diagnosis of susceptibility to injuries during the fall and predicting the effects of safe falls education.

ACKNOWLEDGEMENT

References

1. Kalina RM, Barczyński B, Jagiełło W, et al: Teaching of safe falling as most effective element of personal injury prevention in people regardless of gender, age and type of body build – the use of advanced information technologies to monitor the effects of education. Arch Budo, 2008; 4(4): 89-89

2. Kalina RM, Jagiełło W, Barczyński BJ: The method to evaluate the body balance disturbance tolerance skills – validation procedure of the "Rotational Test". Arch Budo, 2013; 9(1): 59-69

3. Gąsienica-Walczak B, Barczyński BJ, Kalina RM et al: The effectiveness of two methods of teaching safe falls to physiotherapy students. Arch Budo, 2010; 6(2): 63–71

4. Kalina RM, Barczyński BJ, Klukowski K et al: The method to evaluate the susceptibility to injuries during the fall – validation procedure of the specific motor test. Arch Budo, 2011; 7(4): 201-215

5. Kalina RM: Applying non-apparatus and quasi-apparatus tests in a widely understood concept of health promotion – an example of flexibility measurement and assessment. Arch Budo 2012; 8(3): 125-132

6. Sterkowicz S, Chwała W, Ambroży T: Zdolności motoryczne warunkujące rezultat w teście podstawowej umiejętności samoobrony. W: Korzeniowski L. (red) Kształcenie pracowników ochrony. LIPORT. LFK. Kraków 2001: 154-169 [in Polish]

7. Syska JR, Bógdał D: Związek umiejętności bezpiecznego upadku z wszechstronną sprawnością fizyczną. W: A. Dąbrowski, T. Jasiński, RM Kalina (red.) Sporty walki w edukacji dzieci i młodzieży – perspektywa metodyczna. Szkoła Wyższa im. P. Włodkowica. Płock 2002 [in Polish]

8. Chodała A: Porównanie efektywności dwóch metod treningu fizycznego żołnierzy przygotowywanych do misji „operacje inne niż wojna". PhD thesis. Akademia Wychowania Fizycznego w Warszawie. Warszawa, 2003 [in Polish]

9. Jaskólski E, Nowacki Z: Teoria, metodyka i systematyka miękkiego padania. Część I. Teoria miękkiego padania. WSWF. Wrocław 1972: 83–88 [in Polish]

10. Harasymowicz J, Kalina RM: Honourable self-defence – the theoretical and methodological basis of training. Wydawnictwo Novum, Płock, 2006

11. Żak M: Determinanty powtarzalności upadków u osób po 75 roku życia. Studia i Monografie nr 60. Akademia Wychowania Fizycznego. Kraków, 2009 [in Polish, abstract in English]

12. Reece AC, Simpson JM: Preparing older people to cope after a fall. Physiother, 1996; 82: 227-235

13. Larson LA: An international research program for the standardization of physical fitness tests. J Sport Medicine and Physical Fitnes 1966; 4(4): 259-261

14. Skinner JS: Exercise testing and exercise prescription or special cases. Lea & Febiger. Philadelphia 1987

15. Council of Europe: EUROFIT (second edition). Strasburg 1993

16. Osiński W: Antropomotoryka. Akademia Wychowania Fizycznego. Poznań 2000 [in Polish]

17. Raczek J, Mynarski W, Ljach W: Kształtowanie i diagnozowanie koordynacyjnych zdolności motorycznych. Podręcznik dla nauczycieli, trenerów i studentów. Akademia Wychowania Fizycznego. Katowice. 2002 [in Polish, abstracts in English, in Russian]

18. American College of Sports Medicine /ACSM/ ACSM's guidelines for exercise testing and prescription, 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2006

19. Balej M, Junger J et al.: Motor tests of coordination abilities. Prešov University in Prešov. Faculty of Sports. Prešov 2006

20. Heyward V.H. Advanced fitness assessment and exercise prescription. 5th ed. Human Kinetic; 2006

21. Ashok C: Test Your Physical Fitness. Kalpaz Publications. Delhi 2008

22. Schmidt RA, Wrisberg CA: Motor Learning and Performance. A Situation-Based Learning Approach. Fourth Edition. Human Kinetics, 2008

23. Kuński H: Trening zdrowotny osób dorosłych. Poradnik lekarza i trenera. Warszawa 2002 [in Polish]

24. Kalina RM, Jagiełło W, Wiktorek P: Motor competence in self-defence of students of a detectives' school during their course of studies. Arch Budo, 2007; 3(3): 1-6

25. The Global Burden of Disease: Generating Evidence, Guiding Policy. Institute For Health Metrics and Evaluation, University of Washington 2013

26. Kalina RM, Barczyński BJ: EKO-AGRO-FITNESS© original author continuous program of health-oriented and ecological education in the family, among friends or individually implemented – the premises and assumptions. Arch Budo. 2010; 6(4): 179-184

27. Bergier J. Studies and measurements of physical activity of the society. Ann Agric Environ Med. 2012; 19(3): 329-331

28. Witak H, Sturm H: Spezifische Verletzungen in der Kampfsportart Judo. Armeesportler, 1968; 8: 12-13 [in Germany]

29. Sterkowicz S: Accidens in judo in multifactoroal epidemiologic analysis. Akademia Wychowania Fizycznego. Rocznik Naukowy XXII. Kraków, 1987: 199-243 [in Polish, abstract in English]

30. Seiji M, Nobuyuki S, Toshiaki H et al: Investigation of concussion of the brain in judokas. International Judo Symposium – Medical and Scientific Aspect. Tokyo, 8 September 2010. Scientific Research on Judo. 2011; 16: 40

31. Takeshi K: Brain injuries in Judoka – Analysis from the reports of compensation system for Judo injuries. International Judo Symposium – Medical and Scientific Aspect. Tokyo, 8 September 2010. Scientific Research on Judo. 2011; 16: 38-39

32. Pocecco E, Ruedl G, Stankovic N, et al.: Injuries in judo: a systematic literature review including suggestions for prevention. Br J Sports Med. 2013; 47: 1139–1143

33. Bąk R: Definition of extreme physical activity determined through the Delphi method. Arch Budo Sci Martial Art Extreme Sport. 2013; 9: 17-22

Cite this article as: Kalina RM. Non-apparatus safe falls preparations test (N-ASFPT) – validation procedure. Arch Budo, 2013 4: 255-265