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Global Consensus Statement

How Can Judo Contribute to Reducing the Problem of Injurious Falls in Older Adults?

By Mike Callan¹, Charlotte Bird², Slavisa Bradic³, María del Carmen Campos Mesa⁴, Oscar del Castillo Andrés⁵, Maja Sori Doval⁶, Jean-Pierre Dziergwa⁷, Jim Feenan⁸, Michael Headland⁹, Akira Ikumi¹⁰, Kosei Inoue¹¹, Agathe Daria Jadczyk¹², Takeshi Kamitani¹³, Asako Katsumata¹⁴, Hisano Kawahara¹⁵, Nusa Lampe¹⁶, Richard Marsh¹⁷, Katie Mills¹⁸, Kenji Mitsumoto¹⁹, Yasuhiko Moriwaki²⁰, Rustam Orujov²¹, Kristiina Pekkola²², Rashad Rasullu²³, Benoit Séguin²⁴, Akito-shi Sogabe²⁵, Karin Strömquist Båathe²⁶, Hitoshi Sugai²⁷, Meera Verma⁸⁹, Vivian Weerdesteyn²⁹

Abstract: *The Global Consensus Statement on judo-based interventions for older adults addresses the potential of judo techniques, particularly ukemi (safe falling techniques), in minimising the risk and impact of falls among the elderly. Falls represent a significant health challenge for the ageing population, contributing to injuries and high healthcare costs. The statement outlines best practice and recommendations for implementing judo-based fall prevention programmes globally. These programmes leverage judo's multi-faceted approach, incorporating strength, balance, co-ordination, and safe landing skills to reduce the severity of falls and minimise the fear of falling. Research indicates that older adults can learn and retain these motor skills, enhancing their ability to fall safely and reduce injury risks. The consensus also highlights the importance of collaboration between judo federations, healthcare providers and community organisations to scale these interventions effectively. By promoting judo-based exercise programmes, the consensus aims to improve physical, psychological and social wellbeing among older adults, ultimately enhancing their independence and quality of life.*

Keywords: *older adults; fall prevention; judo; ukemi; safe landing; exercise programmes*

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The Global Expert Group on safe falling for the elderly through judo comprises organisations involved in the teaching of and research into safe falling for older adults, through judo. It was formed with the aim of co-ordinating and supporting safe falling through judo activity across the world.

At the International Consensus Conference on Safe Falling for the Elderly Through Judo, held in Japan in November 2023, it was agreed that the Global Expert Group delivering safe falling for the elderly through judo across the world, would create a consensus statement on ways to support and encourage the worldwide rollout of these solutions. This statement outlines the interventions and approaches that the group recommends to national judo federations and other deliverers by detailing the consensus of best practice activities that the Global Expert Group members have developed.

The intended audience for this statement includes local commissioning and strategic leads within countries and national federations which concern themselves with safer falling challenges among older adults that could be impacted upon by the teaching of basic judo falling techniques known as *ukemi*. This consensus statement aims to compile knowledge and evidence of how judo can contribute to reducing injurious falls and benefit the health of older adults.

Following publication, the Global Expert Group and the International Judo Federation (IJF) Academy intend to initiate a programme of work to educate coaches and other professionals around the delivery of programmes for older people based on the guidance provided in this document.

Introduction to the Management of Fall Risk Factors and Safer Falling

The worldwide population is ageing with an increase in geriatric syndromes and physical function decline, leading to a higher risk of falling and fall-related injuries in older people (Christensen, 2009). The World Health Organisation (WHO) lists accidental falls as the second major cause of injuries leading to death and a high cost of medical care (World Health Organisation, 2021). Preventing falls and fall-related injuries in older adults is therefore a major health challenge and it is increasingly important to develop strategies to better manage the rising number of falls but also reduce fall-related injuries.

Geriatric syndromes such as frailty and sarcopenia, as well as physical function decline including limited mobility, impaired balance and gait, postural hypotension, reduced muscle strength and cognitive decline have been associated with an increased risk of falling in older adults (Panel on Prevention of Falls in Older Persons, 2011). These risk factors can be managed with multi-component exercise interventions, which have been shown to improve physical function in older adults (Jadczak, 2018) thus benefitting the fall prevention campaign.

However, one in four older adults still experience a fall each year and 30% require medical attention as a result (Queensland Government, 2022). Data from the United States of America shows that each year about 3 million older adults are treated in emergency departments for a fall injury (Centre for Disease Control and Prevention, 2024) highlighting the tremendous consequences falls for older people.

While multi-component exercise interventions have shown to be beneficial in preventing falls and managing risk factors (Jadczak et al., 2018), there is still a major gap when searching for strategies to reduce harm from falling and fall-related injuries. One innovative strategy is to use the sport of judo to teach older adults how to land safely in case they do fall. Judo is a multi-component exercise intervention that includes balance, posture, strength and flexibility (Kano, 1986). In addition, judo uses specific safe landing techniques, *ukemi*, which can be utilised to teach older adults how to land safely (Kano, 1986). If older adults can learn to land safely, it could be implied that they can prevent injury and fractures, avoid hospital admission and reduce other negative health consequences.

A recent scoping review revealed that judo-based exercise interventions are safe and feasible for older adults and have the potential to impact positively on physical function, muscle strength, gait, quality of life, fear of falling and flexibility (Chan et al., 2023). It has been suggested that teaching judo-specific *ukemi* techniques might be a favourable strategy for reducing falls and consequential injuries in adults with no previous experience in judo (Dobosz, 2018).

Definition of Judo

Judo, originally referred to as '*Nihonden Kodokan Judo*,' literally meaning 'Kodokan Judo of Japanese origin,' is a modern Japanese martial art, founded by Jigoro Kano in 1882 (Hoare, 2009). According to Kano, "Kodokan literally means 'a school for studying the way,' 'the way' being the concept of life itself." (Kano, 1932).

Consisting of two characters, '*jū*,' translates as 'gentle' and '*dō*' translates as 'the way.' *Jūdō* thus means 'the way of gentleness' or 'the way of softness and flexibility.' (Brousse & Matsumoto, 1999; Kawamura & Daigo, 2000).

Judo is a method of physical, intellectual and moral education, which was originally developed for self-defence and evolved into a competition sport after being included in the Olympic Games for the first time in 1964 (IJF, 2024a). Since then, judo has gained international popularity not only as a competitive sport but also as a martial way for young and old with educational value. As of February 2024, 205 national judo federations are affiliated members of the International Judo Federation, with an estimated 40 million practitioners worldwide (IJF, 2024b).

The techniques of judo are derived from traditional jujutsu

and include throwing techniques (*nage-waza*), grappling techniques (*katame-waza*) and striking techniques (*ate-mi-waza*) (Murata, 2009). Throws and groundwork techniques, including holds, chokes and joint locks targeting the elbow, are used in free practice or *randori*, and competition, while the practice of striking techniques is limited to *kata*, a method of formal practice consisting of prearranged patterns of attack and defence (Murata, 2009).

Before judo practitioners master and apply various techniques while engaging in direct contact with each other, they learn how to fall safely. Therefore, *ukemi*, or safe break-falling can be considered the most essential skill of judo. Before learning to throw, judoka must master the basics of safe falling. *Ukemi* is a life skill which can prevent injuries in daily life and has the potential to contribute to fall prevention not only for the young but especially for older individuals (Chan et al., 2023; Dziergwa, 2022).

The health-oriented practice of judo has the potential to improve overall strength (Burns & Callan, 2017), co-ordination, posture and balance in practitioners (Arkkukangas et al., 2021). In addition to the physical aspect, training with a partner also requires mutual co-operation and trust in each other and therefore improves social skills (Bradic, 2023).

Since its inception in 1882, judo has spread from a small room at Eishoji temple in Tokyo to all nations of the world over a period of more than 140 years (Hoare, 2009). Over more than a century, millions of judo practitioners have been thrown by their partners with force and have applied the principles of *ukemi* within their daily practice.

The philosophy of judo is based on two core principles: the principles of 'maximum efficient use of energy' and 'mutual prosperity for oneself and others' (Uozumi, 2010). 'Maximum efficient use of energy' (*seiryoku zen-yo*) is a technical principle referring to the most efficient use of mind and body in judo practice, which can also be applied to all daily activities (Bennett, 2009). 'Mutual prosperity for oneself and others' (*jita kyoei*) is an altruistic concept applying the principle of 'maximum efficient use of energy' to all aspects of daily life (Bennett, 2009), ultimately aiming to contribute to society through individual commitment to self-perfection (Todo, 2020).

According to judo's founder, Jigoro Kano, judo training based on the principle of maximum efficiency aids the "Improvement of the human body, making it strong, healthy and useful, and so constitutes physical education. It can also be applied to the improvement of intellectual and moral power, and in this way constitutes mental and moral education." (Kano, 1932). Based on these universal core values, judo is adaptable to the needs of each individual and thus can be practised by everyone, regardless of age, gender or physical attributes.

Safe Falls – Technical Approaches in Judo

Teaching Knowledge of How to Fall (*ukemi*)

There is a range of coaching methodologies used by judo teachers experienced in working with older populations. Most of these approaches involve very small progressions to develop an understanding of the techniques, known as micro-progressions. This is supported by Callan (2023) who outlined a 14-stage approach to the teaching of *mae-mawari-ukemi*.

Arkkukangas et al., (2021, 2022) suggest that progressions can be thought of in three main blocks:

1. Practising basic falling techniques such as falling backwards and sideways from a sitting or kneeling position, and strength exercises, body awareness, basic balance and mobility training, including getting up and down from the floor.
2. Continuing with falling techniques, increasing load in strength exercises, challenging balance and co-ordination, greater range of movements and possibly power in strength exercises.
3. Continuing with advanced falling techniques (for example, from a standing position), challenging balance and strength exercises and ability to develop power in strength exercises.

The importance of teaching basics to begin with is emphasised by Sakuyama (2021), who suggested that it is important to begin with easy movements in order to retain motivation. These include *ukemi*, cradle motion, backward and sideways, and *uchite* (motion of the hand hitting the mat). Other experts focus on specific exercises to assimilate safe and protected ways of falling (Campos-Mesa et al., 2020).

Another teaching approach which is applied is repetition training; in judo this is known as *uchi-komi* (Ishikawa & Draeger, 2011). Here, the participant repeats new movement patterns and techniques in order to embed the learning. This approach is used for: breakfalls (*ukemi*), training of unbalancing (*kuzushi*) and training with turning of the body (*tai-sabaki*) (Borba-Pinheiro et al., 2016). The motor learning model of Fitts and Posner (1967) and the notion of motor visualisation is also used by some teachers (Dziergwa, 2022).

The technical points of teaching safer falling emphasise three main aspects (McDonald & Callan, 2023). Firstly, maintaining alignment and ensuring that the head does not contact the floor helps to ensure the correct technique is adopted from a safety perspective. Secondly, distributing the force of the impact by making a large surface area contact the ground, practically applies the principles of mechanics to minimise the pressure on a single point of

impact. Finally, reducing the velocity of the fall is achieved by teaching the participants to use rolling to dissipate the force over a longer time.

Standing Up

The importance of being able to rise from the floor independently, to avoid any harm associated with lying for long periods is widely accepted (Montero-Odasso et al., 2022).

Evidence has shown that judo sessions helped older participants to learn techniques to become more confident to stand up safely from the floor (Arkkukangas, Bååthe, Hamilton, Ekholm & Tonkonogi, 2020; Toronjo-Hornillo et al., 2018). Toronjo-Hornillo et al., (2018) also suggest including a warm-up and cool down during the session, along with mobility, balance, posture and strength training, as this can help the older people to feel more confident when practising breakfalls, ultimately reducing their fear of falling. They advocate that within classes, rising from the ground should be taught alongside *yoko-ukemi* (lateral falls) and *ushiro-ukemi* (backward falls).

Burton et al., (2023) found that the two main methods for teaching rising from the floor are 'backward chaining' (Montero-Odasso et al., 2022), and the 'conventional method' (Reece & Simpson, 1996) and recommended that older adults practise the skill of rising from the floor, such as during judo sessions, with Skelton et al., (2005) having shown that it is possible to regain this skill.

Equipment and Safety Considerations

A range of equipment is used by existing safer falling through judo programmes. Supervision by an experienced coach is of great importance to ensure the technique is correct and therefore injury is avoided. As participants build confidence they can complete some basic exercises at home. Some, such as the Nijmegen Falls Prevention Programme and Judo Flanders Carefree Falling, make use of thick safety mats, some using additional equipment such as hoops, balls and chairs. Safety mats also allow people who cannot bend down low enough to practise the safe falling exercises to improve the technique. Most of the programmes deliver the sessions on standard-density judo mats. The scoping review by Chan et al. (2023) found eleven studies that used judo mats to conduct both judo-specific and judo-based interventions in middle-aged, older and mixed-age participants. Some sessions, such as the Quebec Fall Prevention and Control Program (Seguin, 2021) do not use any judo mats, instead, delivering the sessions on an indoor sports hall floor.

Participants, often beginners, wear a variety of clothing such as loose-fitting exercise clothes, usually with no hard items such as belts or buckles. Long sleeves and trousers can also be worn to protect skin. As the participants make progress, they often choose to wear *judogi* (judo suit).

For footwear, most judo sessions encourage bare feet on the mat but some older adults prefer to wear socks or even indoor, soft, training shoes. The aim of the judo teacher is to reduce any barriers to participation, as the participants may already be nervous about taking part.

Specific Training Recommendations

Judo practitioners have utilised a range of different training approaches when delivering their sessions. Individual differences and needs are of great importance when working with older adults. The physicality of the sessions should be adapted to suit the individual if they have any health issues or injuries. British Judo's 'Finding your Feet' course uses a PARQ+ form as a pre-exercise screening tool.

Longer programmes have more benefits concerning fear of falling as the skills learned become more autonomous and the participants build confidence. A weekly 45-minute session over 4 weeks showed a 16% decrease in fear of falling when compared with a control group (Callan et al., 2023).

Reducing Impact Force, the Application of Mechanics

Pressure is Force divided by Area. The pressure of an impact is measured in the S.I. unit pascal (Pa). One pascal is the pressure exerted by a force of magnitude one newton perpendicularly upon an area of one square metre (Page & Vigoureux, 1974).

$$1 \text{ Pa} = 1 \text{ N} / \text{m}^2$$

Where N is a Newton, m is a metre.

A Newton is the S.I. unit of force. One Newton is the force that would give a mass of one kilogram an acceleration of one metre per second per second, and so where 'kg' is a kilogram, 's' is a second.

$$1 \text{ N} = 1 \text{ kg} \cdot \text{m} / \text{s}^2$$

So, an increase in the mass (kg) of the body would increase the pressure (Pa) of the fall. Therefore, a heavier person will exert more pressure than a lighter person for the same fall.

Another way to increase the pressure is to reduce the area (m²) that contacts with the ground, such as landing just on the proximal area of the hand (upper limb fall reflex) or just on a single hip joint. Conversely, landing on a larger surface area, such as during a *yoko-ukemi*, will increase the denominator in the equation and thus result in reduced pressure from the fall. This is one of the mechanical reasons that judo practitioners are able to fall without injury; they land on a large surface area. Groen et al., (2010) showed significant improvements in hip impact force using a 1.2 m × 1.2 m force plate covered by judo mats in older participants after a weekly judo-based intervention over 5 weeks.

Callan (2023b) found that around 14% of the body surface area is in contact with the ground after a *yoko-ukemi*. This is equivalent to someone lying on their side. Rajaei et al., (2018) found that the pressure on the proximal area of the hand for a fall using the upper limb fall reflex was 277 kilopascals (kPa), whereas Callan (2023b) identified the pressure of a *yoko-ukemi* to be less than 3 kPa.

The acceleration of the fall is also a factor. A fall that is slowing down (decelerating) will decrease the landing force and therefore decrease the pressure. In judo breakfalls, deceleration is achieved during the rolling action, for example in *mae-mawari-ukemi*. After fall training, hip impact force was reduced by a mean of 8% (Groen et al., 2010).

Reducing Injury and Harm From Falls

By participating in judo-based exercises, older people may become fitter and stronger, therefore reducing frailty. The 'Clinical Frailty Scale' (Church et al., 2020) is a useful indicator of frailty and the likelihood of falling, so reduced frailty through judo training means that participants will be less likely to experience a fall. If judo participants do fall, they will be more able to apply a breakfall correctly and therefore reduce the pressure of the fall and the severity of any potential injuries.

Acknowledging individual differences and needs is of great importance when working with older adults. The physicality of the sessions should be adapted to suit the individual, if they have any health issues or injuries. British Judo's 'Finding your Feet' course uses a PARQ+ form as a pre-exercise screening tool.

There are many obvious positive health benefits for participants when learning to fall safely. However, there is currently a lack of research data on injuries to participants. This is an area in which further research is needed.

The chronic disease Osteoporosis leads to bone fragility and is associated with fracture risks and consequent issues of mobility. Borba-Pinheiro et al., (2016) demonstrated the favourable effects of adapted judo programmes on bone mineral density (BMD) and quality of life (QoL) for postmenopausal women in pharmacological treatment and a low socioeconomic level. They concluded that combat sports based on throws and grips and immobilisation of the opponent's body, such as judo, are likely to be optimal in achieving positive training effects for postmenopausal women.

Systematic reviews have reported that older adults who have taken part in resistance training, endurance training, multi-component training and balance training show improvements in balance ranging from 16% to 24% and have a lower incidence of falls ranging between 22% and 58% when compared with control groups (Valdés-Badilla et al., 2022).

Position of Body (Shizentai) and Breaking Balance (Kuzushi)

In judo, participants are taught to stand in *shizentai* position. The Kodokan Judo Institute define *shizentai* as natural posture, in which the body is standing normally (Kawamura & Daigo, 2000). Tomiki (1956) explains that it "Is the posture of a person standing quietly with his head and upper body kept upright, arms hanging without constraint and legs not so firm and widely apart." He explains that with this posture, the body keeps stability and does not fall and that additionally the limbs are kept soft so that they can shift to any action at any moment.

In *shizentai*, the balance of the standing person is maintained because the centre of mass of the body is over the feet. Masud and Morris (2001) define a fall as, "A fall results when the vertical line which passes through the centre of mass of the human body comes to lie beyond the support base and correction does not take place in time."

So, we can see that a fall is defined as the absence of *shizentai*. Tencer (2005) explains further that "a fall occurs when the centre of gravity of the trunk moves outside the base of support provided by the feet against the floor." We can think of a fall as being initiated by a loss of balance.

The action of breaking your opponent's balance in judo is known as *kuzushi*. Bountakis (2023) explains that judo teachers make an advanced study of the application of *kuzushi* in eight or 14 directions (Kudo, 1967). During judo sessions, older adults are taught the principles of *kuzushi*, to better understand the feeling of when their balance is broken and how to adjust back to a *shizentai* position or to initiate *ukemi* to help them fall safely.

Coach Education

As judo experts, qualified judo coaches already understand *ukemi* and *kuzushi* and can teach these principles to their students. Most judo participants are children and therefore coaches have built a wealth of experience teaching younger people. Several programmes around the world have developed coach education initiatives to prepare coaches to work with older adults.

The EdJCO (Educational needs for coaching Judo in Older Adults) programme (Palumbo, 2023) based across several European countries, developed recommendations for addressing coaches' educational needs through the implementation of an educational programme targeting judo practice in late adulthood. It achieved this through promoting evidence-based knowledge of judo training for older judo practitioners. They urged coaches to develop specific competencies and skills for addressing the special needs of older practitioners.

The Netherlands research team built on their experience delivering the Nijmegen Falls Prevention Program (Weerdesteyn et al., 2006) to create ZekerBewegen (move with

confidence) in partnership with the Dutch Judo Federation. ZekerBewegen judo instructors are trained to deliver a nine-week course to older adults that involves 20% balance and mobility and 80% *ukemi* practice. In 2023 there were 175 ZekerBewegen instructors operating across the Netherlands.

In the UK, the British Judo Association have developed a Coach Education qualification called Finding your Feet (McDonald, & Callan, 2023). The programme is based on the exercises found in the *Yawara-chan Taiso* project (Kamitani, 2018; Callan et al., 2022). A series of ten coach education sessions were delivered during 2024 which qualified around 120 coaches to work with older adults in their communities.

Psychological Benefits

Exercise has long been known to improve mental health by reducing anxiety, depression and negative mood and by improving self-esteem and cognitive function (Sharma, 2006). In particular, multi-component exercise like judo has been demonstrated to improve quality of life (QoL) in a number of studies, including in the elderly (Chan, 2023. Sakuyama, 2021).

Judo has a strong ethical base anchored by the principles of mutual benefit (*jita kyozei*) and maximum efficiency (*seiryoku zen-yo*) (Kano, 1986), supported by an eight-point moral code: respect, honesty, self-control, friendship, courtesy, honour, courage and modesty (IJF, 2021). Originating in Japan, judo is also influenced by the concept of *Omoiyari* or consideration, altruistic caring for others. These philosophies make the judo dojo a safe, inviting and friendly space for older adults, particularly those with limited involvement in physical activity or sport. Judo coaches usually extend an inclusive, customised exercise programme aimed at achieving the best possible outcomes for all participants.

Some projects also seek to understand the benefits of intergenerational training and therefore adhere to these programmes long-term. By having older adults participate in these programmes at a local judo club, children and grandchildren can also become part of the judo community, instilling these skills from a younger age as well as growing the judo community. The European Union has supported the JOY (Judo connecting Older and Younger Generations) project which helps to raise awareness of intergenerational judo and its positive psychological and social benefits.

One of the negative aspects of ageing is an increased fear of falling (Parry, 2013). Consequences include avoidance of activity, social isolation, increasing frailty and a risk of further falls independently of physical impairment, which can lead to a downward spiral in both physical and

mental capacity. However, judo programmes for novice older adults have been shown to reduce the fear of falling (Callan et al., 2022; Campos-Mesa, 2020) and improve motivation for exercise (Ciaccioni, 2021).

Most people experience an age-related decline in cognitive function as a normal part of the ageing process but exercise at a moderately high level of physical activity can help maintain healthy brain function (Xu, 2023). Judo can be particularly helpful for developing and maintaining cognitive function through the use of *kata* and other challenging co-ordination activities such as *uchi-komi* as these require the use of left and right limbs in an asymmetric manner. It is well known that learning new skills can provide cognitive benefits for older adults (Wu, 2023). Judo can offer an exciting new set of skills using different muscles in everyday life, thus requiring more mental engagement and opportunity for cognitive development and maintenance.

Loneliness and social isolation have also been observed as part of the ageing process, as one loses a life partner and/or friends and this translates into a reduction of physical contact, with its attendant benefits (National Academies of Sciences, Engineering, and Medicine, 2020). Judo is one of the few forms of exercise where people work in pairs, either with the instructor or with each other. This incidental and positive physical contact can benefit older adults in terms of offering a sense of wellbeing and contentment.

The increase in confidence seen from an eight-week judo-based exercise programme (Jadczak et al., 2024) can be summed up by a former study participant (female, 80 years old, personal communication) reporting, "For me there have been some unexpected and surprising gains which may not all have shown up in the study results: I have lost my fear of falling and landing badly, feel generally in control and able to cope if I am not. I now seem to have 'time' midfall to consider my options and choose my landing method(s). If I do fall, I mostly feel in control and even more importantly do not go into shock and disorientation on landing. I have recovered some previously frequently used means of fall prevention that I had lost e.g., rapid stepping to regain balance. I have vastly increased my stability and the number of falls has reduced accordingly. I am generally in control of how and where I land and confidently, I have a range of ways to do so to mitigate consequences. My balance is still far from perfect but is now adequate for daily life and I continue to make gains."

Thus, judo-based exercise programmes for teaching safe falling *ukemi* skills have the potential to positively impact older adults' mental health and psychological wellbeing.

Physical Benefits

In this section, we summarise the reported physical effects of judo-based interventions. We consider controlled and uncontrolled studies involving interventions that are judo-specific, as well as interventions that include a judo-based component - mainly *ukemi* practice - in addition to exercises focusing on balance, strength and agility. Note that due to the mixed content of these interventions, reported effects cannot readily be attributed to any specific exercise component.

Most studies used performance-based tests to evaluate the physical effects of their intervention. The tests used for evaluation varied considerably - in keeping with the heterogeneous content of the interventions - but generally demonstrated beneficial physical effects. Following the Judo4Balance and Dynamic Balance for Life programmes, the participants achieved better scores on the Short Physical Performance Battery (SPPB; Arkkukangas et al., 2020; 2022; Jadczyk et al., 2024). When looking at specific domains of physical performance, improvements in mobility, as measured with the Timed-Up-and-Go test (TUG), were reported following the latter, as well as three other interventions (Jadczyk et al., 2024; Odaka et al., 2023; Weerdesteyn et al., 2009; Campos-Mesa et al., 2023). Increased lower-limb muscle strength was observed following two judo-specific interventions (32 and 36 training sessions; Ciaccioni et al., 2019; Kujach et al., 2022); one of these studies additionally reported improvements in flexibility (Ciaccioni et al., 2019). Two studies observed gains in gait speed and associated step variables (Weerdesteyn et al., 2009; Ciaccioni et al., 2020), whereas gait speed did not change in one study that evaluated three 15-minute sessions of *ukemi* practice added to habitual weekly exercise classes (Odaka et al., 2023). Furthermore, gait adaptability (i.e. obstacle avoidance) was found to improve following the Nijmegen Falls Prevention Program (NFPP) (Weerdesteyn et al., 2006).

Three interventions yielded beneficial effects on balance, as measured with e.g. Mini-BESTest or Berg Balance Scale (Arkkukangas et al., 2022; Jadczyk et al., 2024; Weerdesteyn et al., 2009). Inconsistent results were reported regarding postural control outcomes, as evaluated by force-plate recordings of centre-of-pressure (CoP) excursions while standing quietly; one study observed reduced CoP excursions post intervention (Kujach et al., 2022), whereas another showed no change (Weerdesteyn et al., 2006).

In three studies from the same group, the effects of the NFPP were evaluated regarding falls and fall-related injuries in daily life. These studies demonstrated a significant 32-46% reduction in the number of falls in daily life in a one-year period following intervention (Weerdesteyn et al., 2006; 2009; Smulders et al., 2010). Major fall-related injuries were less common in the intervention group when compared with the control group (3% vs 10% of all falls) but this difference did not reach significance (Smulders et al., 2010).

Additionally, three studies used the physical functions/mobility domain subscores of validated quality-of-life questionnaires to evaluate intervention effects. Mixed results were reported. One study found improvements in the SF36-physical functions domain following a nine-month judo-specific intervention (Sakuyama et al., 2021), whereas non-significant improvements in this SF36 subscore were reported following a combined pilates and judo-based programme (Campos-Mesa et al., 2023). EuroQoL-5D-Mobility scores did not change following the Judo4Balance programme (Arkkukangas et al., 2022).

Social Benefits

Judo, as a holistic intervention for older adults, transcends the individual to address the social dimension (Maekawa & Hasegawa, 1963). Grounded in the principles of *seiryoku zenyo* and *jita kyoei* by Jigoro Kano, this physical-sporting practice challenges ageism, empowers this population, and offers utility in daily life (Ayalón et al., 2019; Hand & Ihara, 2024). All these concepts are fundamental to improving the health and quality of life of older adults and are approached with a long-term progression vision.

This proposal of judo for older adults directly responds to the demand and concern expressed by the World Health Organisation (WHO, 2021), regarding the issue of ageism. According to this organisation, this form of discrimination leads to deteriorating health, social isolation, increased premature mortality, and represents a significant cost to global economies. In line with this approach, entities such as the Office of the United Nations High Commissioner for Human Rights (OHCHR), the United Nations Department of Economic and Social Affairs (UNDESA), and the United Nations Population Fund (UNFPA), urge the adoption of urgent measures to implement effective strategies against age discrimination.

Firstly, facing the challenge of ageism, judo fosters an inclusive environment for a population with increasing life expectancy, becoming a platform for social inclusion that helps break stereotypes, prejudices and social discrimination related to age (Ayalón et al., 2019; Hand, & Ihara, 2024). With this activity, the older adult becomes the owner of their own ageing process and through group classes, judo as physical activity promotes personal interaction, the formation of emotional bonds, and the development of social skills (Ruiz & Casimiro, 2018). In this regard, various studies indicate that practising physical activity and sports such as judo is a powerful antidote against ageism by impacting the physical and psychosocial wellbeing of older adults positively (Oliveira et al., 2024; Sparks, Meisner, & Young, 2013).

Secondly, judo not only counteracts the social limitations associated with ageism but also promotes real empowerment among older adults. The sport directly affects two key factors to enable the empowerment of the older adult: physical wellbeing and personal autonomy (Aminu et al., 2024; Campos-Mesa et al., 2023; Ruiz & Casimiro,

2018; Yamasaki, 2023). By better understanding their bodies and motor skill limitations through judo practice, older adults can exercise more effectively and purposefully to maintain their health and wellbeing. By practising it, older adults not only improve their strength, endurance, balance or cognitive capacity but also redefine their perceptions of ageing, allowing them to foster real personal autonomy (Iso-Markku et al., 2024; Yamasaki, 2023). This translates into greater independence in daily life, mobility, social contact, and an overall improvement in physical and psychological wellbeing (Altermann et al., 2014; Tanaka & Seals, 2003). Likewise, it is noteworthy here that judo affects issues directly correlated with dependency and ostracism (Aminu, Torrance, Grant, & Kydd, 2024), such as the fear of falling. This variable has been shown to be positively modifiable through judo practice and more specifically through its *ukemi* (Campos-Mesa et al., 2023; Callan, 2019; Odaka et al., 2023), allowing the older adult to continue with a social lifestyle by maintaining personal autonomy.

Thirdly, judo as a physical activity focused on older adults can meet the daily functional needs of this population and become a utilitarian physical activity for improving their health and quality of life. Therefore, it must be useful for maintaining or improving motor patterns that the older adult needs to use on a daily basis (sitting/standing, dressing, going up and down stairs, etc.). This viewpoint is addressed by authors such as DelCastillo-Andrés, Toronjo-Hornillo, Toronjo-Urquiza, Cachón Zagalaz, & Campos-Mesa (2018), who propose an adapted utilitarian judo based on Kodokan Judo, the main objective of which is to maintain and develop specific motor skills adapted to integrate norms and habits of life to contribute to the wellbeing of the older adult, providing autonomy in personal, domestic and social contexts. The result is a holistic, utilitarian, adapted, physical activity to meet the physical, psychological and social needs that older adults recognise daily.

Judo presents a utilitarian aspect in terms of working physical condition in a multifunctional way, allowing focusing on grips, balance re-education, displacements, fine and general motor skills, maintenance of joint mobility, etc., but it can also respond to one of the main challenges facing society today, which is directly related to all the parameters mentioned above, by proactively responding to unintentional falls. The application of judo's falling techniques, based on reducing the magnitude of impact on the body (Pocecco et al., 2013), contributing to reducing the risk of injury or its severity, can be a very promising tool for reducing the fragility of older adults, as demonstrated by programmes such as Judo4blance, Dynamic Balance for Life, Yawara-chan taïso, Finding Your Feet, Fall Prevention and Control Programme, Judo Flanders Care-free Falling for the Elderly, Judo KENKO Taïso, All Japan Judo Federation Fall Prevention Project, Educating Judo Coaches for Older Practitioners (EDJCO), Adapted Utili-

tarian Judo, or ZekerBewegen Senior Fall Prevention Programme, among others. On the other hand, it also helps in the development of functional mobility skills on the ground and the transition to safe positions after suffering a fall.

Finally, we can point out the transformative power of judo and its impact on long-term progression by promoting mental wellbeing, instilling a sense of achievement, self-confidence, and resistance to age-related stereotypes at different stages of life. Keeping the mind and body active through physical and cognitive stimulation, such as memorising and executing judo techniques, helps preserve physical and brain function and reduces the risk of age-related cognitive decline (Altermann et al., 2014).

In conclusion, judo offers a multifaceted approach to addressing ageism, empowering older adults, promoting the utilitarianism of daily life, and fostering long-term progression. As society seeks holistic solutions to improve the wellbeing of its ageing population, the integration of judo proves to be a valuable and transformative avenue.

Evidence-Based Programmes

The available judo-based training programmes for older persons developed over the last fifteen years are usually complex in their nature, including the key features of proven effective fall prevention training such as balance, co-ordination, strength and power training. Furthermore, judo-based exercise programmes often offer training methods for safe falling and landing strategies called *ukemi* which can reduce both the impact force of landing and the fear of falling which are known risk factors for falls. (Groen et al, 2020, Arkkukangas et. al, 2020).

Multifactorial judo-based exercise programmes including training strength, power, balance, co-ordination and falling techniques can be effective tools both for mitigating the risk of falling and decreasing the risk of injury should an accidental fall occur. The exercises should be dynamic and there should be an increased progression of exercise loads. Programmes should be followed continuously with an interval of a minimum of at least one training session per week for a minimum of six weeks to offer significant effects.

Group training, which is the most common training method among judo-based programmes, seems to be more effective at achieving both fidelity and increased load progression of fall prevention programmes. The element of playful exercises and games in pairs gives an extra incentive for many participants to attend judo-based programmes.

There is great potential for the larger 'fall prevention community' outside the 'judo family' to add the dimension of playful exercises in pairs and *ukemi* to evidence-based fall prevention exercise programmes lacking this component.

Can Older Individuals Learn *Ukemi* (safe falling and landing skills)?

Several studies show that older novice individuals can learn and retain the motor skills of judo and judo-inspired breakfall techniques. Recent research shows that these motor skills of falling and landing in different directions can be learned by older individuals in a relatively short programme ranging from 6 to 12 weeks, with one to two 60-minute sessions weekly. (Groen et al, 2010 Arkkukangas et.al, 2022). Programmes such as the Judo Flanders Project have a 60-minute taught session each week and recommend practice at home for another 60 minutes as all the exercises can be done within the home and are repeatable.

More research is needed in the field of long-term retention of the breakfall motor skills among older individuals, however some studies (as well as anecdotal evidence) show that the motor skills of *ukemi*, once automated, can be retained over a longer period, from months to years. (Arkkukangas et. al, 2022).

“Landing strategies have a significant effect on reducing impact load during a fall and might be effective to reduce the impact load of falling.” (Moon et al., 2019). However, one limitation is that most studies have been made on self-induced falls in a younger target group. More research is needed of an older target group experiencing unintentional falls. Recent studies show that judo-like falls can indeed reduce the risk of injury to the head and external extremities for an older target group. (Robinovitch et al, 2022, Moon et al 2017, Moon et al. 2019). Biomechanical research shows that the impact severity of falls can be reduced by applying several injury prevention strategies which can be trained and automated. One such area is the impact force on the hip which is often injured among older people when falling. (Groen et. al 2010)

The most important elements of *ukemi* (safe falling and landing strategies) mentioned in several scientific studies are:

1. Protecting the head by tucking it in with the chin toward the chest.
2. Reducing the height of falling by lowering the centre of gravity such as bending the knees.
3. Avoidance of bracing the fall with upper limbs.
4. Reducing the impact force in landing by rolling and/or spreading impact on a larger body area.

Assessment of Falling Competence Among Older Individuals

To date, there are two main methods for assessing *ukemi* skills in a systematic way.

1. Video Assessment – Scale 1 – 10.

Two blind (having not seen the participants before) judo experts assess a video recording of the fall performed and give points for correct *ukemi* movements. The scale is then made from bad breakfall (1-3) to fair (4-6) and to good breakfall (7-10).

2. Strömqvist Bååthe Falling Competence Test (SBFC) – Written protocol

Scale 0–4 for each fall (backwards, sideways and forward). Total max score: 12 points.

The falling competence measured in the Strömqvist Bååthe (SBFC) Test (Arkkukangas et al., 2022) is the sum of the motor skills that can support injury-free, safe falling and landing strategies. Furthermore, it gives an indication of the efficacy of performing a self-induced fall from a low height gradually progressing to making a fall from standing since the participants are asked at each step if they would like to continue the testing. For each step, there is a list of injury-related movements which can be identified, such as bracing falling with the hand, not holding up the head, failure to roll, etc. If any harmful manoeuvres are identified, the test is stopped at this step. The SBFC – Test is a safe and easily reproducible test made up of three parts measuring different breakfall skills (forward, backward and sideways). The test can be used for one, two or all three of the breakfalls depending on which *ukemi* have been taught in the selected exercise programme. The SBFC - Test has been used over 500 times with multiple test leaders and without any major adverse effects. The test protocol is free to use if reference to the test name is made and a notification/registration to the e-mail indicated on the form.

SBFC - Test Procedure:

Falling backwards: The participant is asked to lie on their back on the mat, lift their head up from the mat and stand up again. If unsuccessful, the test is stopped and the score given is 0. If successful, the person scores 1 point. The next step is to sit up on the mat, on the buttocks, and fall backwards. If successful, the person scores 2 points. The subsequent step is to fall backwards safely from a squatting position (3 points) and the final step is to fall safely from a standing position, which results in a maximum score of 4 points if performed correctly.

Falling forward: A similar progression is made as for the forward breakfall strategies: The participant is asked to lie on their stomach. If unsuccessful the test is stopped

and the score is 0. If successful they score 1 point. The next step is falling from the knees (2 points), squatting (3 points), and falling from a standing position (forward rolling *mae-mawari-ukemi* or 'cat breakfall') without any harmful manoeuvres (4 points).

Falling sideways: This test was built using the same methodology as the previous two; Lying down and rolling to one side and standing up scores 1 point, falling from sitting on the buttocks to the side scores 2 points, falling to the side from the knees or squatting scores 3 points and finally, falling sideways from a standing position without any harmful manoeuvres scores the maximum of 4 points.

Future Areas of Research

Although there is convincing and well-established evidence from research that adequate fall-prevention exercise training reduces the risk of falling (Sherrington et al. 2019), the use of safe falling and landing strategies (*ukemi*) for reducing the severity and risk of injury from unintentional falls remains understudied.

More research is needed to study the long-term effects of learning *ukemi* and the development of validated tools for evaluation of the effectiveness of the different *ukemi* skills and falling competence for different target groups. Using standardised and validated new measurement tools such as video analysis and the Strömquist Bååthe Test could add new insights into the commonalities and different effects of various programmes.

Further research is needed in the field of assessing the most effective teaching methods for older adults in judo-inspired/based programmes in general and *ukemi* skills in particular. Evaluation of falling competence among participants and the long-term effects of *ukemi* training on fall incidence, injuries, injury types and recovery times would also be of great interest for an older target group.

Action and implementation research on already established proven effective and scalable judo-based exercise programmes in co-operation with other stakeholders such as international agencies, national judo federations, governments, health care providers and municipalities would be a great step to cascade the skills from the judo community into wider society. Multi-country research on some of the already established programmes could be of interest to gain greater numbers of participants in the studies.

CONCLUSION

This global consensus statement on how judo can contribute to reducing the problem of injurious falls in older adults has been developed by the Global Expert Group on safe falling for the elderly through judo. It has outlined the technical approaches taken and presented evidence of the physical, psychological and social benefits for older adults learning to fall safely utilising judo techniques.

The evidence is clear that judo falling techniques can provide a range of positive outcomes, reducing injurious falls and benefiting the health of older adults.

We hope that national federations will work with local organisations to facilitate access to judo *ukemi* practice within communities based on the guidance provided in this consensus statement.

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