

Three methods of prophylaxis and therapy of innovative agonology, important from the perspective of personal safety

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- ✓ **A** Study Design
- 📁 **B** Data Collection
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Abstract

The expansion of the early twentieth century the eastern martial arts (judo and ju-jitsu then karate, kung-fu, taekwondo) for the European countries and the US was also the transfer of methodical traditions of training. Similarly defence art of aikido. The aim of this review is a recommendations of original Polish achievements in prevention of injuries as a result of falls, collisions and physical aggression, as well as the diagnosis and reduction of aggressiveness by the use of fun forms of martial arts.

Judo therapy remains the specialty of many faculties Japanese universities. While Europe and the American continent penetrate systems therapeutic exercises: qigong, taichi, yoga etc. since 2007 three pillars of the WHO Falls Prevention Model are recommended. Authors of this Model does not directly recommend the necessity to teach the techniques of safe fall. The simplest and the most economic solution of the problem is teaching each person about safe falling as early as possible in their lives. The role of the scientists is still to publish the methods and study results so that the others could accept them or at first subject them to secondary verification process.

Keywords: aggressiveness • body injury risk • judo therapy • safe fall theory

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Aggressiveness – a human characteristic manifesting itself in inclinations to hurt others, to destructive behaviour. **Aggressive** = virulent, truculent, attacking [57].

Bravery – means efficiency in good deeds, efficiency combined with estimable aspirations [57].

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*, *kyūdō* and so on. The primary objective of these “martial ways” is self-perfection (*ningen-kesei*) [58].

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 [59].

Technique – *noun* a way of performing an action [60].

INTRODUCTION

The expansion of the early twentieth century the eastern martial arts (judo and ju-jitsu then karate, kung-fu, taekwondo) for the European countries and the US was also the transfer of methodical traditions of training [1-4]. Similarly defence art of aikido [5]. Sports aspect (motor) has not been developed theoretical thought. Judo therapy remains the specialty of many faculties Japanese universities. While Europe and the American continent penetrate systems therapeutic exercises: *qigong*, *taichi*, *yoga* etc. [6, 7].

President of US Theodore Roosevelt (1858-1919) he was fascinated by judo and friends with Jigoro Kano (founder of judo). The year 1989 was crucial moment when the physical education subject *kakugi* in Japanese system of education was modified to *budo* (judo, kendo, sumo). These three martial arts were taught thereafter in junior high schools, and judo and kendo were taught in high schools [8]. Meanwhile, in Poland, in that year it ends Martial Law (1981-1989). Jaroslaw Rudnianski (1921-2008) publishes its essential work (1989) *A Compromise and a Struggle* [9]. This theory of compromise and struggle was written actually in “two stages”. The general theory of struggle was published 1983 during the Martial Law in Poland (the book was unavailable [10]). In 1991, Kalina RM published the base of cognitive behavioral prophylactic and therapeutic agonology (under a different name: prevention of aggression – the use of sport to reduce aggressiveness [11]). Motor and mental effects of eight months of training based on those criteria was verified five years later [12].

Quarter of an age had passed since publication (1991) of theoretical bases of prophylactic and therapeutic agonology (synonym: innovative agonology [13]) necessary to define innovative self-defence. However, dynamic of events, paradoxically forced firstly empirical verification in real circumstances of unfriendly social environment. For this quarter of an age Kalina RM was improving methods and techniques of an agonology in prevention of pathological violence and aggression in different physical and verbal, overt and camouflaged varieties.

Named *prophylactic and therapeutic agonology* were decisive events associated with the need to defend the journal *Archives of Budo* (since 2014) against unethical group of professors using methods of intellectual and institutional violence

transferred from totalitarian system [14, 15]. Defense of *Archives of Budo* was an important verification of the effectiveness of agonology methods. One of the most important conclusions of this struggle is the redefinition of self-defence: “*innovative self-defence* involves using verbal and/or behavioural methods and means along with available items in counteracting each attack on any good of an individual (honour, dignity, life, health, property, etc.), whereas a defender submits his/her actions to the criteria of *prophylactic and therapeutic agonology*, considering the most general directive of efficient leading of any struggles and also universal assumption of self-defence training as absolutely paramount” [13, p. 341].

Following on of basic rule of agonology – “make weak things strong” – counteraction of such situation activates creative thinking and frees new resources of moral power (strict term of agonology [13]).

The aim of this review is a recommendations of original Polish achievements in prevention of injuries as a result of falls, collisions and physical aggression, as well as the diagnosis and reduction of aggressiveness by the use of fun forms of martial arts.

Consequences of the Iron Curtain

Formally, there are no borders for science, because mind cannot be arrested. Despite political isolation of societies, scientists on the both sides of Iron Curtain made the same findings at the same time. The mission of science is not only scientific discoveries, but also its application in every possible aspect of human actions. Therefore, there is wide category of politically and military neutral issues.

In popularization of knowledge the national language in which are published scientific papers (laws, theories, hypothesis etc.) is a substantial element. Essential limitation of sharing knowledge in global space of science in a period of Iron Curtain was lack of internet access. In a current availability of internet access, language is still a barrier. For example, most of papers about martial arts is published in Japanese, Chinese and Korean language.

Many of the most valuable scientific works (doctoral and postdoctoral) about combat sports are published in Russian [16]. Breaking a language

barrier was possible through English-language journal – *Archives of Budo*. Execution of mission of transferring knowledge previously published in Russian language [17] is possible not only thanks to language qualifications of some members of Editorial Board. Graduating in Poland and then in Russia or Ukraine has significant cognitive benefits concerning cultural and mental aspects of those societies.

However in innovative agonology martial arts and combat sports is only complement to self-defence training (as a preparation for self-defence), recommended as important “life sports”. At the forefront there is their usability health-related training and the secondary is an economical aspect.

On the most general level, first category of combat sports systemically teaches safe fall (judo, in a certain sense sumo and wrestling), second category is avoiding collision (boxing, fencing, karate, kendo, kickboxing, taekwondo). Both aspect are included in jujitsu and unifiight [18]. Because every combat sport is martial arts but not vice versa, precisely this sport formula opens expansion of eastern martial arts for all continents and gradually including it in Olympic Games program.

Aikido, which is not combat sport or martial art, but unique art of self-defense (motor response on numerous forms of physical aggression) [5], fit in its entirety into prophylactic and therapeutic agonology.

In Poland, in a times of the Iron Curtain original scientific bases (theoretical and methodological) of prevention of injuries as a result of falls and collisions were created. Unfortunately, a main barrier of promotion of this knowledge in that period and long after symbolic fall of the Berlin Wall (9/10 November 1989) was language – all papers were publish exclusively in Polish.

In that period research teams and WHO were monitoring increasing problem of a fall, as a cause of years lived with disability as well as years lost to premature death [19-21]. Following reports confirms dynamic phenomenon: within 20 years (1990-2010) a fall rose in a global scale high in this rankings (among 25 causes of those negative phenomena the fall is ranked tenth) [22].

Prevention programs are based on a naive assumption, that fall can be eliminated from a human life. Results of randomized trials denuded this naivety. Effectiveness of multifactorial intervention programs was barely reduction of fall risk by 15% to 48% [23, 24]. Since 2007 three pillars of the WHO Falls Prevention Model are recommended [25]. None does directly recommend the necessity to teach the techniques of safe fall.

In contrast, there is right thesis of Polish scientists, that eliminating falls from human ontogenesis is impossible. Therefore empirical confirmation of effectiveness of prevention programs is one of the most crucial premises of necessity of connecting programs of reduction a risk of balance loss and fall with teaching skills (techniques): 1) safe falls; 2) avoiding collisions and alternative amortization of collisions with objects in motions and vertical obstacles; 3) securing falling person (in a condition, that there are right circumstances of such action – possibility of physical contact).

Safe fall theory in brief

Two Polish scientists, Jaskólski and Nowacki, published in 1972 safe fall theory (‘soft fall’ theory) in a local journal [26]. Based on the laws of physics, the authors defined key concepts of the theory and developed suitable mathematical models of: „energy of base deformation”, „heat released during friction”, „strain energy of human body”, strain energy of distortion”, „strain energy of volume change”.

A falling individual may decrease the unit deformation energy by: (a) increasing body area in contact with the base during fall; (b) increasing time of inhibition or elongation of distance during collision itself. Calculations show that only a double increase in those two values decreases a unit deformation energy by 16 times, while its five-fold increase allows reducing the „*e*” value (*strain energy of volume change*) as many as 625 times.

Based on of those well justified premises, authors tend to associate the sense of preventing body injury in cases of loss of balance, fall and collision with the base with the ability of dispersing falling energy or that of a foreign body in collision with the human body (e.g. when hit by a car, boxer blow, etc.). They argue in a just way that the muscles are appropriate amortisation means for shocks that a human body is submitted

(exposed) to. During a fall the muscles tend to play the amortising role best, if the joint (skeletal) system, which they are running on, is set at the most convenient angle [26].

Techniques of safe fall and avoiding collision with fun forms of martial arts as modern program of prevention of body injured

Jaskólski and Nowacki work [26] became the inspiration to develop a methodology for safe fall for all individuals and for patients with different diseases and also specific techniques of avoiding collision.

First article of this method (methodology for safe fall for all) in Polish were published in 1976 and was recommended in military training [27]. First international applications (1978-1979) happened during "Judosommerschule" in Austria [28]. During the study visit in 1996 in large rehabilitation clinic in Pretoria (RSA) inhabited by numerous patients after limb amputations, the Kalina RM demonstrated balance loss and dynamic safe falls (the performance took place on a parquet floor). After having demonstration, soldier about 20 years old, who lost both lower legs by stepping on a mine, got up from rehabilitation-table, clumsily made a few steps using modern prostheses (the first ones since amputation) and with tears in his eyes stated: "I would like to learn such techniques" [29].

The authors (of this paper), published in 2003, theoretical and methodological postulates of teaching lower extremity amputees to fall safely [29] have been implemented into the teaching programme of physiotherapy students

in two Polish universities no until 6 years later. But previously: first, Artur Kalina empirically verified the universal character of exercises on safe falls [30]; secondly, since 2000 in two other Polish universities, program for physical education students: "Combat sports propedeutics – basics of judo" (including fun forms of martial arts [31, 32]) have been implemented.

In Europe there was strong wrestling tradition. Especially Russian and Polish experts have developed many fun forms of martial arts (FFMA), mainly of wrestling type [33-35]. FFMA fulfill the important functions of adaptive (utilitarian aspect), diagnostic and therapeutic (health one). The most general division of FFMA includes 8 categories. For example, part FFMA category "1 – avoiding a collision" (Figure 1) and "8 – comprehensive settling of close combat" (Figure 2) is useful both for diagnosing aggressiveness (it is one of the most popular indicator of mental health) and for reducing it (the therapeutic factor) [31]. These categories of FFMA also have a prophylactic significance in the sense of preventing injuries to the body as a result of a collision with an object in motion.

Combat sports propedeutics – basics of judo (CSP-BJ) [32] is based on two basic premises. First of all, no combat sports or martial arts constitute a fully complementary system (despite the fact that training affects positively basic systems and functions of the organism, it does not assure optimum adaptation in other scopes, for example as regards widely understood self-defence). Secondly, each martial sport is at the same time a form of self-defence art.

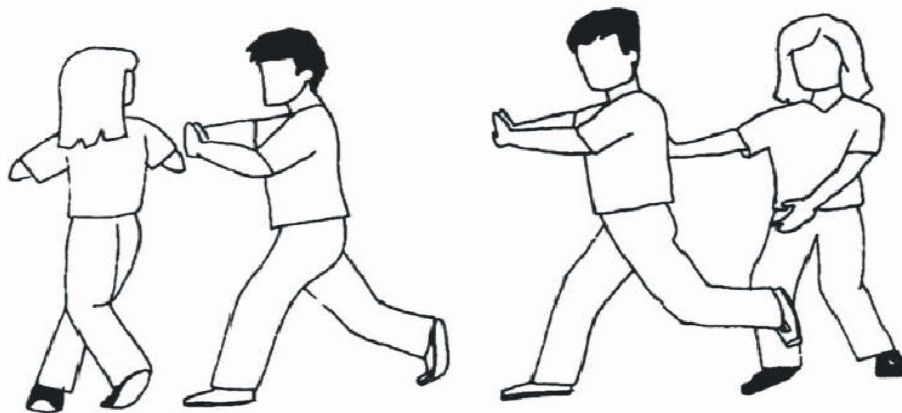


Figure 1. "Matador" example, *fun forms of martial arts* of the category "1 – avoiding a collision" [31].

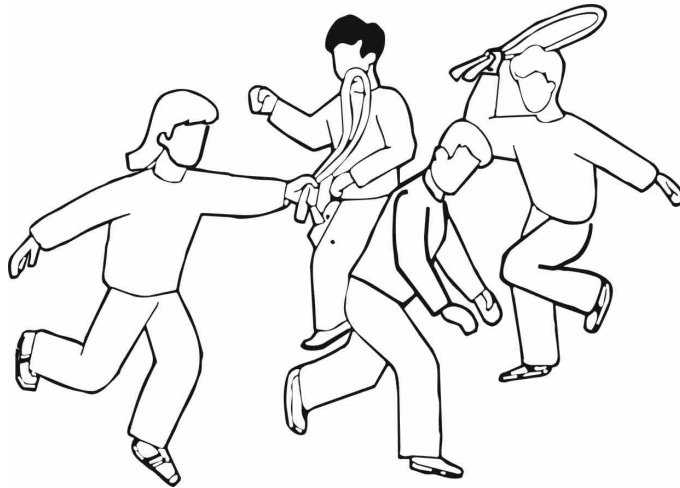


Figure 2. "Mischievous fox" example, *fun forms of martial arts* of the category "8 – comprehensive settling of close combat" [31].

Consequently, we are convinced that already in the initial phase of education each individual should learn elements of self-defence in a wide sense – to protect one's body during falls and collisions with other objects (wall, thrown stone etc.), as well as in situations of danger of physical aggression, respecting principles of necessary defence. On the basis of those presumptions and assumptions we associate the main objectives of propaedeutics of combat sports with elements of judo (especially the ability of falling safely) and formulate them in the following way:

- ability of falling in a safe way to protect the body during falls and collisions with vertical obstacles, as well as during direct fight implemented with criteria of sport type judo, or self-defence based on relatively soft means (which among others means throws applied in judo, sambo, wrestling);
- ability of providing security of a falling body specially thrown off balance;
- feeling of self-confidence in situations of sudden loss of balance or necessity of counteracting to criminals in defence of oneself or other endangered persons;
- learning respect the body of one's own and of other people, as well as soft methods of immobilisation of opponent's body;
- development of self-control in situations of social approval for application of physical force in relation to others;
- making the body resistant to various forms of physical pressure (including blows);
- development of individual predispositions to sports fights of the wrestling type [32].

The effect of permanent participant observation, systematic studies not only modify these programs in the pedagogical sense. Kalina RM has created four (apart from: *basic self-defense skills test* (BSDST) and aggressiveness diagnosis on the basis of direct observation of the behavior during FFMA [12]) important specific motor diagnostic tools (criterion variable is final validation of test): 1) *test of making safe falls* (TSF) [32] 2) *susceptibility test of body injuries during a fall* (STBIDF) [36-39]; 3) *Rotational Test*'(TO) as the method to evaluate *the body balance disturbance tolerance skills* [40]; 4) *non-apparatus safe falls preparations test* (N-ASFPT) [41].

Empirical verification *Safe fall*

The effects of application of theory of safe fall have been verified during the original programs for special forces soldiers, military cadets, students of physical education and physiotherapy (including use of motor and psychomotor multi-dimensional tests [42]) and then during several original clinical experiments involving patients: after amputations of limbs [43, 44], the visual impairment (and blind) [44, 45], mental impairment [46], obese people [47].

The results of correlative research studies verified high accuracy used test for safe falls. Program CSP-BJ may considerably intensified the prevention of physical injuries by universal teaching of safe falls, people in different ages (regardless of sex and preferred physical activity or a daily shortage) and even allow for learning in independent manner [48, 49].

During the academic year 2009/2010 there have been pilot verification "The theory and methodology of safe falls in individuals after limb amputations and the blind" (lectures 20 hours, classes 40 hours). Program was divided into two courses: first (for blind) second (after limb amputations). Due to the number of students ($n = 107$ physiotherapy students), classes were held in 6 student teams of 18-20 individuals each. Every student team was randomly generated using the administrative criteria accepted in university (one of the requirements was to include at least one male student in the student team). Student teams were divided into groups A and B according to a formal "twin pair" principle. The first criterion was the identity of the sex within the pair, so that women and men could be proportionally distributed between groups A and B. Similarity of the results of the TO [40] and the result of the (STBIDF) [36] were assumed as the motor competence criterion [50].

Students in group A were trained by the rigorous method, while students in group B were trained by a method that preferred FFMA. Both methods are effective. However, perspective of training individuals after limb amputations and the blind may raise certain psychological barriers, put up by both patients and physiotherapists. Therefore, as expected, it should be one of the essential didactical goals that students are able to perfectly demonstrate all exercises [50]. Furthermore, the results of the study authenticate the previously verified hypothesis [48].

For print publications there are complex effects on clinical trials: kinesiotherapy based on safe fall techniques for people with mental disorders; safe fall for people after amputation or with abnormalities of lower limb; safe fall for people with diseases the organ of vision.

Very convincing arguments to verify the theory safe fall and long-term effects of adaptive provide the results based on biomechanical criteria. In first experiment [51] balance loss of a person, who was trotting in place simulating elementary movement activity – walking, was caused by an assistant. He was pulling by judo belt wrapped around each ankle joint (left and right leg were wrapped separately) in any moment and caused a fall of a tested man either to the right or left side. The assistant made the decisions independently. Thereby, the conditions of the experiment

reflected the circumstances of a balance loss categorized to CFR 3 category, which *includes the cumulative effects of any external force(s) and internal factors concerning a person performing an action; sub-group (a) fall hazard when even a simple motor activity is hindered by external conditions (e.g. walking on slippery surfaces)* [40]. It is such circumstance, when the ability of motor adaptation is a fundamental matter.

The experiment has provided some obvious evidence that a person is able to safely collide with a hard ground under the condition that he will be properly trained. Moreover, biomechanical analysis of repeated falls, although performed in laboratory conditions, reveals that in contrary to numerous sports techniques (based on closed movement habits) a significant part of effective body control during sudden balance loss and afterwards appropriate amortisation of the collision with the ground is the ability to adapt motoric to certain circumstances [51].

In the second experiment [52] participated the same men: 65 years old, 24 years younger. Elderly man more effectively amortises the collision with the vertical obstacle. This is reflected in the average values of the head mass accelerations, which were lower by approx. 40% than in younger man; the average energy absorbed by the body tissues of elderly amounted to approx. 53%, whereas younger to 71% of the collision energy (elderly man dissipated energy more effectively). More effective amortisation of the collision with vertical obstacle by elderly man resulted moreover from the movements of his body segments after the collision (mainly flexing the knees, which is possible due to the relaxation of the muscles around this joint). The movement of body segments of elderly man in the second phase results in the increase of the mass centre movement in the direction of sagittal axis and in the increase in the body movement range.

The authors conclude: suitable training causes the person in retirement age to more effectively amortise the collision with own body with hard vertical obstacle than a young adult man with significantly shorter training experience. Completion of the specialist course on safe falling and several years of judo practice significantly increase the abilities of protecting the body of a person in the conditions, when an external force results in the collision with the hard vertical obstacle. Increased

probability of the more effective prevention of body injuries or even death in such circumstances requires the inclusion of such simulations to the permanent health-related training [52].

Avoiding collision

In the third experiment [53] participated the same men (but older): a man 68-years-old and man 27-years-old. Measurements have been performed with the use of MVN Biomech System (XSENS). Application projects a ball with a diameter of 12 cm, which fly with constant velocity (three trials; 10-, 6- and 3 m/s) alongside axis perpendicular to a frontal plane on the height the head and legs of the participant in an initial moment. The research team concludes: "Positive adaptation effects for 68 years old man (most of the analysed time graphs of kinematics quantities were similar) is an empiric proof, that some category of 'life sports' guarantee an optimal level of motor safety to a late elderly" [53, p. 209].

Reducing of aggressiveness

In two experiments carried out a comprehensive verification of the effects of health-related training incorporating to all the above-described elements of the motor and the effects on the mental sphere (mental health and social health – interpersonal relations).

During two first semesters of military studies (academic year 1992/1993, three years after the end of Martial Law in Poland), selected (n = 19) from among 182 military cadets exhibiting increased aggressiveness participated in special programme based on physical exercises (judo, self-defence), relaxation exercises, verbal actions – indeed realising the first time in a long period health-related training basic on prophylactic and therapeutic agonology. Pronounced one-way migration from aggressiveness 63.2% towards bravery 68.4% results from cumulated therapeutic and preventive effects (experimental group) – to be exact: before experiment bravery 37%, aggressiveness 63%, after, bravery 68.4% aggressiveness 31.6%. Control group (n = 75 military cadets trained with traditional methods): before military training bravery 59%, aggressiveness 41%; after experiment training bravery 42.4%; aggressiveness 57.6% [12].

Twenty years later, after 9 months of experiment based on similar health-related training, 23 female student participant from different

study faculties, there were confirmed positive motor and mental effects in comparison to control group (n = 97), who was not physically active in that period of time [54].

Klimczak and Kalina RM [55] provided unique observation results. Six 13-year-old students (one female) of school for juveniles with intellectual disability selected by head directed of this school (where one of the workshops in 2015 was conducted). Students were selected by him among group present on a hallway during a break between lessons. He agreed with researchers suggestion, and indicate one with increased aggressiveness. The diagnostic-therapeutic fun forms of martial arts ("modern marketplace") was conducted in three versions, two minutes each, by calling "buyer" by belt colour, code number or a mix of those. The placebo effect explains the results of the following observation: since is clear, that during game ("modern marketplace") belt is perceived by participants as "credit card" and human back of participants as "credit card readers", therefore, the change of the "credit card" strike in the participant's to a symbolic touch of his body it is a real, conscious correction of motor behaviour (evidence of internal transformation). What more, reference group: 1,694 specialist of sports activity organisers for the youth (participants in 2014 and 2015, organised in every of 16 districts in Poland at least one two-day special courses). This diagnostic-therapeutic fun forms of martial arts ("modern marketplace") was conducted during workshops. During every training workshop at least two among 6 participants (33%) for every applied game ("modern marketplace") were excluded in a first minute (empirical proof of revealed aggressiveness). Authors obtained such results during two categories of practical consequences: diagnosing and reducing the aggressiveness of people regardless of age, gender or intellectual disability. Unique means are fun forms of martial arts [55, 56].

CONCLUSIONS

In the course of many years of experimentation of Polish experts, there have been positively verified hypothesis: if methodical and educational standards are met, sex, age, and type of body build are not factors limiting the effectiveness of safe fall learning [48-50]. In addition, empirical data confirm that the cardiological and all other effects will be achieved by a person who is

able to rationally use FFMA in systematic physical, intellectual and mental activity (own, family, friends etc.). With a limited professional intervention he/she can diagnose not only aggressiveness of participants exercise, but also become aware of their weaknesses and other traits (anxiety, shyness, vanity, etc.) which they cannot overcome by themselves. Such an animator of family activity or of a group of friends can play a role of a volunteer of rational prophylaxis or even therapy.

Perhaps, only the most prestigious scientific journals may put effective pressure on people and institutions that have the authority to accelerate the simplest and the most economic solution of the problem, i.e. teaching each person about safe falling as early as possible in their lives. The role of the scientists is still to publish the methods and study results so that the others could accept them or at first subject them to secondary verification process.

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