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The result of "testing fights in a vertical posture" as a criterion of talent for combat sports and self-defence – secondary validation (part II: the accuracy)

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Abstract

Background & Study Aim: The work is a continuation of part I: the reliability and refers to the second element of validity (relevance) "testing fights in a vertical posture" (TFVP) – accuracy. The aim of this study is methodological argumentations concerning the verification of the accuracy aspects of TFVP (a consequence of the hypothesis formulated in the first part).

Material & Methods: We analysed TFVP attended 790 persons (169 female at the age of 11 to 42 and 621 male at the age 10-45). We used mainly the correct version of TFVP basic on general indicators TFVP (winnings fights; F-Index) and specific indicators TFVP (winnings and losing fights; winnings, losing and sum of scuffles; S-Index).

Results: There is a very high correlation ($r = 0.892$, $R^2 = 80\%$) between the number TFVP victory and TFHP (fighting in horizontal posture). Talent for combat sports and self-defence is distributed relatively evenly on people with high physical fitness and others. In the experimental groups (intensively educated to hand-to-hand fight: HTHF) occur occasional correlations between indicators of TFVP and the results of general and specific fitness tests. Many empirical evidence confirms the one hand, the sensitivity of indicators TFVP on modifying factors on the other – that the single factor which constitutes a real talent for HTHF (combat sports and self-defence) substrate is difficult to clearly identify solely on the basis of motoric and somatic indicators.

Conclusions: Secondary validation procedure provides extensive empirical argument that TFVP meets the criteria of methodological tools reliability and accuracy. Final argument stating the TFVP measures talent for fights in a vertical posture will involve positive verification of the following hypothesis: persons who win in accordance with TFVP, achieve successes in combat sports, if effects of professional training may compensate to some extent for shortages in talent.

Key words: experiments • fighting in horizontal posture • fun form of martial arts • hand-to-hand fight • optimal reliability • quasi-apparatus test • scuffle

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Validation – the action of checking or proving the validity or accuracy of something *(Oxford Dictionaries).*

Accuracy – the quality or state of being correct or precise (Oxford Dictionaries); **accuracy** in parts of methodological books is synonymous of validity (degree to which a test or instrument measures what it purports to measure; can be categorized as *logical, content, criterion, or construct validity* [9, p. 193]), whereas **validity** (relevance) include **accuracy** and **reliability**.

Stability – a coefficient of reliability measured by the test-retest method on different days [9, p. 200].

Reliability (feasibility) - human operator's **R.** is understood as his ability to faultlessly perform functions vested in him under defined conditions and within a specific time segment. Object's R. in the normative sense (one of the possible definitions – authors' emphasis for the purposes of this work) is the probability that in a certain period *(O, t)* changes in the specific properties of the object will not exceed the specific limits under certain conditions of the object's existence [53].

Test-retest method – method of determining stability in which a test is given one day and then administered exactly as before a day or so later [9, p. 200].

Scuffle – a short, confused fight or struggle at close quarters (in TFVP fights in the vertical posture based on the simplest forms of pressure on the opponent's body); differently than **encounter** (conflict, dash) in praxeology: the fight destructive during the impact phase at each of two warring parties (both sides attacking either one attacking and the other counterattacking [1, 53, p. 231].

ICSPFT – International Committee on the Standardisation of Physical Fitness Test [36].

Non-apparatus test – that motoric test (exercise endurance test) of the required reliability (accurate and reliable), which use does not require even the simplest instruments [49].

Quasi-apparatus test – can be conducted with simple instruments (a stopwatch, a ruler, a measuring tape, etc.) [49].

Introduction

The paper continues "Part I: The reliability" [1] and concerns the second element of the **validity** (relevance) of the test – **accuracy**. In English the term "accuracy" has many synonyms; however, those used in the theory of tests are defined as in any other natural language [2-9]. In the academic tradition and in the popular science authors explain the essence of "accuracy" in the following way: it is to answer the question of whether the test measures the phenomenon to which it has been created. Creating accuracy tests to measure basic motor abilities (speed, endurance, strength, etc.) is seemingly an easy methodological task. Yet a large number of tests seems to contradict this [8, 11-16]. Although the science of testing already has a long tradition, there is a very wide range of practical applications and specific objectives in the framework of individual social activities: sports, physical education, rehabilitation, ergonomics, psychology, pedagogy, etc.

Premises and assumption – part II: the accuracy

i Since the four-degree scale of evaluation of hand-to-hand fight skills (HTHF) according to military criteria in the case of multiannual military training is either limited to three levels at most (satisfactory, good, very good) or extremely homogeneous (one of these assessments [17]), under the second condition most of the results of TFVP in 5-person test (competition) groups (TG) of similar body weight should end in a draw (everyone should win two fights).

ii If in such a composition of TG, persons with a higher level of physical fitness win, TFVP can be treated as a synthetic measure of fitness, but not as a tool to identify talent for combat sports and self-defence (in short: talent for HTHF).

iii Having met the first condition (***i.***), the TFVP results should highly correlate with the results of the evaluation of HTHF skills according to the military criteria.

iv There are no reasonable grounds to acknowledge that the mastery of certain HTHF techniques at a higher level (in a sense of intersubjective examiners' assessment) would increase the probability of a victory in a fight in which sophisticated techniques (throws, grapplings, hits, etc.) cannot be applied.

v Such a correlation would deny the accuracy of TFVP as a synthetic measure of talent for HTHF. Because both people with a very high motor potential and those with low indices of motor abilities can have such talent, with competitors' similar or identical body weight during TFVP "one against one" (to distinguish the following factors: an opportunity to observe opponents from a numerous TG, preparing separate tactics of fighting against each one, etc.) and having met the selection criteria of random pairs, victories should be distributed proportionately among those with higher motor potential and those inferior to them in fitness tests results. The problem concerns the question: to which span of the level of physical fitness?

vi Both in self-defence and in many combat sports (judo, wrestling, ju-jitsu, unifight, etc.), a loss of balance and a fall do not determine a possible victory. The fight can continue in a horizontal posture. Thus winning TFVP at a ratio of 4:1 (80%) allows concluding about optimal reliability (see glossary). It makes sense to use this prognostic criterion in comparing specific pairs of people in longer training cycles (whether the consistent victor in a given pair reaches or maintains optimal reliability in future TFVP) and with reference to the winners of multi-person TG provided that they won all the fights but not all scuffles. The results of such observations may be relevant in the selection of task forces for specific antiterrorist, police, military, etc. interventions, taking into account other factors (e.g., the necessary knowledge of the language, customs, land, handling a unique device). A fight lost 3:4 in a 5-person TG with three victories 4:0 prevents exceeding the threshold of 80% efficiency, but already in a 6-person TG the result of calculations (83%) attests to the optimal reliability. Therefore, a further assumption that losing one fight means failing to meet the condition of optimality is necessary.

vii The method of multiple verification develops the previous assumption (***vi.***). A change in circumstances may be a repetition of another cycle of TFVP: within the same TG, when a multi-week HTHF or combat sports training is the modifying factor; within another TG with a different compilation of factors, such as body mass, fitness, sport experience, age, gender, etc.; among winners of at least three TG with the same number and similar body mass and fitness; among winners of at least three TG, when each TG is diversified as to

growing weight of its members (e.g. every 3 kg). Other possible compilations of factors are possible to take into account an additional objective (e.g. selecting women able to beat men of specific characteristics).

viii If it is extremely difficult or even impossible to define the actual grounds for talent in any field, then one of the accuracy methods for searching for talent for HTHF is a multithreaded analysis of cumulative events (case study), when the TFVP winner is a person who, in the opinion of experts or on the basis of the previously recognised facts (e.g. recommendations based on results of scientific research), should not win this kind of fight. In-depth reviews of mental and motor potential of those military cadets who defeated judo athletes (having no such experience themselves) in the first two experiments of those described in [1] would be a good example (although referring to the results of the 1st prototype of TFVP [1, p. 231-233]).

ix The highest form of verifying the relevance of the TFVP is their prognostics, which requires answers to the question: are the people who win in TFVP also successful in combat sports? The following combat sports: judo, kurash, sumo, and wrestling [18-20] are the most suitable for such verification, but also those based on mixed fighting techniques: ju-jitsu and unifight [21]. Some quasi sports forms of HTHF [22, 23] are close to self-defence.

The main methodological dilemmas testing fights in a vertical posture (TFVP) as a criterion of talent for combat sports and self-defence we are presents in part I [1].

The aim of this study is methodological argumentations concerning the verification of the accuracy aspects of TFVP the following ***hypothesis***: "persons who have not trained combat sports earlier but outperform their peers in motor abilities should win fights in the vertical posture based on the simplest forms of pressure on the opponent's body (pushing beyond the determined contest area, secure putting out of balance, etc.), i.e. without a use of sophisticated techniques (throws, grips, blows, etc.); if such bouts are also won by persons inferior to their opponents in terms of motor abilities, it means that the sum of motor indicators cannot be an objective measure of talent for combat sports and self-defence; however, the result of several "testing fights in a vertical posture" (TFVP) consecutive in a short period of time would meet the methodological criteria of a synthetic measure of such talent (it can be owned by both people with very high motor potential and persons with low indicators of motor abilities)" [1, p. 231].

Material, methods, results

Verification of the accuracy of TFVP indices based on the correlation with military HTHF tests and results of physical fitness tests – premises and assumption (i., ii., iii., iv., v., vi.)

We examined 40 male cadets from the Military University of Technology. The mean age was 22.6 years (21 to 24), the mean body mass 76.6 kg (62 to 86.5), the mean body height 181.3 cm (167 to 194). TFVP were conducted and evaluated according to the criteria of the 2nd prototype TFVP **–** the second task: *four sumo fights according to the simplified formula, in the system of "everybody with everybody else";* 5-person TGs were subject to evaluation [1, p. 234, 235]. The difference in body mass between members of particular 8 TG did not exceed 3 kg (e.g. with the mass of 57-60 kg the difference in the ratio was 5%, and at 70-73 kg it was 4% and at 92-95 kg only 3%.

Male cadets fought 80 TFVP. The individual distribution of points was possible from 0 (all fights won) to 40 (all fights and all scuffles lost). The F-Index was used in an in-depth analysis: the percentage of fights won relative to all fights conducted by the given subject and the S-Index: the percentage of scuffles won relative to all scuffles conducted by the given subject (e.g. in the numerator 16 and in the denominator scuffles won by an opponent are added to scuffles won by the assessed person, so for example, 16 + 5 yields a result of 0.7619 or 76%).

We have adopted the following respective proportions of fights (F-Index) and scuffles (S-Index) won as a criterion for the effectiveness of TFVP: absolute 100%, very high 80-99%, 65-high 79%, average 50-64%, low 30-49%, very low up to 29%; lack of efficacy (for the F-Index not one fight won, for the S-Index also no scuffle). The S-Index also meets the criterion of the reliability index (see ***vi.***). Optimal reliability was achieved by only one cadet, a leader among 8 cadets (20% of the sample) who defeated opponents in all fights, but did not win all scuffles. The leader lost the allowed number of 4 scuffles, hence his S-Index was 80% (Table 1).

BSDST (basic self-defence skills test) – which comprises three groups of defence actions; each group consists of one-, two-, or multi-element tasks (all in all twelve tasks): G1 – safe fall technique; G2 – defence by pre-emptive strike; G3 – defence against embrace, strangling and strikes [45].

2nd prototype TFVP (non-apparatus test): *four sumo fights according to the simplified formula, in the system of "everybody with everybody else"* as part of "defence biathlon: 1st didactic version" (DB:1st DV) – as the second task (the first task being a zigzag run and 20m run followed by 4 dart throws at a dartboard located at a distance of 2m); 5-person test (competition) groups are subject to evaluation [1].

Table 1. The effectiveness of 40 male cadets during TVP 5-person TG.

Male cadets (n)	General indicators TFVP				Specific indicators TFVP – the number of cadets winners of scuffles in relation (%) to opponents					
					S-Index criteria (%)					
	winnings fights (n)	points min ÷ max	winnings fights (%)	F-Index (%)	absolute 100	very high 80-99	high 65-79	average 50-64	low 30-49	very low up to 29
8	4	0	100	absolute 100		**1**	**7**			
7	3	3÷5	75	high 65-79			**5**	**2**		
8	2	6÷15	50	average 50-64				**7**	**1**	
11	1	13÷27	25	very low up to 29					**9**	**2**
6	0	18÷33	0	lack of efficacy					**1**	**5**

Table 2. The effectiveness of 34 male cadets during TVP 5-person TG who won at least one fight.

Male cadets	General indicators TFVP			Specific indicators TFVP – the number of cadets and won by them fights in the proportion of scuffles:							
	winnings fights		F-Index	4 : 0		4: 1		4 : 2		4 : 3	
n	**n**	**%**	**%**	**cadets**	**fights**	**cadets**	**fights**	**cadets**	**fights**	**cadets**	**fights**
8	4	100	absolute 100	**4**	**5**	**7**	**9**	**5**	**7**	**8**	**11**
7	3	75	high 65-79	**5**	**7**	**4**	**6**	**3**	**5**	**3**	**3**
8	2	50	average 50-64	**5**	**5**	**3**	**3**	**3**	**5**	**3**	**3**
11	1	25	very low up to 29			**2**	**2**	**5**	**5**	**4**	**4**
34	**Sum**			**14**	**17**	**16**	**20**	**16**	**22**	**18**	**21**

Table 3. Differentiation (fights and scuffles) of the effectiveness of 40 male cadets during TVP 5-person TG.

Male cadets	General indicators TFVP			Specific indicators TFVP – winnings (n):							
	winnings fights		F-Index	fights		scuffles			S-Index (%)		
n	**n**	**%**	**%**	**won**	**lost**	**won**	**lost**	**sum**	**mean**	**min**	**max**
8	4	100	absolute 100	**32**		128	56	**184**	70	67	80
7	3	75	high 65-79	**21**	7	102	53	**155**	66	58	79
8	2	50	average 50-64	**16**	16	101	86	**187**	54	48	59
11	1	25	very low up to 29	**11**	33	88	156	**244**	36	26	46
6	0	0	lack of efficacy		24	28	96	**124**	23	16	36
40	**Sum**			**80**	**80**	**447**	**447**	**894**			

A detailed analysis reveals that more than half (18) out of 34 cadets who won at least one fight, won 21 times with the ratio of scuffles 4:3. 16 cadets won 22 and 20 times, each group, with the ratio of scuffles 4:2 and 4:1, respectively. The least (14 cadets) won 17 times with the ratio of scuffles 4:0 (Table 2).

The cadets who won 3 fights were the most varied in the reliability measured by means of the S-Index (21%), while the least (11%) were those who won 2 fights (Table 3). The largest group (11 cadets, i.e. 27.5%) comprised cadets who won 1 fight, the least numerous (6 cadets, i.e. 15%) those who did not win any fight (Tables 1-3).

The result of military tests in the final exam in the last semester of 4-year studies was the criterion for HTHF skills (there are grounds to believe that cadets were optimally motivated). The test consisted in performing 3 tasks randomly selected for each cadet. Each task was assessed on a 4-degree scale from 2 (insufficient) to 5 (very good), according to a two-element criterion: compliance of the technique with the motor model and the dynamics of performance. The arithmetic mean of these assessments (rounded to this 4-degree scale) was the end result, and for the whole group it amounted to 3.93 (15% very good, 45% good, 40% sufficient). The diversity of 85% of cadets fell between the good and the sufficient levels. Therefore, one should expect that in each TG the distribution of winnings fights 2:2 should dominate (yet this relationship applies only to 20% of cadets and 21% of all scuffles fought). The probability of winning all fights (4:0) regards 2 or 6 people (significant is the separation factor of 6 cadets whose HTHF skills were evaluated at the level of very good, and the similarity of body weight can cause that 2 or even 5 could be included in the same TG). Meanwhile, the results of TFVP show otherwise. The level of training was very diverse. The efficiency measured in points amounted from 0 (all fights won) to 33 (all fights lost but not all scuffles – Table 1), while the S-Index from 16% to 80% (Table 3).

A comparison of the proportions of the levels of HTHF skill with the efficiency indices of TFVP clearly shows the reason for a lack of a statistically significant correlation between the results of the HTHF and TFVP tests (−0.240) [17]. This is empirical evidence that, based on TFVP indices, it is highly probable to accurately predict success in some combat sports, at least at the initial stage of training, as well as in self-defence.

A relationship between physical fitness and both methods of assessment of HTHF competence was revealed [17]. The mean rating (according to the military criteria) of the five tests of the final exam for cadets (back hip pull-over, 4x9m run, 200m obstacle run, 5000m run, 50m swimming) correlated at an average level ($r = 0.666$; $p<0.01$) with the HTHF test and poorly with the TFVP results (−0.320; $p<0.05$). This is an important empirical proof for the veracity of the premise that talent for combat sports and self-defence is relatively evenly distributed among people with high physical fitness and others.

Verification of the reliability of TFVP indices based on a sample of the female population – the correct version of TFVP

We examined 45 female cadets from the Military University of Technology (mean age of 23.3 years,

Table 4. The effectiveness of 45 female cadets during TVP 5-person TG.

Female cadets (n)	General indicators TFVP			Number of cadets winners of scuffles in relation [%] to opponents					
	won the fight [n]	won the fight [%]	F-Index criteria [%]	S-Index criteria [%]					
				absolute 100	very high 80-99	high 65-79	average 50-64	low 30-49	very low do 29
7	4	100	absolute 100	**1**	**4**	**1**	**1**		
10	3	75	high 65-79			**6**	**4**		
10	2	50	average 50-64				**3**	**7**	
11	1	25	very low up to 29					**10**	**1**
7	0	0	lack of efficacy					**1**	**6**

Table 5. The effectiveness of 38 female cadets during TVP 5-person TG who won at least one fight.

Female cadets	General indicators TFVP			The number of cadets and won by them fights in the proportion of scuffles:							
	won the fight		F-Index criteria	4 : 0		4: 1		4 : 2		4 : 3	
n	n	%	%	cadets	fights	cadets	fights	cadets	fights	cadets	fights
7	4	100	absolute 100	6	15	5	7	4	4	2	2
10	3	75	high 65-79	9	13	7	10	6	6	1	1
10	2	50	average 50-64	3	3	10	13	2	2	2	2
11	1	25	very low up to 29	2	2	3	3	4	4	2	2
38	Sum			20	33	25	33	16	16	7	7

Table 6. Differentiation (fights and scuffles) of the effectiveness of 45 female cadets during TVP 5-person TG.

Female cadets	General indicators TFVP			The number of:					S-Index [%]		
	won the fights		F-Index criteria	fights		scuffles					
n	n	%	%	won	los	won	los	sum	mean	min	max
7	4	100	absolute 100	28		112	23	135	83	64	100
10	3	75	high 65-79	30	10	131	65	196	67	61	72
10	2	50	average 50-64	20	20	97	105	202	48	40	55
11	1	25	very low up to 29	11	33	81	145	226	36	26	42
7	0	0	lack of efficacy		28	30	112	142	21	6	33
45	Sum			89	91	451	450	901			

mean body mass 58.04 kg, mean body height 167.4 cm). We applied the correct version of TFVP (*four sumo fights according to the simplified formula, in the system of "everybody with everybody else"*) based on general TFVP indices (winning fights; F-Index) and specific TFVP indices (winning and lost fights; winning, lost and the sum of scuffles; the S-Index). Female cadets conducted 89 fights (91 lost fights results from an odd number of experiment participants) in nine 5-person TGs.

The leader manifested the absolutely effective F-Index and S-Index (Table 4). The biggest variation of the S-Index (from absolute to average) concerned 7 female cadets who won all TFVP. The most numerous (n = 11) was the group with a lack of efficacy. In turn, the largest group of female cadets (n = 25) won in 33 fights with the scuffles ratio 4:1 (Table 5). A fewer number (n = 20) of female cadets who represented all levels of the F-Index (Table 5) also won 33 fights, but with the proportion of scuffles 4:0.

In seven TGs leaders won 4 fight each. In one TG two leaders won 3 fights each, while in another one the leader won 3 fights. This is important empirical evidence for the accuracy of TFVP. The circumstances (of which talent for combat sports and self-defence of individual combatants is the most important element, provided that they are similarly motivated) of a specific empirical system determine the diversity of results. In one TG three contestants won 2 fights each with the span of the S-Index from 40% to 55%; the leader won 3 fights (the S-Index 72%), the last contestant 1 fight (S-Index 39%). In this TG there was

Table 7. The main indicators characterizing the 31 male cadets who during a semester fought TFVP twice with four opponents randomly picked from among 7 defined weight categories as match and rematch.

Variable	Indicator	Weight category (kg) and indicator (M; min ÷ max)							
		55-60	61-65	66-70	71-75	76-80	81-85	86-90	91-96
Cardinality	n	2	2	8	9	6	3	-	1
Body mass	kg	**58.5** 58-59	**64.5** 64-65	**68.25** 66-70	**73.11** 71-75	77.33 76-80	**83.67** 82-85	-	96
Body height	cm	**170.5** 169-172	**172.5** 172-173	**177.38** 165-188	**176.67** 172-184	**181.17** 177-185	**186.33** 185-188	-	179
BMI	kg/m^2	**20.10** 19.93-20.28	**21.68** 21.4-21.96	**21.79** 18.98-23.07	**23.70** 21.55-24.51	**23.57** 22.96-24.28	**24.12** 23.23-24.85	-	26.89
IOCSPFT	average points	**56.6** 54-59	**53.3** 51-55	**51** 45.3-63.4	**53.5** 49.1-58.4	**57.2** 52.6-78.1	**52** 42.8-58.9	-	54.50
TFVP time	s	**57** 56-58	**62.5** 57-68	**57.13** 52-62	**65.33** 50-94	**48.33** 38-61	**58** 55-60	-	38
TFVP intensity	HR beats/min	**174** 174-174	**153** 144-162	**169** 156-177	170.22 144-186	**161.67** 142-172	**165.67** 155-187	-	172
F-Index	%	**50** 37.5-62.5	**31.25** 0-62.5	**29.69** 0-100	**47.22** 25-75	**68.75** 37.5-100	79.17 62.5-100	-	100
Spread body mass of opponents	kg	64-76	58-74	58-96	58-96	58-85	68-85	-	67-74

Legend: **M** arithmetic mean

also the smallest span of the S-Index 33% (72-39), while the greatest one 94% (100-6) in another TG. The slightest variation of the S-Index (11%) characterizes female cadets who won 3 fights (Table 6).

Specific applications of TFVP – premises and assumption (*VII.*, *VIII.*)

The sensitivity of TFVP indices to factors modifying the circumstances of fights within the framework of the method of multiple verification

Analysis was based on observation of 248 TFVP of 31 cadets from the Military University of Technology (mean age 20 years old, mean body mass 72.9 kg, mean body height 172.7 cm). During a semester the cadets fought TFVP twice with four opponents randomly picked from among 7 defined weight categories (no one qualified for the 86-90 kg category) as match and rematch (in total, everyone conducted 8 fights and at least 32 scuffles). The F-Index has been adopted as a criterion for TFVP reliability (Table 7).

Body mass, body height and BMI provide information on the somatic development. Evaluation of physical fitness has been based on the ICSPFT results (8 battery tests). The duration of fights was measured in seconds and the intensity in HRmin. This experiment was based on the assumption that during a non-sport confrontation (necessary self-defence, not destructive fighting with each other, when both parties deliberately seek confrontation) there is no division into weight categories, there is no time limit of fights (which does not exclude "time pressure" as an important factor in the given circumstances), and persons attacked by an aggressor are not required to have special preparation to HTHF, etc.

Six cadets, representing 19%, won in all TFVP – absolute efficiency of the F-Index. Three (65, 66, 68 kg) did not win any TFVP (lack of efficacy), and also three lost 2 fights and won 6 each – a high F-Index. Seven (23%) showed low efficiency; six average and very low efficiency each. 48% of the cadets won at least half of their fights, while in the most numerous weight categories (from 66 kg to 75 kg) the range of the F-Index was 0 to 100% (Table 8).

Out of 6 most efficient cadets, those coded A4 and A6 won the fastest (Table 9). Both dominated over their competitors in TG in body weight, while in terms of physical fitness (sum of ICSPFT points) they

Table 8. F-Index 31 male cadets who during a semester fought TFVP twice with four opponents randomly picked from among 7 defined weight categories as match and rematch.

F-Index	Weight category (kg) and cardinality(n)							Sum	
	55-60	61-65	66-70	71-75	76-80	81-85	91-96		
%	2	2	8	9	6	3	1	n	%
absolute 100			1		3	1	1	6	19
high 80-99									
high 65-79				2		1		3	10
average 50-64	1	1		3		1		6	19
low 30-49	1		1	2	3			7	23
very low up to 29			4	2				6	19
lack of efficacy		1	2					3	10

Table 9. The main indicators characterizing 6 out of 31 male cadets who during a semester fought TFVP twice with four opponents randomly picked from among 7 defined weight categories as match and rematch and won all 8 TFVP.

Code cadet	Somatic indicators			Weight categories opponents	ICSPFT (average points)	Effort characteristic (average)	
	body mass (kg)	body height (cm)	BMI			time (s)	intensity (HR beats/min)
A1	68	165	25	55-60kg 2x 61-65kg 71-75kg	63.37	75	156
A2	76	180	23.46	55-60kg 66-70kg 2 x 71-75kg	52.62	55	159
A3	76	180	23.46	2 x 66-70kg 2 x 71-75kg	59.87	43	142
A4	80	183	23.88	2 x 66-70kg 2x 71-75kg	54.25	38	172
A5	85	185	24.85	2 x 66-70kg 76-80kg 81-85kg	58.87	59	155
A6	96	189	26.89	2 x 66-70kg 71-75kg 76-80kg	54.50	38	172

exceeded 20 cadets in the whole experimental group. However, they belonged to 13 cadets who tolerated this specific physical effort the worst (HR ≥172).

A lot of peculiar events give a basis for an in-depth analysis (a case study) and provide unique arguments about the TFVP reliability. Out of 31 experiment participants, 14 (45%) fought 22 pairs of match and rematch. That means that out of 44 TFVP (18% of all observed) they won one and lost the other one against opponents different in body mass from 4 kg to 18 kg (rarely with the same body mass). Therefore, cadets with a smaller body mass experienced satisfaction and a sense of self-confidence, while those with a larger mass – a lesson of

Table 10. Indicators statistically significantly correlated with the F-Index (8 TFVP) fought by male cadets (n = 31) significantly different body mass and physical fitness.

Somatic indicators		Physical fitness		
Body mass	BMI	ICSPFT	Standing broad jump	Sit ups
0.525***	0.538***	0.430**	0.378*	0.438**

*p<0.05 **p<0.02 ***p<0.01

Table 11. Coefficients of correlation between indicators TFVP and physical fitness or body mass military cadets (n = 33).

Variable	Indicators TFVP			
	NV	RPT	F-Index	S-Index
	raw score			
Body mass (kg)	0.719**	–0.720**	0.711**	0.707**
Physical fitness (ICSPFT: points)	0.441*	–0.431*	0.415*	0.438*
	ranking position			
Body mass	0.691*	0.691**	0.687**	0.607**
Physical fitness	0.435*	0.435*	0.424*	0.570**

* p<0.05; ** p<0.01;

humility. The most efficient subject (80 kg, 185 cm) in terms of physical fitness (average ICSPFT 78.1 points) won only 3 (37.5%) out of 8 TFVP – two opponents from the 66-70 kg category and the third one weighing 76 kg (he lost twice to an opponent with a weight of 84 kg). The least efficient (42.75 points) but stout cadet (82 kg, 188) won 37.5% of TFVP. He fought against opponents lighter by 6, 8, and 14 kg, and he lost one fight with each of them. The cadet who did not performed a single pull-up (45.25 points, 70 kg, 180 cm) won 3 (37.5%) TFVP against opponents weighing 70, 74, and 76 kg (he also lost with each of them).

Therefore, extensive empirical evidence confirms, on the one hand, the sensitivity of TFVP indices to modifying factors; and on the other hand, that an individual factor which is the actual background of talent for HTHF is difficult to be clearly identified solely on the basis of motoric and somatic indicators. This conclusion is confirmed by only few correlations between indicators of these variables and the F-Index (Table 10). The coefficients of determination ranging from 14% to 30% prove that the essence of talent for combat sports and self-defence are explained by factors yet unidentified and constitute approximately 70-85% of the variance.

Experiment with an increased number of TFVP – military cadets

We verified the sensitivity of TFVP indices in the circumstances of an increased number of fights "everybody with everybody else" to entire several-person groups randomly selected out of the previously made administrative division according to criteria unrelated to the experiment. A group of 33 male cadets Military University of Technology in Warsaw, were studied. They formed two teams (platoons), counting 15 and 18 subjects. Their age ranged from 19 to 21 years and body mass from 58 to 96 kg. Maximum within-team differences in body mass were 26 and 29 kg. Every cadet had 14 or 17 TFVP during the first semester (105 on the team "A" and 153 in a team "B"). The last contest was always performed by the lightest and heaviest subjects in given team. Thus, every cadet had 2-3 TFVP during PE classes every week of the first academic semester. Four indices were computed to assess the overall contest performance: number of victories (NV), ranking position in team (RPT), F-Index and S-Index. Physical fitness was measured

Table 12. Coefficients of correlation between indicators TFVP and physical fitness or body mass 11-year-old girls (n = 16) – raw score.

Variable (raw score)	Indicators TFVP (raw score)			
	NV	RPT	F-Index	S-Index
Body mass (kg)	**0.860****	**–0.867****	**0.860****	**0.860****
Physical fitness (3 tests ICSPFT: points)	0.037	–0.048	0.035	0.047
standing broad jump (pts)	0.136	–0.181	0.135	0.178
bent arm hang (pts)	–0.016	0.016	–0.019	0.015
sit ups (pts)	0.180	–0.172	0.182	0.167

Table 13. Coefficients of correlation between indicators TFVP and physical fitness or body mass 11-year-old girls (n = 16) – ranked position indicators (RPT).

Variable (ranking position)	Indicators TFVP (ranking position)			
	NV	RPT	F-Index	S-Index
Body mass	**0.868****	**0.868****	**0.879****	**0.837****
Physical fitness (3 tests ICSPFT)	–0.027	0.044	–0.005	0.038
standing broad jump	–0.013	0.054	0.029	0.180
bent arm hang	0.104	–0.102	–0.143	–0.112
sit ups	–0.264	0.249	0.232	0.259

** p<0.01

ICSPFT (8 battery tests).

The 48-50% coefficients of determination between TFVP and body mass testify to the upper limit of an average correlation ($p<0.01$). The correlation of the TFVP indices with physical fitness is statistically significant ($p<0.05$), but lower (R^2 between 17-19%) (Table 11).

Experiment with an increased number of TFVP – eleven girls

In an experiment repeated on a 16-person class of 11-year-old girls from a rural primary school in Poland we also applied ranked position indicators (RPT) of each of the observable variables [24]. Thus correlations refer to the raw score and after converting to RPT. Physical fitness was measured by 3 ICSPFT tests (standing broad jump, bent arm hang, sit ups).

In contrast to adult men, among girls (Tables 12, 13) a statistically significant ($p<0.01$), very high correlation takes place only between TFVP indices and body mass (R^2 = 74-75% for the raw score and 70-77% for RPT for the body mass). The ranking of observable variables proved to be a very useful research tool. With 120 TFVP fought, none of the girls was classified at the same RPT. With two identical F-Indices, a higher value of the S-Index determined higher RPT. These three-level criteria meant that there were 14 RPT for the F-Index and 15 for the S-Index. There was a high diversity of body mass, ICSPFT and standing broad jump (14 RPT). The girls were the least differentiated by bent arm hang and sit-ups tests (10 and 6 RPT, respectively). Therefore, TFVP indices better inform about young girls' motor skills than simple motor tests.

RPT leader won all TFVP and 81% (the most) scuffles. She was the heaviest (60 kg) but only 11 in the ranking of physical fitness (in the ranking of individual tests: 10, 10, 4). The last one in RPT failed to win any TFVP and only 8 scuffles (S-Index 12%, also the

last position). 0.66 points (raw score) decided about a lower position in the ICSPFT ranking (12) behind the leader (11). She was also ranked in the last position (along with 5 girls) on the basis of the bent arm hang test result. She was inferior to the leader in body weight as much as by 42%. However, the last girl in the ranking of body mass (30 kg) was inferior to the leader exactly by 50%, but she was second in the ICSPFT ranking, 14 in RPT, 13 in the F-Index (13%) and 13 in the S-Index (31.6%). The leader in the ICSPFT ranking (38 kg): 10 in body mass; 7 in RPT; 7 in the F-Index (13%) and 5 in the S-Index (57.7%).

Chodała's experiment – a comparison of two methods of military training (premises, assumptions, hypothesis, verification)

It has been proved above that people not only inferior to the opponent in terms of motor abilities, but also in body mass are able to defeat him/her during a hand-to-hand fight in a vertical posture, if they are talented enough for this type of only seemingly motor activity. In such HTHF circumstances (leaving aside all others) it is probably difficult to defeat an opponent without optimally implementing one's own intellectual potential and self-control of emotions.

Two assumptions should not arouse controversy: (1) any talent is a gradable phenomenon, not a binary one, but appropriate training is a prerequisite for its development; (2) in many areas of motoricity (swimming, tennis, skiing, shooting, etc.), including HTHF, those succeed in a direct one against one confrontation (providing there is a similarity of basic characteristics: age, sex, general physical fitness, etc.) who will develop the necessary skills through training (one cannot win in a swimming competition not knowing how to swim, etc.).

Therefore, the zero hypothesis says that all TFVP with same-sex opponents, of a similar age, body mass, the level of physical fitness, etc. will be won by those who complete many months of HTHF training. An alternative hypothesis says: many-month HTHF training only partially will compensate for the lack of talent for this kind of activity, and since during TFVP only extremely mild methods and measures are allowed, at least some of these fights will be won by persons not participating in equally intense specialist training.

In a two-semester experiment (41 micro cycles a week), Chodała [25] studied four training groups of male cadets of the Military University of Technology in Warsaw (n = 68). Half were randomly classified to the experimental group (EG), and half to the control one (CG). In the final analysis the results of 24 cadets from EG and 24 from CG were taken into account (reason: long-term sick leave, dropping out being expelled from the college, changing the course of study after the first semester, etc.). Cadets from EG (mean age 19.8 years old, weight 72.8 kg, body height 178.2 cm) realized the author's own syllabus of Physical Education aiming to intensify HTHF activities enriched with elements of combat sports. The syllabus did not err in the overall structure of the system of physical education of cadets, but it rather related to modification of its content. All cadets participated in two 80-minute classes of Physical Education per week, 30-minute morning warm-up (except on Sundays and public holidays), and since the second semester once a week in 90-minute optional classes of students' activation. The modification of the HTHF block theme meant inclusion of these elements during exercises with obstacles, safe fall exercise from gymnastic vaults, and besides all cadets EG fought 2-3 TFVP a week during the first semester and 2-3 TFHP (testing fights in a horizontal posture) during the second semester and learned elements of combat sports (judo, karate, wrestling, unifight).

Cadets of the CG (beside the content of HTHF training) were not statistically significantly different in terms of arithmetic means (19.7 years), weight (73.4 kg) and height (179.3 cm). However, the effect of the experiment also translated into improvement in physical fitness to a greater extent among cadets of EG (after the experiment they exceeded cadets from CG in speed $p<0.001$, coordination of $p<0.01$, efficiency in the obstacle run $p<0.01$ and muscle strength $p<0.05$). This higher effect of physical adaptation to effort somehow strengthened the efficiency of cadets from CG during HTHF [25].

The greatest adaptation effects, as expected, concerned the results of TFVP (fought as part of "defence biathlon"). TFVP were fought in 6 TG (by 4 cadets from EG and 4 from CG, and the difference in body mass occasionally amounted to 3 kg). Each representative of EG fought with four opponents from CG and vice versa (Figure 1). However, this result primarily positively verifies the alternative hypothesis (Figure 2). All TFVP were won by 12 (exactly half) cadets from EG, and simultaneously none of them lost

all of them. All TFVP were lost by 14 (58%) cadets from CG. All TFVP were won by only one cadet from CG and, in consistence with the assumption that talent is gradable and because he defeated four opponents specially prepared for 41 weeks to HTHF, this is very important empirical evidence that in a population of male cadets from the Military University of Technology in Warsaw he stands out with the greatest talent for combat sports and self-defence. It is also a very important empirical proof that TFVP is the appropriate tool to reveal this kind of talent.

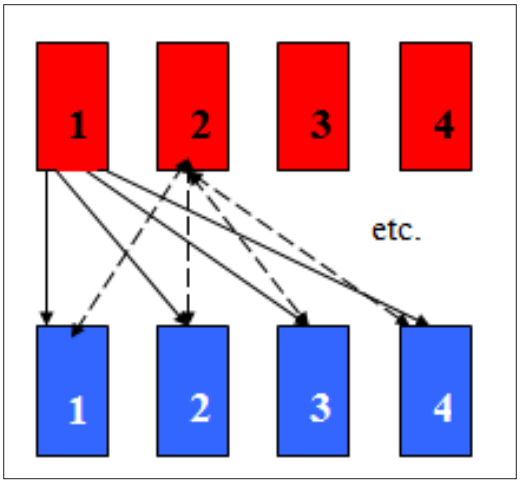

Figure 1. Way of organizing 6 TG military cadets (each representative of EG fought with four opponents from CG and vice versa) [25].

Very high correlation of two types of testing fights (TFVP and TFHP)

Two teams of male cadets (n = 33) who participated in the experiment with an increased number of TFVP during the second semester conducted "testing fights in a horizontal posture" (TFHP) according to the same rules. However, just three successful scuffles on a judo (or wrestling) mat without a specially designated area were enough to win.

The condition for applying TFHP is a rudimentary preparation to a judo fight, wrestling, etc. in a horizontal posture. Any scuffle is to show advantage according to the judo criteria: joint lock (*kansetsu waza*), choking (*shime waza*), grappling (*katame waza*) for 20 seconds. Before the beginning of each scuffle the subjects sit on a mat touching with their backs (long sitting) and keeping their both fists on the floor. On the commands "ready" and "go" they start a fight in a horizontal posture (the vertical posture is not allowed during the combat; only different forms of kneeling are permitted). After deciding on the result of each scuffle or in situations of lack of decision (e.g. blocking each other's moves for about 5 seconds), the scuffle must be resumed. After each interrupted scuffle, the fight should be immediately resumed (the criterion of equal opportunities in relation to the time to think before the

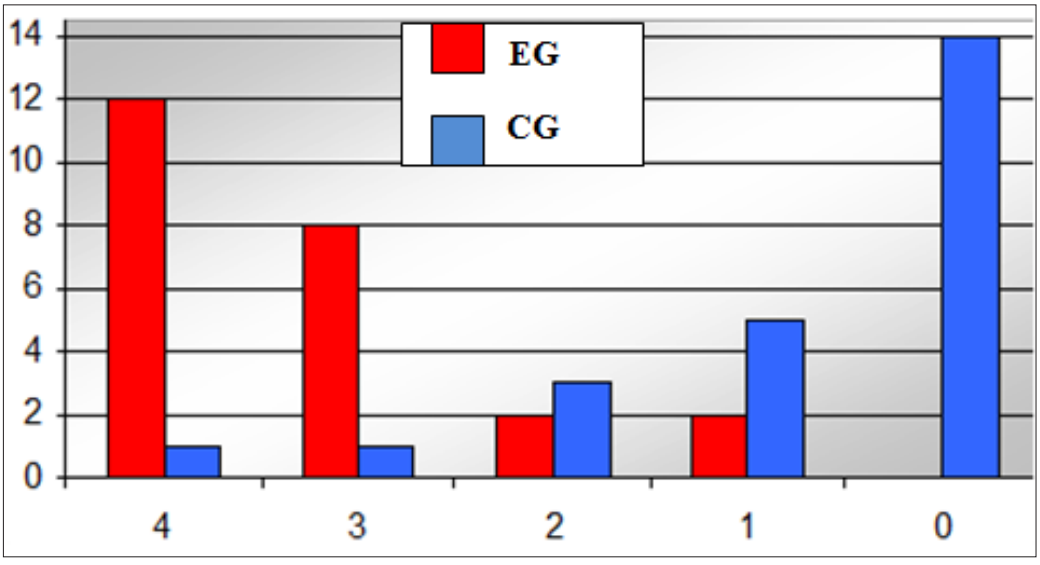

Figure 2. Won TFVP by military cadets experimental group (n = 24) and the control group (n = 24) during Chodała's experiment [25].

Table. 14. Correlation between indicators of TFVP and TFHP 33 military cadets [29].

Indicators	Indicators of fighting effectiveness							
	TFHP				TFVP			
	NV	RPT	F-Index	S-Index	NV	RPT	F-Index	S-Index
	1	2	3	4	5	6	7	8
1	x							
2	–0.970	x						
3	0.980	–0.991	x					
4	0.958	–0.957	0.974	x				
5	**0.892**	–0.878	0.874	0.867	x			
6	**–0.846**	**0.869**	–0.870	–0.869	–0.969	x		
7	**0.869**	**–0.895**	**0.889**	0.879	0.981	–0.990	x	
8	**0.854**	**0.876**	**0.869**	**0.876**	0.958	–0.967	0.972	x

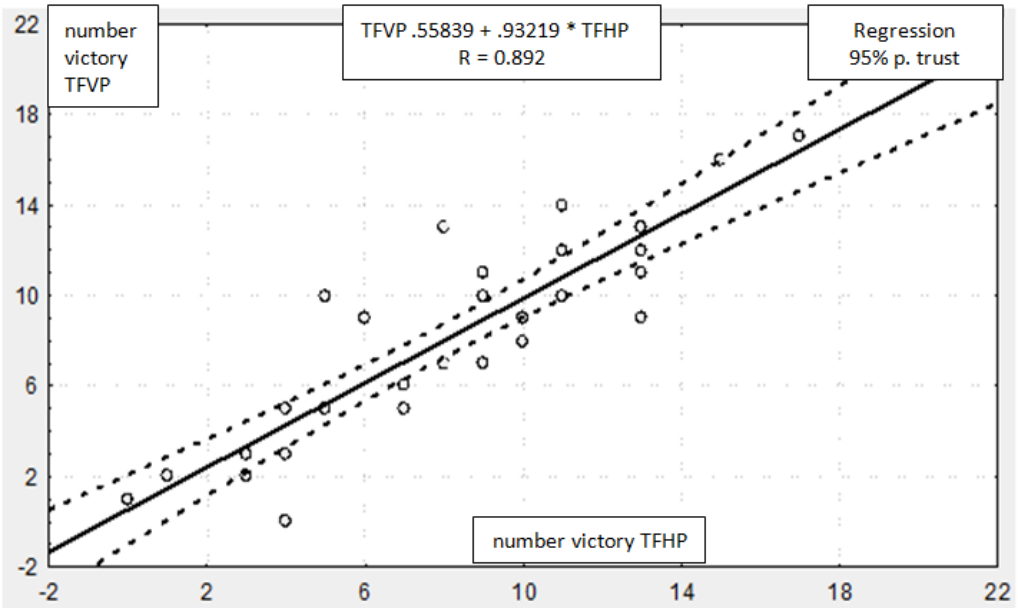

Figure 3. Correlation (r = 0.892, R^2 = 80%) between the number of victories in TFVP and TFHP 33 military cadets [29].

next scuffles). Breaks between fights of specific people come from fighting in TG and their duration; however, they must not be shorter than 1 minute.

There is a very high correlation (r = 0.892, R^2 = 80%) between the number of victories in TFVP and TFHP (Figure 3). Also other indicators very highly correlate: R^2 = 75% to 79% (Table 14). In fact, this high correlation concerns HTHF but conducted in different motor and biomechanical conditions. During TFVP one of the most important elements of success is the ability to maintain one's body balance and putting the opponent out of it with very simple means (there is a lack of a balance test in ICSPFT). In TFHP the conditions of keeping the body balance significantly change, and a possibility to apply sophisticated means of restraining the opponent's movements appears. Strength, agility, and flexibility seem to play a significant role (it is the accuracy of tests assessing these characteristics in relation to a fight in a horizontal posture that

constitute the problem). The proof lies in the dissimilarity of the correlation of results of the sum of 8 ICSPFT tests with TFHP indices – they significantly correlate only with body mass, and the raw score with the indicators revealing greater muscle strength (R^2 = 50% to 56%) than TFVP (Table 14).

Since there is a lack of similarity between these relationships and TFVP indices, human talent for HTHF is the strongest factor in determining efficiency in both types of activity.

Observations of TFVP "one against one" as a single empirical system

Many years of Wojciech Niedomagała's [26] observations provided tentatively verified scientific argumentation that talent for fights in a vertical posture is spread relatively evenly among people who in specific competitive pairs won with opponents who surpassed their levels of physical fitness (or additional body mass) and vice versa – who were inferior in these characteristics. The advantage of these single empirical systems is elimination of factors of learning both by multiple observation of opponents (especially from five-person or more numerous TGs) and by direct experience of fighting with each of them. However, the more the difference in body mass increases, the proportion of people who win with nominally physically fitter competitor decreases. At a difference of 1 kg body mass, 44% of people with a lower ICSPFT result win, and respectively: a difference of 3 kg (39%) and of 5 kg (33%). These data are supported by the distribution of chi-square (c^2) and the convergence index C based on this distribution: c^2 for 1 kg of difference is 0.217; for 3 kg 6.564 ($p<0.05$), for 5 kg 9.149 ($p<0.01$), while C respectively amounts to: 0.036; 0.201; 0.336.

A greater difference in body weight of a defeated opponent starts to be compensated by a greater motor potential of winners of TFVP "one against one". Talent itself combined with intellectual and mental component is not enough. This is an explanatory hypothesis, as it is difficult to indicate any sensible background. Thus when in such an empirical system (only observation of TFVP "one against one" and successively against several opponents), a person with definitely higher body mass and with higher physical fitness indicators wins, a conclusion that he/she lacks in the talent we are talking about would be invalid. In the next step of the diagnosis (provided that the opponent would have experience of only one TFVP) one would need to know the result of a fight in a reversed situation, when he would be surpassed by the opponent in body mass and physical fitness. With each repetition of the formula only "one against one," creating pairs of people who have previously conducted the same number of TFVP is an important methodological criterion. This undoubtedly big organisational nuisance coincides with another methodological challenge – defining the scale of diversification of the level of physical fitness starting with which there is a very high probability of winning by a competitor with a difference in body mass not exceeding 1 kg, but with a higher result of the test or the sum of tests.

Discussion

TFVP and TFHP are not the first tools of selecting candidates to combat sport in a synthetic way. Jerzy Wężowski [27] already in the 1970s empirically demonstrated that "a test of fencing fight" ensures high prediction and should be the basic criterion for the selection of candidates for fencing. He conducted two experiments. The first one aimed to identify characteristics of significant prediction for fencing; the second one to find psychomotor properties essential to a fencing fight. After 20 minutes' lecture, "the test of fencing fight" consisted in a tournament "each against each" until one hit. In the first experiment, no characteristics with significant prediction for the fencing technique was found. During the second experiment the method was based on a correct randomization (155 boys aged 11.5 years were divided into 5 groups, 31 subjects each), and the homogeneity of the groups was ensured by a proportional selection of persons with identical or similar ranking points in the following characteristics: the level of agility and speed according to Denisiuk's test [28], the test result of Johnson's aptitude test and a test of intelligence. In each competitive group a similar number of boys (7 to 9) met the eligibility criterion for further training, i.e. they won at least 16 of 30 fights. Out of 12 correlated psychomotor characteristics, the result of Brace's motor skills test as well as agility (r = 0.339) and speed (r = 0.297) were connected the strongest with the result of this qualifying tournament (r = 0.353, which is merely 12.5% of the determination rate) – the results regard 155 candidates for fencing. These correlations relating to boys already qualified for fencing (n = 40) are only slightly higher in two cases: agility (r = 0.349; R^2 = 12.18%) and speed (r = 0.331; R^2 = 10.95%). However, there are no empirical data as to whether leaders of those "tests of the fencing fight" achieved the greatest sport successes in the future in comparison to the other participants in the experiment.

TFVP used by us in various empirical systems (examining children, adolescents and adults) proved the veracity of the hypothesis saying that exceeding competitors in physical fitness is not a prerequisite for beating them in a certain competitive system [29]. Among 11-year-old boys (n = 22) the correlation of the so-called ranking position of combat efficiency and correspondingly physical fitness measured in four ICSPFT attempts [24] in 6 TGs (from 3 to 5 people each) amounted to 0.454 ($p<0.05$). This means that there is only 20.61% probability that a person with a relatively higher physical fitness index measured by means of the recommended tests might be a winner in a given group. Among boys of different ages, from 7 to 13 years old (n = 21), with the age difference in only one competitive group of 4 years and in the remaining ones of 2 or 3 years, the correlation of both variables is higher ($r = 0.653$; $p<0.01$), $R^2 = 42.64\%$. A logical explanation lies in the impact of the factor of progressive morphofunctional development in older boys. We found no significant correlation between these variables both in the case of 115 Lithuanian security staff ($r = 0.122$) and in 33 male cadets ($r = -0.190$). In studies of cadets from the Military University of Technology physical fitness was diagnosed by the whole set of 8 ICSPFT attempts. By contrast, we found a high correlation ($r = 0.892$) of TFVP with TFHP (based on a judo formula – *ne waza*). TFHP results are negatively correlated ($r = -0.435$; $R^2 = 18.92\%$) with the level of physical fitness. That is a further proof that the victory in a fight in a horizontal posture does not have to be determined by higher physical fitness, nor by higher body weight (for TFVP $r = -0.711$ ($p<0.001$), for TFHP $r = -0.691$ ($p<0.001$)). Therefore, the high correlation between efficiency of both types of test fights is empirical evidence of the primacy of talent for fights of direct confrontation over generally estimated morphofunctional traits.

Our observations are confirmed by an experiment by Sertić et al. [30] based on basic assumptions of the tests described in the previous paragraph. Researchers identified physical fitness of 122 students (aged 19-21 years old) who began practising judo only at college by a battery of 15 tests. Combat efficiency was measured by the number of victories in three-minute test judo fights (a maximum of 5) in the vertical posture (*tachi waza*) and the number of the so-called technical points. A statistically significant correlation of variables identifying the actual motor potential with the criterion of achievements in fight remains, however, unclear. Multiple correlation coefficients of the motor potential indices are statistically significant and almost equal to the number of victories ($r = 0.38$) and to the sum of technical points ($r = 0.40$). Thus they explain about 15% of the common variance. Of the five individual dimensions, only two – flexibility and ability to perform complex motor tasks that require explosive speed – had a statistically significant individual contribution to explaining the variance of the combat efficiency measured by the number of victories.

TFVP used in some experiments constituting the substantive basis for a PhD dissertation confirm most of the observation results presented in this paper. Chodała [25] also provided relevant empirical arguments proving the TFVP accuracy. TFVP result (as the 2nd prototype of TFVP; the second DB task) in male cadets of the experimental group is statistically significantly correlated with only 2 out of 17 indicators (9 ICSPFT in this sum test; 2 military fitness tests; 4 basic self-defence skills test – BSDST; 2 DB results and the first task): $r = -0.472$, $p<0.05$ with G3 (defence against holds, strangling and hits) BSDST; $r = 0.456$, $p<0.05$ with DB results. The result of TFVP for cadets in the control group is statistically significantly correlated with 8 out of 14 (a system of tests decreased by: G2, G3 and BSDST results): from $r = 0.418$, $p<0.05$ to $r = 0.872$, $p<0.01$. In the control group TFVP were won by physically fitter cadets. In the experimental group cadets who were the most talented to combat sports and self-defence dominated. In a sense motor similarity, G3 BSDST is correlated with TFVP, which, on the one hand, is explained by a significant negative correlation of both indicators (-0.472, as a smaller number of points in the 2nd prototype TFVP shows higher effectiveness), and on the other hand, by an average correlation of TFVP with DB results (0.456). 8 indicators for cadets of the control group significantly correlated with TFVP are empirical proof that those physically fitter presented greater resistance during TFVP with the experimental group.

Examining 265 policemen (mean age 27.6 years) and 55 policewomen (mean age 25.2 years), Danuta Bukowiecka [31] found a statistically significant low and average correlation of the F-Index and the S-Index with ICSPFT (except for the hand grip test and for policewomen also bent arm hang). After an experiment involving 23 female students aged 21.17 years (66 workouts twice a week, each session of 60 minutes, the total of 3,960 minutes that relied on a combination of modern gymnastic-dance forms

with self-defence exercise), Syska [32] checked for the essential adaptive effects by associating TFVP results with EUROFIT [33], "Rotational Test" [34] and BSDST results [35]. The following are statistically significantly correlated with the F-Index: plate tapping 0.364, $p<0.05$; sit and reach 0.485, $p<0.01$; standing broad jump 0.453, $p<0.05$; sit-ups 0.496, $p<0.01$; bent arm hang 0.415, $p<0.05$; and with the S-Index (all $p<0.05$): sit and reach 0.355; standing broad jump 0.391; sit-ups 0.426; bent arm hang 0.403.

In Syska's experiment [32] correlations between the F-Index and the S-Index with BSDST results are more expressive than in Chodała's [25] experiment (respectively: 0.515, 0.588 $p<0.01$); G2 (0.453, $p<0.05$; 0.596, $p<0.01$); G3 (0.519, 0.637, $p<0.01$). Neither the result of the "Rotational Test" nor of the flamingo balance test correlates with TFVP indicators (in the ICSPFT structure there is no balance test [36]). Therefore, there are grounds to claim that those participants (regardless of gender) in TFVP with many competitors tolerate imbalance caused by opponents' offensive actions who have at least high F-Index and S-Index. It is obvious that a high ability to tolerate this kind of imbalance during TFVP is an essential component of talent for fights in a vertical posture merged in about 85% of unexplained variance (as mentioned above). Since the correlation of recommended static and dynamic balance [34, 37] tests is low (or there is lack thereof), a lack of correlation between the "Rotational Test" and the flamingo balance test with the F-Index and the S-Index is unsurprising. The results of our research on the correlations of the "Rotational Test" with the results of simulation of firefighters' rescue tasks [38] also support such an interpretation of the phenomenon.

Dadeło [39] correlated results of the "Rotational Test" of 118 male guards from Lithuanian UAB "Falck Security" with the S-Index and with 7 leading factors, i.e. generalised indicators: endurance, speed, strength, power, agility, flexibility, morphological characteristics. A statistically significant relationship only occurs with standing broad jump as a test of power (0.350, $p<0.001$). The S-Index, on the other hand, correlates with strength (0.240, $p<0.05$), agility (0.220, $p<0.05$) and morphological characteristics. In addition, Dadeło [39] correlated the S-Index with six generalised indicators of empirical variables, and all of them proved to be statistically significant ($p<0.01$): physical fitness (0.300); superior's evaluation (0.300); professional activity (0.270); morphological characteristics (0.240); theoretical and practical preparation (0.210); mental traits (0.210). Superior's evaluation was more correlated only with professional activity (0.530) and with morphological characteristics (0.390, $p<0.001$), while this evaluation has no relation with mental traits (0.100) and physical fitness (−0.060). Physical fitness proved to be the only variable entering relevant interactions exclusively with one of the remaining empirical variables (the S-Index, as shown above).

This unique research by Stanisław Dadeło provides convincing evidence about the relationship of the intellectual and mental sphere with talent for fights in a vertical posture, which is difficult to identify on the basis of the recommended laboratory tests of an analytical type by correlating the results of each test with another. Furthermore, the guards' superiors had no knowledge of the test results used in the experiment, and they based their subjective evaluation mainly on long-term observation of their professional activities. It turned out that the better assessed guards stood out with high values of the F-Index and the S-Index (often beating opponents of higher body mass and physical fitness). Therefore, it is legitimate to state that intelligence is a basis for efficient action during TFVP and other professional activities associated with high responsibility for people and property. Dadeło rightly concludes that the S-Index should be recommend as one of the basic criteria of guards' competence [39, p. 78].

Staying in line with this reasoning, the importance of intelligence as a significant component of talent for fights in a vertical posture should be emphasized, even if synthetically revealed only in the course of such a simple TFVP. It is hard to explain (not using the word "talent") the basic cause of the victory in all TFVP by military cadet from the control group with four opponents (with each during the two sessions) who learned HTHF for 41 weeks (Chodała's main experiment [25] described above). The legitimacy of such conclusions is also confirmed by the results of Andrzej Tomczak's experiment [40], who applied TFVP as the third task "survival multi-discipline events" as a multidimensional psychomotor test competence in the field of survival. First: 800-metre run ending with shooting; second: team paintball fight (team against team) [40, 41]. Six teams of 4 people each competed: professional anti-terrorists, cadets from the Military University of Technology (members of Chodała's EG [25]), air force cadets, 3 teams consisting of cadets of land forces. Each participant fought 5 TFVP in accordance with the

principle: the lightest of the team with the lightest of each team, etc. The efficiency of cadets from the Military University of Technology and anti-terrorists, the most intensely trained in HTHF, did not prove to be absolute. This competition was won by the cadets: the F-Index 100%, 100%, 80%, 80%; the S-Index: 78.94%, 78.94%, 77%, 68.42%, respectively. Anti-terrorists took second place: the F-Index 100%, 80%, 40%, 0%; the S-Index: 78.94% 72.22% 40.74%, 16.66%. The most efficient cadet of air forces: the F-Index 80%; the S-Index 66% and the cadet of land forces: F-Index 80%; S-Index 60%.

During no experiment and using TFVP in the PE lessons and sports training of children and adults for over 30 years, there was any damage to the body. Therefore, TFVP is not only an attractive fun form of martial arts [42-44], but it can also be used in sport for all, self-defence training, the formation of defence (military, terrorists, police, guards, etc.) [21-23, 25, 32, 35, 39-42, 45, 46]. TFVP can also be used as a specific test of *self-defence skills* in the context of measuring *the profile of a sense of positive health and survival abilities (SPHSA) – D dimension* [47, 48], in diagnosing aggressiveness, and as a means of reducing this adverse trait [43, 44]. TFVP can be used either in the version of a non-apparatus test or in a quasi-apparatus one [49]. Accumulated knowledge of applications of TFVP and TFHP enriches the dynamically developing since 2015 *agonology* (science about struggle) in the prophylactic and therapeutic dimension [50-52].

Conclusions

The secondary validation procedure provides extensive empirical arguments that TFVP meets methodological criteria of a reliability and accuracy tool. The final argument for acknowledging that TFVP measures talent for fights in a vertical posture will be a positive verification of the hypothesis confirming the prognosticism of TFVP results: people who win in TFVP are also successful in combat sports in the long run, when to some extent the effects of professional training can compensate for the shortage of talent. This hypothesis is a consequence of, on the one hand, initially adopted premises and assumption in paragraph (***ix***.), and on the other hand, of a synthesis of the experimental data analysed in the previous part [1] and in this paper.

Competing interests

The authors declare that they have no competing interests.

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