

# PHYSICAL ACTIVITIES AT DISTANCE: FEASIBILITY AND ACCEPTABILITY OF ONLINE REMOTE EXERCISE INTERVENTION IN OLDER ADULTS

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## Abstract

**Introduction.** During the COVID-19 pandemic, comprehensive social distancing policies, such as prohibiting agglomerations, travel restrictions, and staying-at-home recommendations, were adopted by several countries. Due to these lockdown measures, older adults decreased daily physical activity levels, consequently increasing sedentary behavior. This pilot feasibility study aimed to explore the feasibility of implementation (i.e., adherence, safety) and acceptability (i.e., satisfaction, intent to continue use, perceived appropriateness) of an online face-to-face supervised exercise intervention in a sample of older adults. **Material and Methods.** Seven older adults (mean age: 68 ± 5 years; 38% females) completed the study. The exercise program was composed of two 45-min sessions per week for five consecutive weeks. Participants followed a remote exercise program in Zoom®. After each training session, both participants and the physical trainer completed a questionnaire designed to investigate the acceptability and feasibility of the exercise program. **Results.** Six to seven participants (i.e., 86%) attended 100% of the workouts. No experience of fall/injury occurred during the training. All the participants agreed or strongly agreed to have the competence to perform the proposed exercise (range 100-42.9%), and this perception increased at the end of the intervention. **Conclusions.** Our results suggest that an online physical exercise program using web technology seems to be feasible and acceptable to independent older adults. The program does not require specific equipment, shows a high adherence level, and seems safe. Moreover, both the participants and the physical trainer reported a high level of satisfaction with the activity.

**Key words:** home-based, exercise, elderly, COVID-19, lockdown, social isolation

## Introduction

Regular physical activity is considered a milestone for successful aging [1], leading to a reduction of the risk of developing adverse physical and mental health outcomes, as well as increasing the experience of healthier aging trajectories [2, 3, 4]. Despite this, most older adults do not reach the accompanied physical activity levels to attain these health benefits [5], and this problem increased during the COVID-19 pandemic. Indeed, comprehensive social distancing policies, such as prohibiting agglomerations, travel restrictions, and staying-at-home recommendations, were adopted by several countries to prevent COVID-19 diffusion [6]. Older people are at risk of further reduced activity levels due to lockdown measures that limit opportunities to exercise regularly, decreasing daily physical activity levels, and consequently increasing sedentary behavior [7, 8, 9, 10, 11].

Physical exercise is crucial to maintaining well-being [12, 13] and promoting health-related quality of life in older adults [14, 15]. Thus, detecting alternative exercise interventions different from the common face-to-face ones during lockdown measures is necessary and crucial. Home-based physical exercise may be a valid alternative and approach to face-to-face training to counteract the unintended consequences of confinement and quarantine [16] and reach an appropriate weekly physical activity level. Home-based exercise programs are a simple,

easy, and feasible method of avoiding inactivity-induced losses and maintaining physical fitness and health both in older adults and in pre-frail and frail people [13, 16, 17]. In particular, a recent meta-analysis highlighted that home-based exercise programs seem effective for maintaining/improving the health and fitness (i.e., muscle strength, endurance and power, and balance) and being an effective strategy to counteract physical inactivity [16].

Nevertheless, the majority of the home-based exercises did not include online training supervisions but rather prescriptions of physical exercises with distance monitoring, such as training diary, training log, or home visits [16]. In this regard, the online exercise intervention, including remote delivery of exercise classes through videoconferencing technology, has emerged as a means for community-based programs to resume guided exercise sessions to provide online feedback while complying with the physical distancing restrictions during the COVID-19 pandemic. Online exercise interventions directed at older people may increase physical activity levels and decrease sedentary time [18]. The employment of particular technological elements, such as digital platforms (e.g., smartphones and tablets), may increase participation rates, adherence levels [19], and motivation by providing counseling and facilitating communication [20]. Indeed, it is possible to employ videoconference platforms to provide individually tailored exercise sessions and interventions in a virtual 'group-based' setting with supervised group exercise training [21]. Nevertheless, few studies investigated the

effect of online video conference training [19]. Online training programs bring positive effects on sarcopenia-related factors (i.e., total-body skeletal muscle mass, appendicular lean soft tissue, lower limb muscle mass, and chair sit-and-reach) [22] and positive effects on fall-related risk factors [23], improvements in endurance exercise capacity and self-efficacy [24], as well as positive effects on enjoyment and subjective well-being and decreases in loneliness [25].

To increase physical exercise during COVID-19 lockdown, we realized a project named S.T.E.P.S. (i.e., Shared Time Enhances People Solidarity) to verify the possibility of implementing physical exercise using the face-to-face online intervention. In this first pilot feasibility study, we aimed to explore the feasibility of implementation (i.e., adherence, safety) and acceptability (i.e., satisfaction, intent to continue use, perceived appropriateness) of an online face-to-face supervised exercise intervention in a sample of older adults.

**Material and Methods**

**Study Design and Procedures**

This pilot study investigated the feasibility of implementation (i.e., adherence and safety) and practicality (i.e., digital skill), perceived competence of exercise, and peer relationship of an online group training intervention in a sample of older adults. For this purpose, after each training session, both participants and the physical trainer completed two different original questionnaires. These original questionnaires were designed for this study and investigated the practicality of the training, the perceived competence of exercise, and social relationship. The physical trainer collected data about the adherence to the program and possible injuries or accidents that occurred during the activity. Both original questionnaires were written in Italian and translated into English for publication purposes [26]. The study was conducted in May 2021.

**Participants**

Study participants were recruited in Verona municipalities and neighborhoods (North Italy) via advertisements in the University Center. Eighteen older adults were interested in participating in the study. After screening for eligible inclusion/exclusion criteria, eight participants (44.4%) were enrolled in the study. Nevertheless, one subject withdrew due to family problems and was excluded from the analysis. Thus, seven participants were considered for the analysis. Participants were considered eligible for the study if they were aged over 60 years, were independent with activities of daily living and had a medical certificate for participation in physical exercise. Participants were excluded if they had any acute diseases (e.g., recent fractures or surgical operations) preventing the practical requirements for study participation. The study was conducted according to the Declaration of Helsinki. Participation in the study was voluntary and confidential. The local Ethical Committee of the University of Verona approved the study (protocol number: 3695CESC). Participants provided written informed consent to participate in the study.

**Online Remote Exercise Intervention**

The intervention was composed of two 45-min sessions per week for five consecutive weeks. Participants followed a remote exercise program in Zoom© at their home. All subjects were equipped with a tablet (Hamlet - Tablet - 10" 8.1 4 CORE 2 GB / 16GB WIFI-BT-4GLTE) with the relative application installed to access the lesson. Before beginning the study, all subjects

received standardized instruction on the use of the device and were instructed on the methodology of organizing the remote training session (i.e., location of the video camera, light and background, sports equipment, and choosing a room with sufficient free space).

All the training sessions were supervised and conducted by a graduate in Sport Sciences specializing in physical exercise for older adults. At the end of the session, the exercise intensity was monitored with the rating of perceived effort (RPE) modified Borg CR-10 scale. According to the ACSM [27], the exercise intensity was 5-6 points. The physical trainer monitored adherence to the overall program.

The exercise activity protocol started with a warm-up phase of 10 mins followed by 25-min flexibility, strength, and balance exercises and ended with a 10-min cool-down, including stretching. A schematic summary of the core exercises proposed during the intervention and some specific examples is reported in supplementary file 1.

**Procedure**

*Participants' original self-report questionnaire*

Eight questions were developed to assess the perceptions about the physical exercises and management problems due to the activity. The questions investigated the participants' perception of digital skills, execution of the exercises, and social relationships. For each item, a four-point Likert scale was used (from a minimum of 1 (strongly disagree) to a maximum of 4 (strongly agree)). Table 1 reports the eight questions submitted to each participant.

*Physical trainer's original self-report questionnaire*

The physical trainer filled out the same self-report questionnaire. This process was carried out to observe the participants' behavior in terms of digital skills, competence in exercises, and social relationships during the training sessions.

**Table 1.** Participants' questionnaire about the perception of the activity

Section 1 – Digital skills during the training session		
	Question	Answers
#1	Do you have any problems connecting via Zoom© to follow the lesson?	Likert scale 4 points
#2	Are you able to utilize the tablet device?	Likert scale 4 points
Section 2 – Perceived competence of exercises		
#3	Do you understand the execution of the exercises proposed?	Likert scale 4 points
#4	Do you think that the execution of the exercises is correctly performed?	Likert scale 4 points
#5	Do you find it challenging to adapt yourself to the proposed exercises?	Likert scale 4 points
#6	Are you able to self-correct the exercise during the training?	Likert scale 4 points
Section 3 – Social relationships during the training session		
#7	Do you communicate/collaborate during the training with your peers?	Likert scale 4 points
#8	Do you communicate/collaborate during the training with the physical trainer?	Likert scale 4 points

### Statistical analysis

The questionnaire responses obtained at the beginning and at the end of the intervention (i.e., after five weeks) were considered for the study. Descriptive analyses were carried out for participants' and the physical trainer's self-report questionnaires. Data distribution was examined using the Shapiro Wilk test. Due to the violation of the assumption of normality, Wilcoxon signed-rank tests were used to verify the differences between the beginning and the end of the intervention. All analyses were carried out using the SPSS statistical software, version 27. Statistical significance was set at  $p < 0.05$ .

## Results

### Adherence and injury

Seven older adults (38% female; mean age  $68.3 \pm 4.5$  years) completed the study and entered the final analysis. Six participants (i.e., 86% of the sample) attended 100% of the workouts, while one participant attended more than 75%. No experiences of falls or injuries occurred during the training.

### Participants' self-report questionnaire

Table 2 summarizes the frequency of participants' self-report questionnaires considering the first and last lessons. In addition, Table 2 also reports the Wilcoxon signed-rank test outcomes and the relative means (standard deviation) and median.

In general, focusing on frequency outcomes, participants reported good digital skills to connect at the beginning of the intervention (i.e., 85.7% of the participants strongly agreed) and to follow the intervention sessions (i.e., 42.3% of the participants agreed). Interestingly, at the end of the intervention, all the subjects strongly agreed to be able to self-connect and follow the training well. Similarly, all the participants agreed or strongly agreed to have the competence to perform the proposed exer-

cise (range 100-42.9%), and this perception increased at the end of the intervention. Finally, social relationships with peers and the physical trainer increased at the end of the training. Nevertheless, no statistically significant differences were observed when analyzing the item using the Wilcoxon signed-rank test, even if an improving trend in all considered items was observed.

### Physical trainer's self-report questionnaire

Table 3 reports the frequency, mean (standard deviation), and median of the data relating to the questionnaire for the physical trainer concerning the first and last lesson of the intervention. Table 3 also reports the Wilcoxon signed-rank test outcomes and the relative means and standard deviation.

The physical trainer reported increasing all considered items over time (see frequency outcomes). In particular, the item related to the competence of exercises showed positive answers at the end of the training. Also, the relationship among peers and participants (i.e., agreement answers 42.9%) and physical trainer (i.e., agreement answers 57.1%) showed positive answers. The statistical outcomes showed a difference between the first and the last lesson in items #4 ( $Z = -2.5$   $p = 0.011$ ) and #8 ( $Z = -2.0$   $p = 0.038$ ). Nevertheless, an improving trend in all considered items was observed.

## Discussion

In this first study of the S.T.E.P.S project, we explored the feasibility of implementation (i.e., adherence, safety) and acceptability (i.e., satisfaction, intent to continue use, perceived appropriateness) of an online face-to-face supervised exercise intervention in a sample of independent older adults. For this purpose, two original questionnaires, one for participants and one for the physical trainer, were developed. This aspect is a

**Table 2.** Frequency and mean/median of reply of the participants to the study and relative statistical outcomes

	First Lesson						Last Lesson						Statistical Outcomes
	Strongly Agree	Agree	Disagree	Strongly Disagree	M $\pm$ SD	Median	Strongly Agree	Agree	Disagree	Strongly Disagree	M $\pm$ SD	Median	
<b>Section 1 – Digital skills during the training session</b>													
#1	85.7%	14.3%	0%	0%	3.9 $\pm$ 0.4	4	100%	0%	0%	0%	4.0 $\pm$ 0.0	4	Z = -1.0 p = 0.317
#2	57.1%	42.9%	0%	0%	3.6 $\pm$ 0.5	4	100%	0%	0%	0%	4.0 $\pm$ 0.0	4	Z = -1.7 p = 0.083
<b>Section 2 – Perceived competence of exercises</b>													
#3	100%	0%	0%	0%	4.0 $\pm$ 0.0	4	100%	0%	0%	0%	4.0 $\pm$ 0.0	4	Z = 0 p = 1.000
#4	57.1%	42.9%	0%	0%	3.4 $\pm$ 0.5	3	100%	0%	0%	0%	3.9 $\pm$ 0.4	4	Z = -1.7 p = 0.083
#5	57.1%	42.9%	0%	0%	3.4 $\pm$ 0.5	3	71.4%	28.6%	0%	0%	3.7 $\pm$ 0.5	4	Z = -1.4 p = 0.157
#6	57.1%	42.9%	0%	0%	3.4 $\pm$ 0.5	3	85.7%	14.3%	0%	0%	3.9 $\pm$ 0.4	4	Z = -1.3 p = 0.180
<b>Section 3 - Social relationships during the training session</b>													
#7	14.3%	42.9%	14.3	28.6	2.4 $\pm$ 1.1	3	28.6%	42.9%	14.3%	14.3	2.9 $\pm$ 1.1	3	Z = -1.7 p = 0.083
#8	14.3%	42.9%	28.6	14.3%	2.6 $\pm$ 1.0	3	14.3%	42.9%	28.6%	14.3	2.6 $\pm$ 1.0	3	Z = 0 p = 1

**Table 3.** Frequency and mean/median of reply of the physical trainer to the study and relative statistical outcomes

	First Lesson						Last Lesson						Statistical Outcomes
	Strongly Agree	Agree	Disagree	Strongly Disagree	M ± SD	Median	Strongly Agree	Agree	Disagree	Strongly Disagree	M ± SD	Median	
<b>Section 1 – Digital skills during the training session</b>													
#1	71.4%	0%	28.6%	0%	3.43 ± 0.9	4	100%	0%	0%	0%	4.00 ± 0	4	Z = -1.4 p = 0.157
#2	57.1%	14.3%	0%	28.6%	3.00 ± 1.4	4	100%	0%	0%	0%	4.00 ± 0	4	Z = -1.6 p = 0.102
<b>Section 2 – Perceived competence of exercises</b>													
#3	57.1%	28.6%	14.3%	0%	3.43 ± 0.8	3	100%	0%	0%	0%	4.00 ± 0	4	Z = -1.6 p = 0.102
#4	0%	0%	85.7%	14.3%	2.86 ± 0.4	3	100%	0%	0%	0%	4.00 ± 0	4	Z = -2.5 p = 0.011
#5	71.4%	0%	14.3%	14.3%	3.57 ± 0.8	4	100%	0%	0%	0%	4.00 ± 0	4	Z = -1.3 p = 0.180
#6	85.7%	14.3%	0%	0%	3.86 ± 0.4	4	100%	0%	0%	0%	4.00 ± 0	4	Z = -1.0 p = 0.317
<b>Section 3 - Social relationships during the training session</b>													
#7	0%	0%	42.9%	57.1%	1.57 ± 0.5	2	0%	42.9%	28.6%	28.6%	2.14 ± 0.9	2	Z = -1.6 p = 0.102
#8	0%	0%	28.6%	71.4%	1.29 ± 0.4	1	0%	57.1%	14.3%	28.6%	2.29 ± 0.9	3	Z = -2.1 p = 0.038

limitation that should be considered when discussing the study results.

### Implementation

Our protocol was delivered via simple and accessible technological tools (i.e., videoconferencing platform: Zoom©) and did not require specific equipment to be performed. The adherence to the online program was high and satisfying. Most of the participants completed all the training sessions (i.e., 6 participants). At the same time, the remaining participants completed more than half of the proposed sessions (i.e., > 75%). Overall, the high participation in online exercise interventions is encouraging and demonstrates that older adults can sustain this intervention for five weeks. Moreover, no experience of falls or injuries occurred during the training. On the other hand, only one subject did not complete the intervention due to family problems. These results agreed with other studies in different cultural contexts and underlined that training using the online platform may be well accepted and safe for older adults [19, 25, 28]. For example, Schwartz et al. [19] proposed an exercise protocol for older adults using a video conferencing platform (i.e., Zoom©). They reported no adverse events during the eight weeks of intervention and high adherence to the program (i.e., 90%). Similarly, Buckinx et al. [28] reported a total adherence rate of 82.5% in Zoom© supervised groups, similar to a booklet-based individual home program. Additionally, the data about safety are promising, and this aspect may be considered one of the major concerns of online training for the possible consequences of falls.

### Satisfaction

The acceptability in terms of satisfaction, intent to continue use, and perceived appropriateness of the activity was positive for the participants and the physical trainer. At the end of the intervention, all the participants reported having the digital skills to follow the training session, understand the execution of the proposed exercises, and perform the same correctly. Overall, these results showed that technology tools might be acceptable to engage the older adult population in home-based exercise. Our data showed higher satisfaction which is a critical enabling factor for older people to engage in exercise programs [28] and are in line with other studies on independent older adults [16]. Moreover, all participants strongly agreed (100%) to be able to self-correct the exercise execution after the instruction feedback during the training session. They strongly agreed that competence and perception of exercises increased at the end of the intervention. Finally, social relationships between participants and the physical trainer increased at the end of the training period. Similarly, the physical trainer strongly agreed that the competence of exercises in participants improved at the end of the intervention. Overall, our data were in line with the study of Schwartz et al. [19], who reported that participants were able to use the online platform to follow the training, be satisfied with the exercise training, and have the intention to continue training using similar technology at the end of the online intervention protocol. Our results may be of interest because older adults spend most of their days at home during social restrictions due to the COVID-19 pandemic [7, 8, 9, 10, 11]. New interventions aimed to reduce physical inactivity and increase/maintain physical function in older people are critical health-promoting strategies [16, 19]. Together, these findings suggest that this training can be a promising alternative to traditional exercise programs for older adults, following other studies [16, 19]. Nevertheless, future studies are needed to confirm our preliminary results, and caution is needed when interpreting our results.

### Limitations of the study

Several potential limitations of this pilot study should be considered. First, as previously highlighted, our study investigated the feasibility of the study with two original questionnaires (written in the Italian language), one related to the participants and one related to the teacher. Additionally, the four-point Likert scale adopted in the study may be an additional limitation of our questionnaires. Despite this limitation, we think that implementing new and original questionnaires could effectively contribute to a better understanding of the study's feasibility and satisfaction. Second, the relatively small sample size did not allow us to generalize our results to a larger older population. Third, this study utilized a one-group design that did not allow a comparison between the intervention and control groups, thus limiting the generalization of the findings. Fourth, our sample has a gender imbalance and comprised a higher ratio of females than males. Fifth, we focused our outcomes on the feasibility and acceptability of the online exercise intervention. We did not investigate the effect of the intervention in terms of physical or psychosocial outcomes. Overall, caution is needed when interpreting these data. Nevertheless, these results may be helpful for the implementation of future studies on the topic.

### Conclusions

This pilot study explored the feasibility of implementing an online physical exercise program for independent older adults. The main result of our study was that this online physical exercise program is feasible and acceptable for independent older adults. The program does not require specific equipment to be performed, shows a high adherence level, and seems safe. In line with the preliminary results of this pilot study, further research is needed to investigate the effect of this online intervention on physical function and well-being in a larger sample of older adults.

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