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Adherence to a Physical Activity Program Depends on Individual Fitness Purpose in Older Persons

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Abstract The effect of a long-term program on adherence in older adults seeking to improve low physical fitness compared to a multiactivity practice was studied. Seventy persons (+ 60 years) took part in 10 months program, distributing in three groups: low cardiorespiratory and muscular fitness (n=25, CMF), low coordination and motor skills (n=21, CBM) and free-choice multi-physical activities (n=24, MPA). Adherence was assessed by quantitative indicators and analysis of temporal dynamics. Adherence was 61.3 ± 25.8% for the CMF group, 49.7 ± 25.0% for the CBM and 33.3 ± 25.8 for the MPA. Only about 42% of the participants in MPA would continue the program for 10 consecutive months. The curve of adherence decreased regularly during the 10-month program: after 6 months adherence had fallen by 20% for CMF and by 14% for CBM, and after 10 months by 24% for CMF and by 19% for CBM. When physical activity program was supervised by the same instructor and when the participant's individual goal was clear, adherence was significantly higher ($p<0.05$) in the range 76-81%.

Keywords: *observance, senior, physical fitness, training*

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1. Introduction

Structured, supervised, regular physical activity programs have been found to be positively associated with several fitness variables, and confer about a 30% reduction in risk for all-cause mortality in adults [1]. Observed benefits include helping to prevent falls [2], increasing muscle strength [3], enhancing balance and flexibility [4], improving a range of other outcomes such as functional, psychological, social wellbeing [5] and preserving cognitive and motor functions [6] in older people.

While physical activity is well-known for its positive impact on chronic disease prevention among older adults, to glean the overall benefits, significant emphasis should be focused on continued participation and long-term practice. Although physical activity is among the most important factors affecting health and life expectancy, poor adherence to physical activity is a significant hindrance in achieving health goals [5]. Even so, several studies have noted declining levels of adherence over time [7] and more decrease in adherence in later stages of follow-up than immediately after beginning exercise [8,9]. Although adherence was acceptable in short-term programs, a very low success rate was observed in long-term programs [10]. Generally, the literature states that 50% of participants who start a physical activity program will drop out within the first six months [11].

The definitions and assessments of adherence vary from one study to another. Some studies define adherence based on absolute attendance, while others take the percentage of exercise sessions attended, or duration adherence measured as how long a participant does exercises at each session [12]. Generally, adherence assessment has included the number of exercise sessions that the person engaged in or the number of minutes of exercise done. The most common measures of adherence to exercise programs for older adults are the proportion of participants completing exercise programs, the proportion of exercise sessions attended, or the total sessions attended [13,14].

The systematic review published by Piccorelli et al. [13] showed that a very high adherence was observed in supervised exercise programs and that physical activity adherence was adversely affected by factors such as low self-efficacy, low motivation, depression, lack of interest, fear of falling, health status, physical ability, low expectations, socioeconomic status and exercise program characteristics [13]. In their very recent report, Rivera-Torres et al. [14] identified socioeconomic status, education level, living arrangements, health status, pacemakers, physical fitness, and depression as the major factors affecting adherence in older adults. In the same way, the meta-analysis of Amireault et al. [15] found that beliefs about capabilities and motivation and goals were among the variables most strongly associated with physical activity maintenance.

A mixed-method systematic review of community-based exercise interventions reported that adherence in qualitative studies was around 70% and depended on individual factors (e.g. physical health benefits, personal goal and psychological well-being) and program design (e.g. aerobic exercise versus strength training) [16,17,18]. Group-based physical activity programs have been identified as a particularly effective means of promoting sustained physical activity commitment among older adults [19,20]. After 1 year, adherence rates in group-based exercise programs of 63-84% have been observed [9]. Several studies have shown that if people perceive themselves to be similar to other members of a given group, in terms of salient underlying qualities, they will be more attracted to that group and their commitment will be stronger [21,22]. In older persons, adherence to a physical activity program is promoted by the belief that it could be effective (i.e. outcome expectancy) and that the individual can follow it [23].

Because adherence in older adults is multifactorial and is influenced by both program characteristics and personal factors, it is important to understand the role of these personal factors, such as physical fitness and program characteristics, in terms of personal goals. We assessed long-term (10-month) adherence to a physical activity program in older adults (age > 60 years) intended to improve physical fitness compared with a multiactivity practice. Adherence was assessed by percentage of sessions attended or percentage of persons completing the program, and by analysis of temporal dynamics.

2. Materials and Methods

2.1. Population

Seventy persons aged over 60 years (range 60-76 years) participated in the study. All had previously taken part in a physical fitness assessment day organized by French health insurance. In all, 250 persons were invited to participate. Finally, 206 volunteered to assess their physical fitness with the Vitality Test Battery. Participants who claimed to already have regular physical activity and/or high fitness were excluded (n = 95). A 10-month physical activity program was offered to the remaining persons (n = 111). Forty-seven people did not wish to take advantage of the program offered. Finally, 70 persons volunteered to participate in the program (Figure 1).

2.2. Design

Based on their fitness test scores, volunteers were offered the possibility to enroll in specific physical activity programs aimed at improving their physical fitness.

Participants with low cardiorespiratory and muscular fitness could choose to participate in a program with endurance and strength exercises (CMF) or to practice a free range of multi-physical activities (MPA).

Participants with poor coordination and motor skills could choose to participate in a program with coordination, balance and motor exercises (CBM) or to practice multi-physical activities (MPA).

The three physical activity programs were to be conducted concurrently. The study was conducted at the ASM multi-sport center in Clermont-Ferrand.

The baseline distribution of the 70 participants and their characteristics are presented in Table 1.

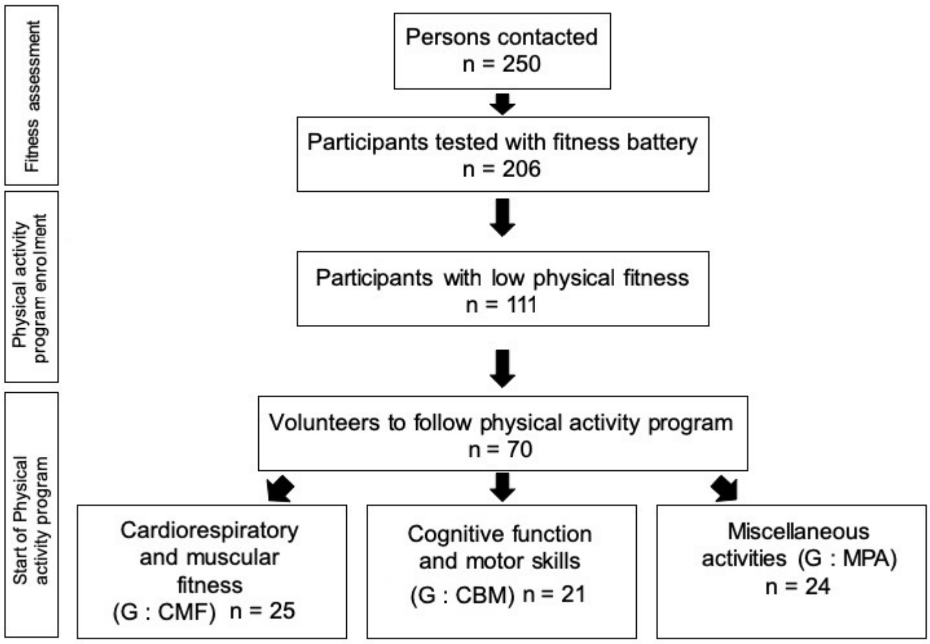

Figure 1. Trial procedure

Table 1. Distribution and characteristics of studied population

	n	Age (y)	w/m
CMF: endurance and strength exercises group	25	65.1 ± 2.8	10/15
CBM: coordination, balance, motor exercises group	21	67.0 ± 3.8	18/3
MPA: multi-physical-activities group	24	64.6 ± 3.4	17/7

Values are means ± SD. w: women, m: men.

All procedures requiring the protection of human subjects were approved by the French data protection office (CNIL, 2016-07-05), and the University's local ethics board approved the study. In accordance with the Helsinki Declaration, written informed consent was obtained from each participant prior to inclusion and participation in the tests.

2.3. Physical fitness assessment: Vitality Test Battery

Before (M0) and after the 10-month physical activity program (M10), physical fitness of all participants was assessed by the Vitality Test Battery [24]. This consists of ten physical tests to evaluate the components of fitness-related health: cardiorespiratory fitness (six-minute walk test), muscular fitness (trunk strength test, hand-grip strength test, medicine-ball throwing test, 30 s chair-stand test), coordination, balance and motor skills (seated flexibility test, balance test and coordination tests - plate-tapping test, ruler drop test, dual task test).

For each test, the performance of the 206 participants was expressed in quintile values. Each data set represented 20% of a given population and determined scores between 1 and 5 points. To be considered as having low cardio-respiratory fitness, participants had to have a score below 2 (40% lowest performance) for the six-minute walk test. The same process was applied for muscular fitness, coordination, flexibility, balance and motor skills.

2.3.1. Body Composition

Body mass (BM), total fat percentage (%) and lean body mass (kg) were measured by bioelectrical impedance analysis (Tanita BC-545N). Stature was measured using a calibrated stadiometer. Body mass index (BMI) was calculated as body weight divided by stature squared (kg/m²). Waist circumference was measured with tape.

2.3.2. Cardiorespiratory Fitness Assessment

The six-minute walk test (6MWT) assesses the submaximal level of functional cardio-respiratory capacity. The 6MWT is a simple, practical test that reflects activities of daily living [25] and is validated in older adults [26].

2.3.3. Muscular Fitness Assessment

Muscular endurance and strength were evaluated by five different tests:

The trunk strength test (TST) consisted of three sets of five different abdominal trials used to assess abdominal strength [27]. The hand-grip strength test (HGS test) assesses gripping force with a hand dynamometer [27]. HGS was measured with a hand-held dynamometer (Takeï TK200, measurement range 5-100 kg with 0.1 kg increments). HGS was evaluated only in the dominant hand. For the medicine-ball throwing test the participants sat with their back against a wall, and the propulsive force of the upper limbs was assessed [28]. Each volunteer performed two test throws of a medicine ball weighing 2 kg for women and 3 kg for men. The best distance was recorded. For the 30 s chair-stand test (30CST), participants were asked to rise to a full stand from a fully seated position and complete as many full stands as possible in 30 s [27,29].

2.3.4. Coordination, Balance and Motor Skills Assessment

Flexibility was assessed using the seated flexibility test (SFT), the distance between fingers and the toes was measured. The distance was positive when the fingers extended beyond the feet and negative when the fingers did not reach the feet [27,30]. The balance test (BT) was 30 seconds eyes open and closed on one leg of choice [31]: the aim was to reach 30 seconds maximum without loss of balance and/or support of the free leg [31]. The longest times achieved for each balancing activity was recorded. Eyes open time, eyes closed time and difference between the times (Δ) were recorded. Only the difference between time with eyes open and eyes closed (Δ) was analyzed. The aim of the plate-tapping test (PTT) was to assess the coordination of arm activity and speed by measuring the time for the dominant hand to touch two discs 80 cm apart 25 times while the other hand is at rest between the two discs. The best time to go back and forth 25 times was recorded [27]. The ruler drop test (RDT) of Mackenzie [32], in which the subject has to catch a 40 cm ruler dropped by the examiner as quickly as possible, evaluates reaction time. The dual task test (DTT) of Lundin-Olsson et al. [33] assesses coordination by measuring the time difference between a 10 m single brisk walk and a 10 m brisk walk with a constraint (holding a ball balanced on a plate without dropping it). The dual task paradigms typically require participants to divide their attention and concurrently undertake two or more tasks. Inability to perform two or more tasks simultaneously (multi or dual tasking) was regarded as an indicator of a higher fall risk [34].

All the tests were performed twice, except for the 6-minute walk test, and the higher score was retained [33].

To analyze the potential secondary effect of the program, moderate-intense physical activity (MVPA), sedentary behavior (sitting time and screen-viewing time) and sleep were evaluated with a recall log. Each participant was asked to report, for each day for one week, time spent sitting, screen-viewing, engaging in physical activity (besides the session of the study program) and bedtime and wake-up times, one week before and after.

2.4. Physical Activity Programs

60-minute sessions held twice a week for 10 months were offered. For the CMF and CBM groups, all the sessions were run by the same trained professional in adapted physical activity who was responsible for each session. For the MPA group, sessions were run by several professionals according to the chosen physical activity (e.g. stretching, dancing, badminton, gymnastics).

All the groups attended two 1 h sessions per week: Tuesday and Thursday for the CMF and CBM groups, and any day for the MPA group. All the program sessions were supervised by a trained instructor.

2.4.1. CMF Program

The CMF program was to be attended two days per week (Tuesday and Thursday), with a rest day between sessions, and each 1 h session included exercises for all major muscle groups in the upper and lower body. Each session consisted of a warm-up, moderate-intensity exercise, and a cooldown. Endurance (aerobic) circuit training to increase cardiorespiratory fitness was performed on Tuesday and circuit resistance training to improve muscle strength was performed on Thursday. The aim was to improve aerobic and muscular fitness.

2.4.2. CBM Program

The program consisted of sessions designed to improve accuracy, balance, dual tasking, coordination, responsiveness and motor skills. Concurrent cognitive tasks were performed during physical games with coordination associated with cognitive tasks. The subjects switched direction, walking either forward or backward, according to the patterns of instruction. Since the constraint was progressive, the exercises were more and more complex and more and more intense during the program, the working hours getting gradually longer and the rest periods shorter. Variations and different levels of complexity and simplification for each person were introduced for each situation.

2.4.3. MPA Program

The participants in the multi-activities group chose the activity they wished to practice among the following: cardio-fitness, yoga, sophrology, badminton, muscular strength training, zumba, biking, step, stretching, dance, gym. For each activity, two 1 h sessions were offered per week.

2.5. Adherence

Adherence was defined as the number and the proportion of sessions attended during the programs as recorded by the instructors, expressed in number and percentage of the total number of sessions. Proportion of participants completing exercise programs, as another indicator of adherence, was observed and expressed as a drop-out percentage. From Tak et al. [35], participation in 75% or more of the exercise sessions was defined as excellent adherence, 50-74% good, 25-49% moderate, and less than 25% poor.

2.6. Statistical Analysis

Statistical analyses were performed using Stata software, Version 13 (StataCorp, College Station, TX, US). All tests were two-sided, with a Type I error set at 0.05. Continuous data were expressed as mean ± standard deviation (SD) or median [interquartile range] according to statistical distribution. The assumption of normality was assessed by using the Shapiro-Wilk test. Random-effects models for repeated data were performed to compare the effects of physical activity program between groups (CMF, CBM and MPA). The following fixed effects were measured: time, group and time x group interaction, taking into account between and within participant variability (subject as random-effect). A Sidak's type I error correction was applied to perform multiple comparisons. The normality of residuals from these models was studied using the Shapiro-Wilk test. When appropriate, a logarithmic transformation was proposed to achieve the normality of dependent outcome. Multivariable analyses were then conducted using the aforementioned mixed models in order to consider age, gender and adherence confounders variables as covariates. Concerning non-repeated comparisons (for example comparisons before the program), the statistical analyses were carried out using analysis of variance (ANOVA), or non-parametric Kruskal-Wallis test if the assumptions of ANOVA were not met. The homoscedasticity was analysed using the Bartlett's test. If appropriate (omnibus p-value less than 0.05), a post-hoc test for multiple comparisons was proposed: Tukey-Kramer test post ANOVA or Dunn test after Kruskal-Wallis test. The adherence was treated as a censored variable and was estimated using Kaplan-Meier method. The comparisons between groups were realized using log-rank test, with proportional-hazard hypothesis studied by Schoenfeld's test.

3. Results

3.1. Adherence

Adherence, assessed by the proportion of sessions attended (total 68 sessions), was 61.3 ± 25.8% for the cardiorespiratory and muscular fitness program (CMF), 49.7 ± 25.0% for the cognitive-balance and motor functions program (CBM) and 33.3 ± 25.8% for the multi-physical activities program (MPA) (Table 2). Adherence was significantly higher for CMF than for MPA ($p < 0.001$), and higher but not significantly so than CBM ($p = 0.094$). No significant difference in adherence between CBM et MPA ($p = 0.284$) was observed.

In the CFM group, 25 subjects started and 19 finished the 10-month program, a total drop-out rate of 24%. In the CBM group, 21 participants and 17 persons completed the program for a total drop-out of 19%, and in MPA group, the ratio was 24 versus 10, a total drop-out of 54% (Table 2). In other words, the percentage of persons completing the program was 76%, 81% and 42% for CMF, CBM and MPA, respectively. Rates of excellent adherence, qualified as participation in 75% or more of the sessions, were 52%, 48% and 4%, respectively for the CMF, CBM and MPA groups.

Table 2. Participation and adherence to physical activity program

		CMF	CBM	MPA	
Participation	Started	25	21	24	
	Not started	18	7	16	
	Finished	19	17	10	
Adherence	Number of sessions (SD)	41.0 ± 16.8 *	33.5 ± 16.2	23.0 ± 16.8	p<0.003
	Mean % adherence (SD)	61.3 ± 25.8 *	49.7 ± 25.0	33.3 ± 25.8	p<0.003
	Dropped out (% started)	6 (24)	4 (19)	14 (58)	
	Excellent adherence (%)	13 (52)	10 (48)	1 (4)	
	Good adherence (%)	5 (20)	6 (28)	4 (17)	
	Moderate adherence (%)	5 (20)	1 (5)	4 (17)	
	Poor adherence (%)	2 (8)	4 (19)	15 (62)	

*Significantly different between CMF and MPA, p<0.001; no significant difference between CMF vs CBM and CBM vs MPA.
Adherence was qualified as excellent for participation in 75% or more sessions; 50-74% were good, 25-49% were moderate, and when participation was in less than 25% of the sessions defined poor adherence.

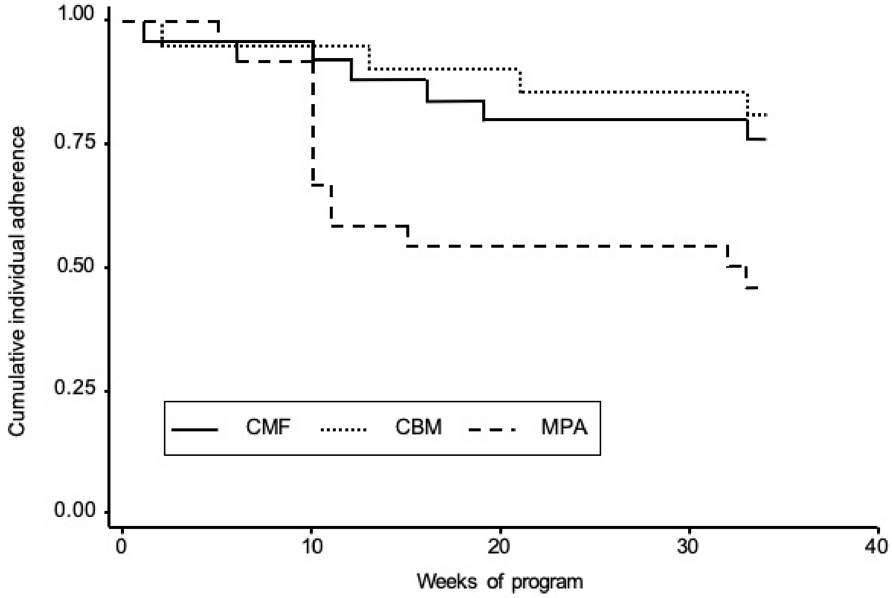

Figure 2. Overall probability of following CBM, CMF and MPA programs (Kaplan-Meier survival analysis)

The graph shows that the probabilities of a person being active in the CMF, CBM and MPA groups were respectively for 12 weeks 0.92, 0.95 and 0.58, for 24 weeks 0.80, 0.86 and 0.54 and for 34 weeks 0.76, 0.81 and 0.42 (Figure 2).

3.2. Effects of the Physical Activity Program

Before the program, CMF subjects were significantly heavier, fatter and had a higher LBM than the CBM and MPA subjects. No significant difference was observed for sleep, sedentary behavior (sitting and screen times) and MVPA between the three groups. However, depending on the inclusion criteria, the CMF group presented the best significant performance for the flexibility test and dual task test (Δs). CBM group presented the best significant performance for the 6-minute walk test.

All three groups significantly improved LBM and performance in the 6-minute walk test, 30 s chair-stand test and plate-tapping test (Table 3, Table 4 and Table 5). Total fat mass decreased significantly only for CBM, while waist circumference decreased significantly for CMF and CBM. Sitting time decreased significantly for CMF and CBM, while MVPA increased, though non-significantly. All significant improvements persisted after adjustment for adherence.

Table 3. Effect of physical activity program on anthropometric parameters for CMF, CBM and MPA groups

Group	CMF			CBM			MPA		
Time	M 0	M 10	p	M 0	M 10	p	M 0	M 10	p
Body mass (kg)	79.2 ± 15.8	79.0 ± 15.6	0.194	63.6 ± 13.0	63.8 ± 13.9	0.755	66.4 ± 12.6	74.1 ± 11.7	0.090
BMI (kg/m²)	27.1 ±4.6	27.2 ± 4.3	0.708	23.3 ± 3.4	23.7 ± 3.2	0.888	23.6 ± 3.7	25.5 ± 3.3	0.084
Lean body mass (kg)	50.7 ± 10.7	52.1 ± 11.9	<0.001	39.2 ± 5.9	40.4 ± 6.4	<0.001	40.9 ± 6.5	46.0 ± 6.9	0.003
Total fat mass (%)	29.8 ± 7.8	29.5 ± 8.5	0.186	29.7 ± 9.4	28.4 ± 7.9	0.024	33.5 ± 6.1	34.8 ± 9.7	0.228
Waist circumference (cm)	95.7 ± 13.2	94.4 ± 12.7	0.002	88.2 ± 9.8	87.0 ± 10.6	0.007	89.9 ± 8.2	93.9 ± 8.3	0.272

Values are means ± SD.

Table 4. Effect of physical activity program on behaviors for CMF, CBM and MPA groups

Group	CMF			CBM			MPA		
Time	M 0	M 10	p	M 0	M 10	p	M 0	M 10	p
Sleep time (h/n)	8.4± 0.8	8.3 ± 0.9	0.467	8.9± 1.0	8.4 ± 0.7	0.007	8.9±0.8	8.9±0.8	0.369
Sitting time (h/d)	6.7± 2.8	5.2 ± 3.2	0.048	7.1±2.0	5.1 ± 1.8	<0.001	6.5±2.0	5.2±1.5	0.058
Screen leisure time (h/d)	4.4±2.1	4.7 ± 1.9	0.209	4.6±2.0	3.5 ± 1.5	0.059	5.7±2.8	4.3±2.2	0.135
MVPA (min/week)	35.0 ± 36.7	62.3 ± 84.8	0.097	44.8 ± 58.1	47.7 ± 34.6	0.772	37.3 ± 47.3	26.0 ± 20.6	0.510

Values are means ± SD.

Table 5. Effect of physical activity program on physical fitness for CMF, CBM and MPA groups (participants who finished the program)

Group	CMF			CBM			MPA		
Time	M 0	M 10	p	M 0	M 10	p	M 0	M 10	p
6-minute walk test (m)	541.0 ± 66.7	619.2 ± 68.6	<0.001	595.7 ± 40.6	664.7 ± 65.7	<0.001	599.8 ± 77.9	664.5 ± 119.0	0.017
Trunk strength test (n)	9.5 ± 5.0	11.8 ± 4.4	0.003	11.5 ± 4.4	11.8 ± 4.3	0.062	10.6 ± 4.8	14.7 ± 1.0	0.004
Hand-grip strength test (N/kg)	4.7 ± 0.1	5.0 ± 1.2	0.018	4.6 ± 1.0	4.8 ± 1.1	0.192	4.7 ± 1.1	4.7 ± 1.0	0.890
Medicine-ball throwing test (m)	4.4 ± 0.6	3.5 ± 0.8	0.536	3.0 ± 0.7	3.0 ± 0.7	0.712	3.1 ± 0.6	3.4 ± 0.5	0.863
30-s chair-stand test	14.2 ± 2.5	18.6 ± 3.2	<0.001	14.5 ± 2.2	18.5 ± 2.1	<0.001	15.5 ± 3.4	18.5 ± 3.4	0.003
Flexibility test (cm)	-2.9 ± 8.1	2.5 ± 9.8	0.878	1.5 ± 6.8	2.6 ± 7.7	0.215	3.2 ± 6.5	3.1 ± 6.4	0.275
Balance test (Δs)	17.0 ± 7.0	15.8 ± 7.0	0.137	15.3 ± 5.9	18.4 ± 8.0	0.005	17.1 ± 7.5	19.6 ± 4.9	0.063
Ruler drop test (cm)	19.4 ± 6.9	22.6 ± 5.6	0.005	21.0 ± 6.6	21.5 ± 7.8	0.748	23.0 ± 6.7	16.8 ± 3.9	<0.001
Plate-tapping test (s)	12.9 ± 3.4	11.1 ± 3.0	0.002	11.8 ± 0.9	10.3 ± 0.8	<0.001	11.5 ± 1.7	10.0 ± 1.4	<0.001
Dual task test (Δs)	1.3 ± 1.1	1.3 ± 1.0	0.964	3.1 ± 1.9	2.2 ± 1.7	<0.001	2.3 ± 1.5	1.4 ± 0.7	0.001

Values are means ± SD.

4. Discussion

In this study, adherence was assessed by indicators such as the percentage of all sessions completed and also considered by temporal dynamics. Regarding both indicators and temporal dynamics of adherence, our results show that the two groups of participants who had as an objective to improve poor physical fitness (CMF and CBM) showed the best adherence compared to the group of participants who chose their physical activities (MPA).

According to the literature, the best adherence is observed with collective programs supervised by qualified instructors. High rates of adherence by older adults to short-term group-based programs (6 months) of 55-100% (mean 84%) have been reported [9]. For long durations (>12 months), adherence rates of 63-84% (mean = 70%) were observed [9,16]. In this study, adherence measured as the percentage of the number of participants who completed the program reached 76% for the cardiorespiratory and muscular fitness and 81% for coordination and motor skills group. However, adherence for the multi-physical activities group reached only 42%. According to the review of [13] showing that higher adherence is obtained with supervised programs, one hypothesis explaining this last result would be the supervision of sessions by different instructors for each activity. Although each session was well supervised, the educator was not necessarily always the same for the MPA group, whereas for the other two groups, CMF and CBM, the instructor was always the same and stayed with the group throughout the program.

When adherence was assessed by percentage of sessions attended, our results were low: 61%, 50% and 33% for CMF, CBM and MPA, respectively. Our results fit the range of results obtained by other authors. Previous studies reported that adherence to physical activity programs might be influenced by intensity and/or duration of exercise. Picorelli et al. [18] conducted a study on adherence to physical activity of women aged 65 and over, divided into two physical activity programs: a muscle training group and an aerobic training group. The adherence rate (calculated based on the number of sessions performed) was 49.70% in the aerobic exercise group and 56.20% in the muscle training group. Self-efficacy to perform a task in accordance with the individual's profile and their individual goals must be adequate to obtain the highest adherence [23].

Previous studies have shown that adherence declines over time [7] and the decrease in adherence is more clearly evident in later stages of a program [8,9]. The temporal dynamics of adherence were very different between MPA and both CMF and CBM. The graph of the probability of completing the program showed that only about 42% of the participants in the MPA group were expected to continue the program for 10 consecutive months. The curve of adherence decreased regularly during the 10-month program, after 6 months the adherence had dropped to 20% for CMF and to 14% for CBM, and after 10 months to 24% for CMF and 19% for CBM. Few studies have examined the temporal aspect of adherence in physical activity programs. Focusing on temporal aspects of adherence, the results of the MPA group could be compared with the studies on adherence in a fitness center. In Sperandei et al. [36], 63% of new participants stopped activities before the third month, and fewer than 4% remained for more than 12 months of continuous activity. The general survival curve shows that the decrease in adherence was rapid during the first 6 months, and slow, regular and progressive during the last 6 months.

In older persons, regular physical activity, aerobic work and multicomponent programs have demonstrated benefits to health, improving cardiovascular, functional, metabolic and cognitive functions [37,38]. We found that 10 months of regular physical activity improved physical fitness in older persons, whatever the modality of the program. All significant improvements were independent of adherence. Previous studies underlined that the amount of exercise was unrelated to adherence [29,40]. The recent report of Rivera-Torres et al. [14] identified factors associated with adherence to physical activity programs in older persons [14]. Better physical ability was one of the facilitators for engaging in physical activity programs [13], and the improvement of physical fitness was not described as a determinant of adherence.

5. Conclusion

Adherence to a 10-month physical activity program was significantly higher for a cardiorespiratory and muscular fitness group and a coordination, balance, motor exercises group than for a multi-physical activities group. The motivation to improve poor physical fitness could explain this outcome. When the group was supervised by the same instructor and when the participant's goal was clear, adherence was in the range 76-81%. Adherence fell during the first 12 weeks for the participants who chose their activities. Knowledge of physical fitness level and opportunities for improvement helps to set goals. A physical activity program intended to improve self-judged weaknesses elicits the best adherence.

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Author Contributions Statement

DMI and PD wrote the manuscript. PD drafted the study design. DMI, CG, BD, ED and JF conducted data acquisition and analysis. BP performed the statistical analysis. PD supervised the project. All the authors contributed to manuscript revision and read and approved the submitted version.

Conflict of Interest Statement

None of the authors have any potential conflicts of interests to disclose.

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