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Early Loss in Ontogeny of the Ability to Protect the Head and Hands During a Fall – Nature Did Not Fail, But Coordinators and Education

Artur Kalina[1] and Roman Maciej Kalina[2]

[1]Plus-Rehabilitation Services Ltd., Crystal Lake, USA
[2]Archives of Budo: Journal of Innovative Agonology, Piwniczna-Zdrój, Poland

ABSTRACT

The Polish School of Safe Falling (this is a conventional name) has its origins in the 1960s. The prototype motor was *ukemi waza* (falling techniques) from Japanese judo. This paradigm dominated for over half a century in research also outside Poland. Our original and co-authored research on the SFI phenomenon (susceptibility to the body injuries during the fall) led us to breakthrough discoveries (after the death of the creators of the theory of safe fall). The largest number of observed motor responses (3613) during a body collision with the ground falls on children from two to six years of age, and the unique cognitive value is determined by motor simulations ensuring an unintentional fall. Therefore, the conclusion is obvious that even in the circumstances of a fall outside laboratory conditions onto the ground on which a person moves, two-year-old children are the safest. This ability of unconscious self-protection, lost in ontogeny, is not absolute, however, and empirical evidence is provided by pilot observations of people over sixty years of age with various affliction and limited motor skills.

Keywords: Innoagon, Polish school of safe falling, Theory of safe fall

INTRODUCTION

The title of this paper is the most general conclusion from our research and co-authorship of the phenomenon of susceptibility to the body injuries during the fall (SFI) (Kalina, 2009; Gąsienica-Walczak and Kalina, 2021; Gąsienica-Walczak and Kalina, 2023; Kalina et al., 2024). When Ewaryst Jaskólski (1932–2007), one of the forerunners in Poland of promoting judo in the academic community, but the absolute leader of teaching safe fall to the blind (Kalina, 2007), published together with Zbigniew Nowacki (1972) the theory of safe fall Artur was born, the first author of this scientific essay. At that time, his father, Roman, inspired by his own judo skills (and importantly – unaware of the existence of both the theory of safe fall and its authors) taught commandos safe falls during various motor simulations of military operations with high dynamics and the risk of bodily injury. Artur participated from early childhood as a spontaneous observer in judo military cadets trainings and out of his own curiosity or encouraged by adult judo

practitioners, he undertook fun forms of combat with them that are difficult to define today, and at the age of eight he began professional judo training. This was the time of creation of the multi-generational, conventionally called Polish School of Safe Falling (name, first used by Iermakov at al., 2022), where the motor prototype was *ukemi waza* (falling techniques) from Japanese judo. This paradigm dominated for over half a century in research also outside Poland. Our original and co-authored research on the SFI phenomenon led us to breakthrough discoveries (after the death of the creators of the theory of safe fall).

Three generations of experts from the Polish School of Safe Falling are still studied the phenomenon of fall in the motor sense (few of the oldest ones remain). This seemingly trivial remark is, however, important not only because of its semantic dimension. In many natural languages, the word 'fall' (of course, according to the spelling and articulation of the given natural language) has no substitutes, similar to English. For example, when it comes to the phenomenon of 'declension', in other languages, when information concerns this phenomenon, it is necessary to use word combinations with the word 'fall'.

However, this dimension is most significant in its methodological approach. Since the synthesis of the results of theoretical and empirical research on the phenomenon of fall in the motor sense is possible from the perspective of many specific disciplines (and within them, taking into account various theories and concepts), then a firm separation of social sciences, humanities and any other is inadmissible. Inadmissible both due to the cognitive and social mission of science. But since interference in the autonomy of sciences and generally limiting the freedom of science is also inadmissible, what imperative authorises this firm 'inadmissible'.

The contradiction disappears when using the author's complementary research methodology. This research tool, not yet published in its entirety, does not allow enthymematic premises in any theoretical or empirical research, except for those that belong to empirical obviousness and elementary logic (Kalina, 2025).

The cognitive goal of this scientific essay is premises based on unique empirical discoveries, which constitute the basis for formulating hypotheses of ground-breaking importance from the perspective of reducing the risk of SFI, regardless of the stage of ontogenesis, up to the predicted changes possible in the dimension of global civilization.

PREMISES OF GREAT IMPORTANCE FOR NECESSARY IMMEDIATE PREVENTION

1. Fall in the motor sense is inextricably linked to two categories of specific phenomena. The internal ones (concerning the person) refer inextricably to the biological layer of personality with a dominant neurological component. The external ones are an infinite number of compilations of factors, the elementary of which are the properties of the surface with which the body collides in the final phase of the fall.
2. The biological tolerance of the human body to collisions with stationary and moving objects (although individually differentiated, but only

to a certain extent) combined with not always conscious motor responses during collisions with the ground are the basic quantitative indicators for predicting SFI risk. With repeated observations, these indicators are transformed into quantitative-qualitative ones. These indicators can be observed even without the need to use specialist tests and professional documentation. Simple mathematical calculations of everyday observation results are a chance to activate the human cognitive layer multiple times in the daily cycle and an effective way to influence personal safety by consciously reducing motor responses qualified as burdened with such risk.

3. The simplest external adaptations to apply (simulated fall from a height with the feet down, etc.) in safe circumstances provide important information about either modifying (in a positive or negative sense) or repeating previously observed motor responses.
4. Combining the transformation of external factors with motor modifications (pressing a sponge with the chin to the torso; clapping hands, etc.), while meeting the criteria of multi-aspect personal safety, is an attractive diagnostic offer with dual use. For some people, they are a factor reducing the potential causes of SFI, for others they are difficult enough in terms of coordination to increase errors during the first contact of the body with the ground (simulated impact).

HYPOTHESES AND PRELIMINARY EMPIRICAL VERIFICATION

Since we are familiar with our own findings and the research results of other representatives of the Polish School of Safe Falling, we formulate below two hypotheses related to the title of this paper and their most general verifications based on evidence.

Hypothesis One

In ontogeny, the second year of life is the safest in terms of minimized SFI risk, and in at least 3% of three-year-old children this risk is already close to extreme, i.e. it concerns damage to at least one part of the body during each unintentional fall. The SFI extreme risk increases to 5% in the population of four- and five-year-old children, and among them there are already cases of multi-organ risk and concerning the most distal parts of the body (upper limbs and head). This phenomenon increases to at least 6% in the population of six-year-olds.

Empirical Argumentation

In the case of children, the diagnosis is based on unintentional falls in safe, identical laboratory conditions. Children were thrown off balance during individual sessions on a soft surface during three different fun forms of fall (FFF in versions a, b, c, which symbolise the use of force, respectively: below the centre of gravity, at the height of the centre of gravity; at height-; below-). The criterion for including the observation results in the statistical analysis was the finding of at least three falls meeting the test criteria of each FFF separately (minimum sum of falls 9). There were no limits and

previously established number of falls or session time. Individual indicators were calculated from a minimum of 9 test falls during the session to 32 found in a two-year-old child. The longest session lasted 40 minutes and was a three-year-old child, while the shortest (10 minutes) was perpetrated by a two-year-old child (Kalina et al., 2022; Gąsienica-Walczak and Zachwieja, 2024).

During the use of FFF, the contact of the head with the ground is sporadic, but each such event is carefully documented and analysed from the perspective of neurological criteria and personal safety. Such cases are described by Gąsienica-Walczak and Zachwieja (2024): 'One child (boy) in the group of 4-year-olds made the mistake of hitting his 9 head on the ground during FFFb (using light force). Moreover, in each FFF he made 3 falls (a total of 9, including 8 times rolling onto the back, one time hitting the head). His SFI degree D = 1. Diagnostic session time: 24 minutes (FFFa 9 minutes, FFFb 7 minutes, FFFc 8 minutes)'.

Therefore, in the synthetic comparison of the basic SFI risk indicators of children and adults, we have placed them under the common name of 'head and upper limbs'. Since in this place of the table motor responses are also monitored during the test collision with the ground of adults, it means that each observed adult in at least 92% of repeated motor simulations provided empirical evidence of extreme threat to these three body parts simultaneously (Table 1).

Table 1: Synthetic presentation of the main SFI risk indicators of sample personal groups.

Variable	Age (years) and proportion of people (%) with SFI risk greater than 80%							
	2^	**3^**	**4^**	**5^**	**6^**	**21^^**	**22****	**62-81#**
participants (n)	34	32	47 (22*)	39 (30*)	39 (34*)	213	30	7
observed falls								
per person (n)	9-32	9-25	9-22 (9-16*)	9-17 (9-17*)	9-15 (9-15*)	3	12	12
total (n)	588	494	627 (258*)	467 (350*)	440 (389*)	639	360	84
SFI risk	**head and upper limbs**							
extreme: 92-100%	0^	0^	2^	3.2^	5^		23	
very high: 80-91.99%	0^	3^	5*	3.3*	6*		7	
extreme SFI risk	**adults only**							
92% of extreme SFI risk is adapted to the evaluation of the results of 12 test falls and slightly lowers the criteria established for the FFF method (Kalina A et al. 2025)	**head**					52	13	
	hand						7	
	upper limbs					34		
	hips					33		100
	legs					8		100
	head, hips, legs							14
	upper limbs, hips, legs							14
	head, upper limbs, hips, legs					2	7[V]	

^(Kalina RM et al 2022); *(Gąsienica-Walczak and Zachwieja 2023); ^^(Gąsienica-Walczak and Kalina A 2023); **physiotherapy students, SD ±0.85 years (Kalina A et al. 2025); # (Klimczak et al. 2024); [V] only during 6 simulated falls from a height, feet down

Hypothesis Two

One of the most obvious empirical evidences that the physical education paradigm is counter-effective, especially from the perspective of social responsibility for basic personal safety, is the increase in SFI risk (instead of reducing it) during compulsory schooling, continuing at the level of higher education.

Empirical Argumentation

Observations of school-age children and adults are based on the susceptibility test to the body injuries during the fall STBIDF (Kalina, 2009) or on the modified version STBIDF-M (Gąsienica-Walczak and Kalina, 2021). These already are test falls, but intentional in the sense that only the results of observations of those people who voluntarily follow the researcher's motor commands are analysed (in our own research, we did not find a case of refusal to take the test).

Simulated test falls, i.e. changing from vertical to horizontal posture, are not only limited in number. Each subsequent repetition is defined as to changing external circumstances. During the three-task STBIDF, the first two motor simulations are performed by the observed person on the ground on which they are standing. The last simulation is a fall from a height of feet down from a 20 cm platform. The six-task STBIDF-M is an alternating repetition of the same motor manipulations at the same level and after a backwards jump. During these motor tasks, no information is provided that could suggest correction of motor responses, but care for the personal safety of the tested person requires intervention each time in cases indicating discomfort experienced by them.

The most important element of the initial diagnostics is the pre-test. Its purpose is to determine whether the person is able to freely perform several deep squats without feeling pain in any part of the body or whether there are objective obstacles to abandoning these initial exercises. The test can be performed using a platform. A person who has difficulty performing squats or has limited ability to bend the legs in the knee joints, but is able to lie down on a platform the height of a standard chair (48 cm) is eligible.

In the reference to the results of the study of 62–81 year old residents, the diagnosis based on observations of 12 test falls of each person is the result of summing up the repeated STBIDF-M in the version of the platform used (rehabilitation bed). Observations of 84 test falls by 7 nursing home care patients provide unequivocal evidence that, over the four months separating the laboratory measurement of the SFI phenomenon, none of these individuals experienced a reduction in extreme risk in the legs, hips, or other parts of the trunk (Table 1). Although Klimczak et al. (2024) provides detailed profiles of each of these individuals, the documentation includes the initial and final SFI measurements of the seven-month experiment.

In such situations, it is justified to use the innovative 'omitted implications review', recommended within the author's methodology of complementary studies (Kalina, 2025). The results of the indirect SFI measurement, to which we refer, were omitted in the cited work, but in this case we are in

a comfortable situation, because we have access to the entire documentation from that experiment. It contains empirical evidence that already in the course of six repeated test falls in the circumstances of alternating modifying factors, some patients over sixty years of age and with a history of a neurological event show a tendency to reduce SFI risk of at least one of the distal parts of the body.

Among the monitored empirical indicators is the result of extreme risk of upper limbs, hips, legs of a 65-year-old patient (right hemiparesis after ischemic stroke; dementia syndrome of unknown ethology; mild dementia). During the first two test falls, his motor responses documented SFI extreme risk of all five observed parts of the body. From the third, when the first time the sponge had to be pressed with the chin to the body, he eliminated the errors of simultaneous contact of the head and back with the ground, assuming a horizontal position until the end of the remaining test falls. He did the same when repeating the test four months later, but in addition, from the third test fall, while lying on his back, he supported himself with one hand. During the final test of the experiment, in the third test fall, while assuming a horizontal posture, he supported himself with both hands, but in the next one, with one hand, and in the 5th and 6th he did not make this error, but stopped clapping his hands by lying on his back.

The monitored result of SFI extreme risk of head, hips, legs of a 75-year-old man (bladder cancer; cognitive impairment without dementia) changed with even greater dynamics, but it is also evidence of resistance to some motor modifications. The error of hitting the head with the ground was repeated until the 14th test fall (i.e. until the third performance of STBIDF-M, ending the experiment), while the reduction of SFI risk of hands, although with alternating effect, was initiated by performing the fourth test fall in the course of the first studies.

The bipolar effects of the applied motor modifications during STBIDF-M are even more pronounced in the results of the repeated test after seven days by 30 22-year-old physiotherapy students (Kalina et al., 2025). We had done retrospective analysis of 360 falls within the STBIDF-M without the need to use the version with an elevation. Although two people (7%) gave evidence of SFI extreme legs, but only in the circumstances of 6 simulated falls from a height, feet down. In this sample from the population, the accumulation of the probability of extreme multi-organ injuries (head and upper limbs) and together with very high SFI risk concerns every third person. Unfortunately, the results of observations of 639 simulated falls of the larger sample from the population are based on the original STBIDF evaluation criteria, where simulated fall from a height, feet down is used as the last, third task ending the test. However, the result of 2% of people who gave evidence of SFI extreme risk of all distal parts of the body and legs, on the one hand, and complete resistance to motor modifications, which should help reduce errors of these body parts during the motor response at the moment of impact with the ground, is cognitively very valuable.

The proportions of children aged four to six years are similar, whose motor responses during body impact with the ground, regardless of the

FFF used, authorise the diagnosis of extreme body damage during a fall in circumstances different from the safe laboratory environment.

We do not see the need or possibility of testing SFI regarding legs among preschool children. Such an assumption is not determined by the epidemiology of the location of body damage caused by falls (e.g. Amin et al., 2023), but above all by concern for the personal safety of children.

SUMMARY REMARKS

The highest number of observed motor responses (3613) during a body collision with the ground is in children from two to six years of age, and the unique cognitive value is determined by motor simulations ensuring an unintentional fall. Therefore, the conclusion is obvious that even in the circumstances of a fall outside laboratory conditions onto the ground on which a person moves, two-year-old children are the safest. This ability of unconscious self-protection, lost in ontogeny, is not absolute, however, and empirical evidence is provided by pilot observations of people over sixty years of age with various affliction and limited motor skills.

In a sense, even contrary to epidemiological data, the greatest risk of multi-organ damage located in the most distal parts of the body during an unintentional fall concerns the population of young women and men undergoing higher education. The available results of studies using STBIDF of people younger and older than the presented sample from the student population are edited at a level of generality that makes it impossible to conduct comparative studies based on a similar synthesis. However, this is not a reason to refrain from concluding that this still burning problem of SFI prevention will not be solved without a radical departure from the physical education paradigm and radical changes in the education and selection of coordinators responsible for public health. An alternative is modern preventive medicine supported by INNOAGON methods and tools – an acronym for innovative agonology (Kalina, 2023; 2024; Kalina and Kruszewski, 2023).

CONCLUSION

We also see the need to redefine SFI prevention based on the so-called safe fall techniques modelled on combat sports. The simplest, cheapest and most accessible investment in a three-year-old child is not to waste the motor potential of a two-year-old endowed by nature with the unconscious ability to protect the head and hands when falling against their will, but to enrich this gift. It is the ability to cushion a fall by using (preceded or not preceded by the word 'technique') a simple 'cradle', finished with rolling onto the back and combined with the ability to transform the lost balance in any direction so that this theoretical and motor condition of safe fall is met. This is a chance for cultural changes on a global scale and corresponds directly to the hypothesis about the primary of the universal human values: 'survival of humans and nature in a non-degenerate form and responsibility for coming generations' (Piepiora and Kalina, 2023, p. 285).

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