

Effects of outdoor recreational physical activities: a retrospective study on adherence and impact on motor abilities in elderly individuals

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Abstract

Introduction: The benefits of physical activity are mainly reflected in the identification of successful ageing models that reduce negative evaluations of ageing; the attempt of physicians and exercise experts is to adapt motor proposals to the needs of individuals over 70-years-old in order to help increase their sense of self-efficacy, perception of security and life satisfaction. **Purpose:** This study aims to (a) verify the effectiveness of physical activity carried out in a recreational form on the motor skills of people over 70 years old and, (b) to ascertain what level of adherence may actually be beneficial. **Materials and methods:** This is a retrospective, observational cohort study using data from the socio-health project "Wellness Waterfront" activated in the city of Bisceglie (Italy) from May 2022 to August 2022. Data were obtained from the project database until August 31, 2023. The project involved the sedentary population over 70 years old residing in the city. A sample (n=107) of women over 75 years old (76.4±3.3 years, 68.8±9.4 kg, 166.4±6.2) participated in the survey. The 8-foot-up-and-go, 5-reps sit-to-stand, Single-leg-stance test, Functional Reach test and Falls Efficacy Scale International were presented at baseline and at the end of 12 weeks of recreational physical activity. **Results:** The results showed statistically significant differences in the 33.5%-70% adherence subgroup (baseline vs final values, $p<0.05$) in the assessments of the 5-reps sit-to-stand, Single-leg-stance test, Functional Reach test and Falls Efficacy Scale International. The subgroup with >70% adherence showed statistically significant differences (baseline vs final values, $p<0.01$) in the 8-foot-up-and-go, the 5-reps sit-to-stand, the Single-leg-stance test, the Functional Reach test, and the Falls Efficacy Scale International. The subgroup with >70% adherence also showed statistically significant differences ($p<0.05$) when comparing the final values against the 33.3%-70% adherence subgroup in the assessments of the 8-foot-up-and-go, the 5-reps sit-to-stand, the Single-leg-stance test, the Functional Reach test, and the Falls Efficacy Scale International. **Conclusion:** The values obtained in this study from the group with adherence > 70% are in line with what has been shown in the literature even with younger age samples. The results obtained by the group with adherence between 33.3% and 70%, while showing a statistically significant difference from the values recorded in the baseline, are below what has been obtained from multimodal motor activity programs in the literature. This aspect would suggest that recreational-type activities were effective for the group's baseline condition, but the results obtained are far from what could actually be achieved with higher adherence. The potential from recreational physical activities presented free of charge to reach the greatest number of people has significant social and health value. Recreational physical activities represent the first step in bringing individuals over 70years-old closer to active lifestyles. Indeed, they have easily modulated intensity levels and allow presenting motor tasks adapted to the elderly population.

Key words: recreational physical activity – older adult – motor ability – fall prevention

Introduction

The increase in life expectancy forces a series of questions about what is the successful aging and how to improve the people lifestyles. For this reason, the educational offer aimed at the over-65 population diversifies in an attempt to counteract the effects of ageing and to respond to very different motivations, needs and characteristics. Therefore, the attempt to change sedentary lifestyles uses the most diverse strategies to adapt to a population that is very heterogeneous (Hoseinian et al., 2023; Mittaz Hager et al., 2019; Bernabei et al., 2022; Mittaz Hager et al., 2019; Sannicandro et al., 2020a).

As a consequence, the literature has sometimes monitored the effects of specific motor activity programmes (Yang et al., 2022; Balachandran et al., 2022; Sannicandro et al., 2020b; Sannicandro et al., 2017), sometimes described the effects of multicomponent plans (Bernabei et al., 2022; Labata-Lezaun et al., 2023), and sometimes verified the effectiveness of home-based exercises on the motor skills of the over-65-70-years-old population (Stasi et al., 2021; Mittaz Hager et al., 2019; Dillon et al., 2018).

The benefits of physical activity are mainly reflected in the identification of successful ageing models that reduce negative evaluations of ageing (Jopp et al., 2017; Altavilla et al., 2018); the attempt of physicians and exercise experts is to adapt motor proposals to the needs of individuals over 70-years-old in order to help

increase their sense of self-efficacy, perception of security and life satisfaction (Sargent-Cox et al., 2012; Jopp et al., 2017; Raiola, 2013).

Recreation-type activities include many areas of education and relationships that older people can identify within the area in which they live: these activities may involve social gatherings, volunteering, religious activity, and cultural activities or physical sessions (Yoon, 2015 ; Yoon et al., 2020). The landscape of recreational activities remains very broad because it also includes active and inactive hobbies, such as gardening work, cultural outings, reading newspapers or books, raising domestic animals or pets, playing cards, listening to radio, and participating in social activities (Zhao et al., 2023).

Thus, it is appropriate to distinguish motor-engagement activities from cognitive-only and sedentary activities: for these reasons, the literature needs to be implemented (Sala et al., 2019; Levinger et al., 2018). For some Authors, recreational activities are defined as those that are carried out by people during their free time (Portegijs et al., 2020; Schehl & Leukel, 2020; Sannicandro, 2021).

Motor recreation activity has received modest attention, although it is the first step towards an active lifestyle for successful ageing (Nivestam et al., 2023; Sannicandro, 2021; Yamashita et al., 2019). Recent reviews on the topic, while indicating a preponderance of recreational activities performed outdoors, raise questions about how exercise is controlled, how exercise intensity is assessed, and the heterogeneity of outcomes described (Noseworthy et al., 2023).

An open problem in the literature remains that of understanding the effectiveness of physical activity carried out recreationally and in an outdoor environment: the very nature of physical activity carried out recreationally (which often has a weekly frequency freely chosen by the person) raises questions about the duration, intensity of the exercises, type of motor tasks, adherence to the proposed activities, etc.

The characteristics of recreational motor activities differ greatly from structured training programmes, which provide for a progressive load, a quantification of the training volume and a careful modulation of the exercise and rest phases (Balachandran et al., 2022; Sannicandro et al., 2020b; Sannicandro et al., 2017). These characteristics of structured physical activities are a definite advantage because they allow the motor load to be increased and adapted to the functional adaptations brought about by the training sessions; but, at the same time, they are a limitation because they require high levels of motivation and the availability of a lot of free time (Spiteri et al., 2019; Thøgersen-Ntoumani et al., 2023). The participation in recreational activities is subject to mobility and the possibility of accessing opportunities present in the area, overcoming the barriers present in the environment or the fear of moving in the environment (Shumway-Cook et al. 2002; Rantakokko et al., 2013 & 2015). Some factors may be related to the real barriers present in the environment (poor lighting, difficult movements, etc.) and widely documented in the literature (Shumway-Cook et al. 2003; Seematter-Bagnoud et al., 2004; Seematter-Bagnoud et al. , 2011; Nordstrom et al. 2007; Rantakokko et al., 2013; Rantakokko et al., 2015); other fears that hinder the start of an active lifestyle can be changed through work on changing behavior (lack of time, lack of interest in movement, lack of knowledge on the movement benefits, etc.). These barriers can only be overcome through integrated project proposals between the various public and / or private institutions operating in the area.

Therefore, in order to reduce the loss of muscle strength, joint mobility, flexibility, and balance, less structured forms of physical activity are also suggested to be followed in the time free from commitments, the so-called recreational type of physical activity (Sannicandro, 2021; Gümüş & Erbaş, 2020; Sannicandro et al., 2020a) While young people and adults can choose from a variety of activity proposals (including extreme sports or in extreme natural environments), for the population over 65-70 years old, the offer is definitely smaller. For these reasons, cultural and sports associations of individual territories, often in agreement with local governments, promote projects to bring the population over 70 closer to the systematic practice of physical activity. The organization and motor proposals must be carefully and specifically tailored to the needs of this type of population; in addition, they require the identification of appropriate spaces and a functional time slot to meet the needs of the over-70s.

This study aims to (a) verify the effectiveness of physical activity carried out in a recreational form on the motor skills of people over 70 years old and, (b) to ascertain what level of adherence may actually be beneficial.

Materials and methods

Study participants

This is a retrospective, observational cohort study using data from " Wellness Waterfront (Lungomare del Wellness) " social and health project activated in the City of Bisceglie (Italy) from May 2022 to August 2022. The data were obtained from the project database until August 31, 2023. The project involved the population over 70 years old residing in the city.

A sample (n=107) women over 75-years-old (76.4±3.3 years, 68.8±9.4 kg, 166.4±6.2) participated in the investigation.

Recruitment was carried out by placing advertisements in the city, publicising the project among physician and with a public presentation event of the project. Inclusion criteria were the following: being over 70 years of age, being sedentary, no falls in the previous 12 months, no surgery in the previous 12 months, no

diabetes, no muscle/joint disease, no cognitive disease, being able to perform housework, no contraindications given by referring physician. From the initial recruitment, $n=26$ older women were excluded from the analysis because they had occasional attendance.

The study was performed according to the principles expressed in the Declaration of Helsinki. The written informed consent was obtained from the participants in the first lesson.

Study organization

In this retrospective observational study, the participants' motor skills were assessed before starting the adapted motor activities and at the end of the project. Anthropometric measurements were taken prior to participation in the activities. Evaluation tests were presented in the first and second lessons; similarly, post evaluations were conducted in the first and second lessons after the end of the activities. At the end of each physical activity session, the Rate of Perceived Exertion (RPE) was requested: the first week was used to familiarise oneself with the RPE scale.

The 8-foot-up-and-go test was presented to evaluate dynamic balance in a daily task; the assessment involves getting out of a chair, walking 2.44 meters to and around a cone, and returning to the chair in the shortest time possible. The time needed to perform the task measured with 1/10-second accuracy constitutes the test's result (Gouveia et al., 2013). The 5-rep sit-to-stand test has been used for the assessment of lower limb strength along with balance and postural control (Albalwi & Alharbi, 2023, Bohannon, 2006a): is asked to stand up and sit on a chair five consecutive times. The time required to perform the task, measured to an accuracy of 1/10th of a second, constitutes the test result.

The Single Leg Stance test was presented for static balance evaluation; the participant standing on one foot, with his hands on the chest and with open eyes, is invited to maintain the position assigned taking care not to tilt the bust, abduct the lower limb in suspension or touching the ground. It detects the time at which the subject is able to keep the assigned task. The test was performed on the favorite limb, and measured with 1/10 second accuracy (Bohannon, 2006b).

The Back Scratch test was presented to assess the flexibility of the upper body (shoulders). Participants placed one hand behind the shoulder of the same side with forearm pronated and fingers extended and the other hand behind the back with fingers extended. Participants were asked to determine their preferred hand position and were given two trials; the best trial was scored. The score corresponded to the number of centimetres between the middle fingers and their contact (Milanović et al., 2013).

Functional Reach Test (FRT) was used to assess the static balance in one daily simple task. In standing, the participant being assessed tries to reach the maximum distance with the upper limb flexed to 90 degrees, without moving the support of the feet. The score is obtained in cm (Chen et al., 2021).

The Falls Efficacy Scale International (FES-I) questionnaire was presented to measure the falling fear. The FES-I was developed and validated by the Prevention of Falls Network Europe and has become a widely accepted tool for assessing concern about falling (Gazibara et al., 2017). In this scale, scores are treated as continuous variables ranging from 16 to 64, where 16 indicates no concern and 64 indicates severe concern about falling. Participants in this study were further classified as having had low concern (score of 16–19), moderate concern (score of 20–27), or high concern (score ≥ 28) about falling according to the previous study (Kelly et al., 2013).

The Borg Rating of Perceived Exertion (RPE) on ratio of categories (0-10) was presented in each session to measure the intensity level of physical activity, as has been used in other studies (Arney et al., 2019).

Procedures

The activity under observation lasted 12 weeks and included 3 sessions/week for a total of 36 classes. The classes were conducted by teachers experienced in adapted physical activity and were supported by technical staff to collect attendance and data useful for monitoring the project. Adherence to the physical activity sessions was noted for each participant, and 3 subgroups were obtained as follows: a) with adherence of at least 33.3% (1 lesson/week, $n=21$), b) with adherence between 33.3% and 70% (2 lessons/week, $n=37$), and c) with adherence $> 70\%$ (3 lessons approximately/week, $n=23$). Those ($n=26$) who had occasional attendance or otherwise $< 33.3\%$ of total lessons were excluded from the observation.

Statistical analysis

Descriptive statistics (mean $\pm$ standard deviation) were performed for the data analysis. One-way analysis of variance (ANOVA) was used to determine within-group comparisons (adherence of 33.3%, adherence from 33.3 to 70% and adherence $> 70\%$). For the differences between the values of the subgroups, Cohen's d was used to check the effect size index (Effect Size, ES). As for the effect size index, after calculating the δ index it is possible to convert it into Effect Size: ≤ 0.20 small; 0.50 average; ≥ 0.80 large. All statistical analyses were performed using SPSS software, version 22.0 (IBM Corp., Armonk, NY, USA). The level of statistical significance was set at $p < 0.05$.

Results

The results showed statistically significant differences in the 33.5%-70% adherence subgroup (baseline vs final values) in the assessments of the 5-reps sit-to-stand ($p<0.05$), Single-leg-stance test ($p<0.05$), Functional Reach test ($p<0.05$) and Falls Efficacy Scale International ($p<0.05$).

The subgroup with $>70\%$ adherence showed statistically significant differences (baseline vs final values, $p<0.01$) in the 8-foot-up-and-go, the 5-reps sit-to-stand, the Single-leg-stance test, the Functional Reach test, and the Falls Efficacy Scale International.

The subgroup with $>70\%$ adherence also showed statistically significant differences ($p<0.05$) when comparing the final values against the 33.3%-70% adherence subgroup in the assessments of the 8-foot-up-and-go, the 5-reps sit-to-stand, the Single-leg-stance test, the Functional Reach test, and the Falls Efficacy Scale International.

The values are summarized in Table 1.

	Baseline	Post test 33.3% adherence	Post test 33.5-70% adherence	Post test $>70\%$ adherence	ES
8-foot-up and go (sec)	9.7 $\pm$ 1.4	9.5 $\pm$ 1.9	8.8 $\pm$ 1.5	7.6 $\pm$ 1.2**#	1.61
5 reps sit-to-stand (sec)	14.9 $\pm$ 1.8	14.8 $\pm$ 0.9	12.1 $\pm$ 2.4*	10.9 $\pm$ 2.1**#	1.99
Single-leg-stance test (sec)	10.2 $\pm$ 4.8	12.6 $\pm$ 4.5	16.5 $\pm$ 2.3*	19.1 $\pm$ 1.8**#	2.08
Back-skretch test (cm)	13.6 $\pm$ 4.9	13.3 $\pm$ 3.7	13.2 $\pm$ 4.1	12.5 $\pm$ 3.6	-
Functional Reach test (cm)	21.2 $\pm$ 3.7	21.9 $\pm$ 1.8	23.4 $\pm$ 1.9*	26.2 $\pm$ 1.8**#	1.71
Falls Efficacy Scale International (FES-I)	35.8 $\pm$ 2.6	33.9 $\pm$ 2.7	31.3 $\pm$ 1.5*	27.7 $\pm$ 2.2**#	2.32
RPE	-	7.2 $\pm$ 1.1	6.3 $\pm$ 0.9	5.6 $\pm$ 1.2	-

Table1. Values obtained from the 3 subgroups in the baseline condition (start of the project) and at the end of the activities.

Legend: * $p<0.05$ to baseline; ** $p<0.01$ to baseline; # $p<0.05$ from group 33.5-70% adherence

Discussion

This study aimed to monitor the effects of recreational physical activity on motor skills in a sample of people over 70 years old involved in a project to counter sedentary lifestyle; in addition, the study sought to identify whether different levels of adherence to classes, may result in different effects on the development of motor skills. Health authorities and local communities are impregnated to convey the message that an active lifestyle can counteract the effects of aging through communications and activation of specific projects (Levinger et al., 2018). It is indeed important to point out that sedentary time (especially sitting time) carries independent health risks. The simple message "move more and sit less" is probably more understandable by the entire population and is based on a very strong body of scientific evidence (Arena & Lavie, 2020; Warburton & Bredin, 2016; Segar et al., 2020).

The originality of this project consisted in recruiting people over 70 from the "real world", i.e., engaging people directly from general practitioners, supermarkets, city green areas, post offices, etc. The 12 weeks of physical activity determined significant increases in tests of walking agility (+21.7%, ES:1.61), lower limb strength (+26.9%, ES:1.99), static balance (+87%, ES:2.08), and functional reach (+23.5%, ES:1.71) in the group that showed 70% higher adherence.

The values obtained in this study from the group with adherence $> 70\%$ are in line with what has been shown in the literature even with younger age samples (Mittaz Hager et al., 2019; Park & Shin, 2023; Nawrocka et al. 2017; Sannicandro, 2017).

The results obtained by the group with adherence between 33.3% and 70%, while showing a statistically significant difference from the values recorded in the baseline, are below what has been obtained from multimodal motor activity programs in the literature (Lee et al., 2022; Li et al., 2018; Cordes et al., 2019; Khang et al., 2013; Sannicandro et al., 2008).

This aspect would suggest that recreational-type activities were effective for the group's baseline condition, but the results obtained are far from what could actually be achieved with higher adherence (Park & Shin, 2023; Nawrocka et al. 2017). The mobility tests for the scapulohumeral joint showed no statistically significant changes at the end of the planned activity periods.

Possibly, the decision to favour exercises aimed at maintaining individual autonomy and personal mobility may have limited the presentation and number of motor tasks for increasing the joint mobility of the upper limbs. Furthermore, it is known from the literature that the glenohumeral joint is the third most common large joint affected by osteoarthritis. Studies have shown that 16% to 20% of adults older than 65 years have radiographic signs of glenohumeral joint osteoarthritis (Tirabassi & Aerni, 2020).

The Falls Efficacy Scale values showed a statistically significant decrease at the end of the activity period (-22.7%, $p < 0.01$, ES:2.32): this assessment allowed the sample to transition from a score that showed a strong belief that they could fall to a score that attested to a moderate concern.

The values observed in the sample are consistent with what has been described in the literature (Gazibara et al., 2017; de Albuquerque et al., 2022). Possibly, increased functional assumptions related to static balance, walking speed, and lower limb strength may have resulted in increased confidence in the observed sample: indeed, the literature confirms this potential functional relationship (Prince et al., 2023; Wiedenmann et al., 2023; Weber et al., 2018; Clemson et al., 2012).

Indeed, the training aimed at increasing strength and balance in populations over 70 years old demonstrate not only a reduction in the sense of fear but more importantly a reduction in the actual risk of falling (Gerards et al., 2023 & 2017; O'Bryan et al., 2022).

Finally, another original aspect of this study arises from the values obtained from observing the intensity of the proposed physical activities through the RPE value: the measurement of recreational physical activity intensity is a critical element in the assessment of effectiveness in older individuals (Noseworthy et al., 2023). In fact, it is an indicator that is often overlooked in the monitoring of recreational motor activity.

The value of RPE correlates with that of cardiac frequency and is a valid measure of exercise intensity even in elite sports (de Dios-Alvarez et al., 2023; Inoue et al., 2022).

Monitoring within the observed subgroups returned different values of RPE: notably, it was observed that The lowest values were associated with those who manifested greater adherence. It would appear that participating more systematically in classes results in a reduction in perceived exertion in the individual over 70-years old. In contrast, more occasional participation appears to return the over-70-years old individual to a greater perception of exertion, probably due to reduced adaptation to exercise.

Conclusions

Participation and use of the training offer of fitness centers and associations present in the area is often conditioned by social and economic reasons (Gümüş & Erbaş, 2020; Waller et al., 2018). These two factors often constitute a real obstacle to continuing participation in motor activity opportunities in the area: often the offer is not specific to or needs of the elderly; at other times, however, it can be very expensive (Gümüş & Erbaş, 2020).

Countering sedentary lifestyles can reduce risk factors for health and chronic non-communicable diseases (Both et al., 2012, Sannicandro et al., 2020a); it is known that even a simple parameter, such as time spent sitting, is a relevant predictor of mortality (Bouchard et al., 2015). Physical inactivity is therefore a factor that, associated with the effects of the aging process, significantly influences the decline in motor skills (Arena & Lavie, 2020; Warburton & Bredin, 2016; Segar et al., 2020): it must therefore be eliminated if we want to better identify the factors of biological decline related to human aging.

Cultural associations, sports associations, local authorities, and major stakeholders are working to convey this information both through communication campaigns and concrete projects involving adults over 70-years old. Recreational motor activities are the first step toward active lifestyles: this study shows their effectiveness provided there is significant adherence to the lessons(meetings).

Further studies may investigate how many individuals over 70-years old, continue with an active lifestyle when the promotion project is discontinued; it may also be possible to investigate what type of physical activity is chosen and how often it is practiced weekly. All these further investigations will be able to help more effectively delineate what type of recreational physical activity needs to be planned to achieve a change in the health behavior of individuals over 70-years old.

Conflict of interest

The author declares no conflict of interest.

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