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The Effect of Adapted Utilitarian Judo, as an Educational Innovation, on Fear-of-Falling Syndrome

María Carmen Campos-Mesa *, Óscar DelCastillo-Andrés, Luis Toronjo-Hornillo and Carolina Castañeda-Vázquez

Department of Physical Education and Sports, Faculty of Education Sciences, University of Seville, 41013 Seville, Spain; ocastillo@us.es (O.D.-A.); ltoronjo@gmail.com (L.T.-H.); carolinacv@us.es (C.C.-V.)

* Correspondence: mccampos@us.es; Tel.: +34-625-11-58-01

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Abstract: Background: The aim of the research was to analyze the effects of an intervention program based on Adapted Utilitarian Judo (AUJ) to teach fall control, over fear of falling syndrome (FOF) in a group of older adults. Method: A quasi-experimental design (pre–post measurement) was adopted, with a healthy and pre-fragile sample of 19 subjects in the experimental group and 11 subjects in the control group (65–85 years), chosen using non-probabilistic-incidental accessibility sampling. The intervention program was conducted over six weeks, with two 60-minute sessions each week. To evaluate FOF, it was applied (pretest and post-test) the 16-item version of the Falls Efficacy Scale-International (FES-I). Results: The data show significant differences between pre- and post-test in reducing FOF into both specific variables (do the shopping, walk on a slippery surface, walk in a crowded place, walk on an uneven surface, and go up and down a ramp), as in the overall score (the global values of the experimental group decreased six points in the perceived fear scale, while the global values of the group increased three points). Conclusion: The application of the AUJ program meant significant improvements in subjects' perception of FOF.

Keywords: adults; older adults; falls; fear; injury; innovation

1. Introduction

The ageing of the world population is a reality that will see 420 million octogenarians living on planet earth by the year 2050 [1]. Americans over 55 contributed 3.3 billion volunteer hours in 2016, the equivalent of 78 billion dollars [2]. Global life expectancy is now over 72 years, and in 30 countries in the Americas, Oceania, Asia, and Europe, the average is over 80. In this regard, Spain leads the longevity rankings according to European Commission reports, and will soon be the most aged country in the world with 40% of its population over the age of 60 [3].

Medical breakthroughs and improved diets have given us 15 additional years of life. Greater longevity is an opportunity to help save the European Union's accounts, and the consumption of older people will account for 32% of Gross Domestic Product (GDP) and 38% of employment by 2025. Old age as a generator of wealth; the grey-haired economy is now a reality [2].

This conceptual change in old age has led to a multitude of research focused on its study.

An active ageing process can prevent older people from becoming considered fragile and/or dependent. One of the causes of fragility is the high number of falls suffered by older people and its consequences. Indeed, the World Health Organization [4] warned that falls are the second leading cause of death from unintentional injuries, since it is estimated that 646,000 fatal falls occur annually.

In addition, together with the fragility that results from a fall, a no less serious psychological effect appears: so-called fear of falling (FOF). Tinetti, Richmond and Powell (1990) [5] defined FOF as

the loss of self-confidence to avoid a fall in day-to-day activities. In the study of FOF syndrome in the over 65 group, this loss of confidence can range from a slight concern about falling to avoidance of carrying out most of the daily tasks. These same authors developed the Falls Efficacy Scale (FES), which considers that fear of falling is a decrease in the confidence of older people to perform daily activities without falling. On this scale, some authors found that the FES can discriminate between older people who are afraid and those who are not afraid of falling.

There are studies stating that the practice of physical activity and modifications at home are effective measures for reducing the risk of older people falling [6]. A review of the scientific literature on interventions to prevent older people from falling [7–9] shows that physical activity has significant beneficial effects on the older population, but there is still no consensus on the individual impact of different sporting exercises on the specific characteristics of the physical abilities of older people [10].

However, the international scientific literature more reliably shows an association and explanation of the effects of falls on the quality of life of the elderly, specifically its effect on frailty or FOF, among other factors. Along this line, the researches of Choi et al. [11], Lee, Oh, and Hong [12], Li et al. [13], Byun et al. [14], and Curl et al. [15] can be highlighted.

Within this literature, one study is especially notable and original for addressing fall prevention and risk minimization among older people through the teaching of safe ways to fall as an educational innovation, achieving significant improvements in the perception of FOF subjects after the intervention This study focuses on the application of the Adapted Utilitarian Judo (AUJ) program described in detail in DelCastillo-Andrés et al. [16].

With the concept of active ageing in mind, and from the perspective of older people being considered an important asset to society, the AUJ program could emerge as an effective tool for this new paradigm by contributing to healthy ageing and helping to maintain the quality of life, both physical and mental, of older people for as long as possible.

Based on all of the above, the objective of the present research is to check if the AUJ program would be an adequate proposal to decrease FOF levels, as well as to teach safe ways of falling in older adults.

2. Materials and Methods

2.1. Participants

The sample was classified as healthy and pre-fragile [17] within the fragility parameters for the elderly population. The design was quasi-experimental, with pre- and post-measures of the control and experimental group. They were selected using non-probabilistic-incidental sampling [18] for their accessibility (convenience sampling). Thirty subjects aged between 65 and 85 took part in this study. Experimental group consisted of 19 subjects, 15 women (72.6 ± 5.75 years) and 4 men (76 ± 7.3 years). The anthropometric characteristics were adjusted to average weight 67.23 ± 10.24 kg (BMI 28.2 ± 3.1) in women and 84.6 ± 10.93 kg (BMI 32.1 ± 3.8) in men, and average height of 1.54 ± 0.076 m in women and 1.62 ± 0.057 m in men. Control group consisted of 11 women (77.8 ± 54.7 years). Their anthropometric characteristics were adjusted to average weight 68.71 ± 11.38 kg (BMI 29.9 ± 5.4), and average height of 1.52 ± 0.051 m. Regarding marital status, in the experimental group 28.8% of the subjects were widowers, 61.1% married, and 11.1% single or divorced, while in the control group 55.6% reported being widowed, 33.3% married, and 11.1% single or divorced.

All the participants in both groups (control and experimental) participated in a municipal physical activity program with two weekly sessions of 60 minutes, prior to the development of the intervention.

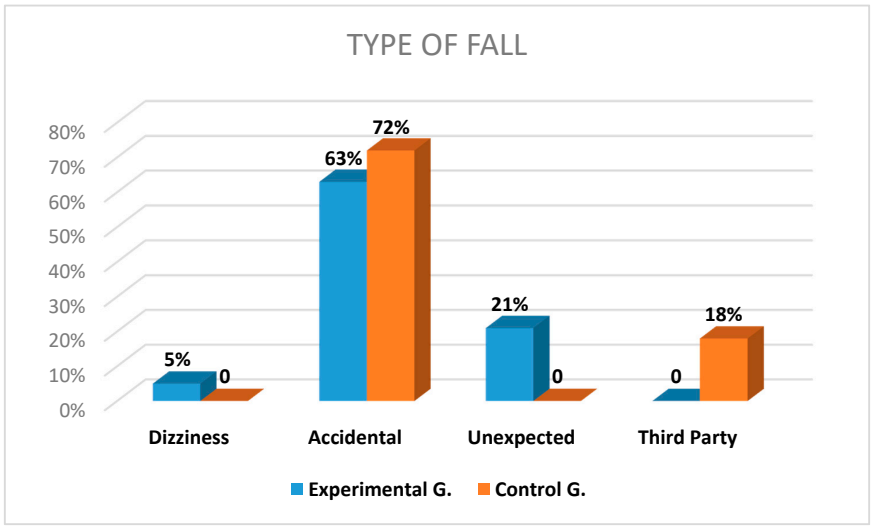
As inclusion criteria, subjects had to be 60 or over and with no diagnosed illnesses that would prevent them from exercising. Subjects were excluded if, for medical reasons, they had been advised against performing physical exercise, had suffered from congestive heart failure, felt chest pain, dizziness or angina during exercise, or had uncontrolled high blood pressure (160/100).

The fall history of the sample is shown in Table 1. Most people of both groups, control (90.9%) and experimental (89.5%), reported having suffered a fall at some point; 31.6% of the experimental group and 27.3% of the control group said they had fallen in the previous 6 months.

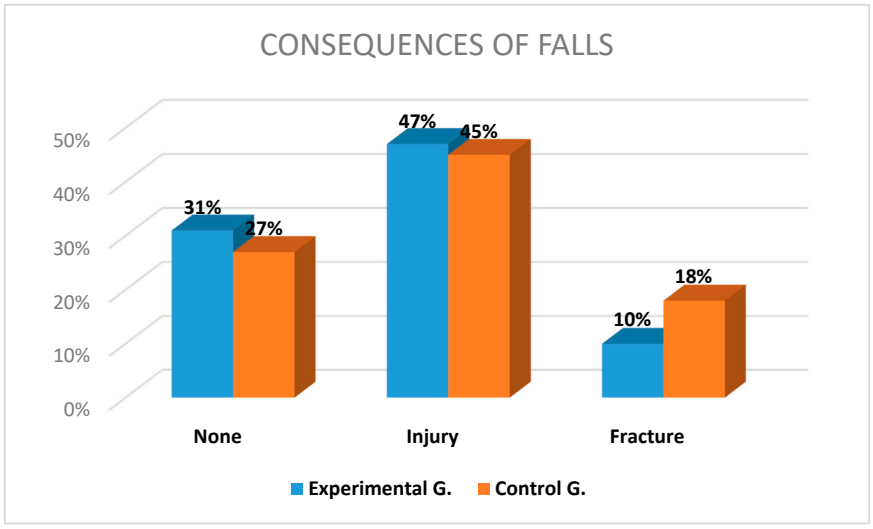
Table 1. Description of the sample according to fall history and incidents.

	%	Have Suffered a Fall	First Fall	Have Fallen in Previous 6 Months
Experimental Group	Yes	89.5	15.8	31.6
	No	10.5	73.7	68.4
Control Group	Yes	90.9	36.4	27.3
	No	9.1	54.5	72.7

In regard to type of falls (Figure 1a), the majority of falls in both, the control (72%) and experimental (63%) groups, were accidental. While regarding the consequences of these falls (Figure 1b), they were mostly injuries (47–45%) and fractures (10–18%) in both groups.



(**a**)



(**b**)

Figure 1. Type and consequences of falls. (**a**) Type of fall; (**b**) consequences of falls.

2.2. Instruments

Two questionnaires were used to collect information. The WHO questionnaire [19] for the study of falls in the elderly was used for the functional assessment of the fall, and the 16-item version of the Falls Efficacy Scale-International (FES-I) [5] was applied before (pretest) and after (post-test) the intervention, to assess the STAC. This scale analyzes confidence and skill at avoiding a fall while performing routine daily activities.

In the STAC analysis, the established cut-off points [5] were used to define the low (16–19 points), moderate (20–27 points), and high (28–64 points) concern about falling.

2.3. Procedure

Specific exercises to assimilate safe and protected ways of falling, established in the Adapted Utilitarian Judo (AUJ) program [16,20], were implemented in an experimental group over 6 weeks, with two weekly sessions of 60 minutes. The exercises proposed focused on giving overall treatment to the prevention of falls and their consequences, with a utilitarian function for the group studied. The choice of exercises selected was based on a progression of increasing difficulty, following the principles of progression, assimilation and, above all, participant safety.

Control group subjects were applied an intervention program based on physical exercise adapted for older adults (light and moderate intensity aerobic activity, muscle-strengthening activity, coordination, balance, and flexibility), over the course of 6 weeks, with 2 weekly sessions each lasting 60 min, like the experimental group.

All sessions in both groups (experimental and control) were developed by the same trained and experienced instructor. All subjects in the sample were informed about the objectives of the study and agreed to participate after giving informed consent. Additionally, the Ethics Committee of the Biomedical Research of Andalusia approved waiver of consent for this study.

2.4. Data Analysis

SPSS program for Windows (Version 24, SPSS, Inc., Chicago, IL, USA) was used to conduct a descriptive analysis, with the category variables presented in terms of frequencies and percentages, with the mean and standard deviation presented for the numerical variables. The nonparametric test, Mann–Whitney U test, was used for independent samples, and the T-test was used for paired samples, to analyze significance in mean difference; it was considered that the differences were significant when $p \leq 0.05$.

3. Results

The following table (Table 2) shows the scores of all of the variables analyzed through FES-I, with their respective pre- and post-intervention values. It can be observed that the AUJ program significantly reduced the subjects' fear of falling, especially in certain situations: bathing or showering, going up and down stairs, walking on a slippery uneven surface or in a crowded place, as well as going up and down a ramp.

If we analyze the overall results of the experimental group, as shown in the last row of Table 2 and in the following Figure 2, intervention through the AUJ program was significant (0.00*) in terms of STAC reduction, since after six weeks of the program, the subjects went from an overall score of 25.16 to 19.05 points. In other words, they went from a moderate to a low level of fear of falling (22 points).

Table 2. Falls Efficacy Scale-International (FES-I) pre–post intervention scores and values by variables analyzed in experimental group.

	Pretest		Post-test		t Paired-Samples	
Variables	**M**	**SD**	**M**	**SD**	**t**	**Bilateral Sig.**
Clean the house	1.74	0.99	1.37	0.597	1.508	0.149
Dress or undress	1.16	0.37	1.05	0.229	1.455	0.163
Prepare food	1.26	0.65	1.00	0.000	1.756	0.096
Bath or shower	1.84	1.01	1.26	0.452	2.357	0.030 *
Do the shopping	1.32	0.67	1.00	0.000	2.051	0.055
Sit down or get up from a chair	1.16	0.50	1.00	0.000	1.372	0.187
Go up or downstairs	1.95	0.78	1.37	0.597	3.284	0.004 *
Walk in the neighborhood (outside)	1.26	0.65	1.00	0.000	1.756	0.096
Reach up or down for something	1.47	0.61	1.16	0.375	1.837	0.083
Answer the phone	1.05	0.229	1.00	0.000	1.000	0.331
Walk on a slippery surface	2.68	0.885	1.63	0.496	4.729	0.000 *
Visit a friend or relative	1.26	0.653	1.00	0.000	1.756	0.096
Walk in a crowded place	1.95	1.177	1.11	0.315	3.618	0.002 *
Walk on an uneven surface	2.16	0.501	1.84	0.501	2.364	0.030 *
Go up and down a ramp	1.79	0.787	1.21	0.419	3.012	0.007 *
Go out for a social event	1.16	0.501	1.00	0.000	1.372	0.187
Pretest–Post-test	25.16	6.719	19.05	1.715	4.610	0.000 *

* $p \leq 0.05$ in T Paired sample test; M = mean; SD = Standard deviation; t = t-statistic.

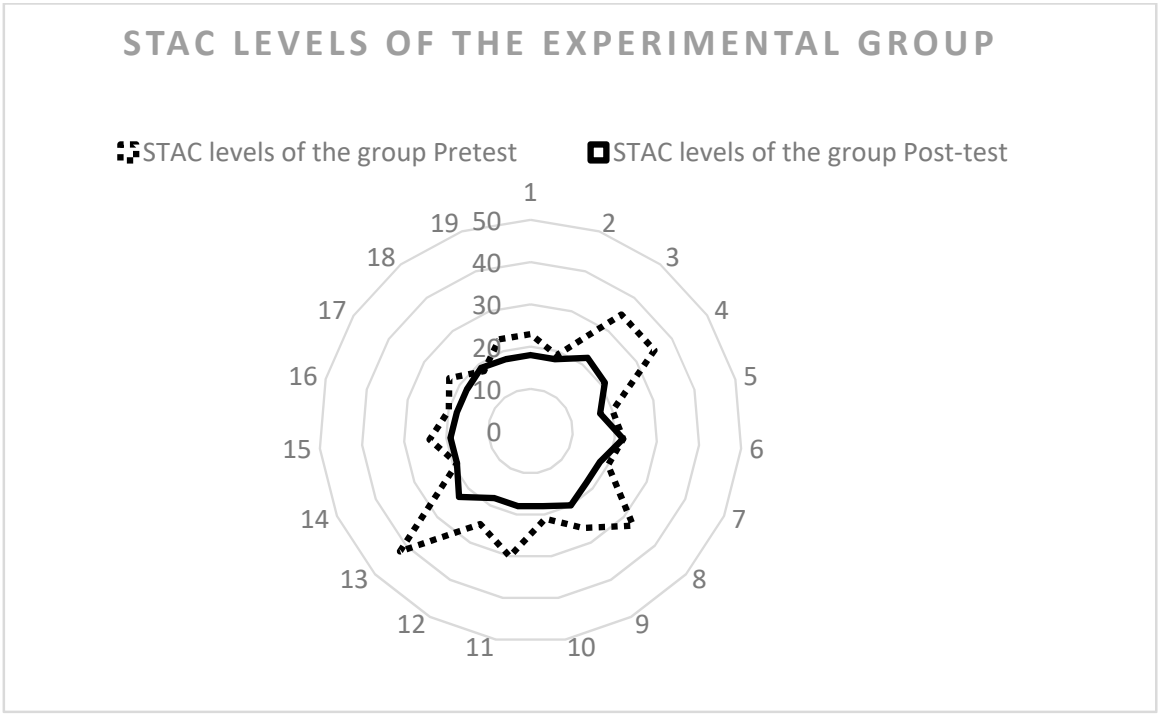


Figure 2. Spiderweb of experimental group subjects' pre- and post-test scores obtained in the FES-I.

Table 3 shows the values of the control group, pre- and post-test, of the variables analyzed in the FES-I. It can be observed that there was even an increase in fear of falling under certain circumstances, depending on the rise in values of different variables. Thus, the values increase in situations such as walking in a crowded place, on an uneven surface, going up or down a ramp, and even in the case of walking on a slippery surface, the differences become significant (0.038). Similarly, overall, the scores show a general increase in fear of falling, from a score of 21 to 23.64 points, with both cases representing a moderate level of fear without the differences becoming significant.

Table 3. FES-I pre–post intervention scores and values by variables analyzed in the control group.

	Pretest		**Post-test**		**t Paired-Samples**	
Variables	**M**	**SD**	**M**	**SD**	**t**	**Bilateral Sig.**
Clean the house	1.36	0.924	1.73	0.786	−0.886	0.397
Dress or undress	1.00	0.000	1.36	0.809	−1.491	0.167
Prepare food	1.00	0.000	1.00	0.000	-	-
Bath or shower	1.64	1.206	1.55	0.688	0.191	0.852
Do the shopping	1.09	0.302	1.36	0.674	−1.150	0.277
Sit down or get up from a chair	1.27	0.467	1.18	0.405	1.000	0.341
Go up or downstairs	1.55	0.820	1.36	0.505	0.690	0.506
Walk in the neighborhood (outside)	1.18	0.405	1.09	0.302	0.559	0.588
Reach up or down for something	1.45	0.688	1.36	0.505	0.363	0.724
Answer the phone	1.09	0.302	1.00	0.000	1.000	0.341
Walk on a slippery surface	1.82	0.603	2.55	1.036	−2.390	0.038 *
Visit a friend or relative	1.00	0.000	1.00	0.000	-	-
Walk in a crowded place	1.09	0.302	1.64	0.809	−1.936	0.082
Walk on an uneven surface	2.00	0.775	2.55	0.522	−1.747	0.111
Go up and down a ramp	1.45	0.688	1.91	0.701	−2.193	0.053
Go out for a social event	1.00	0.000	1.00	0.000	-	-
Pretest–Post-test	21.00	3.606	23.64	4.296	−1.365	0.202

* $p \leq 0.05$ in T Paired sample test; M = mean; SD = Standard deviation; t = t-statistic.

Table 4 shows the values of the difference of averages in the pretest and posttest, comparing the experimental group with the control, to see the possible differences. Specifically, there are five variables in which significant differences were recorded: going shopping (0.018*), walking on a slippery surface (0.009*), walking in a crowded place (0.025*), walking on an uneven surface (0.002), and going up or down a ramp (0.004*). Significant differences were also recorded in the overall score (0.002*), since, as shown in the previous tables (Tables 1 and 2, respectively), while the overall values of the experimental group decreased by six points on the fear scale (from 25.16 to 19.05 points) after the intervention, the overall values of the control group increased by three points (from 21.00 to 23.64 points) on the fear scale.

Table 4. Comparison of pretest and post-test bilateral significance values between experimental group and control group.

	Experimental G.–Control G.	**Experimental G.–Control G.**
Variables	Sig. Bilateral pretest	Sig. Bilateral post-test
Clean the house	0.152	0.182
Dress or undress	0.172	0.231
Prepare food	0.173	1.000
Bath or shower	0.325	0.239
Do the shopping	0.370	0.018 *
Sit down or get up from a chair	0.288	0.059
Go up or downstairs	0.159	0.875
Walk in the neighborhood (outside)	0.974	0.189
Reach up or down for something	0.842	0.207
Answer the phone	0.690	1.000
Walk on a slippery surface	0.009 *	0.009 *
Visit a friend or relative	0.173	1.000
Walk in a crowded place	0.017 *	0.025 *
Walk on an uneven surface	0.546	0.002 *
Go up and down a ramp	0.239	0.004 *
Go out for a social event	0.274	1.000
Pretest–Post-test	0.092	0.002 *

* $p \leq 0.05$ in Mann–Whitney U test.

4. Discussion

After analyzing the results of the study, we found that the value of fear of falling in the analyzed variables, before the implementation of the program, was greater in the experimental group than the value of the control group. After the intervention, these data are reversed and the experimental group ends the intervention with a lower score than the control group.

The results obtained in our study are discussed with others that also propose interventions with the aim of reducing the fear of falling. There is research that was based on yoga and tai chi [21,22]. In other cases [23], in addition to tai chi, cognitive behavioral therapy and posture control exercises were used, and there has also been research that compared a group that practiced tai chi with another that underwent a well-being education intervention [24]. Other studies were based on vibration training [25], as well as on the improvement of balance and flexibility [26–28]. However, regarding research like the present study in which AUJ is implemented to reduce the fear of falling, we only found the one conducted by Toronjo et al. [10].

The results obtained with respect to our intervention, in terms of reducing the fear of falling, are consistent with those of Halvarsson, Olsson, Farén, Pettersson, and Ståhle [29]; Logghe et al. [30]; Parraca et al. [24]; Li, Fisher, Harmer, and McAuley [21]; Brouwer et al. [31]; Barnett et al. [32]; Dueñas et al. [33]; Sattin et al. [34] (much larger in the tai chi group than in the education for well-being); Huang [35]; and Toronjo et al. [10]. In all of the studies cited, the fear of falling was reduced and they concluded that the interventions were effective. The results of the present study do not, on the contrary, accord with those of Schmid et al. [22], as these researchers recorded that the results were not significant, so the fear of falling did not diminish. The data of this research are, however, consistent with that of Toronjo et al. [10], since STAC decreased using a similar intervention. In many of the variables, we obtained similar results. In our case, the AUJ intervention was significant in the experimental group ($p \leq 0.000$), with decreases obtained in situations of bathing or showering, going up or down stairs, walking on a slippery surface, walking in a crowded place, and walking on an uneven surface. In the study carried out by Toronjo et al. [10], the intervention was also significant for reducing the STAC ($p \leq 0.004$), and the study recorded a decrease in the fear of falling in situations of walking on a slippery surface, taking something from height or off the floor, walking in a crowded place, and going up or down a ramp; some of them being common in both cases.

Decreased fear of falling among older people is related to doing physical exercise, so as the fear of falling diminished, the subjects were able to carry out daily activities such as going up or down stairs or walking in a crowded place, with these variables significantly decreasing between pretest and posttest.

This work is considered an educational innovation for older people. However, it has several limitations. Firstly, one of the limitations of the research is that self-selection, or non-random allocation of the sample, can bias the effects of the intervention program. Additionally, as derived from this process, the characteristics of the participants that constitute the control and experimental group are not equivalent. Likewise, the age range of the subjects in the sample is very wide. Secondly, the duration of the intervention, and being able to extend it, with it being a variable that can affect other indices of improvement in the quality of life of older people.

As future lines of research, we propose the conducting of longitudinal studies in order to enable us to achieve greater consistency in the results obtained, referring both to the assimilation of the program and decrease in the STAC. With that in mind, improvements to the AUJ program could be studied, in addition to analyzing its influence on other variables such as BMI, health perception, or the improvement of physical abilities.

5. Conclusions

We can conclude that AUJ is an intervention program focused on an educational innovation that allows older people to take part in quality sporting activities, since it provides strategies to help reduce the consequences of a possible fall and improve the ability to get off the floor. All of this influences the decrease in the STAC by improving their quality of life and social relationships, greatly reducing dependency levels that increase with age. It should be noted that the control group of this study was active, and significant changes were seen, so in a group that does not carry out physical activity in their day-to-day lives, the changes could be even more significant.

We can, therefore, conclude that the AUJ intervention is useful for the older population. We venture to suggest that it could be an innovative and attractive initiative that could be offered by sporting institutions and bodies, helping them to fulfil the powers entrusted to sport-for-all institutions, as well as being a specialized offer in the case of sporting bodies.

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