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Safe Fall-Safe Schools (SFSS) LEVEL I

Research Protocol

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Octaedro
Editorial

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1. Introduction

The research protocol presented in this document, Safe Fall-Safe Schools (SFSS), stems from the research line known as Adapted Utilitarian Judo (JUA), which was introduced in 2015 at the 6th International Congress on Physical Activity and Sports for Seniors (Málaga, Spain). It marked the first time a proactive intervention proposal for addressing falls, specifically among the elderly population, based on ukemis or judo falls, was presented to the scientific community. Encouraged by promising results obtained in various research studies, work continued along this line, presenting new findings at the 3rd European Science of Judo Research Symposium & 2nd Scientific and Professional Conference on Judo: "Applicable Research in Judo," held in Porec, Croatia in 2016. These results received the 2nd prize for research at the conference.

As a result of this pioneering work in the proactive management of falls among special populations, a Memorandum of Understanding (MOU) was signed between the European Judo Union (EJU), the Andalusian Judo and Associated Sports Federation (FANJYDA), and the University of Seville (US). The final document proposed providing institutional support and developing a specific program for children to complement the previous one (JUA). This challenge was embraced by all three institutions, leading to the design and development of the Safe-Falls Safe-Schools program. In this context, the comprehensive potential of judo as a social tool for improving the health and quality of life of children and the elderly is considered.

To address the demands of the World Health Organization (WHO) in the area of unintentional fall prevention, these programs were designed and implemented under the auspices of two research contracts. One in 2015 focused on Adapted Utilitarian Judo, with its primary aim being the teaching of falls to the elderly, and a second contract in 2016, Safe Fall-Safe Schools, focused on teaching falls to the school population. Both programs have scientific and methodological content approved and endorsed by the Biomedical Research Ethics Portal of Andalusia.

As a result of the development and implementation of these programs to date, their projects have been presented at over 50 global and international conferences, including noteworthy events such as Safe Kids Worldwide: PrevCon 2023 in Washington and the 11th European Conference on Injury Prevention and Safety Promotion: EU-Safety 2023 held in Iceland. Regarding program dissemination in specialized journals, 15 scientific articles have been published in prestigious journals with high impact factors. Additionally, 11 book chapters have been published, and four doctoral theses and more than 15 Master's and undergraduate final projects have been defended. All of the above has also been supported by radio spots, digital and print media coverage, and television programs.

The results of several of these studies were presented to the World Health Organization in Copenhagen in January 2018 during a meeting with the director of the WHO's Injury Prevention programs. The internationalization of the program began with seminars in Brighton

(United Kingdom, 2016) and Milan (Italy, 2018). These efforts were complemented by the 1st International Training and Research Seminar Safe Fall-Safe Schools© (Spain, 2018) and the 1st International Training and Research Seminar Safe Fall-Safe Schools, Judo Ukemi at School (United Kingdom, 2023).

This research protocol has been developed as part of the research project (PRJ202304755) executed by researchers from the University of Seville (Spain), University of Osuna (Spain), University of Castilla-La Mancha (Spain), Polytechnic University of Catalonia (Spain), University of Barcelona (Spain), University of Milan (Italy), University of Split (Croatia), and the University of Pécs (Hungary). It represents an international study aiming to analyze the motor response of students to unintentional falls before and after the implementation of the proactive Safe-Fall Safe-Schools program for teaching the skill of falling.

What does participation entail?

The implementation of the Safe-Fall Safe-Schools program in a school involves the participation of the entire educational community in the project. However, specifically in relation to this research protocol, it focuses on the participation of the students in the school, within the Physical Education (PE) subject, through the application and assimilation of the exercises designed for teaching and learning the skill of falling in the school context by Physical Education teachers. Undoubtedly, the support that Judo coaches trained in the Safe-Fall Safe-Schools program can provide for the proper execution of the exercises proposed in this protocol is evident. Prior to the study, informed consent from parents/guardians will be required.

The study will require an initial evaluation through a questionnaire and recording of weight, height, and physical activity habits. Likewise, Observation Test Level I (Annex 4, 5, 6, and 7) is conducted to assess the students' motor response to an unexpected fall.

Once this is done, the program is implemented during the Physical Education class: a theoretical presentation on falls and their consequences in the school-age; practical sessions on specific falling techniques and Safe Fall-Safe Schools exercises during warm-ups session in the school subject Physical Education.

After the program implementation, a final evaluation is conducted (questionnaire, weight, height, physical activity habits, and *Observation Test Level I: Backwards fall, Sideways fall and Forwards fall (frontal and roll-over).*

Benefits of the participation

Students can learn and assimilate a protected and safe way to fall in the event of an unintended fall (falling skill), actively contributing to the reduction of the risk and severity of injuries resulting from this phenomenon.

We encourage all physical education and sports professionals to carry out this research protocol among their students. As responsible educators for the health of our students, we must not forget that falls are an inherent component of human motor skills, and not responding adequately to them can lead to injuries with a high health and economic cost for the child population. Acquiring the skill of falling among our students can make a significant difference in the degree of injury incurred.

In the guide published by the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2015), as a result of collaboration between the European Commission, the

International Council of Sport Science and Physical Education (ICSSPE), the International Olympic Committee (IOC), the United Nations Development Program (UNDP), the United Nations International Children's Emergency Fund (UNICEF), the United Nations Sport for Development and Peace (UNOSDP), and the World Health Organization (WHO), physical education is presented as part of physical literacy for comprehensive human development. They urge policymakers to emphasize physical education, supporting it through school education programs that promote active play every day (running, jumping, climbing, dancing, and skipping). It speaks of quality physical education, which should enable the physical literacy of children and youth, with motor skills being a vital aspect of it, and also for the development of healthy, capable, and active citizens. Let us include within this purpose the learning of the falling skill by our students.

If you are reading these lines, it is because you are convinced that the development of motor skills and verifying their acquisition interests you. This research protocol comes from a broader educational program with analytical exercises, global activities, and games that will enable you to expand the exercises you can implement in this protocol.

2.
Justification

2.1 The Incidence of Falls

According to the World Health Organization (2012a), falls are involuntary events that cause a loss of balance and result in the body hitting the ground or another firm surface.

This organization designates falls as a global public health issue, specifically the second leading cause of unintentional injury-related deaths worldwide, with an estimated total of 684,000 fatal falls annually. In fact, the incidence is even higher because, although not fatal, 37.3 million falls requiring medical attention occur worldwide each year. Furthermore, the costs in the healthcare system resulting from the consequences of falls are substantial, leading to not only health but also economic consequences.

The child population is one of the risk groups for the incidence of falls, due to various factors, including the characteristics of different stages of development, their innate curiosity about their surroundings, and the autonomy they acquire, which leads them to engage in riskier behaviors. Therefore, it can be understood that, despite necessary prevention and care mechanisms, children will experience falls at some point.

In 2019, there were approximately 31,818 deaths of children and adolescents under 15 years of age due to falls (WHO, 2012a). The infant mortality rate due to falls is up to three times higher in low- and middle-income countries than in higher-income countries (Institute for Health Metrics and Evaluation, 2020), with an association between socioeconomic status and childhood falls.

According to the WHO (2021b), the contexts in which most childhood falls occur are varied. The home itself is one of them, regardless of the country and socio-cultural level. Likewise, playgrounds and play areas are places where the incidence of falls is very common and can have serious consequences, especially if there are bone fractures or head injuries. Educational institutions are also a focal point for these types of accidents, especially during recess and physical education classes. Sports practices and physical activities during leisure time are also contexts with a risk of falls. However, according to Bloemers et al. (2012), sedentary children are more likely to suffer injuries when engaging in activities than active children. Therefore, physical activity, physical fitness, and motor skills could be considered protective factors against falls. Less physically active children may benefit more from educational programs (interventions) related to injury prevention or teaching the skill of falling (Verhagen, Collard & Chinapaw, 2009). Therefore, it is essential to promote physical activity and motor development among children, promoting an active lifestyle and proposing initiatives to reduce or minimize the consequences of falls while they are physically active, rather than avoiding activity as a means to reduce the risk of fall-related injuries.

Preventing these types of accidents is a top priority in all areas, from public administrations to raising awareness among families and, of course, from an educational and healthcare perspective. Professionals in direct contact with children need to be aware of this problem and assess the effectiveness of various prevention actions. As a result of this awareness of the risk of falls, various studies have been conducted to prevent falls, and strategies and mechanisms for preventing falls in the child population have been developed, including providing families with information about the risks of falls in children and how to reduce the risk at home, family education programs, and school- based prevention programs, etc.

In particular, the WHO sets prevention and fall management as a priority line of action. This is evident in their publication "Step Safely: Strategies for preventing and managing falls across the life-course" (WHO, 2021c), through which they aim to promote fall prevention and management, urging various institutions at political, research, and practical levels to reduce the burden of fall-related injuries, calling on all interested parties to work together to implement strategies that reduce the harm, suffering, and loss caused by falls.

In this context, most initiatives are aimed at fall prevention, established at a primary prevention level, meaning they are intended to avoid falls as much as possible, for example, by improving safety measures, handrails, non-slip surfaces, etc., as well as with programs and publications focused in this direction. For example, in Spain, the accident prevention program, "Aprende a crecer con Seguridad" (Burgos & Tejero, 2012), or guides oriented towards preventing unintentional injuries in childhood by Soriano (2008) and Esparza & Mintegi (2016), among others. Internationally, the WHO (2021c) meticulously details various proposals for fall prevention in young people and adolescents, among them:

- Child Safety Europe. Good practice guide for fall prevention in children: https://www.eurosafe.eu.com/uploads/inline-files/good-practice-guide.pdf
- Fall prevention (0-6 years) program outlines and resources including images and videos: https://parachute.ca/en/injury-topic/fall-prevention-for-children/
- Fall Safety for kids: How to prevent falls. https://middlesexhealth.org/learning- center/articles/fall-safety-for-kids-how-to-prevent-falls
- Safe kids Wordwide. Safety tips for child fall-prevention. Safety Tips | Safe Kids Worldwide

However, there are far fewer initiatives aimed at secondary or tertiary prevention, i.e., aimed at minimizing injuries and harm caused by a fall. These programs are especially relevant in cases where we know that falls are likely to occur, such as during sports activities. But they are also important at a general level because we are aware that the incidence of falls in both children and the elderly is so high that it is virtually impossible to prevent them.

For this reason, the Safe Fall-Safe Schools group, in collaboration with the European Judo Union, has developed a program for active intervention in accidents involving schoolchildren: teaching safe and protected falling techniques. The main goal of this program is to help reduce the harmful consequences of accidental falls in school-age children.

2.2 The Significance of Falls in Judo

Falls are an integral part of the motor actions carried out by practitioners of certain physical-sportive disciplines (although in these cases, the falls are intentional). We find them in well-known sports such as parkour, football (in the actions of goalkeepers), volleyball (such as receiving in a dive or falling during backward movements), and, for instance, athletics (high and long jump).

Among these disciplines, there is one that places particular emphasis on teaching falls as part of the motor skills of its practitioners. Thabot (1999, p. 70) explains that, "in the discipline of judo, the individual (in this case the defender) may fall if the action of the attacker is carried out correctly. Therefore, it is advisable to learn how to fall, even if the aim of the fight is to avoid it."

In the practice of this sport, the actions used to control falls that may occur are known as "ukemis" and form part of the technical-tactical elements of judo. These elements are understood as essential and indispensable components of the technical-tactical action, which, when interconnected in a biomechanical training system, form the basis of the motor structure of technique and practice in judo (Miralles, 1995). We can think of these actions as ways of falling without injury – in other words, specific work to learn how to fall in a controlled manner, minimising damage caused by the fall.

Authors such as Uzawa (1981, p.28) and Lasserre (1975, p.28) highlight the crucial importance of these actions, with the latter noting that they are "the first thing one should learn in the practice of this discipline." Carratalà (2000, p.51) expresses that they represent "the most rational method of cushioning the impact with the surface on which the fall occurs; in the case of judo practice, this is the 'tatami'."

Although with slight variations, there is broad consensus within specialised literature in categorising these "ukemis" according to the action performed: "ushiro ukemi" or backward fall, "yoko ukemi" or sideways fall, "mae ukemi" or forward fall, and "mae mawari ukemi" or forward rolling fall. In the case of the latter, learning will take place on both the right and left sides.

Ushiro ukemi	Yoko ukemi
	
Mae ukemi	**Mae mawari ukemi**
	

Figure 1. Types of falling techniques "ukemi" in Judo

Taira (2009, p.112) points out that to cushion falls, the action of the arms and the body's rotational movement is essential.

a) Softening the impact with the arms: Striking with the arms significantly reduces the force with which the rest of the body hits the ground. This is because the arms oppose the downward force, creating an upward force when struck. Therefore, the stronger the impact with the hands against the ground, the less momentum the body will have when hitting the ground, reducing the risk of injury. Research conducted by different authors supports this assertion. Hashimoto et al. (2015) demonstrated that the impulsive force generated by hand contact can greatly contribute to reducing the impulsive force on the head during a fall. Koshida et al. (2014) suggest that hand contact may be associated with decelerating the head during backward falls in judo. In theory, hand contact would decrease the momentum of the backward fall and dissipate tension applied to the body.
   In the case of the Safe Fall-Safe Schools program, a significant adaptation to hand striking is proposed because it is crucial to understand the context where an unintended fall can occur. When falling on the street, it is vital to avoid direct head impact with objects such as

curbs, rocks, street furniture, cars, etc. To achieve this, we propose and work with exercises where the primary function of the hands is to protect the head, acting like a "helmet," to prevent possible impact with objects found in the path of an unintended fall. By protecting the head with the hands, we achieve a dual function: preventing direct impact and avoiding placing the hands on the ground.

b) Softening the impact through rotational movement: It is important to perform falls by rolling on the surface on which contact is made as if it were a sphere. Falling with a tense and fully extended body leads to a strong impact, with vibrations transmitted to the head or internal organs. Conversely, rolling over the body significantly reduces the resonance effect, as the relaxed body absorbs the vibrations and transforms the falling force into rotational force, allowing the body to rotate. Groen et al. (2010) explain that one of the most important characteristics of martial arts falling techniques is the rolling movement and head protection. Trunk and neck flexion also prevent the head from impacting the ground. It has been shown that a squat response reduces impact velocity by up to 18% in backward falls, but its effectiveness depends on the phase of descent (Robinovitch et al., 2004) and available joint muscle strength (Sandler & Robinovitch, 2001). By reducing the speed and acceleration that affect the head during judo practice, the angular momentum of the head and peripheral neck moment decreases, resulting in reduced head injuries (Gennarelli & Thibault, 1982).

From a methodological perspective, the learning of "ukemis" is recommended in three stages. The process begins from a seated position, then slightly raising the center of gravity to squat, and finally, they are performed in an upright position (Lasserre, 1975, p.29). In the case of the Safe Fall-Safe Schools program, we add a fourth level of falling, suspended falls. This progression can be done individually, with a partner, assisted, resisted, without equipment, and with equipment.

It is essential to consider Miralles' (1995) distinction between "falling" and "being projected," particularly regarding the difference in kinetic energy involved in each. When one falls by themselves, the kinetic energy generated is lower. Conversely, when "being projected," the kinetic energy is higher due to the combined mass of the person being projected and the muscular force exerted by the projecting person, along with their displacement in the direction of the projection.

Here are some of the principles that should be considered in the study of falls, according to Miralles' (1995):

- If the impact of the fall is distributed over a large surface, the force's magnitude on any specific part of the body is reduced.
- The danger of falls greatly depends on the deformity and compressibility of the impact surface.
- The severity of trauma resulting from a fall depends mainly on the anatomical part that receives the impact.

In judo practice, falling is generally considered an inherent aspect of the activity, primarily aimed at ensuring the safety of the practitioner who is destined to be projected. However, the real scope and utility of this concept should be seen more broadly, emphasizing its educational resources and its importance as a fundamental element (Kolychkine, 1989, p.41). This author adds that mastering falls allows for offering certain benefits to the projected athlete, among which we highlight "protection against accidents." We understand that this protection is initially perceived in the specific sports practice but extends beyond it, into real life.

Judo practice indeed takes place on a specialized surface that, among other purposes, helps minimize injuries due to the impact in throwing actions that practitioners undergo. However, this competency can be useful in various everyday situations. Research (Mroczkowski & Taiar, 2023) suggests the advisability of introducing fall learning into regular physical education to reduce the harmful effects of falls and practice them throughout life as part of personal safety.

2.3 Falling as a Motor Skill

Based on the evidence previously discussed, the existence of a new skill, the falling skill, could be considered (Nauta, Knol, Adriaensens, Wolt, Van Mechelen & Verhagen, 2013). Focusing on the teaching of motor skills, it can be asserted that from birth, individuals face numerous challenges that they resolve through practice and experience. There are phylogenetic activities, that are inherent to humans (such as the ability to move), and others that require practice and training, referred to as ontogenetic, and thus are developed to a greater extent through teaching (Barnett et al., 2013).

All these, taught with an authentic approach, i.e., in playful and/or real situations, enable children to acquire complete physical literacy. Barnett et al. (2013) argue that physical literacy consists of four key indicators: fundamental skills, physical fitness, healthy physical status, and cognitive aspects.

In scientific literature, debates can be found regarding the concept of skill and dexterity (Guthrie, 1957; Knapp, 1963; Batalla, 1994), and this debate persists to the present day (Zagalaz, Chacón & Lara, 2014; Cañizares & Carbonero, 2016). If motor skill is understood as mastery in performing a task that involves movement and must be done efficiently, intentionally, with a specific goal, in a short time, and using the least possible energy (Serra, 1987), the falling skill could be included within motor skills and therefore taught to children.

The aforementioned debate also exists in the classification of motor skills. Cañizares & Carbonero (2016) propose various classifications based on different authors. Internationally, the term "Fundamental skill" or "motor skill" encompasses all of them.

Despite the various types and classifications of skills found in the literature, it is a fact that until 2013, the term "fall skills" (Nauta, Knol, Adriaensens, Wolt, Van Mechelen, & Verhagen, 2013) had not been found in scientific literature, which can be translated as "falling skill."

Since the 1970s, one of the most important theorists, Richard Schmidt, formulated the motor schema theory and how it guides the execution of families of motor skills, a multitude of authors have studied possible classifications of skills. Thus, Cañizares & Carbonero (2016) compiled these, starting with Wikstrom (1990) and continuing to Zagalaz, Cachón & Lara (2014).

Based on the literature review conducted on these skills and the different classifications analyzed, as well as the most current scientific knowledge, the authors of this manual propose the inclusion of the falling skill within the current classification of motor skills (Figure 2).

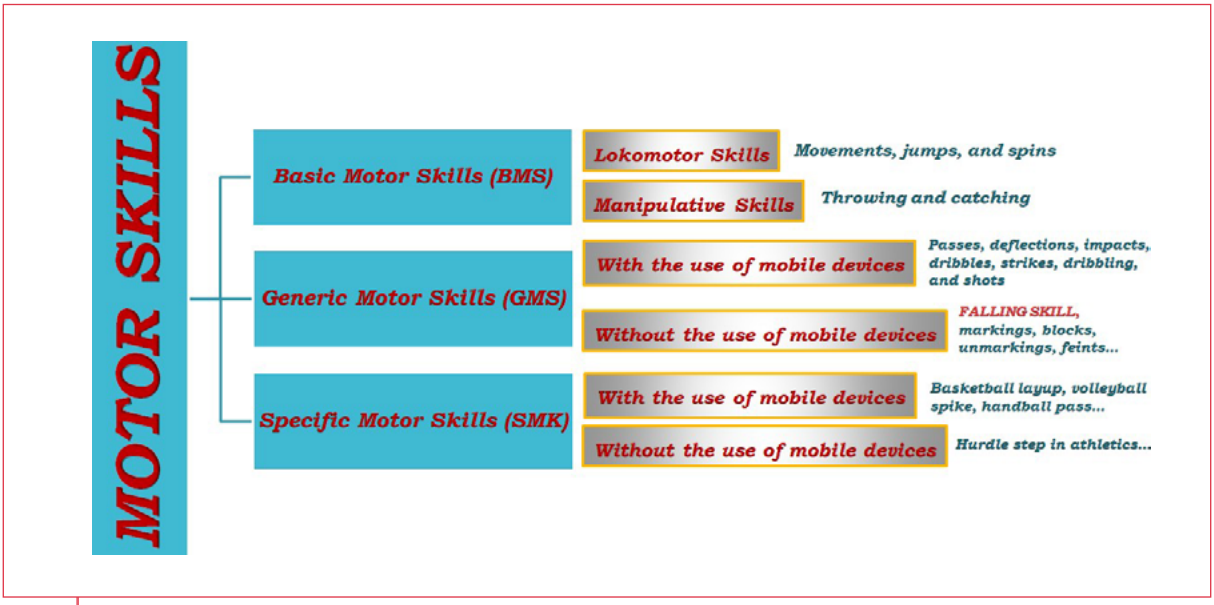


Figure 2. Motor skills

Why can the falling skill be considered a Generic Motor Skill (GMS)?

Referring to the evolutionary itinerary described by Gallahue (1982), cited in Contreras (1998, p.192), we talk about Basic Motor Skill (BMS) when we refer to those early coordinated and intentional actions that individuals perform in their early life stages, after having passed earlier stages related to reflexive and involuntary actions or those performed with a certain level of muscle control and voluntary movement, albeit imprecisely.

We should be aware that the first falls, more or less controlled, in childhood accompany the first locomotor actions. These actions are worked on in later developmental stages and are developed specifically to improve an individual's motor skills. As coordination and control become more evident, we tend to forget about falls, thinking that mastering the first ones prevents the latter, and interpreting them as accidents or as resulting from coordination errors in these movements. Falls can be understood as a failure in the basic locomotor system and, therefore, are part of it. Working on falls skillfully reduces their potential consequences, and therefore, in this sense, the falling skill is at the same motor level as other locomotor skills.

The importance of recognizing falls as a skill lies in the knowledge of the falling skill by physical education professionals and, consequently, its introduction into their students' learning programs in the same way that the work on other skills is introduced. It is part of a basic kinetic system within what we have been interpreting as motor literacy (Whitehead, 2010).

Therefore, basic motor skills are innate motor patterns, embedded in the evolutionary development of the individual, in their phylogenetic development, which all individuals develop, and where variability in teaching them is enriching and allows students to adapt to different situations and solve different environmental problems. The falling skill is found in the next step as a generic motor skill, where students are taught to know how to fall in a specific

way and apply a specific technique, which can become common to other sports, hence, it is not specific but has a technique and a learning pattern.

Generic Motor Skills (GMS) are patterns of movement learned, at an intermediate stage between basic and specific skills, which can be applied to different game situations or sports and, therefore, do not imply a high degree of specialization. They result from the combination of several basic skills and are transferable to any sport or motor requirement. Therefore, the falling skill is defined as follows.

Definition of the falling skill

The World Health Organization defines a fall as "an involuntary event that causes a loss of balance and results in the body hitting the ground or another firm surface that stops it" (WHO, 2021a).

The authors of this manual, from the Safe Fall-Safe Schools program, propose the falling skill as a Generic Motor Skill (GMS), a motor skill that can be taught and perfected, defining it as follows:

The falling skill is the generic motor response of an individual carried out in the event of a voluntary or involuntary occurrence that causes a loss of balance, resulting in the impact of the body against the ground or another surface, allowing for a protective and safe position to be adopted to eliminate or minimize potential injuries caused by falling.

For the teaching of the falling skill, falls are classified into three types based on their direction:

- **Backwards falls:** A generic motor skill or a controlled way to fall on the individual's back after a loss of balance, which could lead to the impact of the back of the body against a specific surface, decreasing or minimizing the impact force, and thus, potential injuries (it is vital in this type of fall to protect the head as a vital part of the body).
- **Sideways falls:** A generic motor skill or a controlled way to fall on the individual's side after a loss of balance, which could lead to the impact of the body's side against a specific surface, decreasing or minimizing the force, and thus, potential injuries (it is vital in this type of fall to protect the head as a vital part of the body).
- **Forwards falls:** Depending on the action in the fall, they are subdivided into:
  - **Frontal falls:** A generic motor skill or a controlled way to fall flat on the individual's forearms after a loss of balance, which could lead to the impact of the front of the body against a specific surface, decreasing or minimizing the force, and thus, potential injuries, while protecting vital parts such as the head.
  - **Roll-over falls:** A generic motor skill or a controlled way to fall in a rolled manner on the individual's side after a loss of balance, which could lead to the impact of the front of the body against a specific surface, decreasing or minimizing the force, and thus, potential injuries, while protecting vital parts such as the head.

Regarding the established methodological progression, three levels of difficulty are proposed in the teaching of falls. These didactic levels related to teaching are organized based on the center of gravity's height, the number of axes involved in the fall's rotation, the number of participants involved in the fall, and, lastly, the speed of fall execution.

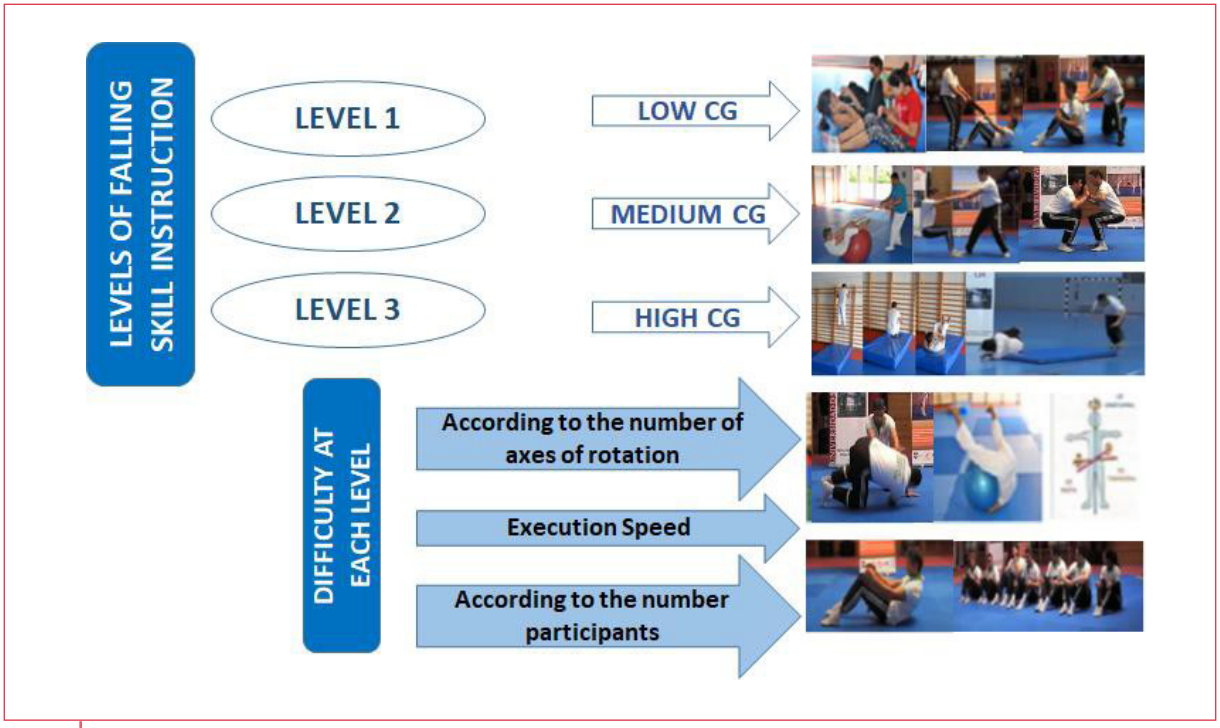


Figure 3. Didactic levels of falling skill instruction

Below, the levels established based on the mentioned variables are detailed.

Level 1 or Initial Level:

At this level, the center of gravity's height is low (individual seated or just a few centimeters from the ground). During the fall, rotation occurs along a single axis, there may or may not be uncertainty, the fall is performed individually and/or in a group, and the execution speed is low. In the following picture we can see the initial level of one of the types of fall, backwards fall.

Level 2 or Intermediate Level:

At this level, the center of gravity's height is medium (height defined by a knee flexion from approximately 90 degrees to the ground). During the fall, rotation can occur along one or two axes, there may or may not be uncertainty, the fall is performed individually and/or in a group, with a medium execution speed. In the following picture we can see the intermediate level of one of the types of fall, backwards fall.

Level 3 or Advanced Level:

At this level, the center of gravity's height is high, meaning the individual is in a standing position or above the basic anatomical position (elevated from the ground). During the fall, rotation can occur along one or two axes, there may or may not be uncertainty, the fall is performed individually and/or in a group, and the execution speed is high. In the following picture we can see the advanced level of one of the types of fall, backwards fall.

Another aspect to consider when carrying out both analytical and playful activities for teaching falling skills is the level of uncertainty that can exist in each of them. You can go from a level of 0% uncertainty, where students decide when and how they will act, i.e., when and how they will execute the falling skill, to a maximum uncertainty level of 100%, where it's the teacher or their peers who decide when they will perform the action of falling, i.e., when they will execute the falling skill unexpectedly, requiring them to apply the technique learned for that purpose.

Based on a holistic and comprehensive view of motor development, falling skill is considered content of motor skills that should be learned by people at any stage of their lives, but it is children and adolescents who should focus on its teaching, allowing them to improve their health by promoting physical, psychological, and mental development, thus achieving physically literate youth.

2.4. Elements Associated with a Protected and Safe Fall

Safety positions are a set of consciously performed motor actions that tend to become automated with practice. They aim to transition from a potentially harmful position to a safe one, helping with the process of falling and reducing or even eliminating potential harm in falls.

The main safety positions can be classified as follows:

Lowering the Center of Gravity.

During the descent of our center of gravity in the act of falling, we decrease the distance of this trajectory and, most importantly, the distance our head travels during a potential fall. Lowering the center of gravity in a controlled manner proportionally reduces the force with which the body could impact the ground.

Curling Up.

Once we've lowered the center of gravity, we curl up to prepare for the next phase in our controlled falling action. This is a preparatory phase in which we consciously position our body for the subsequent moments of the action. The importance of this gesture lies in not falling flat, thereby avoiding a dry impact on our body and the transmission of impact vibrations throughout the body. This significantly reduces the resonance effect as the body absorbs the vibration produced by the impact.

Protecting the Head.

One of the primary concerns when falling is to protect our head from any impact, even at the cost of injuring other parts of our body. It's essential to remember that vital organs for our functioning are located in our head. Therefore, when falling forward, the first reflex action is to place our arms, which stops the fall and prevents the head from hitting the surface of contact, even if it results in injuries to the bony, ligamentous, and/or muscular structures of our upper extremities. Learning to fall avoids head contact with the ground through the correct positioning of the head, protecting us from any type of cranial trauma.

Rolling on the Back.

Rolling on the back allows us to progressively absorb the kinetic energy of the body during the impact with the ground, transforming this energy into a rotational force that dissipates at multiple contact points. This is different from what would happen if we didn't roll, where the energy would concentrate at a single contact point. Rolling also helps reduce the time each point impacts the contact surface, thus reducing the intensity of pressure at each point of contact, which positively correlates with the reduced probability of injury.

Arm Impact (Damping).

The fundamental importance of the impact on the fall's surface is that it transforms kinetic energy into impact energy. This impact is actually made with the hands, forearms, arms, and even the feet. For the human body, absorbing all the energy produced in the fall at a single point would be traumatic. The different body segments that hit the ground at the moment of impact represent a set of contact points that increase the surface area. This increase allows

the distribution of all the kinetic energy during the impact over a larger area, thus reducing the impact energy at each of the contact points (Miralles, 1994). We can add to these observations the usefulness of having a contact and support point on the fall's surface after impact, which allows us to exert force against this surface to tense certain parts of our body (such as the neck to lift and position the head correctly or the abdominal area to raise the legs) and, in turn, create, maintain, or fix the desired body posture.

2.5. Positions to Avoid

Here are the positions to avoid when falling in different directions, along with corresponding images.

Positions to Avoid in Backwards Falls and Sidewards Falls:

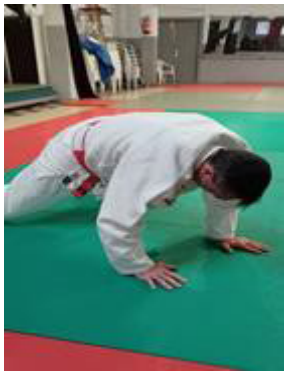
1.- Hitting the head and/or hitting the back flat on the ground in backwards falls: avoid the position where the head or back is about to hit the ground directly during a backwards fall.

2.- Hitting the shoulder and/or head in sidewards falls: prevent the position where the shoulder or head is in danger of hitting the ground during a sidewards fall.

3.- Hitting the hip against the ground in Sideways falls: prevent the position where the hip is at risk of hitting the ground directly during a Sideways fall. Hitting the coccyx (tailbone) in backwards falls: avoid the position where the coccyx, also known as the tailbone, is in danger of hitting the ground directly during a backwards fall.

Positions to Avoid in Forwards Frontal Falls and Forwards Rolled Falls:

1.- Placing hands on the ground in forwards falls: avoid the position where you instinctively reach out and place your hands on the ground during a forwards fall.



2.- Hitting the head or face in forwards frontal falls: avoid any situation where you might hit your head or face when falling forward.

3.- Supporting the shoulder, elbow, or face in forwards roll-over falls.

3.

Intervention Protocol Exercises

3.1. Level I Exercises

Next, in this section, the exercises for assimilating the skill of falling in the following directions are presented: backward, sideways, forward, and rolling.

In all Level I exercises (Initial Level), the center of gravity, focused on the hips, should be in contact with the ground or at a maximum height of 5 centimeters. Additionally, a progression of increasing difficulty is established for their implementation. The exercises will be implemented (with one session for the pre-test and another for the post-test) during the warm-up of Physical Education classes, following the progression shown in table 1.

Table 1. Implementation of the Safe Fall-Safe Schools Program

Session Number	Implemented Exercises
Session 1	PRE-TEST
Session 2	CA1, CA2, CA3, CL3
Session 3	CA6, CA9, CL4, CL5
Session 4	CA4, CA5, CL1, CL2
Session 5	CA7, CA22, CL6, CF1, CF2
Session 6	CA10, CA15, CA21, CL7, CR1
Session 7	CA8, CA27, CA23, CL8, CF4
Session 8	CA11, CA13, CA17, CL9, CR2
Session 9	CA14, CA18, CA24, CL7, CF5
Session 10	CA16, CA19, CA25, CF6, CR3
Session 11	CA13, CA26, CR4, CR5, CR8
Session 12	CA27, CF7, CR6, CR7, CL6
Session 13	CA26, CA20, CL5, CR9, CR10
Session 14	POST-TEST

1.- Backwards Fall Assimilation Exercises (CA).

Exercise 1 (CA1)	Neck flexion
Objective	Protect the head
Equipment	None
	**Description** Starting position: Lying supine. Execution: The student will perform a neck flexion, bringing the chin to the chest. 5 repetitions of the exercise will be performed.
Observations Isometric contraction of the trunk (abdominals, intercostals, etc.) should be performed for 3 seconds in each repetition.	

Exercise 2 (CA2)	Neck flexion with hand protection to the head
Objective	Protect the head
Equipment	None
	**Description** Initial Position: Lying supine. Execution: The student will perform a neck flexion, bringing the chin to the chest. Simultaneously, they will bring their hands to the head to protect it from possible impact. 5 repetitions of the exercise will be performed.
Observations An isometric contraction of the core (abdominals, intercostals, etc.) should be performed for 3 seconds in each repetition.	

Exercise 3 (CA3)	Protect the head
Objective	Protect the head and huddle
Equipment	None
	**Description** Initial Position: Lying supine. Execution: The student will perform a neck flexion, bringing the chin closer to the chest and slightly lifting the cervical area. Simultaneously, they will bring their hands to the head to protect it from possible impact and bend their knees to bring them towards the chest. 5 repetitions of the exercise will be performed.
Observations A concentric contraction of the core (abdominals, intercostals, etc.) should be performd.	

Exercise 4 (CA4)	Head protection and hand tapping (damping)
Objective	Protect the head
Equipment	None
	**Description** Initial Position: Lying supine. Execution: The student will perform a neck flexion, bringing the chin closer to the chest and slightly lifting the cervical area. Simultaneously, they will perform hand tapping (damping). 5 repetitions of the exercise will be performed.
Observations A concentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 5 (CA5)	Neck flexion, rolling onto the back & damping
Objective	Protect the head and huddle
Equipment	None
	**Description** Initial position: Bent knees and hands gripping. Execution: We lower, supporting vertebra by vertebra. Upon reaching the dorsal area, hand tapping is performed (damping). 5 repetitions of the exercise will be performed.
Observations An isometric contraction of the core (abdominals, intercostals, etc.) should be performed for 3 seconds in each repetition.	

Exercise 6 (CA6)	Rolling over the trunk with head protection
Objective	Protect the head and know how to roll
Equipment	None
	**Description** Initial position: Sitting with knees bent. Execution: Gradually lower the back to the floor, supporting vertebra by vertebra. Simultaneously, bring the hands to the head to protect it from possible impact. 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 7 (CA7)	Roll & Dumping
Objective	Protect the head and know how to roll
Equipment	None
	**Description** Initial position: Sitting with knees bent. Execution: Gradually lower the back to the floor, supporting vertebra by vertebra. Simultaneously, perform hand tapping (damping). 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 8 (CA8)	Roll & Dumping with Tennis Ball
Objective	Protect the head and know how to roll
Equipment	Tennis ball
	**Description** Initial position: Sitting with knees bent. Place a tennis ball held between the chin and the chest. Execution: Gradually lower the back to the floor, supporting vertebra by vertebra. Simultaneously, perform hand tapping (damping). It is essential to prevent the tennis ball from falling at all times, thus avoiding the head going backward and hitting the floor. 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 9 (CA9)	Roll & protect the head with tennis ball
Objective	Protect the head and know how to roll
Equipment	Tennis ball
	**Description** Initial position: Sitting with knees bent. Place a tennis ball held between the chin and the chest. Execution: Gradually lower the back to the floor, supporting vertebra by vertebra. Simultaneously, bring the hands to the head to protect it from possible impact. It is essential to prevent the tennis ball from falling at all times, thus avoiding the head going backward and hitting the floor. 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 10 (CA10)	Rolling on the back: crib
Objective	Rolling from an elevated position
Equipment	None
	**Description** Initial position: Hands on the knees and bent hips. Execution: Roll on the back, supporting vertebra by vertebra, without letting go of the knees. It is important to avoid the head from going backward and hitting the floor at all times. 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 11 (CA11)	Rolling on the back: crib & dumping
Objective	Rolling from an elevated position
Equipment	None
	**Description** Initial position: Hands on the knees and bent hips. Execution: Roll on the back, supporting vertebra by vertebra. Simultaneously, perform hand tapping (damping). It is important to avoid the head from going backward and hitting the floor at all times. 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 13 (CA13)	Rolling on the back: crib & protect the head with tennis ball
Objective	Roll from an elevated position
Equipment	Tennis ball
	**Description** Initial position: Hands on the knees and bent hips. Ball held by the neck. Execution: Roll on the back, supporting vertebra by vertebra. Once the rolling starts, simultaneously bring the hands to the head to protect it from possible impact. It is important to prevent the ball from falling and the head from going backward and hitting the floor at all times. 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 14 (CA14)	Rolling on the back: crib & dumping with tennis ball
Objective	Roll from an elevated position
Equipment	Tennis ball
	**Description** Initial position: Hands on the knees and bent hips. Ball held by the neck. Execution: Roll on the back, supporting vertebra by vertebra. Once the rolling starts, simultaneously perform hand tapping (damping). It is important to prevent the ball from falling and the head from going backward and hitting the floor at all times. 5 repetitions of the exercise will be performed.
Observations An eccentric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 15 (CA15)	"Toca-tocha" protect the head and tennis ball
Objective	Protect the head
Equipment	Tennis ball
	**Description** Initial position: In pairs. One person lying supine, with hands on their head and knees bent. They flex their neck and place a tennis ball held between their chin and chest. The other person stands in front of their feet. Execution: The standing partner must try to touch the head of the lying partner from the side, while the lying partner must turn to the right and left on their back to avoid it. Each member of the pair will perform 1 repetition.
Observations An isometric contraction of the core (abdominals, intercostals, etc.) should be performed.	

Exercise 16 (CA16)	Rolling on the back with hands on the head using a rope
Objective	Protect the head and assimilation of rolling on the back
Equipment	One rope
	**Description** Initial position: In pairs. One person sitting with bent knees holding a rope with both hands. The other partner standing in front of them, holding the ends of the rope with their hands, keeping it under tension. Execution: The seated partner slowly lowers themselves, releasing the rope and letting themselves roll backward onto their back. Simultaneously, they bring their hands to their head to protect it from possible impact. It is important to prevent the head from going backward and hitting the floor at all times. Each member of the pair will perform 3 repetitions.
Observations The trunk (abdominals, intercostals, etc.) should undergo an eccentric contraction.	

Exercise 17 (CA17)	Rolling on the back with a rope & dumping
Objective	Protect the head and assimilation of rolling on the back
Equipment	One rope
	**Description** Starting position: In pairs. One person sits with knees bent, holding a rope with both hands. The other partner stands in front, holding the ends of the rope with hands, keeping it taut. Execution: The seated partner slowly lowers down, releasing the rope and rolling onto their back. Simultaneously, they perform hand striking (damping). It's crucial to avoid letting the head go backward and hit the ground at any point. Each member of the pair will perform 3 repetitions.
Observations The trunk (abdominals, intercostals, etc.) should undergo an eccentric contraction.	

Exercise 18 (CA18)	Rolling on the back with wrist grip & damping
Objective	Protect the head and assimilation of rolling on the back
Equipment	None
	**Description** Starting position: In pairs. One person sits with knees bent, shoulders flexed, elbows extended, and palms facing down. The other partner stands in front, holding the wrists of the seated partner, applying traction to create tension. Execution: The standing partner releases the wrists of the seated partner (creating uncertainty), and the seated partner lets themselves fall, rolling onto their back. Simultaneously, they perform hand striking (damping). It's crucial to avoid letting the head go backward and hit the ground at any point. Each member of the pair will perform 3 repetitions.
Observations The trunk (abdominals, intercostals, etc.) should undergo an eccentric contraction.	

Exercise 19 (CA19)	Rolling on the back with wrist grip & protect the head
Objective	Protect the head and assimilation of rolling on the back
Equipment	None
	**Description** Starting position: In pairs. One person sits with knees bent, shoulders flexed, elbows extended, and palms facing down. The other partner stands in front, holding the wrists of the seated partner, applying traction to create tension. Execution: The standing partner releases the wrists of the seated partner (creating uncertainty), and the seated partner lets themselves fall, rolling onto their back. Simultaneously, they bring their hands to their head to protect it from potential impact. It's crucial to avoid letting the head go backward and hit the ground at any point. Each member of the pair will perform 3 repetitions.
Observations The trunk (abdominals, intercostals, etc.) should undergo an eccentric contraction.	

Exercise 20 (CA20)	Rolling on the back with ball
Objective	Protect the head and assimilation of rolling on the back
Equipment	Foam rubber ball (approximately 20cm in size).
	**Description** Starting position: In pairs. One person sits with knees bent. The other partner stands in front, holding a ball. Execution: The standing partner throws the ball to the seated partner in such a way that the seated partner has to rotate on their back. It's crucial to avoid letting the head go backward and hit the ground, so maintain neck flexion at all times. Each member of the pair will perform 3 repetitions.
Observations The trunk (abdominals, intercostals, etc.) should undergo an eccentric contraction.	

Exercise 21 (CA21)	Rolling on the back with ball & dumping
Objective	Protect the head and assimilation of rolling on the back
Equipment	Foam rubber ball (approximately 20cm in size).
	**Description** Starting position: In pairs. One person sits with knees bent, holding the ball in hand. The other partner stands in front. Execution: The partner on the ground throws the ball to the standing partner; at the same time, they will roll on their back, finishing with hand striking (damping). It's crucial to avoid letting the head go backward and hit the ground, so maintain neck flexion at all times. Each member of the pair will perform 3 repetitions.
Observations The trunk (abdominals, intercostals, etc.) should undergo an eccentric contraction.	

Exercise 22 (CA22)	Rolling on the back pivoting on the hips
Objective	Protect the head, balance and coordination, with spatial-temporal adjustment, with a partner.
Equipment	None
	**Description** Starting position: In pairs. Both sitting with knees bent, facing each other. Execution: Upon the signal, they let themselves fall, rolling onto their back, and must pivot on the hip to change sides in coordination with their partner. Each member of the pair will perform 5 repetitions.

Observations

Both eccentric and concentric contractions of the trunk should be performed (abdominals, intercostals, etc.).

Exercise 23 (CA23)	Rolling on the back pivoting on the hips & damping
Objective	Protect the head, balance and coordination, with spatial-temporal adjustment, with a partner and damping.
Equipment	None
	**Description** Starting position: In pairs. Both sitting with knees bent, facing each other. Execution: Upon the signal, they let themselves fall, rolling onto their back, and must pivot on the hip to change sides in coordinated fashion while performing hand striking (damping). Each member of the pair will perform 5 repetitions

Observations

Both eccentric and concentric contractions of the trunk should be performed (abdominals, intercostals, etc.).

Exercise 24 (CA24)	Backwards fall slip
Objective	Increase in inertia during backwards fall
Equipment	None
	**Description** Initial position: Individually, seated on the floor with bent knees. Execution: When the student decides, they slide on their glutes propelled by their arms (palms of the hands on the floor), allowing themselves to fall and roll onto their back while performing damping. Each repetition should change direction. Each member of the pair will perform 5 repetitions.
Observations Both eccentric and concentric contractions of the trunk should be performed (abdominals, intercostals, etc.).	

Exercise 25 (CA25)	The Death Star
Objective	Rolling with uncertainty
Equipment	One rope
	**Description** Initial position: Groups of 5 to 8 people. Sitting in a circle, knees and hips flexed, arms extended in front, holding a rope with their hands. Execution: Everyone tilts backward, lifting their hips slightly off the ground (approximately 5 cm). When any student decides, they will unexpectedly release the rope, and everyone will fall backward, rolling onto their back and bringing their hands to their heads to protect them. It is essential to prevent the head from going backward and hitting the ground, so we must always maintain neck flexion. 5 repetitions of the exercise will be performed.
Observations In each repetition, a different student releases the rope to create uncertainty.	

Exercise 26 (CA26)	The clock
Objective	Rolling with uncertainty
Equipment	One rope
	**Description** Initial position: Groups of 5 to 8 people. Sitting in a circle, knees and hips flexed. One person in the center of the circle standing, holding a rope. Execution: The person in the center begins to spin with the rope sliding on the floor. Those who are sitting will fall backward, rolling onto their back, aiming to avoid being hit by the rope as it passes. Hands should protect the head. It is essential to prevent the head from going backward and hitting the ground, so we must always maintain neck flexion. They will perform 5 spins and then switch partners.
Observations The person in the center does not spin; it changes the rope from right to left behind its back. This way, we will avoid dizziness.	

Exercise 27 (CA27)	The clock with damping
Objective	Rolling with uncertainty
Equipment	One rope
	**Description** Initial position: Groups of 5 to 8 people. Sitting in a circle, knees and hips flexed. One person in the center of the circle standing, holding a rope. Execution: The person in the center begins to spin with the rope sliding on the floor. Those who are sitting will fall backward, rolling onto their back, hitting the ground (performing damping), aiming to avoid being hit by the rope as it passes. It is essential to prevent the head from going backward and hitting the ground, so we must always maintain neck flexion. They will perform 5 spins and then switch partners.
Observations The person in the center does not spin; it changes the rope from right to left behind its back. This way, we will avoid dizziness.	

2.- Sideways Fall Assimilation Exercises (CL).

Exercise 28 (CL1)	Lateral, supine position
Objective	Grouping in Sideways fall
Equipment	None
	**Description** Initial position: Lying supine, with knees flexed, both arms extended, hands resting on the knees. Execution: Rotate the trunk laterally over the hip towards the floor, performing the impact with the hand closest to the ground (damping). Always maintain neck flexion. 5 repetitions of the exercise will be performed.
Observations Both eccentric and concentric contractions of the trunk should be performed (abdominals, intercostals, etc.).	

Exercise 29 (CL2)	Lateral, supine position with elevated legs
Objective	Roll in Sideways fall
Equipment	None
	**Description** Initial position: Lying supine, with elevated legs and knees slightly bent, both arms extended, hands resting on the knees. Execution: Rotate the trunk laterally towards the floor, performing the impact with the hand closest to the ground (damping). Always maintain neck flexion. 5 repetitions of the exercise will be performed.
Observations Both eccentric and concentric contractions of the trunk should be performed (abdominals, intercostals, etc.).	

Exercise 30 (CL3)	Lateral, supine position with elevated legs
Objective	Roll in Sideways fall
Equipment	None
	**Description** Initial position: Lying supine, with elevated legs and knees slightly bent, both arms extended, hands resting on the knees. Execution: Rotate the trunk laterally towards the floor, bringing the hands to the head. Always maintain neck flexion. 5 repetitions of the exercise will be performed on each side.
Observations Both eccentric and concentric contractions of the trunk should be performed (abdominals, intercostals, etc.).	

Exercise 31 (CL4)	Spinning top
Objective	Roll in Sideways fall
Equipment	None
	**Description** Initial position: Sitting with knees bent, feet together, and hands holding the feet. Execution: Allow yourself to fall laterally, rolling onto the back, backward, and laterally, in all directions, as if you were a spinning top. While rolling, release the hands from the feet and place them behind the nape for protection. 5 repetitions of the exercise will be performed.
Observations Both eccentric and concentric contractions of the trunk should be performed (abdominals, intercostals, etc.).	

Exercise 32 (CL5)	Hip shift & protect the head
Objective	Roll in a Sideways fall
Equipment	None
	**Description** Initial position: Lying supine with knees bent and hands on the knees. Execution: Lift the legs together and rotate, performing a hip shift to fall laterally. As you fall, bring your hands from your knees to behind your head for head protection. 5 repetitions of the exercise will be performed.
Observations Concentric contraction of the trunk should be performed (abdominals, intercostals, etc.).	

Exercise 33 (CL6)	Hip shift & damping
Objective	Roll in a Sideways fall
Equipment	None
	**Description** Initial position: Lying supine with knees bent and hands on the knees. Execution: Lift the legs together and rotate, performing a hip shift to fall laterally. When the arm closest to the ground falls, it performs the damping strike. 5 repetitions of the exercise will be performed.
Observations Concentric contraction of the trunk should be performed (abdominals, intercostals, etc.).	

Exercise 34 (CL7)	Flamingo. Rolling laterally over the back & damping.
Objective	Roll in a Sideways fall
Equipment	None
	**Description** Initial position: Squatting, with buttocks no more than 5 cm off the ground. Execution: Perform the lateral rolling fall with damping. 5 repetitions of the exercise will be performed.
Observations Always keep the chin close to the chest (neck flexion) to promote head protection.	

Exercise 35 (CL8)	Flamingo. Rolling laterally over the back & protect the head.
Objective	Roll in a Sideways fall
Equipment	None
	**Description** Initial position: Squatting, with buttocks no more than 5 cm off the ground. Execution: Perform the lateral rolling fall, bringing hands to the back of the neck to protect the head. 5 repetitions of the exercise will be performed.
Observations Always keep the chin close to the chest (neck flexion) to promote head protection.	

Exercise 36 (CL9)	Side fall with momentum
Objective	Roll in a Sideways fall
Equipment	None
	**Description** Initial position: Seated; one leg with knee extension forward. Hands placed on the knees. Execution: A partner applies a slight force to the extended leg (lifting it upward) so that the person performs a lateral rolling fall, finishing the action with damping. 5 repetitions of the exercise will be performed.
Observations Always keep the chin close to the chest (neck flexion) to promote head protection.	

3.- Forwards Frontal Fall Assimilation Exercises (CF)

Exercise 37 (CF1)	Plank fall
Objective	Assimilate the final position of a forwards frontal fall
Equipment	None
	**Description** Initial position: Lying prone, with the head to the side and supporting forearms and toes. Execution: The students perform an arm extension and fall onto their forearms to cushion the fall. Remember to turn the head and look to the side. 5 repetitions of the exercise will be performed.
Observations Remember that in the initial position, forearm support should be done forming a triangle (elbows apart and hands close together).	

Exercise 38 (CF2)	Plank fall with uncertainty
Objective	Assimilate the final position of a forwards frontal fall
Equipment	One rope
	**Description** Initial position: In pairs. One of the pair kneels down. The other partner stands behind, holding a rope that has been previously passed under the arms and chest of the kneeling partner. Execution: The partner holding the rope releases it at will; the kneeling partner, upon falling, should do so with their forearms to cushion the fall. Remember to turn the head and look to the side. Each member of the pair will perform 5 repetitions.
Observations Remember that in the initial position, forearm support should be done forming a triangle (elbows apart and hands close together). In this exercise, uncertainty in the fall is addressed.	

Exercise 39 (CF3)	Plank fall with uncertainty with alternating hand placement
Objective	Assimilate the final position of a forwards frontal fall
Equipment	None
	**Description** Initial position: In trios. One person kneels down. Other person stands behind, holding a rope that has been previously passed under the arms and chest of the kneeling partner. The third person stands in front. Execution: The person in front of the one performing the exercise has to show their hands to the performer, who should try to touch them. When the partner holding the rope releases it, the performing partner must fall on their forearms to cushion the fall. Remember to turn the head and look to the side. Each member of the trio will perform 5 repetitions.
Observations Remember that in the initial position, forearm support should be done forming a triangle (elbows apart and hands close together). In this exercise, uncertainty in the fall is addressed.	

Exercise 40 (CF4)	Plank fall with uncertainty with alternating hand placement
Objective	Assimilate the final position of a forwards frontal fall
Equipment	One rope
	**Description** Initial position: In pairs. One of the pair kneels down. The other partner stands behind, holding a rope that has been previously passed under the arms and chest of the kneeling partner. Execution: The partner holding the rope releases it at will, and the performing partner changes the position of their arms and hands (e.g., hands behind the head, hands along the body, hands in front of the chest, etc.). Upon falling, the performing partner must do so with their forearms to cushion the fall. Remember to turn the head and look to the side. Each member of the pair will perform 5 repetitions.
Observations Remember that in the initial position, forearm support should be done forming a triangle (elbows apart and hands close together). In this exercise, uncertainty in the fall is addressed.	

Exercise 41 (CF5)	Individual forwards frontal fall
Objective	Gain agility and confidence in the forwards frontal fall
Equipment	None
	**Description** Initial position: Upright position with knees as the point of support. They should be slightly apart. Execution: The students, letting themselves fall similarly to the previous exercise but without the intervention of a partner, perform the frontal fall. To gain agility, the initial placement of the hands should alternate between having them in front of the face (standard position), at the nape of the neck, or on the back... 5 repetitions of the exercise will be performed.
Observations	

Exercise 42 (CF6)	Individual forwards frontal fall in a plank position
Objective	Gain agility and confidence in the forwards frontal fall
Equipment	None
	**Description** Initial position: Upright position with knees as the point of support. They should be slightly apart. Execution: The students, letting themselves fall similarly to the previous exercise but without the intervention of a partner, perform the frontal fall, this time supporting the tips of their feet in a plank position and not on their knees. To gain agility, the initial placement of the hands should alternate between having them in front of the face (standard position), at the nape of the neck, or on the back... 5 repetitions of the exercise will be performed.

Exercise 43 (CF7)	Forwards frontal fall in a plank position with a partner
Objective	Gain agility and confidence in the forwards frontal fall
Equipment	None
	**Description** Initial position: In pairs. One of the pair in an upright position with knees as the point of support. They should be slightly apart. The other person in the pair stands behind. Execution: The student, positioned behind their partner, applies gentle force forward, causing a slight acceleration for the partner executing the movement. The partner lets themselves fall, performing the frontal fall, this time supporting the tips of their feet in a plank position and not on their knees. To gain agility, the initial placement of the hands should alternate between having them in front of the face (standard position), at the nape of the neck, or on the back... Each member of the pair will perform 5 repetitions.

4.- Forwards Rolled Fall Assimilation Exercises (CR)

Exercise 44 (CR1)	Forwards rolled fall with arm grip
Objective	Assimilating the final position of a forwards rolled fall
Equipment	None
	**Description** Initial position: In pairs. One person in the pair is in an upright position with knees as the point of support. They should be slightly apart. The other person in the pair is kneeling on one of their sides. Execution: The partner on the side leans and offers the hand farthest from the lateral partner. The lateral partner assists in the forward fall by guiding the hand and arm of their partner towards themselves, aiding in the rotation and protecting the head of the partner performing the forwards rolled fall with their other hand. 5 repetitions of the exercise will be performed on each side, both right and left, for each person in the pair.

Exercise 45 (CR2)	Forwards rolled fall with arm grip & dumping
Objective	Assimilating the final position of a forwards rolled fall
Equipment	None
	**Description** Initial position: In pairs. One person in the pair is in an upright position with knees as the point of support. They should be slightly apart. The other person in the pair is kneeling on one of their sides. Execution: The partner on the side leans and offers the hand farthest from the lateral partner. The lateral partner assists in the forward fall by guiding the hand and arm of their partner towards themselves, aiding in the rotation. Upon executing the fall, the person should perform the damping action with the free arm. 5 repetitions of the exercise will be performed on each side, both right and left, for each person in the pair.

Exercise 46 (CR3)	Forwards rolled fall rolling over a partner
Objective	Understanding the kinetic chain in a forwards rolled fall
Equipment	None
	**Description** Initial position: In pairs. Execution: The person performing the exercise utilizes a partner who assumes a quadruped position for the fall. The left arm of the one executing the fall surrounds the torso of the partner in quadruped, while the other arm grips the upper back. The exercise concludes with a damping action. It is important to note that the person in the quadruped position should have their forearms on the ground and their head supported by the forearms for protection 5 repetitions of the exercise will be performed on each side, both right and left, for each person in the pair.
Observations It is important to touch the shoulder to the ground before starting to roll.	

Exercise 47 (CR4)	Forwards rolled fall with fitball
Objective	Gain agility and confidence in the forwards rolled fall
Equipment	Fitball
	**Description** Initial position: Individually. Upright position with knees as the point of support. They should be slightly apart. We grab a fitball. Execution: From a kneeling position, lean over the fitball, embracing the ball, and let yourself fall forward, rolling. 5 repetitions of the exercise will be performed.
Observations It is important to turn the head during the fall and look to the side.	

Exercise 48 (CR5)	Frontal wheelbarrow
Objective	Gain agility and confidence in the forwards rolled fall
Equipment	None
	**Description** Initial position: Paired activity. Performing the wheelbarrow. One person in prone position, supported on the palms with the body raised, and the standing partner behind, helps maintain the elevated position by holding onto the ankles. Execution: From a kneeling position, lean over the fitball, embracing the ball, and let yourself fall forward, rolling. 5 repetitions of the exercise will be performed on each side, both right and left, for each person in the pair.
Observations It is important to turn the head during the fall and look to the side.	

Exercise 49 (CR6)	Frontal wheelbarrow with dumping
Objective	Gain agility and confidence in the forwards rolled fall
Equipment	None
	**Description** Initial position: Paired activity. Performing the wheelbarrow. One person in prone position, supported on the palms with the body raised, and the standing partner behind, helps maintain the elevated position by holding onto the ankles. Execution: From a kneeling position, lean over the fitball, embracing the ball, and let yourself fall forward, rolling. Upon executing the fall, the person should perform the damping action with the arm. 5 repetitions of the exercise will be performed on each side, both right and left, for each person in the pair.
Observations It is important to turn the head during the fall and look to the side.	

Exercise 50 (CR7)	Forwards rolled fall, rolling over a partner, concluding with head protection
Objective	Understanding the kinetic chain in a forwards rolled fall
Equipment	None
	**Description** Initial position: Paired activity. Execution: The person executing the fall uses the partner, who assumes a quadruped position, for the fall. The left arm of the one executing the fall surrounds the torso of the partner in quadruped, while the other arm grabs the upper back. The exercise concludes with head protection. It is important to note that the person in the quadruped position should have their forearms on the ground and their head supported by the forearms for protection. 5 repetitions of the exercise will be performed on each side, both right and left, for each person in the pair.
Observations It is important to touch the shoulder to the ground before starting to roll..	

Exercise 51 (CR8)	Forward rolled fall, rolling with arm control, concluding with damping
Objective	Understanding the kinetic chain in a forwards rolled fall
Equipment	None
	**Description** Initial position: Paired activity. During the execution of the fall, the person places one knee on the ground and the other leg with the knee flexed at 90°, supporting the sole of the foot. The partner positions themselves in front, holding the wrists of the person executing the fall, whose palms are facing downwards. Execution: The assisting partner grabs the wrists of the person executing the fall and guides them in the descent. 5 repetitions of the exercise will be performed on each side, both right and left, for each person in the pair.
Observations	

Exercise 52 (CR9)	Forwards rolled fall, rolling on an inclined plane, concluding with head protection
Objective	Understanding the kinetic chain in a forwards rolled fall
Equipment	Mattresses for designing an inclined surface
	**Description** Initial position: Individual. Execution: Students will perform the forwards rolled fall facilitated by the inertia of the inclined plane of the mat. The exercise will conclude with head protection. 5 repetitions of the exercise will be performed on each side, both right and left.
Observations Increase the incline of the plane as the falling technique improves	

Exercise 53 (CR10)	Forwards rolled fall, rolling on an inclined plane, concluding with dumping
Objective	Understanding the kinetic chain in a forwards rolled fall
Equipment	Mattresses for designing an inclined surface
	**Description** Initial position: Individual. Execution: Students will perform the forwards rolled fall facilitated by the inertia of the inclined plane of the mat. The exercise will conclude with dumping. 5 repetitions of the exercise will be performed on each side, both right and left.
Observations Increase the incline of the plane as the falling technique improves	

4.
Research Methodology

The data collection technique employed will be scientific observation, understood as “the previously planned capture and controlled recording of data with a specific purpose for research, through the visual perception of an event” (Heinemann, 2003, p.135).

Therefore, it is a systematic, controlled, and structured technique of aspects of an event that are relevant to the current topic of study and the theoretical assumptions on which it is based. The fact that it is systematic and controlled means that the observer must consciously direct their attention to specific elements of the event and record those that are relevant for determining the corresponding variables. Structured means that what is perceived is organized, distributed, and documented according to established guidelines (Heinemann, 2003).

Furthermore, this observation must be recordable; it should not rely solely on the observer’s intuition. Instead, the data should be recorded as objectively as possible, and for this purpose, recording allows the visualization of the event as many times as necessary.

5.

Intervention and Evaluation Procedure

This section describes the protocol to be followed for the proper implementation of the program, as well as the evaluation and analysis of falling skills. It includes the procedure from presenting the project in schools for proper authorization prior to program implementation, to the development of the teaching program and the initial and final evaluation of the students.

This procedure, intervention and evaluation has been approved by the Research Ethics Committee of the General Directorate of Quality, Research, Development and Innovation, of the Ministry of Health of the Regional Government of Andalusia, Spain.

It is worth noting that the Safe Fall-Safe Schools teaching program can be delivered to all selected classroom groups where the physical education teacher proposes the intervention, as its contents are included in the school curriculum. Informed consent from the students applies exclusively to the pre-, post-, and retest evaluations.

Phase 1: Presentation at the School, Authorization, and Informed Consent.

1. Presentation of the program to the school's management, physical education teachers, and the school council, preferably in a face-to-face meeting. Delivery of the presentation letter and consent from the school for participation in the program (Annex 1. Presentation and Informed Consent for the School).
2. Once consent is obtained from the school's management, physical education teachers, and the school council, students participating in the program are provided with informed consent (Annex 2. Presentation and Informed Consent for Families) and the Parent/Guardian Questionnaire (Annex 3. Questionnaire for Parents/Guardians) for parents/guardians to complete.
3. All students selected by the physical education teachers will benefit from participation in the program, while students whose parents/guardians have not signed the consent form will not be included in the evaluation and data collection.

Phase 2: Determination of Subgroups.

For the program's implementation, teachers will select one classroom group as the experimental group, while the other classroom group(s) will serve as the control group, depending on the number of class lines in each grade.

Phase 3: Pre-test Evaluation.

Conducting a pretest before any theoretical or practical training of the Safe-Fall Safe- Schools program:

The Observation Test Level I is implemented: backwards, Sideways and forwards falls (Annexes 4, 5, 6, and 7) to evaluate the untrained motor response of the children who have provided informed consent, both in the experimental group and the control group. Only one attempt at the *Observation Test Level I: Backwards fall, Sideways fall and Forwards fall (frontal and roll-over).*

1. Observation Test Level I: Backwards fall, Sideways fall and Forwards fall (Frontal and Roll-over) may be made.
   Attempts will be invalidated in the following cases:
   - Students observe the test being conducted before their attempt.
   - The observer was unable to view the test, and/or the recording process was not carried out correctly. If the first attempt is invalidated, a second attempt will not be possible, and that subject will be excluded from data collection. If a student becomes apprehensive and refuses to perform the test due to fear, this will be noted in the observation sheet in the corresponding section (Annexes 4, 5, 6, and 7).

2. During the initial data collection, the weight (in kg) and height (in m) of all participating students in the program, both in the control group and the experimental group, will be recorded. Additionally, they will be surveyed about their physical activity habits.

Phase 4: Implementation of the Safe-Fall Safe-Schools Program with the Experimental Group.

During physical education classes, the physical education teachers will be responsible for implementing the Safe Fall-Safe Schools program, in accordance with the following guidelines.

Experimental Group.

1. During the planned intervention period, within the activation phase or initial part of the session, all exercises and games described in this manual will be carried out.
2. The specific activities will be implemented over 14 interventions: 12 activation phases to be included in the sessions already planned by the physical education teacher.

Control Group.

Physical education sessions will be conducted according to the teacher's classroom schedule, without delivering any content from the Safe Fall-Safe Schools program, either theoretical or practical.

Phase 5: Post-Test Evaluation

At the end of the program implementation period, the Observation Test Level I will be administered again: backwards, Sideways and forwards falls (Annexes 4, 5, 6, and 7), for the evaluation of untrained motor responses, both for the experimental group and the control group. Clear correlations will be made for each subject between the two tests performed (pre- and post-) to analyze the motor responses obtained before and after the program's application.

Phase 6: Implementation of the Safe-Fall Safe-Schools Program with the Control Group.

The Safe Fall-Safe Schools program will be taught to the students in the control group in the same way as it was done with the experimental group.

Phase 7. Retest Evaluation.

At the end of the program implementation period with the control group, the Observation Test Level I. will be administered again: backwards, Sideways, and forwards falls (Annexes 4, 5, 6, and 7), for the evaluation of untrained motor responses, exclusively for the control group. Clear correlations will be made for each subject between the results of this test and the two tests conducted previously (pre and post).

6.

Confidentiality and Student Identification Code

It is recommended, whenever possible, to record the pre-test, post-test, and re-test assessments for later review due to the speed at which students perform the tasks. Of course, this should be done while strictly adhering to all conditions of image protection and confidentiality.

To ensure that the database remains entirely anonymous, student identification will follow the following pattern:

School name (first two letters), grade (from 1 to 6), group (a, b, c), and list number (from 01 to the last). For example, a student at Jacarandá Elementary School, in 4th grade, group B, listed as number 09, would be identified as JA4B09.

7.

Observation and Data Recording Protocol

The observation and data collection must rigorously follow the instructions outlined in this protocol to ensure objectivity and accuracy in data collection.

7.1. Observation Zone

The area in which the evaluation through the *Observation Test Level I: Backwards fall, Sideways fall and Forwards fall (frontal and roll-over)* will take place must be isolated so that students do not see their peers' responses to the exercise.

The test is conducted on a polyurethane foam mat (or similar material) with a density of 20 kg/m3, covered with plastic-coated canvas and an air expulsion system to cushion/absorb the energy generated by the fall. The dimensions of the mat are at least 100 cm x 200 cm x 5 cm. The mat should be the same or have very similar characteristics for the pre-test, post-test, and retest. The mat is positioned so that its exact location can be reproduced, using indelible marks or pre-existing markings on the floor (see Figure 4). When this is not possible, measurements will be used as reference points, based on existing parameters, to determine its specific location.

On this mat, a 1m * 1m square is marked with contrasting adhesive tape, with the width of the tape included within the square. In the center of the side closest to the controller, inside the marked square, the location of the height reference point is marked, ten centimeters from the outer edge of the square. The height reference point should be made of very soft material (like a sponge), with a height of 5 cm, and it should be large enough for the controller to visually check when to release the student (when they are nearly touching the reference point).

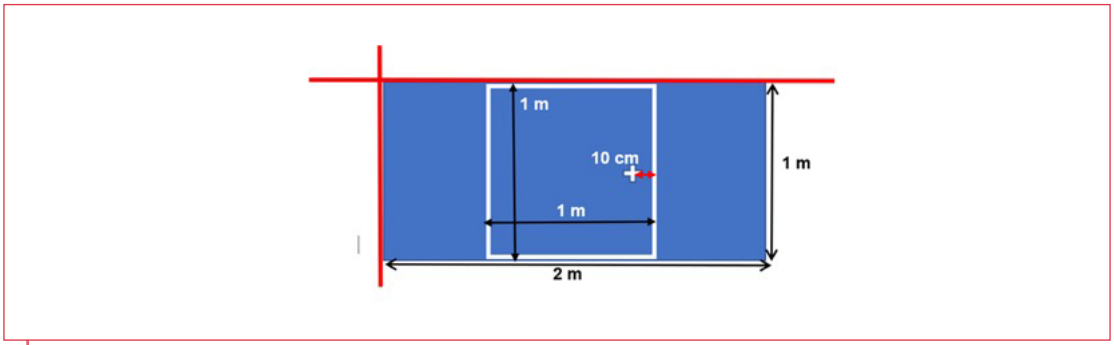


Figure 4. Mat for the test

The purpose of the recording camera is to serve as a reference point for its location concerning to the recording area. The camera is placed on a tripod at a height of one meter and at a distance of three meters perpendicular to the midpoint of the outer edge of the mat. Each leg of the tripod should be marked on the floor using indelible markers or existing floor references.

The typical recording frequency for a regular camera is usually between 25 and 30 frames per second (fps). However, there is also the option to record in high-speed (slow- motion), so cameras that record at 60, 90, 120, or 240 fps are available.

An observer's seat is necessary to allow the observer to position themselves alongside the camera, ensuring that their line of sight is at the same height as the camera's lens and perpendicular to the mat.

It's important to document and record the measurements and references used during the placement of equipment, both photographically and in writing, for potential future reference.

7.2. Observation Team

The entire observation process must be carried out by a team trained in data collection and coordinated in the execution of the following roles:

Controller: Responsible for executing the fall, thus directing and overseeing the entire implementation process. They verify the student's starting position, the placement of equipment, and the student's attire. They also monitor the stress and motor responses to the given situation.

Observer: Verifies the student's identification code when entering the test area. Checks the video equipment's functionality, gives the green light for the Controller to initiate the fall sequence, and records the motor response data of the students.

Assistant: Controls the entry and exit of students from the recording area, checks the student's identification code, attire, and records weight, height, and sports practice data. If necessary, they reposition the markers on the mat.

To ensure that direct observation is as consistent as possible, students' attire should not interfere with their motor movements (avoid hoodies, scarves, loose or baggy clothing, etc.).

The age of the students influences the test's execution pace, so it is essential to give younger students the time needed to assume the correct starting position.

The typical recording frequency for a regular camera is usually between 25 and 30 frames per second (fps). However, there is also the option to record in high-speed (slow- motion), so cameras that record at 60, 90, 120, or 240 fps are available.

An observer's seat is necessary to allow the observer to position themselves alongside the camera, ensuring that their line of sight is at the same height as the camera's lens and perpendicular to the mat.

Figure 5. Observation and data recording area

7.3. Student Reactions

In the pre-tests, untrained motor responses of students to an unintentional backward fall are recorded. This fall is carried out in a controlled and secure setting, prioritizing and ensuring the child's safety above any other objective. However, not all students react the same way to the induced imbalance in the starting position of the test. In some cases, avoidance responses may be observed, characterized by the child's actions such as not listening to instructions, not reacting to given directions, grabbing onto the controller, displaying bodily stiffness and rigidity, bending their arms and leaning forward, slipping their feet and sitting on the mat, not leaning backward, trembling, and so on. In cases where fear is extremely intense, the controller will gently lower the student to the ground without releasing their arms at any point, or they may directly invalidate the subject's test, making a note of this circumstance in the recording sheet (observations) (Annexes 4, 5, 6, and 7).

8.

Description of Tests to be Performed in Observation Test Level I: Backwards Fall, Sideways Fall, and Forwards Falls (Frontal and Roll-Over)

8.1 Height

Students will step onto the stadiometer in lightweight clothing, without shoes, hair accessories, or head adornments, and stand straight. They should keep their heels together and arms at the sides of the body. The entire body should be in contact with the stadiometer (heels, buttocks, and upper part of the back). The head should be oriented so that the top protrusion of the ear's tragus and the lower edge of the eye socket (Frankfurt Plane) are in the same horizontal plane. They should take a deep breath and hold it. The measurement will be taken at that moment, and the highest point of the head will be used as a reference, with the hair compressed.

Two measurements will be taken.

The height reading should be recorded with an approximation of 1 cm.

Example: a result of 1 m and 7 cm is recorded as 107 cm.

8.2. Body Weight

Students will step onto the scale without shoes, in lightweight clothing, and without accessories. They should position themselves in the center of the scale platform, distributing their weight evenly between both feet, facing forward, with arms along the body, and without making any movements.

Two measurements will be taken.

Weight is recorded with an approximation of 100 grams.

Example: a result of 32 kg and 200 g is recorded as 32.2 kg. The area in which the evaluation through the Observation Test Level I: backward, sideways, and frontal falls will take place must be isolated so that students do not see their peers' responses to the exercise.

8.3. Body Mass Index (BMI)

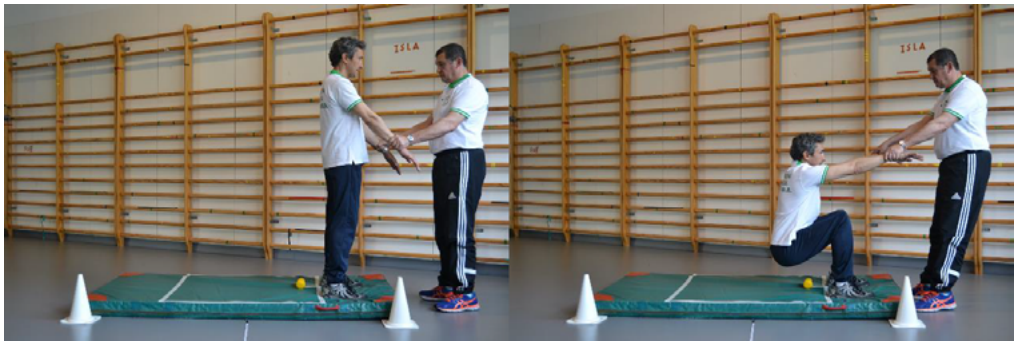
Body weight in kilograms divided by the square of height in meters (kg/m2).

Observation Test Level I: Backwards fall, Sideways fall and forwards falls (frontal and roll-over).

8.4. Backwards Fall

Initial or Starting Position:

The controller and the student stand facing each other. The controller holds the student's wrists from above, ensuring that the student's palms are facing downward (looking at the ground to prevent them from grabbing the controller when released) with arms extended. From this position, the student will bend their knees until they reach below 45°, with the buttocks outside the base of support (coccyx behind the heels), and thus, in a position of imbalance. The controller gradually lowers the student's center of gravity without touching the marker (maximum to the height indicated by the marker: 5 cm).

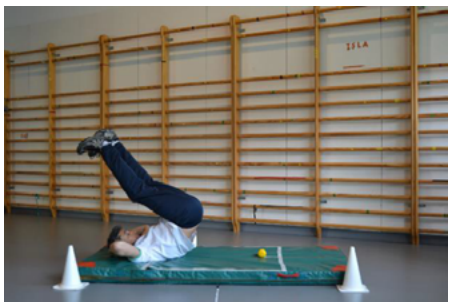


Proceed:

During that descent, and once a flexion greater than 45° has been reached, the instructor will release the student's wrists without prior notice to induce an unexpected backward fall.

Data Recording:

Once the wrists have been released, the observer will note in the Observation Test Level I: Backwards Fall (Annex 4), the occurrence or non-occurrence of the mentioned action concerning different body segments.



8.5 Forwards Frontal Fall

Initial or Starting Position:

The student will be positioned on their knees, with their knees spaced shoulder-width apart. The body should be straight and fully extended, maintaining an upright posture. Hands should be placed at the sides, resting naturally. The neck should be straight, maintaining an anatomical position with the head facing forward. The instructor will stand behind the student. The instructor will pass a belt or rope around the student's chest, positioned just below the armpits.

Proceed:

The instructor will begin to unbalance the student to approximately a 45-degree angle. At a moment of their choosing, the instructor will release the belt or rope unexpectedly, surprising the student.

Data Recording:

Once the belt is released, the observer will note in the Observation Test Level I: Forwads Frontal Fall (Annex 5) whether the student acquires or not the motor protective actions mentioned and related to different body segments (head turn protection position and protection position without head turn).

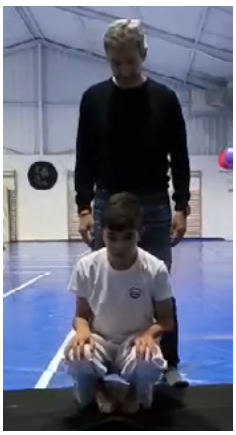
Special attention will be given to ensuring that the head does not touch the ground (most important) and turning the face to one side (better position); forearms will be fully supported, forming an angle ≤90°. During contact with the mat, fingers are extended, closed, palm down, with the torso locked and extended. Lastly, the hip will be locked.

8.6. Sideways Fall

Initial or starting position:

The student will assume a deep squat position, characterised by a full flexion of the knees. The feet should be placed close together, with the weight supported on the metatarsus. Hands should rest gently on the knees. The trunk should be fully extended, maintaining a straight and upright posture and the should also be extended, with the student looking straight ahead, ensuring the neck is aligned with the spine.

The instructor will stand behind the student.



Proceed:

The instructor will push the student laterally, without warning (either to the right or the left). The student must respond with a protected sideways fall, following the patterns outlined in the table.

Data Recording:

The observer will note in the Observation Test Level I: Sideways Fall (Annex 6), the occurrence or non-occurrence of the mentioned action concerning different body segments.

8.7. Forwards Roll-Over Fall

The authors of the protocol contend that, at the initial level, there is no feasible means to safely perform the unintentional roll-over front fall test for the students. The complexity of this fall, owing to rotations along various body axes (longitudinal and transversal), combined with the low starting height, precludes the adoption of a protective and secure posture.

Like any other generic motor skill, the level of competency achieved, its assimilation, and subsequent automation, will be assessed through the correct performance of the skill.

Accordingly, the forward roll-over fall will be evaluated through the correct execution of the intentionally performed protective movement. This will be assessed using Annex 7. Consequently, the pretest-posttest protocol is set aside, with only one data collection occurring at the conclusion of the intervention (Annex 7).

Initial or starting position:

The student will begin in a quadruped position, ensuring that both hands and knees are firmly placed on the ground. The arms and elbows should be fully extended, creating a strong, stable line from the shoulders to the hands. The head should be slightly lifted, not tilted upward or downward, maintaining a straight-ahead gaze.

Proceed:

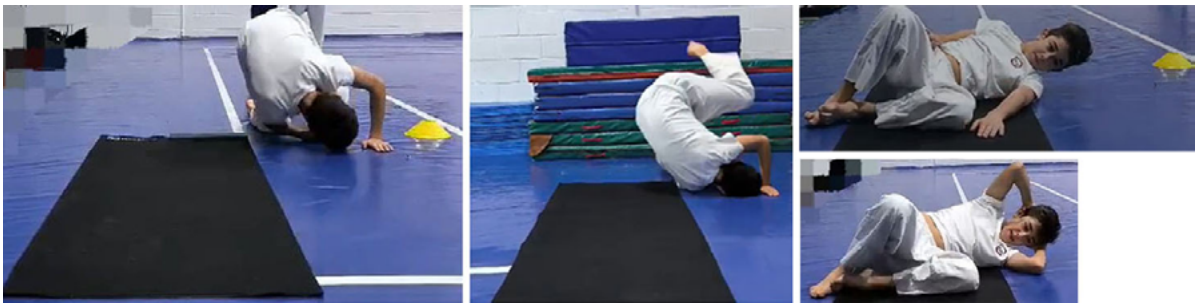
The student will perform a forward rolling fall as follows:

Phase 1: The student will place the turning hand between the opposite hand (which rests on the ground) and the knee on the same side.

Phase 2: The student initiates a forward imbalance, beginning to roll over the turning arm without any discontinuity or striking the arm, progressing until the shoulder contacts the ground. Concurrently, the head should be turned and flexed to protect it on the opposite side of the roll.

Phase 3: The student will roll diagonally across their back, from the shoulder to the opposite hip, while maintaining hip flexion.

Phase 4: In the final phase of the fall, the students will bring their hands to their head to shield it from potential impacts or perform a forearm strike on the ground. The legs should remain semi-flexed and never crossed.



Data Recording:

The observer will note in the Observation Test Level I: Forward Roll-over Fall (Annex 7), the occurrence or non-occurrence of the mentioned action concerning different body segments.

9.
References

Barnett, L., Hinkley, T., Okely, A. D., & Salmon, J. (2013). Child, family and environmental correlates of children's motor skill proficiency. *Journal of science and medicine in sport,* 16(4), 332-336. https://doi.org/10.1016/j.jsams.2012.08.011

Batalla, A. (1994). Habilidades, destrezas y tareas motrices. Concepto, análisis y clasificación. Actividades para su desarrollo. *Tema 9 de oposiciones a maestro de Educación física*. Barcelona: INDE.

Burgos, A. & Tejero, M.D. (2012). *Aprende a crecer con seguridad*. Granada: Consejería de Economía, Innovación, Ciencia y Empleo. https://www.juntadeandalucia.es/servicios/publicaciones/detalle/76732.html.

Bloemers, F., Collard, D., Paw, M. C., Van Mechelen, W., Twisk, J., & Verhagen, E. (2012). Physical inactivity is a risk factor for physical activity-related injuries in children. *British journal of sports medicine,* 46(9), 669–674. https://doi.org/10.1136/bjsports-2011-090546

Cañizares, J. M., & Carbonero, C. (2016). *Temario de oposiciones de educación física (LOMCE)*. Sevilla: Wanceulen editorial deportiva.

Carratalà, V. & Carratalà, E. (2000). *La actividad física y deportiva extraescolar en los centros educativos. Judo*. Madrid: MECD/CSD

Contreras, O. R. (1998). *Didáctica de la Educación Física.* Un enfoque constructivista.
Barcelona: INDE.

Esparza, M.J. & Mintegi, S. (2016). *Guía para Padres sobre la prevención de lesiones no intencionadas en la edad Infantil.* Madrid: Asociación Española de Pediatría. Fundación Mapfre. https://www.aeped.es/comite-seguridad-y-prevencion- lesiones-no-intencionadas-en-infancia/documentos/guia-padres-prevencion- lesiones-nointencionadas

Gennarelli, T. A., & Thibault, L. E. (1982). Biomechanics of acute subdural hematoma. *The Journal of trauma*, 22(8), 680-686. https://doi.org/10.1097/00005373- 198208000-00005

Groen BE, Smulders E, Duysens J, Van Lankveld, W & Weerdesteyn, V. (2010). Could martial arts fall training be safe for persons with osteoporosis?: a feasibility study. *BMC Research Notes* 3, 111. https://doi.org/10.1186%2F1756-0500-3-111

Guthrie, E. (1957). *The psychology of learning.* Harper et Brothers. New York.

Hashimoto, T., Ishii, T., Okada, N., & Ito, M. (2015). Impulsive force on the head during performance of typical ukemi techniques following different judo throws. *Journal of Sports Sciences*, 33, 1356–1365. https://doi.org/10.1080/02640414.2014.990482

Heinemann, K. (2003). *Introducción a la metodología de la investigación empírica.*
Paidotribo.

Institute for Health Metrics and Evaluation (2020). Global Burden of Disease Results Tool. Washington, DC. http://ghdx.healthdata.org/gbd-results-tool.

Knapp, B. (1963). *La habilidad en el deporte*. Valladolid: Minón

Kolychkine, A. (1989). *Judo. Nueva didáctica*. Barcelona: Paidotribo

Koshida, S., Ishii, T., Matsuda, T., & Hashimoto, T. (2017). Kinematics of judo breakfall for osoto-gari: Considerations for head injury prevention. *Journal of sports sciences*, 35(11), 1059-1065. https://doi.org/10.1080/02640414.2016.1210194

Lasserre, R. (1975). *Judo. Manual Práctico.* Barcelona: Hispano Europea

Mirallas, J.A. (1995). *Bases didácticas del judo. Biomecánica para el estudio y el aprendizaje de la técnica y la táctica del judo*. Barcelona: Centre de Publicacions del Campus Nord.

Mroczkowski, A.; Taiar, R. (2023). Influence of the Backward Fall Technique on the Transverse Linear Acceleration of the Head during the Fall. *Sensors*, 23, 3276. https://doi.org/10.3390/s23063276

Nauta, J., Knol, D. L., Adriaensens, L., Wolt, K. K., Van Mechelen, W., & Verhagen, E. A. (2013). Prevention of fall-related injuries in 7-year-old to 12-year-old children: a cluster randomised controlled trial. *British journal of sports medicine*, 47(14), 909-913. http://dx.doi.org/10.1136/bjsports-2012-091439

Organización Mundial de la Salud (2021a). Caídas. Nota descriptiva de 26 de abril de 2021. https://www.who.int/es/news-room/fact-sheets/detail/falls

Organización Mundial de la Salud (2021b). *Step Safely: Strategies for preventing and managing falls across the life-course*. https://www.who.int/publications/i/item/978924002191-4

Organización Mundial de la Salud (2021c). *Global Health Estimates 2019: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2019*. Geneva: World Health Organization. https://www.who.int/data/gho/data/themes/mortality-and-global- healthestimates

Robinovitch, S. N., Brumer, R., & Maurer, J. (2004). Effect of the "squat protective response" on impact velocity during backward falls. *Journal of Biomechanics*, 37, 1329–1337.https://doi.org/10.1016/j.jbiomech.2003.12.015

Sandler, R. & Robinovitch, S. (2001). An Analysis of the Effect of Lower Extremity Strength on Impact Severity During a Backward Fall. *Journal of biomechanical engineering*, 123. 590-8. https://doi.org/10.1115/1.1408940

Serra, E. (1987). Habilidades desde la base al alto rendimiento. *Actas del Congreso de Educación Física y Deporte de Base*. FCCAFD. Granada.

Soriano, M. (2008). *Accidentes infantiles*. Granada: Junta de Andalucía. Consejería de Empleo. https://www.juntadeandalucia.es/export/drupaljda/1_1928_accidentes_infantiles. pdf

Taira, S. (2009). *La esencia del Judo (I)*. Gijón: Satori Ediciones.

Thabot, D. (1999). *Judo* Óptimo. *Análisis y metodología*. Barcelona: Inde. Uzawa, T. (1981). *Pedagogía del Judo*. Valladolid: Miñón.

Whitehead, M. (2010). *Physical literacy. Throughout the lifecourse*. London: Routledge. https://doi.org/10.4324/9780203881903

10.
Annexes

School Information and Informed Consent

SAFE FALL-SAFE SCHOOLS RESEARCH PROJECT

Safe Fall-Safe Schools. Analysis of Primary and Secondary School Students' Motor Response to an Unintentional Fall

Why This Brochure?

We would like to invite you to participate in a research project conducted by researchers from the University of Seville (Spain), the University of Castilla-La Mancha (Spain), Universitat Politècnica de Catalunya (Spain), UB-INEFC_Bcn (Spain), Università degli Studi di Milano (Italy), University of Split (Croatia), University of Pécs (Hungary), and the University of Osuna (Spain). This is an international study aiming to analyze the motor response of students to an unintentional fall before and after the implementation of the proactive program Safe Fall-Safe Schools for teaching safe ways to fall.

If you would like your school to participate, please complete and sign the consent form included in this brochure, cut it out, and hand it over to the researcher at your school.

What does participation Entail?

Student participation in the project will take place at the educational centre during Physical Education (PE) classes, with prior informed consent and agreement from parents/guardians.

The study involves an initial assessment through a questionnaire, recording of weight, height, and physical activity habits. Additionally, the *Observation Test Level I is conducted: Backwards, Sideways, and Frontals falls* to gather the students' motor response to an unexpected fall.

Subsequently, the program is implemented during Physical Education classes, including a theoretical presentation on falls and their consequences in school-age children and specific Safe Fall-Safe Schools exercises during warm-ups in PE sessions.

After the program implementation, a final evaluation is conducted (questionnaire, weight, height, physical activity habits, and *Observation Test Level I: Backwards, Sideways, and Frontals Falls*).

Benefits of Participation

Students can learn and internalize a protected and safe way to fall in the event of an unintentional fall, actively contributing to the reduction of the risk and severity of injuries resulting from a fall.

Consent Form

Full Name Headteacher:

_____

School Name:

_____

I agree to the school's participation in the research Project *Safe Fall-Safe Schools. Analysis of Primary and Secondary School Students' Motor Response to an Unintentional Fall (0021-M1-18)*

I understand that the results of this study may be presented at conferences and published in academic journals. The data will be reported anonymously, and I give my consent for them to be used in this way.

I have read the information in this document and had the opportunity to ask questions.

(Please, mark with a circle)

YES **NO**

Date: _____

Sign:

Annex 1. Presentation and Informed Consent for the School

School Information and Informed Consent

Low Risk in Participation

Besides the time required to participate in this study, we do not foresee any risks. In any case, the safety of the child will be ensured through the use of mats.

Confidentiality

The information provided by the students in the study will be handled confidentially. Each student's information will be assigned a code number. The list connecting the student's name and their code will be kept in a secure file. Once the study is completed and the data is analyzed, this list will be deleted. The students' names will not be used in any report. There will be no attempt to disclose the identity of the students publicly.

For data collection, students will be photographed and recorded on video solely for educational and pedagogical purposes. These images will not be disseminated or published by any means.

Ethical Review and Concerns

This study has been approved by the Scientific Ethics Committee (0021-M1-18) of the Junta de Andalucía (Spain).

Participation in this study is voluntary, and you and the school can refuse to participate at any time. Additionally, you can withdraw from the study at any time. Simply notify your desire to the researcher or person in charge. Please note that all collected data will be strictly confidential. Students will not be identified anywhere in the research.

Any questions you may have during the research process can be directed to the project director: Dr. Óscar del Castillo Andrés (University of Seville), ocastillo@us.es, +34670905026. Senior Lecturer at the Faculty of Education Sciences, Department of Physical Education and Sport (University of Seville).

Next Steps in Participation

If you feel you have enough information about the study and have no further questions, please sign and return the consent form to the researcher.

Thank you very much for your participation!

Responsible researcher in the country and can be contacted at any time if you have questions:

……..

CUT ALONG THE LINE AND HAND OVER THE CONSENT TO THE RESEARCHER

YOU MAY KEEP THE REMAINING INFORMATION FOR ANY REFERENCE

THANK YOU

Annex 1. Presentation and Informed Consent for the School

Information and Informed Consent for Parents/Guardians

SAFE FALL-SAFE SCHOOLS RESEARCH PROJECT

Safe Fall-Safe Schools. Analysis of Primary and Secondary School Students' Motor Response to an Unintentional Fall

Why This Brochure?

We would like to invite you to participate in a research project conducted by researchers from the University of Seville (Spain), the University of Castilla-La Mancha (Spain), Universitat Politècnica de Catalunya (Spain), UB-INEFC_Bcn (Spain), Università degli Studi di Milano (Italy), University of Split (Croatia), University of Pécs (Hungary), and the University of Osuna (Spain). This is an international study aiming to analyze the motor response of students to an unintentional fall before and after the implementation of the proactive program Safe Fall-Safe Schools for teaching safe ways to fall.

If you would like your kid to participate, please complete and sign the consent form included in this brochure, cut it out, and hand it over to the researcher at your school.

What does participation Entail?

Your child's participation in the project will take place at the educational center, primarily during school Physical Education (PE) classes.

The study involves an initial assessment through a questionnaire, recording of weight, height, and physical activity habits. Additionally, the Observation Test Level I is conducted: Backwards, Sideways, and Frontals falls to gather the students' motor response to an unexpected fall.

Subsequently, the program is implemented during Physical Education classes, including a theoretical presentation on falls and their consequences in school-age children and specific Safe Fall-Safe Schools exercises during warm-ups in PE sessions.

After the program implementation, a final evaluation is conducted (questionnaire, weight, height, physical activity habits, and Observation Test Level I: Backwards, Sideways, and Frontals Falls).

Benefits of Participation

Your kid can learn and internalize a protected and safe way to fall in the event of an unintentional fall, actively contributing to the reduction of the risk and severity of injuries resulting from a fall.

Consent Form

I agree to allow my child to participate in the research project *Safe Fall-Safe Schools. Analysis of Primary and Secondary School Students' Motor Response to an Unintentional Fall (0021-M1-18)*

I understand that the results of this study may be presented at conferences and published in academic journals. The data will be reported anonymously, and I give my consent for them to be used in this way.

Full Name (Mother/Father/Guardian):

_____

Phone number: _____

Date: Sign:

Participant Child's Identification Information

Child's Full Name:

_____

Child's gender (mark with a cross):

O Boy O Girl O Other

Child´s date of bith: _____

School name: _____

Annex 2. Presentation and Informed Consent for Families

Information and Informed Consent for Parents/Guardians

Low Risk in Participation

Besides the time required to participate in this study, we do not foresee any risks. In any case, the safety of the child will be ensured through the use of mats.

Confidentiality

The information provided by the students in the study will be handled confidentially. Each student's information will be assigned a code number. The list connecting the student's name and their code will be kept in a secure file. Once the study is completed and the data is analyzed, this list will be deleted. The students' names will not be used in any report. There will be no attempt to disclose the identity of the students publicly.

For data collection, students will be photographed and recorded on video solely for educational and pedagogical purposes. These images will not be disseminated or published by any means.

Ethical Review and Concerns

This study has been approved by the Scientific Ethics Committee (0021-M1-18) of the Junta de Andalucía (Spain).

Participation in this study is voluntary, and you and your child can refuse to participate at any time. Additionally, you can withdraw from the study at any time. Simply notify your desire to the researcher or person in charge. Please note that all collected data will be strictly confidential. Students will not be identified anywhere in the research.

Any questions you may have during the research process can be directed to the project director: Dr. Óscar del Castillo Andrés (University of Seville), ocastillo@us.es, +34670905026. Senior Lecturer at the Faculty of Education Sciences, Department of Physical Education and Sport (University of Seville).

Next Steps in Participation

If you feel you have enough information about the study and have no further questions, please sign and return the consent form to the researcher.

Thank you very much for your participation!

Responsible researcher in the country and can be contacted at any time if you have questions:

……

CUT ALONG THE LINE AND HAND OVER THE CONSENT TO THE RESEARCHER

YOU MAY KEEP THE REMAINING INFORMATION FOR ANY REFERENCE

THANK YOU

INFOSECA Questionnaire for Parents/Guardians: Safe Fall-Safe Schools Program

This questionnaire is intended to obtain information regarding your child who is enrolled in the Primary/Secondary Education center and participating in the Safe Fall-Safe Schools research project. Through this questionnaire, we aim to gather information from the father/mother/legal guardian about the falls their child has experienced, the knowledge and importance they attribute to fall-related training, and their physical activity habits.

The questionnaire is completely ANONYMOUS. Please answer with the utmost HONESTY. It will not take more than 5 minutes to complete.

School name: _____ **STUDENT CODE:** _____

Type of School: O Public O Independent O Private

Town:_____*Province*: _____

Mark with an X the selected option in each case.

1. Gender (father/mother or guardian): O Man O Woman O Other
2. Age (father/mother or guardian): ____
3. What grade your child is in?: _____
4. Your child falls down often? O YES O NO
5. Has your child suffered a fall requiring medical attention in the last two years?
   - YES. Indicate how many: _____
   - NO (Go directly to question 11 on the next page)
6. What was the last fall your child had that required medical attention? Please tick the options to describe it.
   a. Type of fall:
      - Dizziness
      - Accidental
      - Caused by a third party (animals, other person, etc.)
      - Cannot say
      - Other

   b. Mechanics of falling:
      - Forward
      - Backwards
      - Sideways
      - Head first
      - Sitting
      - On hands
      - On arms
7. Where was the last fall your child suffered that required medical attention?
   - In a public open space (park, street, etc.)
   - At school
   - At home
   - In another place

8. When was the last fall your child suffered that required medical attention?
    - Part of the day:
        - Morning
        - Afternoon
        - Evening
    - Day of week:
        - From Monday to Friday
        - During the weekend
    - Period of the course:
        - During school term
        - School holiday period

9. What were the immediate consequences of your child's last fall that required medical attention?
    - None
    - Superficial wound or contusion
    - Fracture and other serious consequences
    - Head trauma

10. Has your child's lifestyle changed as a result of a fall?
    - YES
    - NO

11. Did you know that in the year 2021 the World Health Organisation has identified falls as the second leading cause of accidental or unintentional injury deaths worldwide?
    - YES
    - NO

12. Do you think it is important for schools to include specific training on how to learn to fall in the safest possible way, minimising the possible consequences of falling??
    - YES
    - NO

13. In the event of an unexpected fall, would you know how to fall in order to try to minimise the damage sustained in the fall? If yes, please explain the guidelines you consider most important:
    - YES
    - NO

_____
_____
_____

14. Have you received any specific training on falls?
    - YES
    - NO

If yes, please describe the training according to the items indicated:
    - Through a public body. Details which:_____
    - Through a private organisation. Details which:_____
    - Through videos. Details which:_____
    - Through books or journals. Details which:_____
    - Others. Details which: _____

INFOSECA Questionnaire for Parents/Guardians: Safe Fall-Safe Schools Program

We are also interested in your child's physical activity.

The World Health Organisation defines physical activity as any bodily movement that involves an increase in energy consumption. Physical activity refers to all movement, including movement during leisure time, to move to certain places, etc. Common physical activities include walking, cycling, cycling, pedalling, sports, recreational activities and games, all of which can be undertaken at any level of ability and can be enjoyed by everyone.

Intense physical activities refer to those that involve intense physical effort and make you breathe much harder than normal, such as running, swimming, playing football, skipping rope, fast cycling, etc.

How many hours per week of intense physical activity does your child usually engage in? (Please circle)

0 1 2 3 4 5 6 7 or more

Moderate physical activities are those that require moderate physical exertion that makes you breathe somewhat more intensely than normal, brisk walking, cycling at a regular speed, aerobic dancing....

How many hours per week of moderate physical activity does your child usually engage in? (Please circle)

0 1 2 3 4 5 6 7 or more

How many days a week does your child usually engage in moderate or vigorous physical activity? (Please circle).

0 1 2 3 4 5 6 7

How many hours per week does your child usually spend sitting during leisure time? Watching TV, tablet, reading, etc.? (Please circle).

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 or more

Please review the questionnaire to ensure that it is completed correctly

Thank you for your time

SAFE FALL-SAFE SCHOOLS

Annex 4. Observation Test Level I: Backwards Fall

Analysis of the motor response of pupils to an unintentional **backwards fall** (ushiro ukemi)

Center Name: _____Student code:_____

Level: Course: Group:

Note: the organization of schools into levels, courses and groups varies by country. These fields are to be modified in a way that fits each country, so that students can be identified anonymously.

Age: _____ Gender: Male Female

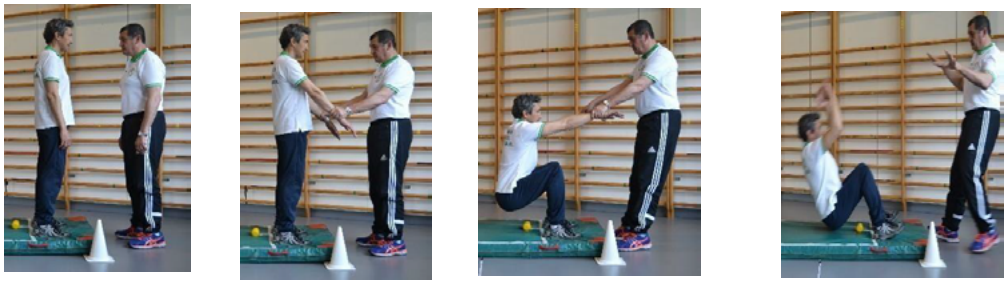
Height in cm: _____ Weight in kg: _____

Physical activity: None Recreative Competitive

Sport or Physical Activity: _____

Pre-test: ☐ Post-test: ☐ Date:_____/_____/_____

Name of observer: _____



Photographic description of the Observation Test Level I: Backwards Fall

Criterium	Description	YES (1)	NO (0)
Head	Flex the neck and bring the chin to the chest, keeping the head away from the ground.		
Hands	Bring hands behind the head to protect it.		
Trunk	Roll onto the back.		
Hip	Maintains hip block.		
Knees	Maintains flexion of the knees.		

Observations: _____

Annex 4. Level I Observation Sheet. Backwards Fall

SAFE FALL-SAFE SCHOOLS

Annex 5 Observation Test Level I: Forwards Frontal Fall

Analysis of the motor response of pupils to an unintentional **forwards frontal fall** (mae ukemi)

Center Name: _____Student code:_____

Level: Course: Group:

Note: the organization of schools into levels, courses and groups varies by country. These fields are to be modified in a way that fits each country, so that students can be identified anonymously.

Age: _____ Gender: O Male O Female

Height in cm: _____ Weight in kg: _____

Physical activity: None Recreative Competitive

Sport or Physical Activity: _____

Pre-test: ☐ Post-test: ☐ Date:_____/_____/_____

Name of observer: _____

Photographic description of the Test Level I: Forwards Frontal Fall

Criterium	Description	YES (1)	NO (0)
Head	Keep the head away from the ground.		
	Turn face to one side.		
Forearm	Land on his/her forearm forming angle ≤90º.		
	During the dumping, the fingers are extended, closed, palm down.		
Trunk	Block the trunk extended.		
Hip	Maintains hip block.		

Observations: _____

Annex 5. Level I Observation Sheet. Forwards Frontal Fall

SAFE FALL-SAFE SCHOOLS

Annex 6 Observation Test Level I: Sideways Fall

Analysis of the motor response of pupils to an unintentional **sideways fall** (Yoko ukemi)

Center Name: _____Student code:_____

Level: Course: Group:

Note: the organization of schools into levels, courses and groups varies by country. These fields are to be modified in a way that fits each country, so that students can be identified anonymously.

Age: _____ Gender: O Male O Female

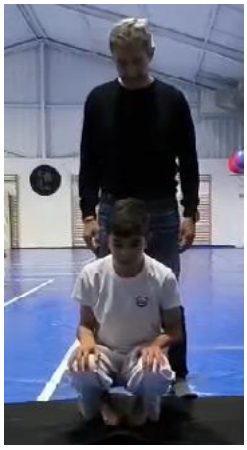
Height in cm: _____ Weight in kg: _____

Physical activity: None Recreative Competitive

Sport or Physical Activity: _____

Pre-test: ☐ Post-test: ☐ Date:_____/_____/_____

Name of observer: _____



Photographic description of the Test Level I: Sideways Fall

Criterium	Description	YES (1)	NO (0)
Head	Turn the head to one side, looking towards the opposite hip, without touching the ground.		
Arm	Bring their hands behind their head to protect it, or avoid placing them on the ground for cushioning. (Damping).		
Trunk	Roll diagonally from the hip to the shoulder while maintaining flexion.		
Hip	Keep the hip flexed.		
Legs	Keep the legs semi-flexed without crossing them.		

Observations: _____

Annex 6. Level I Observation Sheet. Sideways Fall

SAFE FALL-SAFE SCHOOLS

Annex 7 Observation Test Level I: Forwards Roll-over Fall

Analysis of the motor response of pupils to an unintentional **forwards roll-over fall** (Mae maware ukemi)

Center Name: _____Student code:_____

Level: Course: Group:

Note: the organization of schools into levels, courses and groups varies by country. These fields are to be modified in a way that fits each country, so that students can be identified anonymously.

Age: _____ Gender: O Male O Female

Height in cm: _____ Weight in kg: _____

Physical activity: None Recreative Competitive

Sport or Physical Activity: _____

Pre-test: ☐ Post-test: ☐ Date:_____/_____/_____

Name of observer: _____




Photographic description of the Test Level I: Forwards Roll-over Fall

Criterium	Description	YES (1)	NO (0)
Head	Turn the head to one side without hitting the ground.		
Arm	Roll continuously (without elbow support) from the hand to the shoulder.		
Trunk	Roll diagonally from the shoulder to the opposite hip while maintaining flexion.		
Hip	Keep the hip flexed.		
Legs	Keep the legs semi-flexed without crossing them.		

Observations: _____

Annex 7. Level I Observation Sheet. Forwards Roll-over Fall

SAFE FALL
SAFE SCHOOLS

Safe Fall-Safe Schools (SFSS) - Level I

Research Protocol

The Safe Fall-Safe Schools programme aims to teach safe falling techniques, minimising injuries resulting from accidental falls, particularly in school environments. This approach is based on judo techniques known as “ukemis,” adapted for use in everyday and educational contexts, not solely in sports.

The programme promotes the development of a new motor skill: the ability to fall in a controlled manner. This is achieved through progressive exercises that teach participants to protect their heads, distribute impact, and reduce the risk of injury. Learning is organised into levels, starting from low positions and advancing to more complex falls.

This research protocol describes the first level of fall instruction, addressing backward, sideways, and forward falls (frontal and roll-over) through well-defined exercises. It also specifies the tests and evaluation protocols, along with all necessary documents for implementation.

Dr. Óscar del Castillo Andrés, Senior Lecturer at the University of Seville, is an expert in combat sports, physical activity, and teacher training. He developed the Safe Fall-Safe Schools programme and leads research projects with numerous publications on the topic.

Dr. Carolina Castañeda Vázquez, Senior Lecturer at the University of Seville, specialises in physical education, health, and psychosocial factors in sports. She has published extensively and contributed to projects like “Safe Fall-Safe Schools” and “Educajudo”.

Dr. María del Carmen Campos Mesa holds a PhD in Educational Sciences, is a Senior Lecturer at the University of Seville. She is the lead researcher of the IACE Group and an expert in physical activity and sport. She has published numerous articles on physical education and health, and is a member of the Safe Fall-Safe Schools team.

Octaedro
Editorial