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Staying physically active during the COVID-19 quarantine: exploring the feasibility of live, online, group training sessions among older adults

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Abstract

The COVID-19 outbreak has led to recurring quarantines resulting in drastic reductions in physical activity (PA) levels. Given its health benefits, there is a need to explore strategies to increase PA rates during this period. Video-conferencing platforms can be used to deliver live, online, group PA sessions. However, there are only few established PA protocols on how to use such platforms. Hence, the purposes of this study were to (a) design an online PA protocol and (b) explore its feasibility among older adults during a quarantine. A group of exercise specialists developed a PA protocol while accounting for challenges that may arise when using a video-conferencing platform ("Zoom"). A special focus was placed on safety, individualization, and motivational aspects. Then, 31 community dwelling older adults (71.5 ± 4 years) were recruited via social media to follow this protocol twice a week for 8 weeks. Outcome measures included adverse events, adherence rates, and satisfaction with the protocol, its delivery, and technological aspects. Twenty-eight participants completed the protocol. No adverse events occurred, and adherence rates were high (90%). Most participants (97%) indicated they would participate in such a program in the future and highly rated all aspects of the protocol (median score >6 in 1–7 Likert scales). The PA protocol delivered live via a video-conferencing platform was found to be safe and feasible with this cohort. It can therefore be implemented in practice, and in future studies planning to utilize home-based PA sessions for older adults.

Keywords

Coronavirus, Quarantine, Physical inactivity, Older adults, eHealth

Implications

Practice: Delivering live, online, group-training sessions via video-conferencing interfaces can be used to increase physical activity levels of healthy, community dwelling, older adults.

Policy: This study suggests that this form of training should be made available to healthy, community dwelling, older adults who are physically inactive due to the COVID-19 outbreak, or any other reason.

Research: Future randomized controlled trials should be aimed at identifying the optimal doses, delivery strategies, and long-term physiological, psychological and performance outcomes of live, online, group training sessions.

INTRODUCTION

The COVID-19 pandemic has led many countries to impose recurring quarantines. While effective in containing the pandemic, quarantines also lead to a 30% reduction in physical activity (PA) levels in adults of different age groups [1]. Since insufficient levels of PA increase the likelihood of suffering from a range of diseases [2, 3] and all-cause mortality [4], there is a need to explore ways to increase PA levels. This is especially so in view of the insufficient PA levels of the world's population (e.g., 31% not meeting global PA recommendations [3, 5]), which are further reduced during pandemic states. Specific home-based PA recommendations and guidelines have been recently published in an attempt to increase PA levels [6–8]. These guidelines include routines composed of body-weight exercises such as planks, squats, and stepping in place [6]. However, compared to performing PA at designated facilities with a present instructor, individuals may find it more challenging to commit to exercising at home according to pre-written scripts or pre-recorded demonstrations. A possible way to increase the likelihood of initiating and adhering to at-home PA is to use E-health strategies, which can be broadly defined as health services delivered remotely via electronic devices and related technologies [9].

E-health rehabilitation interventions have been shown to be effective in treating patients recovering from musculoskeletal and post-operative conditions [10], as well as from chronic diseases [11–14]. E-health strategies are being gradually implemented to promote regular PA among a range of populations, including older adults [9, 15–19]. For example, E-health interventions using digital platforms (e.g., smart phones and tablets) and remotely detected wearable devices (e.g., wrist bands and pedometers) increase PA participation rates and adherence levels

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[9, 20]. Yet, little research was conducted on live video-conferencing interfaces as a tool to deliver group PA sessions despite its potential (e.g., [14, 16, 21, 22]). Based on the psychological and physiological benefits of training with an instructor [23, 24] and in group settings [25, 26], it can be presumed that live, online, group PA sessions delivered via video-conferencing platforms can assist older adults in initiating and adhering to PA. The potential of using this approach is augmented by the increasing availability and popularity of smart phones and technological devices among older adults, which allow for video-conferencing interfaces [27, 28].

While live, online, group PA sessions hold great promise, there is a need to examine their feasibility among older adults as unique challenges may arise. From a safety perspective, an adverse event such as a fall, when the older adult is home alone, can have severe consequences. Greater precautions may therefore be required, such as a removal of specific exercises from the PA protocol, as the possible risks may outweigh their benefits. This is especially the case in view of the logistical aspects involved with live, online, group PA sessions. Participants are required to follow the PA protocol while observing a screen that has to be placed at a certain distance and height from them. Such a set up could be challenging due to hearing or vision difficulties that are common with older adults. Additionally, such a set up may lead to distraction or disorientation, which may be associated with specific risks or discomforts that are currently underexplored. Therefore, this study had two main goals: design a live, online PA protocol, and explore its feasibility over 8 weeks in a group of older adults.

METHODS

Study overview

This study included two stages. First, our research team planned the PA protocol while considering technological aspects, safety concerns, exercise selection, progressive overload, and personalization of the program (see below). Second, when the protocol was prepared, 31 older adults were recruited to participate in two weekly sessions of live, online, group PA for 8 weeks, led by one of two experienced instructors.

Outcome measures included adverse events, adherence levels, satisfaction with various aspects of this program and intentions for future participation in similar programs. We agreed on three criteria that would fulfill the protocol's feasibility among this population. The first was zero severe adverse events occurring during the sessions, such as falls. If such an event occurred, we agreed that the study would be paused to allow for a careful inspection of the incidence. Note that muscle soreness and other minor aches were not considered as adverse events. The second was adherence rates of ≥80% to the program. This value was selected based on previous literature examining the adherence rates to different PA programs [29] and the duration of this study. The final criterion was satisfaction scores collected via surveys. This criterion was softer compared to the other two, as we had no clear cut-offs. Our plan was to inspect if any result stood out (e.g., inability to operate video-conferencing) and to discuss it per case.

The study took place in Israel during the first COVID-19 wave. The planning and recruitment phases were held during a 5-week strict lockdown, in which all non-essential services were closed, and citizens were restricted to a radius of 100 m around their place of residence. Data collection began on May 24, 2020, a few weeks after the government gradually removed some of the restrictions. Nevertheless, at that time, older adults were strongly encouraged to stay at home and minimize unnecessary personal contact. This study was approved by the university ethics committee (number 0001270).

Participants

We aimed to recruit 30 older adults from various parts of Israel, which would be split into two groups of 15 participants. Based on the experience of the research team members, this ratio of instructors to participants would allow for proper monitoring and individual feedback provision. Recruitment was done via advertisements in social media, mostly by posting in various Facebook groups (Facebook Inc., Menlo Park, CA). Inclusion criteria consisted of independent and ambulatory, community dwelling, older adults >60 years old who were medically approved to participate in moderate PA by a physician. Exclusion criteria consisted of medical conditions preventing PA including any acute orthopedic, neurological, cardiovascular, or vestibular conditions that may elevate the risk of injuries and falls. Interested candidates filled out an online form (Google LLC., Mountain View, CA) where they indicated their demographic (e.g., place of residence) and anthropometric data (e.g., height and weight). The candidates were asked to report their current level of PA and a basic self-reported health status. The recruitment stages included screening for initial eligibility of interested candidates according to the inclusion criteria. We then contacted eligible candidates via a telephone call and asked them to provide medical clearance to participate in group PA classes from their general physician. Once a scanned copy of the medical clearance was delivered via email the preparation procedure (see below) was initiated.

Preparation procedure

A team member scheduled a 15-min online introductory session with each participant using "Zoom video communications" (San-Jose, CA). The meeting included a technical explanation of how to use Zoom, a brief overview of the study goals and the required

equipment. The instructor then inspected the location of the exercise area, placement of device, and made sure there was a full view of the participant's body, including their feet. The five times sit-to-stand test was then explained and completed. Participants had to perform five repetitions in less than 15 s, as longer durations are associated with greater risk of falls [30]. If successful, participants were asked to sign the online informed consent form which was sent and signed via Google forms. This process was repeated until we reached the desired sample size. We note that all participants passed this test. The included participants were assigned to one of two groups, led by one of two instructors (I.H-N and T.W), according to their preferred schedule (either Monday and Thursday at 10 am or Sunday and Thursday at 10 am).

Measurements and procedures

Technological tools

We selected the Zoom video-conferencing application due to its popularity and user-friendly interface. Moreover, Zoom does not require participants to pre-install it on their devices nor does it require pre-registration, making it suitable for the target population. Participants were instructed to constantly use the same device, location, and settings throughout the intervention. Additionally, both instructors used WhatsApp group chats (Facebook Inc., Menlo Park, CA) to deliver updates and reminders. A third team member (H.S) who served as the technical assistant was included in both WhatsApp groups. Assuming technical challenges arose during the sessions, participants had the choice of asking for help in the group chat or in a private message.

Protocol design

Coming to an initial agreement about the PA protocol required approximately eight, 90-min meetings. The research team included two physiotherapists (H.S and T.W) and two personal trainers (I.H-N and I.H) with extensive experience in training older adults. During those meetings, we attempted to integrate the best available evidence from established PA guidelines [31–33], while considering foreseeable logistical challenges (e.g., location of the chair relative to the screen), safety concerns, equipment availability (e.g., water bottles and cans) and ways to adjust exercise intensity in an individualized manner (see below). The agreed upon protocol was then piloted on three different occasions, on three older adults. After each pilot session, we asked the participants to freely express their experience (e.g., perceived level of difficulty and the delivery via Zoom). This feedback led to additional, albeit minor modifications. The final protocol lasted approximately 45 min and consisted of warm-up, resistance training, aerobic, and mobility components. We agreed that we might modify some aspects of the protocol after a few weeks as a function of the feedback collected via biweekly surveys (see below). The exercises and their order can be seen in Table 1. A video of the protocol, including exercise demonstrations, can be found in the following link https://bit.ly/30qplcy (note that weeks 1–4 and 5–8 are referred to as "phase 1" and "phase 2" respectively in the video).

Equipment, exercises, and rest intervals

The required home-based equipment consisted of a stable chair with a backrest and without armrests, two shopping bags, weighted items such as cans, sugar or flour bags, and a towel. We selected resistance exercises targeting the major muscle groups of the lower and the upper extremities and the body's center. Aerobic exercises were selected to raise the participant's heart rate without risk of falling (e.g., jumping). Work to rest ratio in weeks 1–4 was set to 20:30 s, respectively (15 s each side for unilateral exercises), and in weeks 5–8 to 30:30 (20 s each side for unilateral exercises).

Effort regulation

To individualize the exercise sessions, we used time based sets during which participants regulated exercise intensity by monitoring their rating of perceived effort (RPE) using a modified Borg CR-10 scale, ranging from 0 (no effort) to 10 (maximum effort one can apply in a specific task) [34]. We selected a target rating of 6/10 for all exercises, which was increased to 7/10 after the fourth week, based on previous studies and recommendations [17, 32, 35]. Prior to the first session, participants were requested to watch a 5-min video we prepared that included explanations on how to use the RPE scale. Specifically, participants were instructed on how to modify different variables of each exercise to increase or decrease the level of effort (e.g., tempo, load). The maximum effort was explained to be task-specific [36] which was anchored per exercise. For example, in the "walking in place" exercise, "10" was set as the fastest tempo one can walk at (see Table 1).

Individualization and motivation

In order to promote motivation and adherence to exercise, we implemented a number of strategies. First, instructors emphasized positive feedback and encouraging statements throughout the sessions (e.g., "You are looking great today"), which are known to increase positive affect, the sense of competence and future intentions to exercise [37, 38]. Second, we decided that each participant would receive at least one feedback from the instructor in each session that involves mentioning their name. We anticipated that by doing so participants will feel acknowledged and their sense of relatedness would be greater [37]. Third, the effort regulation approach implemented (see above) was expected to

Table 1 | Exercise Protocol

Exercise	Work-rest ratio (seconds). Phase 1/Phase 2	RPE anchoring (0 = no action)	Increase (↑) and decrease (↓) exercise difficulty
Strength component			
Sit to stand from a chair	20/30 X2	10 = maximum reps in 20 s	↑ ↓ tempo/ROM ↓ arms support
Shoulder flexion and abduction w/cans or filled bags[a]	20/30 X2	10 = cannot complete another rep[b]	↑ ↓ load/tempo/ROM ↓ flex elbows
Lunges in place (hands on wall)	15/30 (each leg) X2	10 = maximum reps in 15 s	↑ ↓ stance ↑ ↓ length/tempo/ROM
Squeezing a towel (draining water)	20/30 X2	10 = cannot continue squeezing	↑ ↓ force ↓ lower elbows
Standing pushups against a wall[a]	30/30 X2	10 = cannot complete rep[b]	↑ ↓ tempo/ROM
Standing hip abduction (hands on wall)	15/30 (each leg) X2	10 = cannot complete rep[b]	↑ ↓ tempo/ROM
Pressing a towel—palm to palm behind the lower back	20/30 X2	10 = cannot continue pressing	↑ ↓ squeezing force ↓ flex elbows
Bent over row w/ cans or filled bags[a]	20/30 (each arm) X2	10 = cannot complete rep[b]	↑ ↓ load/tempo/ROM
Pressing towel—hand to opposite knee	20/30 X2	10 = cannot continue pressing	↑ ↓ squeezing force
Seated side bend w/cans or filled bags	30/30 X2	10 = cannot complete rep[b]	↑ ↓ load/ROM
Shoulder internal and external rotation	20/30 X2	10 = cannot complete rep[b]	↑ ↓ load/ROM
Standing biceps curls w/cans or filled bags[a]	30/30 X2	10 = cannot complete rep[b]	↑ ↓ load/tempo/ROM
Aerobic component			
Walking in place with high knees	30/15 X3	10 = perform task as fast as possible	↑ ↓ tempo/knee height
Straight punches in standing position	30/15 X3	10 = perform task as fast as possible	↑ ↓ tempo/ROM
Step touch[a]	30/15 X3	10 = perform task as fast as possible	↑ ↓ tempo/ROM

Warm up: 3–5 min of mobility and cardiovascular preparation: arm and wrist circles, trunk rotation, hip external rotation, walking in place.
Mobility and cool down: hip stretch in external rotation, seated hip extensors stretch, reach up, hands behind back, torso rotations, neck mobility.
REP repetitions; *ROM* range of motion; *RPE* rating of perceived exertion.
Work intervals increased at week 3 from 20 to 30 s and from 15 to 20 s.
[a]Exercises introduced at weeks 5–8.
[b]Cannot complete another repetition despite attempting to do so.

elicit a greater sense of control over one's actions as participants were required to monitor and regulate their efforts on their own. Allowing people to control their actions by providing them with certain choices regarding their surrounding increases psychological well-being [39, 40] and positive affective responses [41]. Hence, in addition to the benefits of using RPE scales to regulate exercise intensity, it may positively influence motivational aspects.

Surveys

We sent a biweekly survey to the participants approximately 2 hr after the last session of weeks 1, 3, 5, and 7 via Google forms in order to evaluate their experiences of the protocol (Table 2). Participants were asked to respond within 48 hr. The survey included six Likert items concerning the satisfaction levels with the implemented technology and the PA protocol and included an open-ended section in which participants were able to freely share their perspectives on the protocol. We discussed the survey's results during our weekly team meetings and integrated them in the decision-making process regarding protocol modification. A final survey was sent to the participants after the last session (16th) and they were asked to respond within 48 hr. The survey consisted of 14 Likert items concerning satisfaction levels with the technological aspects, satisfaction with the protocol (e.g., exercise variety and enjoyment), and future intentions to participate in similar programs (Table 3). Additionally, participants were given the opportunity to describe in their

Table 2 | Bi-weekly Surveys Results

	Median score (range)			
Likert item	Week 1	Week 3	Week 5	Week 7
A: Technology. Scores range from 1 = very little to 6 = very much.				
To what extent did you find "Zoom" easy to operate?	6 (1–6)	6 (2–6)	6 (2–6)	6 (3–6)
How satisfied were you with the quality of the audio during the sessions?	5 (1–6)	5 (3–5)	6 (2–6)	6 (2–6)
How satisfied were you with the quality of the video (image) during the sessions?	6 (1–6)	6 (3–6)	6 (3–6)	6 (5–6)
B: Protocol. See score range for each item.				
To what extent did you find the rating of perceived exertion scale (0–10) convenient to use? 1 = not at all, 5 = very much.	4 (2–5)	4 (2–5)	4 (3–5)	4 (3–5)
The exercise surrounding was comfortable for me. 1= not at all, 5 = very much.	5 (4–5)	5 (3–5)	5 (4–5)	5 (3–5)
The difficulty level was:		Percent		
1 = too easy	22%	16%	9%	11%
2 = right for me	78%	79%	91%	89%
3 = too hard	0%	5%	0%	0%
C: Qualitative feedback ("please make any additional comments")				
Examples of comments regarding technology	"Make sure the connection is stable before the class begins"	"The quality of the sound can be improved."	"It bothers me when the microphones are not muted"	"For a home-based situation, the setting is just fine"
Examples of comments regarding the exercise protocol	"Some exercises are more difficult than others"	"The concept of effort is not clear."	"I would like to receive more feedback"	"I prefer a greater exercise selection"

Items were translated to English.

own words the advantages and disadvantages of the intervention, and how participation in it influenced other aspects of their lives (e.g., societal and emotional). Examples of the responses to the open-ended questions are presented in the results section.

Documentation, adherence, and dropout

The instructors kept detailed record of the sessions in a logbook containing attendance, injuries, or other adverse events and any technological or personal issues that arose. Attendance was verified by name-reading at the beginning of each session. Participants were asked to inform the instructor if they were unable to attend and the underlying reason for unattendance which was also recorded in the logbook. If a participant indicated a medical reason for the missed session, the instructor inquired about it via a text message.

Analysis

First, we calculated the potential number of entries by multiplying the number of participants by the number of sessions. We then calculated the proportion of actual attendance as a percent of the potential attendance. Second, we extracted all data from the surveys into a spreadsheet and analyzed the variables for frequencies, central, and distributional values. Nominal data are presented as frequency (percent) and ordinal data are presented as median and range. Analysis was conducted using Excel (Microsoft, Washington). The answers to the open-ended questions were extracted separately and translated to English by the first author. They were then coded according to main identified themes, in line with Halperin et al. [42], to assist with qualitative interpretation of the survey's results.

RESULTS

Thirty-one participates (20 women and 11 men) initially agreed to participate in this study. They were 71.5 ± 4 years old, had a BMI of 26.9 ± 4.2, and reported exercising for 2.3 ± 1.8 days per week (e.g., walking, Yoga, or Pilates sessions). All participants graduated from high school and the majority had academic education (n = 21, 67%). Most participants were from middle to middle-upper class backgrounds, as indicated by their self-reported income (n = 24, 7 missing values): below average (21%), average (54%) and above average (25%).

Table 3 | Final Survey Results

A: Technology	
Likert item	Median score (range)
To what extent did you find "Zoom" easy to operate?	7 (5–7)
How satisfied were you with the quality of the audio during the sessions?	7 (5–7)
How satisfied were you with the quality of the video (image) during the sessions?	7 (6–7)
B: Protocol	
How satisfied were you with the variety of exercises in the sessions?	7 (4–7)
To what extent did you find the rating of perceived exertion scale (0–10) convenient to use?	6 (3–7)
To what extent do you agree with the sentence: "I feel I received enough personal attention during training sessions."	7 (4–7)
How much did you enjoy training?	7 (5–7)
C: Intentions and adherence	
Would you like to continue with online training in the future if COVID-19 regulations continue?	Yes = 97%
Would you like to continue with online training in the future if COVID-19 regulations end?	Yes = 75% Maybe = 19% No = 6%
Assuming you wish to continue with this type of training, what is a weekly training frequency that will help you adhere to the training?	2 = 73% 3 =21% N/A = 6%
Assuming you wish to continue with this type of training, what is the duration of training that will help you adhere to the training?	30 min = 6% 45 min = 70% 60 min = 22% N/A = 2%
Would you be willing to pay the average group training fees in your area for this type of training?	Maybe = 50% Yes = 41% No = 6% N/A = 3%

All the items ranged from 1 = very little to 7 = very much. Values are median (range). Items were translated to English.

Approximately half were retired, and the other half were still working part or full time.

Twenty-eight participants completed the intervention. One participant dropped out prior to the first session for personal reasons unrelated to the study. This participant's entries were not included in the adherence calculation. Two participants of the remaining 30 dropped out after week 5, one due to back pain unrelated to the study, and the other due to schedule conflicts. Their missed entries were included in the adherence calculation. Overall, 435 entries were recorded out of the potential 480 entries (90% adherence). Nineteen participants (68%) missed up to one session. The reasons for missing a session consisted of five work-related issues, 26 personal reasons (e.g., family matters and doctor appointments), and 13 medical reasons unrelated to the study of which 11 entries were missed due to back pain and two due to not feeling well. Note that eight out of the 11 documented back pain episodes were from a single participant who was one of the two that eventually dropped out from the study at week 5. After she missed two sessions due to back pain, the instructor called to inquire if the pain may be related to the sessions. The participant explained that she suffers from chronic back pain that periodically worsens. She was under the impression that the sessions were not related to her painful back since the pain did not increase during or after the sessions. We coded the rest of her missed entries as "medical reasons-back pain" and included them in the adherence analysis.

The bi-weekly surveys and their results are presented in Table 2. Based on the survey's results, we decided to change some of the exercises at the end of the fourth week. These changes included more standing exercises and increasing the weight of the items inside the grocery bags (see Table 1). Throughout the study, there was a change in the perceived difficulty level of the protocol: in weeks 1 and 3 approximately 79% of the cohort indicated that the level of difficulty was right for them, whereas in weeks 5 and 7 the rates increased to approximately 90%. The final survey's results are presented in Table 3. Satisfaction with the technological aspects of Zoom, the protocol, and the RPE scale were very high with median scores >6. The intention to continue training in similar programs in the case of continued quarantine was higher (97%) than in the possibility of returning to regular routine (75%). For the most part, participants did not require technical assistance during the sessions. The eight occasions in which participants contacted the technical assistant concerned login difficulties, unstable internet connection, and inability to turn on the camera. All issues were easily resolved.

The qualitative analysis of the open-ended questions revealed a number of answers that tended to repeat themselves. First, participants reported that participation in the program had a positive effect on their physical and mental wellbeing and reduced their loneliness and boredom. As stated by one participant: "I enjoyed exercising in a group as I did not feel alone during the sessions." Second, participants enjoyed, and found considerable value in the live interaction with the instructor. Some have stated that more frequent feedback would have improved their experience further. As stated by another participant: "I enjoyed how the instructor explained and demonstrated the exercises, and the personal feedback provided to me during the sessions." Third, many stated that the protocol could be improved by introducing more variability. For example, one participant suggested that the exercises could be changed every 2 weeks, rather than once a month.

DISCUSSION

The purpose of this study was to develop and examine the feasibility of a live, online, group PA protocol among older adults. Twenty-eight community dwelling older adults completed eight weeks of a PA protocol that included resistance, aerobic and mobility components. The protocol was delivered via simple and accessible technological tools which did not require registration or installation of equipment, or any face-to-face interactions. Participants completed the protocol without any adverse events, with high adherence and satisfaction rates. We have shown that this PA protocol is feasible with community dwelling older adults training at home, and encourage further exploration of this approach in randomized controlled trials.

Designing the protocol was a challenging undertaking as various aspects had to be accounted for. The safety aspect was one of our major concerns, as the consequences of a fall may be severe. Whereas in some online PA studies preliminary home-visits were included to ensure that the exercises are performed safely [14, 15, 18, 43], this was not a feasible option in the current study due to social distancing recommendations. Accordingly, we followed a more defensive approach as indicated by a number of steps. First, our inclusion criteria included only those with medical clearance to participate in PA, and those who performed the sit-to-stand test faster than the cutoff time of 15 s, to confirm basic functional capacity [30]. Second, an emergency contact number was required for each participant, in case an adverse event occurred. Finally, while our protocol included some exercises used in common fall prevention programs, such as the Otago exercise program [33], we included more resistance exercises rather than balance exercises. Since each instructor had to monitor 15 participants using one screen, we felt that the possible risks outweighed the benefits. These precautions seem to have been effective as no adverse events occurred during the sessions. Conversely, they might have led to selection bias and sub-optimal physical or functional adaptations.

Another aspect that required attention was how to individualize the level of effort. Several online PA studies used RPE scales to assist participants in regulating their effort and repetitions number [15–18]. This approach accounts for individual differences in abilities [44, 45] which is why we decided to use it in the present study. We instructed participants to reach an RPE value of 6–7 during all exercises and explained how they can modify certain aspects of each exercise to increase or decrease effort. This strategy was deemed successful as most participants reported that they understood the scale and were able to use it. Moreover, in order to fulfill participants' psychological need of relatedness [39], we aimed to create personal interactions with participants, in which the instructors provided at least one corrective or encouraging feedback in each session while stating the name of each participant. This personal approach was mentioned by many participants as a positive aspect of the program.

A number of online PA studies delivered exercise equipment to participants homes, with resistance bands being the most common item [14, 15, 17, 18, 43]. We considered providing participants with exercise equipment but decided against it for two reasons. First, delivering the items to participant's homes before May 24, 2020 was not possible due to COVID-19 restrictions. Second, we agreed that using home-based equipment would increase the external validity of the study. While participants reported high satisfaction rates with the protocol, a number of them reported that the exercise selection was too limited for their taste. Accordingly, future studies can consider including additional exercises to the ones used in the present study. This can be done by delivering exercise equipment, such as resistance bands, to participants' homes, or by using other items that are present in most households. Both options will allow for a greater variety of exercises.

This feasibility study has a number of limitations worthy of discussion. First, no physiological or functional outcome measures were collected before or after the intervention, which limits what can be concluded about the usefulness of this protocol. Second, our sample was small, and we did not include a control group. The main reason for our decisions was that we aimed to act fast. This study took place during the first COVID-19 wave, and by adding more layers of complexity, we would have had to spend longer durations in planning and in recruiting, which could have come at the expense of capturing the "real-time" influences of the quarantine. Third, most participants had academic education and were classified as middle class. It is unclear if the implemented protocol would work as well among participants of lower socioeconomic background as they may have less experience in operating such technologies. In view of the above, future studies should implement randomized controlled trial designs and collect health, performance, and psychological outcomes before and after completing the online PA protocol, or others like it. Moreover, it is of value to examine if the responses to the protocol are consistent among a range of populations.

CONCLUSION

The protocol designed by our group was found to be feasible with this cohort: it is safe, led to high adherence and satisfaction rates, and the use of RPE scale to individualize effort was understood by participants. While more research is clearly required, we conclude that live, online, group PA sessions delivered via video-conferencing platforms might hold

the potential to confront the problem of reduced PA in older adults.

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Compliance with Ethical Standards

Conflicts of Interest: The authors declare that they have no conflict of interests.

Human Rights: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants included in the study

Welfare of Animals: This article does not contain any studies with animals performed by any of the authors.

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