

# Testing fights in a vertical posture of 11-year-old schoolgirls in round robin system as an example of complementary health and survival education in a modern school

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## Authors' Contribution:

- A Study Design
- B Data Collection
- C Statistical Analysis
- D Manuscript Preparation
- E Funds Collection

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**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 [15, p. 231])

**Violence (in the praxeological sense)** – physical pressure (physical force) or the application of chemical, electrical stimuli, etc., which causes the subject of action to be flung into a situation undesirable by him and becomes the object of someone's action [61].

**Budo (Budō)** – originally a term denoting the "Way of the warrior", it is now used as a collective appellation for modern martial arts of kendō, jūdō, kyūdo and so on. The primary objective of these 'martial ways' is selfperfection (ningen-kesei) [62].

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## Abstract:

**Background and Study Aim:** Self-defence, in spite of its momentous links with personal security, quality of life and public health, is a phenomenon insufficiently explored by science, especially in complementary terms. These three aspects of linkages do not exhaust knowledge about self-defence precisely because of the complementarity factor. The aim of this paper is to argue, based on empirical evidence, for the necessity of the complementary use of self-defence exercises in the education of young people as early as possible in ontogeny.

**Material and Methods:** The author imitatively analyses unique, unpublished research findings from Jarosław Szajerski's diploma thesis on testing fights in a vertical posture (TFVP) of eleven-year-old girls ( $n = 16$ ) in round robin system during a cycle of physical education classes. The result of TFVP (type non-apparatus test) is conventional criterion of talent for combat sports and self-defence. Each TFVP ends with one of the participants winning 4 scuffles based on a simplified sumo formula (the possible result is in the proportions of won scuffle from 4:0 to 4:3). Effectiveness was measured by two indices: F-Index (proportion of fights won) and S-Index (proportion of scuffles won). Muscle strength was measured by four indices: total score (Index MS) and each of the three trials (standing broad jump, bent arm hand, sit ups) of the International Physical Fitness Test. Somatic potential by three indicators: body height, body mass, BMI. The individual profiles taking into account the nine indicators were based on the principle of comparing the proportion of the score to the highest leader value of each indicator.

**Results:** The result of the post-hot reveals four factions: A-1 female leader who won all TFVPs (F-Index = 100%), but not all scuffles (S-Index 81%); B faction female students who won more than half of the TFVPs ( $n = 8$ ) – individual codes B-1 to H-8; C female students who won less than half of the TFVPs ( $n = 8$ ) – individual codes I-8 to O-13; P-14 female student who did not win a single TFVP. Leader A-1 dominated with the highest scores of 5 indices: F-Index, S-Index, body height, body mass, BMI. The physically strongest student (G-7) 2 indices: Index MS and trial 'sit ups', The farthest jumped was by student F-6 and the longest continued 'bent arm hang' was by student N-13, at the same time with the lowest body mass (30 kg) and the lowest BMI (14.07). The TFVP performance indices show the highest correlation (near-perfect:  $r = 0.974$ ,  $p < 0.01$ ). None of the muscle strength indicators show statistically significant correlations with TFVP performance indicators, nor with body composition indicators. However, none of the body composition indices used is stable in terms of predicting the effectiveness of the TFVP.

**Conclusions:** During mild hand-to-hand-combat measures, the greater likelihood of successful self-defence against physical aggression by female peers should be linked to the somatic potential of eleven-year-old girls identified with BMI. However, the determining factor for success in most such interpersonal confrontations will be the predisposition to combat sports and self-defence,

**INNOAGON (Innovative Agonology)** – is an applied science dedicated to promotion, prevention, and therapy related to all dimensions of health and the optimization of activities that increase the ability to survive (from micro to macro scales) [42].

i.e. traits strongly determined by the mental sphere of personality (courage, will to fight, bravery, or, more generally, a predisposition for hand-to-hand combat i.e. traits strongly determined by the mental sphere of personality (courage, will to fight, bravery, self-esteem, intelligence, etc.). If TFVP were widely used in physical education practice, the results of such observations would be a good predictor of necessary interventions to strengthen the defensive potential (personal safety) of students with the lowest F-Index and S-Index.

**Keywords:** aggressions, INNOAGON, preventive medicine, self-defence, violence

## 1. Introduction

Self-defence, despite its significant links to personal safety, quality of life and public health, is a phenomenon that has not been sufficiently explored by science, particularly from a complementary perspective. These three aspects of the connections do not exhaust our understanding of self-defence precisely because of this factor of complementarity.

There are at least two reasons underlying the fundamental premises of this study outlined above. Firstly, since 1902, the term ‘self-defence’ has been used in the titles of publications even in highly unrelated academic disciplines that have no connection with human motor activity aimed at repelling physical aggression [1]. Thus, there is no basis for assuming that these publications (apart from a small proportion specifically dedicated to this issue) refer to the specific nature of actions characteristic of combat sports, exercises and hand-to-hand combat systems. Secondly, artificial intelligence (ChatGPT 3) was unable to formulate such a statement when asked by an expert in self-defence in the broadest sense (including the ability to defend against violence and psychological aggression) – *According to your knowledge, what does the word “self-defence” mean?* [2]. After all, these publications are available, particularly in the most prestigious literature database, Web of Science (WoS).

During Jan Harasymowicz’s second dialogue with the AI, the responses (AI, ChatGPT 4) exemplify adherence to a principle known in journalistic parlance as ‘political correctness’. Harasymowicz put forward an argument that the AI was unable to refute, so it agreed: *Criticism of brutal forms of sports competition, such as cage fights, mixed martial arts (MMA) competitions or cage fights for children, is understandable, especially in the context of the Olympic philosophy, which emphasizes harmonious human development, respect and fair play* [3, p. 14]. However, the AI fails to draw the radical conclusion that these very forms of commercialising the appeal of hand-to-hand combat constitute a pathology directly reminiscent of gladiatorial games [4] and that, thanks to the internet, this precedent has been irrevocably embedded in global civilisation [5–8]. The viewership of these spectacles has already exceeded the capacity of the Roman Colosseum many times over. This argument, in almost verbatim form, is available in the digital realm, so the question of the necessity of self-defence against AI before it is too late inevitably arises. This is not a groundbreaking conclusion, as the implications regarding the interference of authorities in the fundamental human right to freedom of opinion have served as a pretext for censoring books (and even burning them) and films [9, 10].

In this paper, however, I limit the ‘complementary approach’ – in both methodological and educational terms – to the three aspects of self-defence mentioned in the first sentence: personal safety, quality of life and public health. Precisely because of the context of self-defence (with the awareness that this is only one element of survival

skills), a fundamental methodological premise is to move away from two paradigms. One relates to physical education, the other to combat sports. Interpreting the results of recommended motor tests according to gender criteria constitutes an absurd interference with their predictive value, given identical circumstances of threat to health or life [11, 12]. Basing hand-to-hand combat exercises on criteria of body weight similarity (the standard weight categories in many combat sports) deprives practitioners of the opportunity to acquire not only physical (motor) experience. The essence of educational opportunities and personal development through the practice of hand-to-hand combat, as well as meaningful warnings, was aptly captured by Jan Harasymowicz in one of his seminal works inspired by Eastern philosophy: that '(...) the traits of human nature – fear, aggression, pride, vanity, physical dispositions, motor aptitude, intelligence and knowledge (...) – are revealed in combat.' [13].

The aim of this paper is to present an empirically grounded argument for the need to incorporate self-defence training into the education of young people as early as possible in their ontogenesis.

## 2. Materials and Methods

The author imitatively analyses unique, unpublished research findings from Jarosław Szajerski's diploma thesis [14] on testing fights in a vertical posture (TFVP) of eleven-year-old girls ( $n = 16$ ) in round robin system during a cycle of physical education classes. The result of TFVP (type non-apparatus test) is conventional criterion of talent for combat sports and self-defence (generally: hand-to-hand combat). Each TFVP ends with one of the participants winning 4 scuffles based on a simplified sumo formula (the possible result is in the proportions of won scuffle from 4:0 to 4:3). Effectiveness was measured by two indices: F-Index (proportion of fights won) and S-Index (proportion of scuffles won) [15, 16]. Muscle strength was measured by four indices: total score (Index MS) and each of the three trials (standing broad jump, bent arm hand, sit ups) of the International Physical Fitness Test [17]. Somatic potential by three indicators: body height (kg), body mass (cm), BMI. The individual profiles taking into account the nine indicators were based on the principle of comparing the proportion of the score to the highest leader value of each indicator. However, in the tables linked to the graphical profile models, the values displayed under the symbols 'cm' and 'kg' are expressed as percentages.

### Statistical analysis

I use the following statistical indicators: frequency ( $n$ ); proportion (in %); correlation ( $r$ ). I calculate the correlation between the indicators of empirical variables in relation to the identified groups of girls based on specific analysis criteria. Where appropriate, I use the symbol (^) when applying statistical significance criteria for a one-tailed test.

## 3. Results

The F-Index (proportion of TFVP wins) is the only metric whose range includes extreme possible outcomes. The leader of these 15 TFVPs (code A-1) won all of them (100% – absolute success rate and the only one to win 81% of scuffles). In contrast, the student with code P-14 lost all TFVPs (her F-Index = 0, and her S-Index is the lowest: 11.7%, meaning she won 12 out of 72 scuffles). However, the second part of this code indicates that this basic criterion for TFVP effectiveness covers 14 ranking positions (RP), not 16. This is because students H-8 and I-8 each won 7 fights (F-Index = 46.7), and the

higher RP denoted by the letter ‘H’ was determined by a higher S-Index value (the pupil won 54.4% of the scuffles fought), whilst pupil I-8 won 43.5% of the scuffles. Similarly, pupils N-13 and O-13 each won two TFVPs (each with an F-Index = 13.3), whilst pupil N-13 had an S-Index = 31.6, and pupil O-13 had an S-Index = 24.6. Due to the limited availability of raw data, it is impossible to determine the winner of the fights between each of these two pairs of pupils. Among the remaining eight indicators analysed, a further very high inter-individual variation concerns the results of the trial bent arm hang (range 80 percentage points), with one pupil (N-13) achieving the maximum score of 80 points, whilst six pupils (i.e. 37.5% of those participating in the experiment) scored 0 points. The smallest range (10.7%) was observed for body height.

The TFVP performance indices show the highest correlation (near-perfect:  $r = 0.974$ ,  $p < 0.01$ ). There is also a near-perfect correlation between the components of the indices: muscle strength with bent arm hang  $r = 0.964$ , whilst BMI, which is a general criterion for body composition, with body mass  $r = 0.947$ . However, in the overall analysis of the empirical data, body mass has the highest predictive value for TFVP results associated with body composition ( $r = 0.860$  with F-Index and  $0.847$  with S-Index). Thus, body mass explains 74% of the variance in TFVP wins, including 72% of scuffle wins. Meanwhile, body height explains 35% and 33% respectively, and BMI 57% and 56%. None of the muscle strength indicators show statistically significant correlations with TFVP performance indicators, nor with body composition indicators (Table 1).

**Table 1.** Correlations between key indicators of performance in sparring tests, and the physical and motor abilities of 11-year-old primary school girls ( $n = 16$ ) who took part in sparring tests in a standing posture using a ‘round-robin’ system during their PE lessons throughout the term.

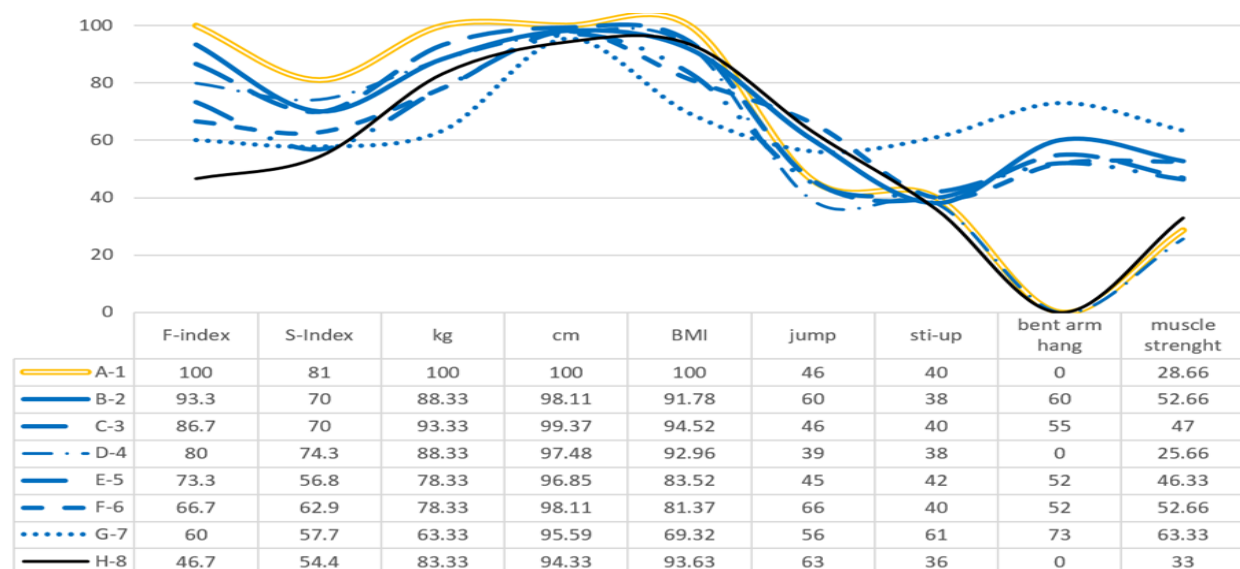
| Indicator     | Effectiveness TFVP (%) |                | Body composition<br>(% towards the leader) |        |        | Muscle strength (points/%) |         |                |
|---------------|------------------------|----------------|--------------------------------------------|--------|--------|----------------------------|---------|----------------|
|               | F-Index                | S-Index        | Mass                                       | height | BMI    | Jump                       | sit-ups | bent arm hang  |
| F-Index       | x                      |                |                                            |        |        |                            |         |                |
| S-Index       | <b>0.974**</b>         | X              |                                            |        |        |                            |         |                |
| mass          | <b>0.860**</b>         | <b>0.841**</b> | x                                          |        |        |                            |         |                |
| height        | <b>0.595^</b>          | <b>0.576^</b>  | <b>0.564*</b>                              | x      |        |                            |         |                |
| BMI           | <b>0.758**</b>         | <b>0.746**</b> | <b>0.947**</b>                             | 0.278  | x      |                            |         |                |
| Jump          | 0.089                  | 0.164          | -0.064                                     | 0.041  | -0.110 | x                          |         |                |
| sit-up        | 0.180                  | 0.177          | -0.198                                     | 0.038  | -0.273 | 0.108                      | x       |                |
| bent arm hang | -0.016                 | -0.027         | -0.279                                     | 0.140  | -0.387 | 0.385                      | 0.375   | X              |
| Index MS      | 0.037                  | 0.046          | -0.272                                     | 0.130  | -0.383 | <b>0.578^</b>              | 0.485   | <b>0.964**</b> |

\* $p < 0.05$ , \*\* $p < 0.01$ , ^ $p < 0.02$

### Profiles of the 8 most effective female students (each won over 50% of their scuffles)

The indicator that most strongly distinguishes the most effective female students is the trial bent arm hang score (range 73 points/%). Extreme inter-individual variation of over 50% is also observed for the F-Index (range 53.3), whilst the smallest variation is seen for body height (range 5.67). Range of the remaining indicators lies between 25 (sit-ups) and 37.67 (muscle strength). Among these female students, three (A-1, D-4,

H-8) were unable to support their own body weight whilst hanging from the bar (Figure 1).



**Figure 1.** Profiles of the 8 most successful female students in the TFVP, contested in a ‘round-robin’ format – F-Index ordinal variable.

There is no linear relationship between the F-Index and S-Index, but the correlation is very high ( $r = 0.878$   $p < 0.01$ ). The almost perfect correlation ( $r = 0.900$ ) between F-Index and body high is coincidental, as the 5.67% range between the extreme body height values (in the raw data this is 9 cm: leader A-1 159 cm, and student H-8 is 150 cm) is unlikely to be a decisive factor in the outcome of this form of hand-to-hand combat. Especially since the body mass range is 36.67% and the correlation of this indicator with the F-Index is 0.716 (explaining 51% of the variation in the result), although the correlation with the S-Index (0.786) explains 62% of this variation. In the group of the most effective female students, BMI loses its predictive power for TFVP results measured by the F-Index and S-Index. The negative correlations between these two indicators of TFVP effectiveness and all muscle strength indicators demonstrate that ultimate success in this form of hand-to-hand combat is determined by other physical characteristics and mental components of the young girls’ personalities that were not assessed in this experiment (Table 2).

**Table 2.** Correlations between key indicators of combat effectiveness, physical fitness and muscle strenght in 11-year-old primary school girls ( $n = 8$ ) who won more than 50% of their matches during the 15 TFVP (ordinal variable).

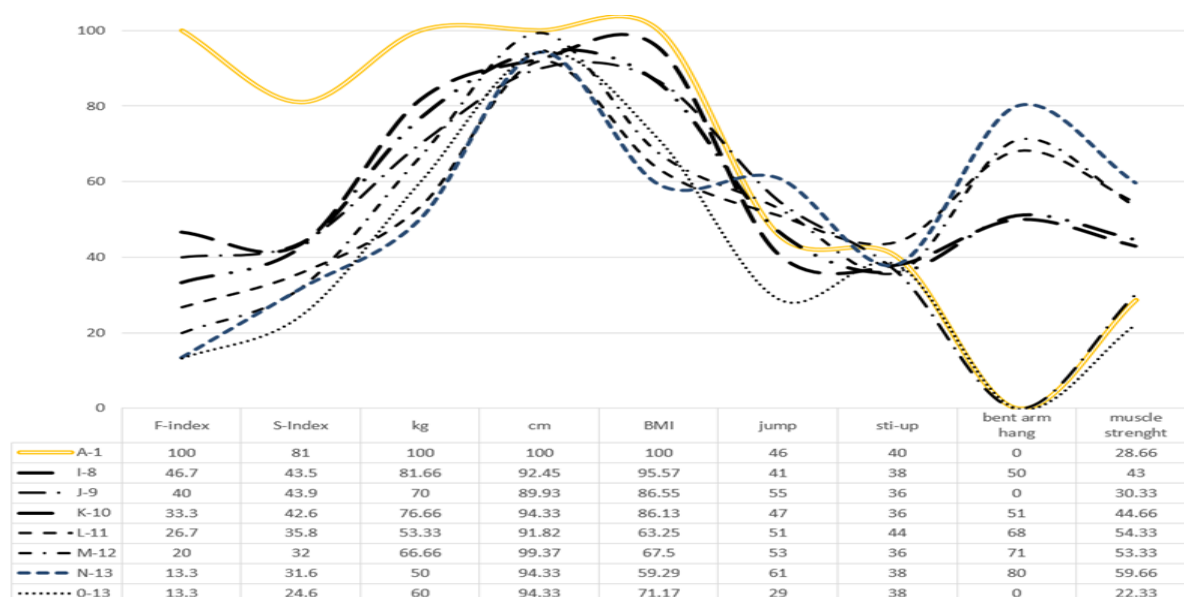
| Indicator   | Effectiveness TFVP (%) |                | Body composition (% towards the leader) |        |     | Muscle strength (points/%) |        |               |
|-------------|------------------------|----------------|-----------------------------------------|--------|-----|----------------------------|--------|---------------|
|             | F-index                | S-Index        | mass                                    | Height | BMI | jump                       | sit-up | bent arm hang |
| F-index     | x                      |                |                                         |        |     |                            |        |               |
| S-Index     | <b>0.878**</b>         | X              |                                         |        |     |                            |        |               |
| mass (kg)   | <b>0.716*</b>          | <b>0.786*</b>  | x                                       |        |     |                            |        |               |
| height (cm) | <b>0.900**</b>         | <b>0.839**</b> |                                         | x      |     |                            |        |               |

|               |        |        |                |        |                |       |       |                |
|---------------|--------|--------|----------------|--------|----------------|-------|-------|----------------|
| BMI           | 0.535  | 0.641  | <b>0.963**</b> | 0.487  | x              |       |       |                |
| Jump          | -0.503 | -0.504 | -0.394         | -0.389 | -0.328         | x     |       |                |
| sit-up        | -0.268 | -0.323 | <b>-0.746*</b> | -0.284 | <b>-0.823^</b> | 0.048 | X     |                |
| bent arm hang | -0.031 | -0.368 | -0.568         | 0.009  | -0.694         | 0.291 | 0.564 | X              |
| Index MS      | -0.202 | -0.476 | -0.689         | -0.144 | <b>-0.786*</b> | 0.485 | 0.651 | <b>0.963**</b> |

\*p<0.05, \*\*p<0.01, ^p<0.02

### Profiles of seven female students, none of whom won at least 50% of their scuffles, yet none of whom lost all their TFVP matches – compared to the leader's profile

The indicator that shows the greatest variation within this group of female students is the bent arm hang (range: 80 points), whilst the indicator showing the least variation is the trial sit-up (range: 8 points). The greatest gap between the leader and the four outliers (A-1) concerns the F-Index: minimum 53.3%; maximum (for two pupils) 86.7%. For body mass, the distances are 18.34% and 50% respectively, whilst the smallest distance relates to body height: 0.43% and 10.07%. Although the leader's S-Index is not the maximum value, it is the highest among those recorded, and the range of results is also considerable: minimum 37.1%; maximum 56.4% (Figure 2).



**Figure 2.** Profiles of 7 female pupils (compared to the top-performing one), none of whom won at least 50% of their scuffles, yet none of whom lost all their TFVP matches – F-Index ordinal variable.

In this group of female students, there is an almost perfect correlation between TFVP efficacy indices ( $r = 0.928$ ), with BMI and body mass serving as predictors of outcomes. As with the most effective female students, not all but most muscle strength indices show a negative and low correlation with F-Index and S-Index (Table 3).

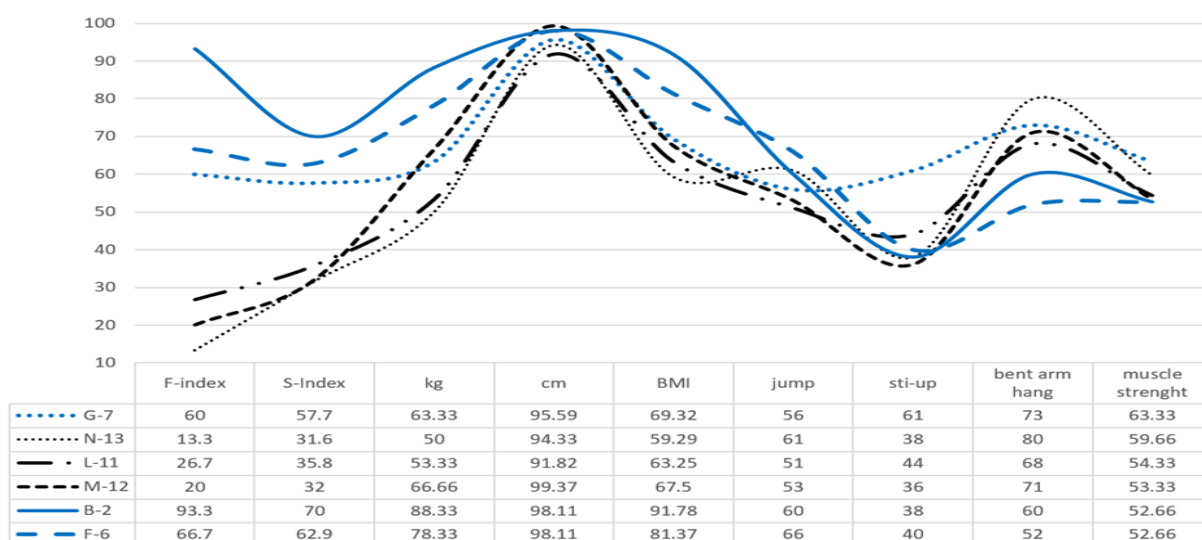
**Table 3.** Correlations between key indicators of performance in sparring matches, and the physical and motor abilities of 11-year-old primary school girls (n = 7) who did not lose all their matches but won fewer than 50% of their bouts during 15 TFVP (ordinal variable).

| Indicator     | Effectiveness TFVP (%) |               | Body composition (% towards the leader) |        |        | Muscle strength (points) |        |                |
|---------------|------------------------|---------------|-----------------------------------------|--------|--------|--------------------------|--------|----------------|
|               | F-index                | S-Index       | mass                                    | height | BMI    | jump                     | sit-up | bent arm hang  |
| F-index       | X                      |               |                                         |        |        |                          |        |                |
| S-Index       | <b>0.928**</b>         | x             |                                         |        |        |                          |        |                |
| Mass          | <b>0.796*</b>          | 0.691         | X                                       |        |        |                          |        |                |
| Height        | -0.546                 | -0.514        | -0.067                                  | X      |        |                          |        |                |
| BMI           | <b>0.881**</b>         | <b>0.760*</b> | <b>0.938**</b>                          | -0.391 | x      |                          |        |                |
| Jump          | -0.009                 | 0.289         | -0.298                                  | 0.003  | -0.322 | x                        |        |                |
| sit-up        | -0.119                 | -0.177        | -0.536                                  | -0.325 | -0.432 | -0.022                   | x      |                |
| bent arm hang | -0.195                 | -0.020        | -0.258                                  | 0.451  | -0.439 | 0.554                    | 0.293  | x              |
| Index MS      | -0.169                 | 0.046         | -0.324                                  | 0.345  | -0.471 | 0.708                    | 0.302  | <b>0.978**</b> |

\*p<0.05, \*\*p<0.01

**Profiles of six female students, each of whom recorded an overall muscle strength score of over 50% of the reference value**

The overall muscle strength index ranges from 10.67%, with the minimum value (52.66%) applying to two pupils (B-2 and F-6); it is certain that B-2 won the direct TFVP, but the S-Index ratio is unknown. The difference in F-Index between them is 26.6%, whilst the S-Index difference is only 7.1%. The seventh-ranked student in terms of TFVP wins, but fourth in the ranking of scuffles wins, emerged during the experiment as the leader in muscle strength (63.33 points), and also as the leader in the sit-up trial (61 points). The greatest differences in extreme results among this group of female students relate to the F-Index (range 80%) and 38.4% S-Index, whilst the smallest (7.55%) relate to body height (Figure 3).



**Figure 3.** Profiles of the 6 female students with the highest muscle strength scores (this is also an ordinal variable).

The statistically non-significant correlations between muscle strength indices, and in particular the high negative correlations ( $r = -0.705$  and  $r = -0.713$ ) between the bent arm hang and the F-Index and S-Index respectively, clearly indicate that performance in this mild form of hand-to-hand combat is not determined by a high level of muscle strength. BMI and body mass are positively and very highly correlated with these performance indicators (Table 4).

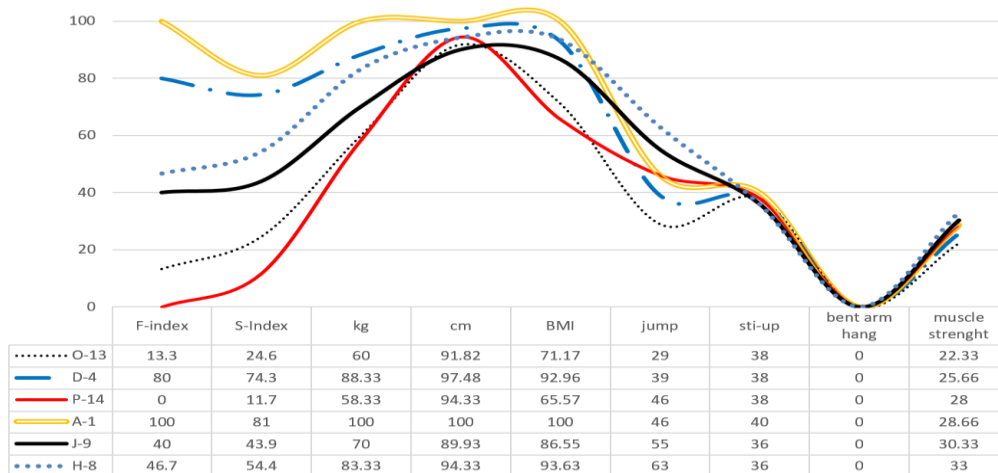
**Table 4.** Correlations between key indicators of test performance, physical fitness and motor ability in 11-year-old primary school girls ( $n = 6$ ) who, during the experiment, demonstrated a level of muscle strength — as measured by the average of three indicators exceeding 50%.

| Indicator     | Effectiveness TFVP (%) |               | Body composition<br>(% towards the leader) |        |        | Muscle strength (points) |        |               |
|---------------|------------------------|---------------|--------------------------------------------|--------|--------|--------------------------|--------|---------------|
|               | F-index                | S-Index       | mass                                       | height | BMI    | jump                     | sit-up | bent arm hang |
| F-index       | x                      |               |                                            |        |        |                          |        |               |
| S-Index       | <b>0.987**</b>         | X             |                                            |        |        |                          |        |               |
| Mass          | <b>0.875*</b>          | <b>0.839*</b> | X                                          |        |        |                          |        |               |
| Height        | 0.412                  | 0.401         | 0.746                                      | x      |        |                          |        |               |
| BMI           | <b>0.932**</b>         | <b>0.894^</b> | <b>0.980**</b>                             | 0.606  | x      |                          |        |               |
| jump          | 0.456                  | 0.545         | 0.458                                      | 0.374  | 0.488  | x                        |        |               |
| sit-up        | 0.191                  | 0.253         | -0.196                                     | -0.329 | -0.157 | -0.221                   | x      |               |
| bent arm hang | -0.705                 | -0.713        | -0.791                                     | -0.436 | -0.802 | -0.483                   | 0.208  | X             |
| Index MS      | -0.203                 | -0.128        | -0.535                                     | -0.398 | -0.503 | -0.097                   | 0.759  | 0.688         |

\* $p < 0.05$ , \*\* $p < 0.01$ , ^ $p < 0.02$

### Profiles of the 6 female students with the lowest muscle strength

This is a homogeneous group of female students in terms of their inability to hold their own body suspended on a bar with bent arms for even a second, and is differentiated by a mere 4 points in sit-up trial, as well as an average of 10.67 points across three trials measuring muscle strength. This group includes the profile of student P-14, who did not win any TFVP. Consequently, it is only in this model of distinct profiles that the maximum variation in TFVP performance scores, as measured by the F-Index, and the highest range (63.3%) of extreme S-Index scores appear (Figure 4).



**Figure 4.** Profiles of the 6 female students with the lowest muscle strength scores (this is also an ordinal variable, ranked from the lowest score).



In this model, the student with the lowest BMI value is missing (nominal score 14.07, which is 59.29% of the leader's score; thus, the difference is the largest possible at 40.71%). This student (N-13) ranks second among those with the highest muscle strength scores (Figure 3). Furthermore, she won two TFVPs and 31.6% scuffles. These basic findings explain the reason for the almost complete correlation between BMI and body mass with the TFVP performance indices (F-Index and S-Index) of the physically strongest students. Furthermore, this correlation explains the almost linear relationship between the standing broad jump trial results and the overall muscle strength index – they did not meet even the minimum criterion for the bent arm hang trial (Table 5).

**Table 5.** Correlations between key indicators of test performance, physical fitness and motor skills in 11-year-old primary school girls (n = 6) who demonstrated the lowest levels of muscle strength during the experiment.

| Indicator | Effectiveness TFVP (%) |                | Body composition<br>(% towards the leader) |        |       | Muscle strength<br>(points) |        |
|-----------|------------------------|----------------|--------------------------------------------|--------|-------|-----------------------------|--------|
|           | F-index                | S-Index        | mass                                       | height | BMI   | jump                        | sit-up |
| F-index   | X                      |                |                                            |        |       |                             |        |
| S-Index   | <b>0.989**</b>         | X              |                                            |        |       |                             |        |
| Mass      | <b>0.973**</b>         | <b>0.973**</b> | x                                          |        |       |                             |        |
| Height    | 0.744                  | 0.694          | 0.788                                      | x      |       |                             |        |
| BMI       | <b>0.929**</b>         | <b>0.958**</b> | <b>0.947**</b>                             | 0.551  | x     |                             |        |
| Jump      | 0.121                  | 0.176          | 0.258                                      | −0.090 | 0.418 | x                           |        |
| sit-up    | 0.417                  | 0.303          | 0.373                                      | 0.753  | 0.093 | −0.573                      | x      |
| Index MS  | 0.185                  | 0.229          | 0.326                                      | 0.005  | 0.460 | <b>0.994**</b>              | −0.479 |

\*\*p<0.01

#### The reliability of the body composition indices used in predicting the efficacy of TFVP

Most of the schoolgirls studied (62.5%) met the criteria for a healthy BMI at the time of the experiment (the minimum index was 19.31, the maximum 23.73). These pupils are ranked from 1 to 6 and from 8 to 10 according to the F-Index criterion. Among the remaining results, the lowest BMI = 14.07 indicates that pupil N-13 is malnourished. Similarly, the BMIs of pupils L-11 (15.01) and P-14 (15.56). The indices of the remaining pupils are evidence of their emaciation: M-12 (16.02); G-7 (16.45); O-13 (16.89).

This configuration of the profiles of the schoolgirls studied (two subgroups which together encompass the results of all 16 girls) provides definitive evidence that none of the body composition indices used is stable in terms of predicting the effectiveness of the TFVP. Among the subgroup of three emaciated and three underweight girls, body mass is correlated on average positively ( $r = 0.327$ ) with F-Index and weakly positively ( $r = 0.214$ ) with S-Index. BMI, respectively:  $r = 0.301$ ; 0.148, whilst the correlation is negligible ( $r = 0.099$ ) body height with F-Index and weak ( $r = 0.114$ ) with S-Index.

However, none of these correlations is statistically significant. However, in this subgroup, a high positive correlation is observed for the directional test ( $r = 0.775$ ) between the S-Index and muscle strength (the significance level for the one-tailed test is justified, as each of these pupils won between 11.7% and 57.7% of the scuffles). In the subgroup of 10 female students with a normal BMI, although there is a very high positive correlation with the TFVP effectiveness indices of body mass and body height ( $r$  from 0.814 to 0.888), however, BMI correlates positively on average ( $r = 0.399$ ) and weakly positively ( $r = 0.150$ ) with F-Index and S-Index respectively, and these correlations are not statistically significant.

The TFVP results, which are re-analysed here using the complementary approach, therefore provide strong evidence that they primarily measure a predisposition to mild forms of hand-to-hand combat regardless of ultimate physical and motor potential (albeit reduced to measuring muscle strength, but across three major areas of body composition).

#### 4. Discussion

A secondary analysis of the results of this unique experiment provides important evidence of methodological and social (educational) significance. This statement becomes even more pertinent when one considers that the experiment was described in 2006, meaning it was conducted 20 years ago.

While studying part-time, the author of the experiment first passed the module 'Theory and Practice of Combat Sports' (4 hours of lectures and 16 hours of practical sessions), and then, whilst undertaking his teaching placement at a primary school as a PE teaching assistant, he carried out the experiment. The requirement for passing the course (which the author of the experiment met) was to obtain a passing mark on the assessment questions set by the teacher before and during the practical sessions, and the main component was the result of the 'basic self-defence skills test' [18]. She became familiar with the TFVP during the practical sessions.

The issue of 'basic self-defence skills' is also irrelevant in light of historical facts, as this test was developed and introduced into research practice in the 1990s [19, 18]. The key issue is the correlations between the results of 'basic self-defence skills' and TFVP as well as with the motor and mental potential of the test subjects. The 'basic self-defence skills' consist of three groups of defensive actions: I safe falling techniques; II defence through pre-emptive strikes; III defence against grabs, chokes and strikes. The first publications reporting on the results of 'basic self-defence skills' concern studies of military cadets [18]. Furthermore, in 2001, the first publication appeared reporting on the correlations between the results of the 'basic self-defence skills test' and indicators of general physical fitness [20].

Meanwhile, the first work reporting the results of the TFVP (originally known as the 'fights following sumo formula' without the word 'test' [21]) correlated with motor potential in the general sense appeared in 2003 [22]. In addition, Andrzej Chodała [22] and Joanna Syska [23] correlated the TFVP results with the 'basic self-defence skills test' indicators, as well as with indicators of general physical fitness. However,

Chodała used the International Physical Fitness Test (IPFT [17]), whilst Syska used EUROFIT [24] and 'Rotational Test' [25, 26]. Danuta Bukowiecka, conducting research in parallel with Chodała and Syska, correlated the TFVP results of 265 male police officers and 55 female police officers with the IPFT and with 'police physical fitness tests' [27], but not with the 'basic self-defence skills test'. In these experiments, the common criterion was the use of the TFVP and tests measuring general physical fitness, but significant differences emerged in the correlation of F-Index and S-Index results with other empirical variables.

In Chodała's experiment (from 21 August 2020 to 22 June 2001), four groups of first-year military cadets at the Military University of Technology (WAT) undertook a standardised military training programme over a period of six weeks. Students from the control group (also selected through a random draw) followed the standard WAT PE programme. Twenty-four students in each group completed the experiment, and the key observation was the TFVP result (as the second component of special physical fitness). Each student in the experimental group competed in the TFVP against four students from the control group, and vice versa, according to the following principle: the student with the lowest body weight competed against the four students with the lowest body weight from the opposing group, and so on, up to the heaviest student, who competed against the four students occupying the bottom four positions in terms of this characteristic in the opposing group [22]. However, the TFVPs were conducted as part of a 'defensive biathlon', and were therefore preceded by an 800-metre run followed by shooting [28]. Of the 13 winners of all TFVPs (F-Index = 1), 12 were students from the experimental group and one from the control group. The documented effectiveness (F-Index = 0.75) was achieved by 8 students from the experimental group and 1 from the control group. Two TFVP won (F-Index = 0.50) two military cadets from the experimental group and three from the control group. Respectively F-Index = 0.25 two and five students. All TFVPs were lost by 14 military cadets from control group (58.3%), but none were lost by students from the experimental group [22].

This result provides important empirical evidence that elements of combat sports, as well as 'playful forms of combat' [29-31], when competently incorporated into physical education, significantly enhance an individual's defensive capabilities. Conversely, when these elements are omitted, they reduce this potential, since standard military training does not yield comparable results. However, this briefly discussed result clearly highlights the most important strictly methodological aspect – TFVP measures aptitude for hand-to-hand combat. The military cadet from the control group who defeated four rivals from the experimental group in the TFVP had not trained in any combat sport before or during his studies. Meanwhile, the competitors from the experimental group were not inferior in body mass to this military cadet and, moreover, had repeatedly engaged in TFVP during innovative PE sessions over several months. Thus, this result demonstrates that aptitude for hand-to-hand combat is primarily genetically determined, and can be stimulated through competent training. This hypothesis was confirmed by Wojciech Nedomagała's observations. Students who

emerged as TFVP leaders during the recruitment process for judo clubs across Poland achieved success in tournament fights more frequently during the first three years of practicing this combat sport than their peers [32].

It would therefore be naive to assume that the leader (A-1) in Szajerski's experiment [14] outperformed each of her peers in the class in the TFVP solely because of her somatic potential. This is all the more so given that she ranks far behind in the physical fitness rankings. Both student A-1 and student N-13, who had the lowest BMI, also showed a predisposition for hand-to-hand combat. PE teachers who do not use TFVP will not make similar discoveries, but such requirements are still lacking in the PE curriculum in Polish schools. This part of the discussion is closely related not only to personal safety but also to quality of life and public health in the broadest sense.

In a sense, another result of Chodala's experiment is also linked to quality of life and public health. In the experimental group, no statistically significant correlations were found between the F-Index and the overall IPFT score or any of the eight trials. The only significant negative correlation ( $r = -0.472$ ,  $p < 0.02$ ) between the F-Index and the 'basic self-defence skills test' was observed in the third group of defensive actions (defence against grabs, chokes and strikes) 'basic self-defence skills test' [22]. This makes it all the more evident that since most TFVP matches were won by individuals who were rated lower by the expert while demonstrating simulated self-defence scenarios, this is further evidence that effectiveness was determined by innate predispositions – naturally reinforced by experience participating in various training forms of hand-to-hand combat (including diverse 'playful forms of combat') during the experimental sessions. Therefore, the omission from publicly available recommendations on physical activity and healthy lifestyles of forms of exercise that include safe elements of hand-to-hand combat in direct competition with another person undermines, to some extent, the potential benefits for personal safety, quality of life and public health. Meanwhile, the promotion of brutal cage fights in electronic media is available 24 hours a day [33, 5, 7, 34].

Even if advocates of daily physical activity recommend various forms of *tai chi* – backed by documented health and athletic benefits, etc. [35-38] – this negative correlation between TFVP results and defence against grabs, chokes and strikes military cadets from experimental group is clear empirical evidence that nothing can better prepare one for self-defence than practice based on competently repeated and safe hand-to-hand combats. A good example is competitions for veterans in combat sports classified as mild or relatively mild – such as judo, wrestling, etc. The results of Chodala's experiment also provide evidence that deficiencies in hand-to-hand combat skills can be compensated for to some extent by motor potential. F-Index for military cadets from control group is positively correlated with indicators of speed capacity (high,  $r = 0.568$ ,  $p < 0.01$ , with trial 50 m dash and on average,  $r = 0.492$ ,  $p < 0.02$  with shuttle run). However, there is a high negative correlation between the F-Index and the overall IPFT score ( $r = -0.513$ ,  $p < 0.02$ ), as well as a negative correlation ( $r = -0.430$ ,  $p < 0.05$ )

with bend trunk test. Furthermore, there is a high positive correlation ( $r = 0.559$ ,  $p < 0.01$ ) between F-Index and 4x10m shuttle run with one-handed ball dribbling, as well as a moderate correlation ( $r = 0.418$ ,  $p < 0.05$ ) with the result of completing the 200m obstacle course in the so-called OSF (both tests were then components of physical fitness according to military criteria) reinforce the conclusion that the lack of hand-to-hand combat is partially compensated for by motor potential [22].

In Joanna Syska's experiment [23], the size of the experimental group was similar (23 female students from various fields of study), but the control group consisted of 97 female students, also representing various fields of study, and for most of them, the only form of physical activity was a 90-minute PE class once a week. In addition to participating in PE classes following the same standard, the students in the experimental group also took part in two sessions (each 60 minutes long) of modern gymnastics and dance forms combined with self-defence exercises. From October 2001 to June 2002, 66 sessions were held, with attendance ranging from 85.3% to 98.4%. For the safety of the students in the TFVP control group, students from the experimental group competed against each other according to the following criteria: the students were divided into 6 testing group based on identical or similar body mass, of which 5 testing group consisted of 4 students each, and one of 3 (body mass 44-48kg); students with identical body mass competed in two four-person testing group (50kg and 60kg); the highest range applied to the four students with the highest body mass (from 61kg to 86kg). Unlike Chodała, Syska correlated TFVP effectiveness indices with the participants' somatic potential. Furthermore, Syska based her analysis of TFVP effectiveness indices on three criteria: young women who won all TFVPs ( $n = 6$  and F-Index = 100); those who won at least one TFVP but not all ( $n = 11$ ); and those who lost all TFVPs ( $n = 6$ ) but did not lose all scuffles. In Szajerski's experiment [14], only one female student (coded O-13) lost all TFVPs but not all scuffles. Thus, the probability that such an outcome is possible in any testing group of at least 3 people was met – one person won all TFVPs, and one lost all of them.

Considering alternative outcomes makes sense for at least two reasons. From an educational and psychological standpoint, it is beneficial when competing individuals achieve identical F-Index and S-Index scores. For example, in a three-person testing group, each participant might win one TFVP 4:3 and lose one 3:4. From a utilitarian perspective, such a result means that there is no clear leader in this group and each member exhibits a high aptitude for hand-to-hand combat. With identical F-Index values, S-Index values may differ. Therefore, S-Index is an effectiveness indicator that can be meaningfully correlated with other empirical variables in homogeneous groups due to extreme results: F-Index 1 or 0. In the case of Szajerski's experiment (each student fought 15 TFVPs in a 16-person testing group), so only one could win all the test fights and only one could lose them all, and that is exactly what happened [14]. An alternative outcome was impossible – each student would win the same number of TFVPs and, theoretically, the same number of scuffles as well. The reason is precisely the aforementioned odd number of TFVP matches played. Although one student won

all the fights, it would be methodologically incorrect to decompose the results while excluding the leader for at least two reasons. The first is obvious, as the proportions of scuffles won against the leader by each student are unknown. The second is both statistical and psychological in nature. The unexplained portion of the S-Index variance correlated with other empirical variables includes the unknown impact of losing a TFVP to the leader on the mental state of individual students. This is especially true since some had already accumulated this experience, while for others, the TFVP against the already identified leader was yet to occur. Furthermore, after 7 TFVPs (i.e., half, with the number of battles against the leader reduced), only two students won (H-8 and I-8), but the lack of information on the outcome of the TFVP fought between them negates the value of a secondary in-depth comparative analysis of these students' profiles. However, another result of this experiment and its conclusions deserve special attention. The student with the code O-13 should be classified as being at very high risk of helplessness in a situation of physical aggression directed at her. The school, however, is the most appropriate place to make such a diagnosis and, together with the parents (legal guardians), to take appropriate preventive and, in many cases, therapeutic measures.

From a methodological (or, more precisely, diagnostic) standpoint, a shortcoming of the documentation for Szajerski's experiment [14] is the lack of information regarding the TFVP results between specific individuals, especially since general data on the somatic and motor potentials of each student is available. After all, a scuffle result, such as 4:3, could be the result of various combinations of events. The winner may lose the first three scuffles and win the remaining ones, or the combatants may take turns gaining the upper hand until a 3:3 result, etc. An analysis of these results from a complementary perspective (taking into account even just such modest knowledge of the students' somatic and motor potential), but also information derived from individual conversations with the girls, especially regarding their potential experiences of violence or interpersonal aggression, opens up a broad perspective for prevention and therapy specific to INNOAGON [39-45].

Similar shortcomings apply to the available results of experiments by Chodała [22] and Syska [23]. Therefore, in educational practice, overlooking this diagnostic tool would be a serious mistake. This conclusion is reinforced by Szajerski's observations. Already in the first sentence of his discussion of his own research results, he emphasizes that 'The idea of conducting fitness tests and sparring matches among fifth-grade elementary school girls aroused great interest and was received with approval.' [14, p. 31]. Syska, on the other hand, notes in the results of his experiment that nearly all participants expressed a desire to continue the innovative program [23].

This general synthesis of the re-analysed results of Szajerski's experiment [14] and references to empirical data from other observations [22, 24, 23] are useful in critiquing certain social and methodological aspects related to various specific phenomena within one of humanity's greatest fascinations – hand-to-hand combat in the broadest sense.

In a social sense, this constitutes an important argument for criticising educational authorities and non-governmental organisations which, on the one hand, declare the need to counteract violence and interpersonal aggression, whilst on the other hand, demonstrate that these multi-stakeholder bodies tolerate not only the media promotion of bloody spectacles in cages but also the involvement of celebrities and advertisers in this practice.

In the first paragraph of this discussion, I emphasise that Szajerski's experiment [14] was conducted 20 years ago (Chodała [22] and Syska [23] even earlier), and further that it met with the approval of the fifth-year primary school pupils who took part in it. This was a time of intensive promotion in Poland of the health and educational benefits of a wide range of combat sports and non-sporting forms and systems of hand-to-hand combat [46]. In a sense, the culmination of this innovative initiative for health promotion and attractive physical and moral education – which had been ignored by educational authorities, non-governmental organisations and the media – was the organisation, mainly on the initiative of experts associated with the Editorial Board of the *Archives of Budo*, 1st Word Scientific Congress of Combat Sports and Martial Arts (22-24 September 2006) [47]. One earlier, local exception was the organisation, at the very end of the previous century, of budo shows by the Polish Budo Foundation (established in October 1977) in the Theatre on the Water in Park-Lazienkowski in Warsaw [48] which were broadcast on numerous occasions by commercial television in Warsaw.

The following example illustrates the stark, socially detrimental consequences of this missed opportunity. In 2024, a distinguished researcher into various aspects of hand-to-hand combat and a wrestling coach was asked by the headteacher of a Warsaw school to promote this safe combat sport during a PE lesson. Following a demonstration by a multiple medallist at world, continental and national wrestling tournaments of attractive, specific preparatory exercises, the expert, in accordance with prior arrangements, intended to begin the practical session with the pupils. However, the headteacher stated that, after giving it some thought, he had abandoned this plan for fear of complaints from parents that the children were touching each other (!) during PE lessons.

In my critique of the methodological approach to linking TFVP results with motor potential, I highlight certain gaps of a cognitive and practical nature. In terms of motor activities, TFVP scores, based on the sumo formula, are most closely aligned with combat sports of the wrestling type. The previously cited results of Nedomagała's [32] research provide evidence of an F-Index correlation between the selection procedure for judo training and tournament performance during the first months and years of practice [32]. However, there is no complementary link between these results and the changing motor potential of judo trainees. And this potential is significantly stimulated by the practice of judo, as well documented by Jagiello's observations [49], partly published in co-authored works [50-52], based on the results of all IPFT trials.

Chodała [22] and Bukowiecka [27] used the identical set of IPFT trials, correlating these indices with TFVP results. As we associate the significant predictive value of TFVP with self-defence, key elements of the analysis are the correlations between the F-Index and S-Index indices and not only body structure and composition, motor skills, etc. When, in contrast to combat sports practice, a specific TFVP involves individuals differing in gender, age, body weight or a combination of at least two variables, it is reasonable to decompose the raw results of motor tests into the recommended standards expressed as points on the T-scale that are the most restrictive within a given testing group (e.g. for the oldest person). In a certain sense, the equivalent of the T-scale is the decomposition of other variables (e.g., BMI, body mass) based on percentage ratios [11]. In this case, a value of 100% is assigned to the person (or persons) with the highest raw score. In an experiment involving 11-year-old schoolgirls, age was not subject to such decomposition, but BMI, body mass and body height were. The number of such unified indicators depends, in a sense, on the degree of diversity among the participants in the analysed testing group.

Individual profiles based on such standardised indices provide clear models of methodological significance. The models presented in this study show that the bent arm hand trial (the flexed-arm hang) has no predictive value, although the results show the greatest variation among the subjects (Figures 1 and 2). Furthermore, this indicator is of no use when the composition of the testing group consists of boys and girls, and at least one boy is aged 12 or older. The International Physical Fitness Test uses pull-up (for relative strength) in place of the bent arm hand trial [17].

Unfortunately, to date, no published profile of motor potential (apart from the association of results with TFVP) has been produced for any group of individuals based on UTPA-MP results [53]. This innovative method of measuring human motor potential, based on 10 motor trials, does not take into account the breakdown of norms by age and gender. The UTP-MP structure includes the 'Rotation Test' (RT) trial, which measures the body balance disturbance tolerance skills – BBDTS [26]. In my own and co-authored studies, I combined RT results with selected IPFT trials [11], merely decomposing them onto the T scale in accordance with Gąsienica Walczak's recommendation [54].

However, general physical fitness profiles have been published for adults practising various forms of hand-to-hand combat, based on comprehensive IPFT results (8 trials). The most valuable model is that of Artur Litwiniuk et al. [55]. The reference for men aged 19–22 who have practised jujitsu, kyokushin karate or ITF taekwondo for 3 to 5 years consists of are results of military cadets (age 19.8 years) who had received one year of hand-to-hand combat training as part of their university military studies in the experimental formula [22]. In this analysis, what is significant is not the extent of changes in the motor potential of military cadets during a year of military cadets training combined with other forms of military training, but the structure of their motor skills following this period of exposure to various psychophysical stimuli. The



dominant characteristic, also in relation to the combat sports athletes, is abdominal muscle strength (average score of sit ups 70.88 points), whilst the least developed characteristic, also compared to combat sports athletes, is speed (50 m dash score of 54 points). Combining this knowledge with the facts that, firstly, there are no statistically significant correlations between the F-Index and the physical fitness indicators of the military cadets' experimental group and, secondly, that they outperformed the students in the control group in TFVP results, does not mean that the factor of motor potential can be ignored. On the contrary, this profile of potential provides an accurate basis for predicting the chances in hand-to-hand combat of individuals who differ significantly (either positively or negatively) in terms of general physical fitness from young men who have been trained for at least a year to fight in close combat. There is a possibility that individuals who do not practise any form of hand-to-hand combat, but whose own indicators exceed this model of general physical fitness may in certain circumstances compensate for the lack of specific (trainable) hand-to-hand combat skills of potential aggressors (hypothetically equated with all elements of the military cadets experimental group profile [22]). Such predictions are possible, but the following strictly methodological criteria must be met. Firstly, the researcher must possess well-documented knowledge of the general physical fitness, as measured by the IPFT, of the individuals being compared. Secondly, if the results pertain to individuals younger (regardless of gender) than 19-year-old men, they must be decomposed in accordance with the standards adopted specifically for men of that age. Thirdly, if the results concern women aged 19 or older, their decomposition is subject to the same principle

There is little empirical data in the available literature to meet the criteria for such analyses. Apart from the study by Litwiniuk et al. [55] a comprehensive profile of general physical fitness, as measured by the IPFT, was developed by Witkowski et al. [56] for men aged 18, who trained krav maga for one year twice a week for 90 minutes each during COVID-19 period. The authors present individual results for practicing krav maga, so it is possible to decompose these in accordance with the norms for 19-year-old men. The difference will be even greater both in favour of the military cadets examined more than twenty years earlier by Chodała [22], and of the ju-jitsu, kyokushin karate and taekwondo ITF athletes by Litwiniuk et al. [55] prior to COVID-19 period. A breakdown of a similar profile developed by Maśliński et al. [57] for 11–12-year-old boys who train judo for 4 years (three times a week for 90 minutes each training session) makes sense from the perspective of predicting their chances of self-defence against adults trained in hand-to-hand combat. However, such a profile would be less precise for two reasons. Firstly, the authors do not provide the boys' individual results, but rather the arithmetic mean, standard deviation, and the minimum and maximum results for each trial. Secondly, the bent arm hang trial should be excluded from the profile, as the results are not equivalent to pull ups (which apply to adults). This dilemma arises in analyses of TFVP studies involving girls and boys [11], which are moreover mainly based on trials measuring muscle strength [17].

The content of not only the final paragraph of this discussion serves as an example of the limited application of the review of ‘omitted implications’ – one of the innovative reviews of scientific publications recommended within the methodology of complementary research [58, 59]. This statement does not amount to a negative criticism of the authors on the grounds that they failed to include such omitted implications in their publications. On the contrary, it is obvious that they could not have done so, as the review of ‘omitted implications’ method was published in 2025 [60]. However, the key works cited in this discussion date back many years. In my view, however, this relatively extensive discussion of the re-analysed results of the TFVP’s application may encourage researchers of the escalation of violence and interpersonal aggression, particularly in schools, to conduct a review of ‘omitted implications’ in relation to other specific aspects of these phenomena – for example, the effectiveness of verbal methods of countering violence and aggression in the context of unsatisfactory social outcomes.

## 5. Conclusions

During mild hand-to-hand-combat measures, the greater likelihood of successful self-defence against physical aggression by female peers should be linked to the somatic potential of eleven-year-old girls identified with BMI. However, the determining factor for success in most such interpersonal confrontations will be the predisposition to combat sports and self-defence, or, more generally, a predisposition for hand-to-hand combat i.e. traits strongly determined by the mental sphere of personality (courage, will to fight, bravery, self-esteem, intelligence, etc.). If TFVP were widely used in physical education practice, the results of such observations would be a good predictor of necessary interventions to strengthen the defensive potential (personal safety) of students with the lowest F-Index and S-Index.

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