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The Intensity of Chair-Assisted Exercises in Cognitively Healthy Older Adults

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Introduction: The American College of Sports Medicine prescribes regular performance of at least moderate-intensity physical activity for healthy aging. This study examined whether 1 session of 30 min of chair-assisted exercises for the elderly meets this intensity criterion. ***Method:*** This cross-sectional study included 47 cognitively healthy volunteers (mean age 84 years). During the performance of 30 min of chair-assisted exercises the authors determined oxygen uptake (VO_2), carbon dioxide production, heart rate (HR), and rating of perceived exertion (RPE). These measures were expressed as a percentage of the estimated maximal VO_2 (VO_{2max}) and the estimated maximal HR (HR_{max}) and estimated as metabolic equivalent units (METs). ***Results:*** Participants performed chair-assisted exercises at 61.0% ± 14.7% of VO_{2max}, 67.6% ± 11.3% HR_{max}, 3.9 ± 0.9 METs, and 13.1 ± 2.1 RPE. ***Conclusions:*** The intensity of these chair-assisted exercises is at least moderate for older adults, which is necessary for healthy aging.

Keywords: aerobic exercise, energy expenditure, elderly, rehabilitation

Regular physical activity can help reduce age-related cognitive decline and comorbidities such as cardiovascular disease (Chodzko-Zajko et al., 2009). A little physical activity is better for health than none, but for most health aspects, additional benefits occur when people increase the amount and/or intensity of physical activities (Chodzko-Zajko et al., 2009). The American College of Sports Medicine prescribes that all adults regularly perform physical activity of at least moderate intensity for healthy aging (Chodzko-Zajko et al., 2009). Multiple measures are used in the literature to determine the intensity level, that is, percentage of maximal oxygen uptake ($\%VO_{2max}$); percentage of maximal heart rate ($\%HR_{max}$); energy expenditure, or metabolic equivalent units (METs); or a subjective rating of perceived exertion (RPE). Each of these measures has a threshold that should be reached for (at least) moderate intensity. For example, an unfit person is exercising at moderate intensity when the following thresholds are gained: 40% of VO_{2max} (Swain & Franklin, 2002), 64% of HR_{max}, 2.0 METs (for people age >80 years), or 12 on the RPE scale (American College of Sports Medicine, 2006). These values

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could be considered thresholds; higher scores on these measures indicate a higher intensity level (Swain & Franklin, 2002).

A widely applied type of physical activity for the oldest age group in, for example, long-term care is a group activity that is performed on and behind a chair (chair-assisted exercises) to guarantee safety (Edwards, Gardiner, Ritchie, Baldwin, & Sands, 2008), as older people may have balance problems (Deandrea et al., 2010). For many other daily activities the intensity is known (Ainsworth et al., 2000), but it is unclear whether chair-assisted exercise for older adults is of (at least) moderate intensity—the recommended intensity level for healthy aging. Therefore, the goal of this study was to examine the level of physical intensity of 30 min of chair-assisted exercises consisting of endurance, strength, and balance exercises on and behind a chair.

Methods

Participants

This study sample consisted of 47 volunteers (17 men) varying from independent living (n = 13) to assisted-living (n = 24) and nursing home residents (excluding psychogeriatric wards, n = 10). Mean age was 84.1 ± 5.6 years; mean systolic and diastolic blood pressure were 148 ± 24 mmHg and 77 ± 13 mmHg, respectively; body-mass index (BMI) was 25.3 ± 3.4 kg/m^2; and the level of global cognitive functioning was 27.0 ± 2.1 on the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975; see Table 1). Participants were excluded from the study if they were younger than 70 years, not able to walk short distances with or without a walking aid, or suffering from a cognitive impairment (MMSE < 23). Participants' medical history showed comorbidities that were representative of the general population of this age (Eggermont, van Heuvelen, van Keeken, Hollander, & Scherder, 2006). Fifteen participants used β-blockers during their participation in this study, and 3 participants used other heart-rate-reducing medication (amiodaron, flecainide). The latter 3 participants were not included in either the non-β-blocker users or the β-blocker users group. This study was approved by the medical ethics committee of VU University Medical Center, and all participants signed informed-consent forms.

Table 1 Participant Characteristics

Characteristic	*M*	*SD*	*n*	Median	Range
Age (years)	84.1	5.7	47	84.0	71.0–96.0
Mini-Mental State Examination score	27.0	2.1	47	28.0	23.0–30.0
Diastolic pressure (mmHg)	77	13	46	76	47–120
Systolic pressure (mmHg)	148	24	46	148	97–217
Body-mass index	25.3	3.4	47	25.4	17.0–32.5
Education level	4.4	1.4	35	4.0	2.0–7.0

Note. Education level is based on a 7-point scale on which 7 is the highest education and 1 the lowest (Verhage, 1964).

Procedure

Participants performed one session of 30 min of chair-assisted exercises (see Figure 1) once in our laboratory, with 1 or 2 participants at the same time. Before exercising, participants had to place a soft mask over mouth and nose to measure oxygen consumption (VO_2) and carbon dioxide production (VCO_2) and a Polar Vantage belt to measure heart rate (HR). They were able to get used to the mask and belt for approximately 5 min. Thereafter, the exercises of a specially designed program for older adults started. These exercises were designed by a human movement scientist and were a combination of endurance, strength, and balance exercises, since multicomponent interventions show the best improvements in functioning (Blankevoort et al., 2010). Two instructors demonstrated the exercises while motivating the participants. Participants performed the exercises at a level of intensity that was comfortable for them. While performing the chair-assisted exercises for 30 min, VO_2, VCO_2, and HR were measured continuously. Directly after cessation of the exercises participants rated their perceived intensity on a Borg RPE scale (Borg, 1998).

Outcome Variables

VO_2 during the performance of 30 min of chair-assisted exercises was determined by use of an Oxycon Alpha. The Oxycon Alpha is a valid and reliable online system for the measurement of parameters of respiration, at least at workloads up to 150 W (Carter & Jeukendrup, 2002). This system consists of a soft mask to sample exhaled air to measure VO_2 and VCO_2 every 5 s.

VO_2. The VO_2 (and VCO_2) measures fluctuated between the different exercises. The mean intensity of the 30-min session of chair-assisted exercises was calculated and expressed as mean VO_2 (L/min) and mean VO_2 per kilogram of body weight (ml $\cdot$ min^{-1} $\cdot$ kg^{-1}). To estimate whether VO_2 was of at least moderate intensity, it was recalculated as a percentage of participants' estimated VO_{2max} by the same method as a comparable study for people age 55–86 years (Eggermont et al., 2006). The VO_{2max} regression equations for men were

$$VO_{2max}\ (\text{L/min}) = -0.034 \times \text{age} + 4.142$$

and

$$VO_{2max}\ (\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}) = -0.31 \times \text{age} + 44.23$$

and for women,

$$VO_{2max}\ (\text{L/min}) = -0.019 \times \text{age} + 2.518$$

and

$$VO_{2max}\ (\text{ml} \cdot \text{min}^{-1} \cdot \text{kg}^{-1}) = -0.25 \times \text{age} + 36.63$$

HR. HR was determined by use of a Polar Vantage belt. HR fluctuated between the different exercises, but to determine the mean intensity of the complete 30 min of exercises, the mean HR over the 30 min was determined. To estimate whether this HR was of at least moderate intensity, it was recalculated as a percentage

10 min **Standing**	30 s stepping while standing in place♦ 30 s rotate trunk (look over shoulder to the back) ♦ 30 s rotate each ankle: Turn 7 s left and 7 s right♦ 30 s rotate shoulders: Turn 15 s forward and 15 s backward♦ 30 s hula-hoop movements: Turn 15 s left and 15 s right♦ 30 s standing on toes: fast up and down 30 s standing on toes: slow up (stay 3 s up) and down 30 s standing on toes: fast up and down♦ 90 s bring knee to chest, stay 3 s in position and back: 45 s left leg and 45 s right leg♦ 90 s bring straight leg backwards up, stay 3 s in position and back: 45 s left leg and 45 s right leg♦ 90 s bend the knees: slow down and up. If possible, stay 3 s in down position◊
10 min **Sitting**	50 s walk movements: with arms and legs♦ 50 s sit-stand-sit♦ 50 s bring straight leg up: slow up (stay 3 s up) and down: 25 s left leg and 25 s right leg ♦ 50 s walk movements: with arms and legs♦ 50 s boxing: 25 s left arm and 25 s right arm♦ 50 s bring knee to chest, stay 3 s in position and back: 25 s left leg and 25 s right leg♦ 50 s stomp on floor: alternating left and right♦ 50 s both legs lifting: slow up (stay 1 s up) and down♦ 50 s sit-stand-sit♦ 50 s walk movements: with arms and legs◊
10 min **Standing**	30 s standing on toes: fast up and down 30 s standing on toes: slow up (stay 3 s up) and down 30 s standing on toes: fast up and down♦ 90 s bring knee to chest, stay 3 s in position and back: 45 s left leg and 45 s right leg♦ 90 s bring straight leg backward up, stay 3 s in position and back: 45 s left leg and 45 s right leg♦ 90 s bend the knees: slow down and up. If possible, stay 3 s in down position♦ 30 s stepping while standing in place♦ 30 s rotate trunk (look over shoulder to the back) ♦ 30 s rotate each ankle: Turn 7 s left and 7 s right♦ 30 s rotate shoulders: Turn 15 s forward and 15 s backward♦ 30 s hula-hoop movements: Turn 15 s left and 15 s right

Figure 1 — The 30-min chair-assisted aerobic exercise session. ♦ 10 s rest until next exercise; ◊ 15 s rest until next exercise.

of participants' estimated HR_{max}, which was estimated by 220 – age. The mean percentage of HR_{max} was determined for the whole group (n = 44, because HR measure failed in 3 participants) and for the group of non-b-blocker users (n = 26), because β-blockers (n = 15) reduce HR (Parakh & Bhargava, 2011).

Energy Expenditure. Mean energy expenditure was determined from the mean VO_2 and VCO_2 measures by the following formula (Garby & Astrup, 1987):

$$\text{Energy expenditure (J/s)} = VO_2 \text{ (L/s)} \times [16{,}040 + (VCO_2/VO_2) \times 4{,}940]$$

Mean intensity of the activities was also expressed as an estimated number of METs; 1 MET is generally assumed to be 3.5 ml · min^{-1} · kg^{-1} (Ainsworth et al., 2000), but due to the high age of participants this resting metabolic rate is probably overestimated (Kozey, Lyden, Staudenmayer, & Freedson, 2010). Therefore, the Harris-Benedict equation (Harris & Benedict, 1918) was used to estimate the resting metabolic rate as recommended recently for this age group (Kozey et al., 2010); for men the resting metabolic rate in kilocalories per day is 66.4730 + 5.0033 × height (cm) + 13.7516 × weight (kg) – 6.7550 × age (years), and for women it is 655.0955 + 1.8496 × height (cm) + 9.5634 × weight (kg) – 4.6756 × age (years). To convert these kilocalories per day to ml · min^{-1} · kg^{-1}, the following formula was used: kcal · day^{-1} · $1{,}440^{-1}$ = kcal/min; kcal · min^{-1} · 5^{-1} = L/min; L · min^{-1} · weight $(kg)^{-1}$ × 1,000 = ml · min^{-1} · kg^{-1}.

RPE. Borg's standard 6–20 RPE scale was used to measure the participants' subjective level of perceived intensity (Garcin, Vauiert, Vandewalle, & Monod, 1998).

Statistical Analysis. All continuous variables were tested for normality by Kolmogorov-Smirnov statistics. Means and standard deviations for the whole group were calculated for all variables with Statistical Package for the Social Sciences 17.0. These means were used to define at what intensity level the group was exercising. Differences in variables between β-blocker users and non-β-blocker users, as well as between men and women, were analyzed with the Mann-Whitney *U* tests. Differences between living situations— independent living, assisted living, or nursing home—were analyzed with a Kruskal-Wallis test. Spearman correlations between the outcome variables were performed to indicate whether the different variables represent the same construct "physical intensity." To determine possible influencing characteristics on the performed intensity, Spearman correlations between characteristics (MMSE, age, education, BMI, blood pressure) and outcome variables were analyzed.

Results

All continuous variables were normally distributed for the whole group and for subsets of the group ($p > .05$): β-blocker users, non-β-blocker users, independent living, assisted living, and nursing-home residents.

VO_2

Mean VO_2 was 681 ml/min and 10.0 ml · min^{-1} · kg^{-1} (see Table 2). This is 66.0% and 61.0% of the estimated VO_{2max}, respectively. The $\%VO_{2max}$ (mL/min and ml

Table 2 All Measured and Estimated Outcome Variables During 30 min of Chair Exercises

Measured variable	*M*	*SD*	Median	Range	*n*	Estimated variable	*M*	*SD*	Median	Range
VO_2 (ml/min)	681	196	674	312–1,265	47	$\%VO_{2max}$ (L/min)	66.0	16.5	66.9	30.3–115.8
β-blocker users			611	312–893	15	β-blocker users			54.6	30.3–77.7
non-β-blocker users			688	462–1,265	29	non-β-blocker users			69.9	43.8–115.8
VO_2 ($ml \cdot min^{-1} \cdot kg^{-1}$)	10.0	2.5	9.8	5.2–15.7	47	$\%VO_{2max}$ ($ml \cdot min^{-1} \cdot kg^{-1}$)	61.0	14.7	62.2	32.9–87.8
β-blocker users			7.7	5.2–11.9	15	β-blocker users			50.3	32.9–67.7
non-β-blocker users			10.5	6.2–15.7	29	non-β-blocker users			65.4	35.9–87.8
Heart rate (beats/min)	92	16	94	61–131	44	$\%HR_{max}$ (beats/min)	67.6	11.3	68.1	44.9–95.5
β-blocker users			83	62–101	15	β-blocker users			59.1	47.8–74.0
non-β-blocker users			99	84–131	26	non-β-blocker users			72.9	62.2–95.5
VCO_2 (ml/min)	610	188	596	270–1,150	47	METs	3.90	0.93	3.90	2.01–6.09
EE ($J \cdot s^{-1} \cdot kg^{-1}$)	3.41	0.86	3.36	1.82–5.37	47	β-blocker users			3.01	2.01–4.68
RPE	13.11	2.14	13.00	8.00–18.00	47	non-β-blocker users			4.16	2.51–6.09

Note. VO_2 = oxygen uptake; $\%VO_{2max}$ = percentage of maximal oxygen uptake; $\%HR_{max}$ = percentage of maximal heart rate; VCO_2 = carbon dioxide production; EE = energy expenditure; METs = metabolic equivalent units; RPE = rating of perceived exertion. *n* is lower for heart-rate data because data of 3 participants were unreliable.

· min^{-1} · kg^{-1}) was significantly higher for non-β-blocker users than for β-blocker users ($U = 8.2$, $p < .01$, and $U = 5.0$, $p < .03$ respectively). There was no difference in %VO_{2max} between men and women or between people in different living situations ($p > .05$).

HR

The whole group of participants reached a mean HR of 92 beats/min, which was estimated to be 67.6% HR_{max}. The non-β-blocker users performed at a higher %HR_{max} than the β-blocker users ($U = 37.5$, $p < .01$). There was no difference in %HR_{max} between men and women or between people in different living situations ($p > .05$).

Energy Expenditure

Mean energy expenditure was 3.41 J · s^{-1} · kg^{-1}. Mean intensity was estimated to be 3.9 METs. Energy expenditure was not different between β-blocker users and non-β-blocker users or between men and women ($p > .05$). The number of METs was significantly higher for non-β-blocker users than for β-blocker users ($U = 337.0$, $p < .01$). There was no difference in number of METs between men and women or between people in different living situations ($p > .05$).

RPE

Mean RPE score was 13.1, and RPE did not differ between β-blocker users and non-β-blocker users, between men and women, or between people in different living situations ($p > .05$).

Correlations

All outcome variables based on objective measures (%VO_{2max} [L/min], %VO_{2max} [ml · min^{-1} · kg^{-1}], energy expenditure [J · s^{-1} · kg^{-1}], %HR_{max}, METs) showed significant positive correlations with each other in the whole group ($p < .05$; see Table 3). However, the subjective variable (RPE) was not related to any of the objective variables. In the group of β-blocker users only %HR_{max} was not related to any other variable.

Table 4 shows that systolic blood pressure was positively related to %VO_{2max} and number of METs. BMI was negatively related to %VO_{2max} (ml · min^{-1} · kg^{-1}) and positively related to RPE.

Discussion

The results suggest that older people perform chair-assisted exercises with an intensity that is above the moderate-intensity threshold for all outcome variables (%VO_{2max}, %HR_{max}, METs, RPE). The mean intensity performances of 66% VO_{2max} (L/min) and 61% VO_{2max} (ml · min^{-1} · kg^{-1}) are above the moderate-intensity threshold of 40% VO_{2max} (Swain & Franklin, 2002), regardless of use of β-blockers. The mean of 68% HR_{max} is also above the threshold of 64% HR_{max} (American College of Sports Medicine, 2006), but this threshold is not reached by people who

Table 3 Spearman's rho Correlations Between the Outcome Variables

	$\%VO_{2max}$ (L/min)	$\%VO_{2max}$ (ml · min^{-1} · kg^{-1})	METs	EE (J · s^{-1} · kg^{-1})	RPE
$\%HR_{max}$	.51**	.56**	.53**	.53**	–.19
non-β-blocker users	.44*	.68**	.56**	.64**	–.12
β-blocker users	–.04	–.10	–.08	–.04	–.03
$\%VO_{2max}$ (L/min)		.84**	.81**	.75**	.02
non-β-blocker users		.73**	.69**	.61**	.14
β-blocker users		.89**	.92**	.84**	.00
$\%VO_{2max}$ (ml · min^{-1} · kg^{-1})			.87**	.88**	–.12
non-β-blocker users			.81**	.82**	–.13
β-blocker users			.95**	.91**	.00
METs				.98**	–.21
non-β-blocker users				.98**	–.26
β-blocker users				.94**	–.01
EE (J · s^{-1} · kg^{-1})					–.23

Note. $\%VO_{2max}$ = percentage of maximal oxygen uptake; METs = metabolic equivalent units; EE = energy expenditure; RPE = rating of perceived exertion; $\%HR_{max}$ = percentage of maximal heart rate.

*$p < .05$. **$p < .01$.

Table 4 Spearman's rho Correlations Between Characteristics and Outcome Variables

	Age	BMI	Education	MMSE	DBP	SBP
$\%HR_{max}$	.07	–.22	.06	.16	.07	–.04
non-β-blocker users	.06	–.32	–.04	.34	.20	.10
β-blocker users	.09	.00	.56	.33	.16	–.19
$\%VO_{2max}$ (L/min)	.19	.11	–.19	–.13	.26	.33*
non-β-blocker users	.15	.35	–.11	–.08	.12	.26
β-blocker users	.25	–.01	–.45	–.06	.36	.27
$\%VO_{2max}$ (ml · min^{-1} · kg^{-1})	.23	–.30*	–.26	–.16	.22	.30*
non-β-blocker users	.20	–.21	–.12	.02	.12	.29
β-blocker users	.20	–.28	–.51	–.19	.27	.14
METs	–.07	–.07	–.08	.01	.21	.30*
non-β-blocker users	–.21	.04	.09	.15	.08	.26
β-blocker users	.14	–.08	–.42	–.05	.32	.28
Energy expenditure (J · s^{-1} · kg^{-1})	–.11	–.20	–.14	.06	.19	.27
Rating of perceived exertion	.21	.29*	–.16	–.22	.06	–.04

Note. BMI = body-mass index; MMSE = Mini Mental State Examination; DBP = diastolic blood pressure; SBP = systolic blood pressure; $\%HR_{max}$ = percentage of maximal heart rate; $\%VO_{2max}$ = percentage of maximal oxygen uptake; METs = metabolic equivalent units.

*$p < .05$. **$p < .01$.

use β-blockers (59% HR_{max}), because these medications are known to reduce HR (Parakh & Bhargava, 2011). The mean intensity of 3.9 METS was also above the threshold of 2.0 METs (American College of Sports Medicine, 2006), regardless of use of β-blockers. The mean of 13 on the subjective RPE scale was also above the threshold of 12 (American College of Sports Medicine, 2006), regardless of use of β-blockers.

All outcome variables that are based on objective measures seem to assess the same construct physical intensity, because all objective measures are significantly correlated. Only in the group of β-blocker users, $\%HR_{max}$ was not related to any other variable, but this was expected since β-blockers reduce HR (Parakh & Bhargava, 2011) so HR is influenced during the exercises in this group. In contrast, the subjective outcome variable (RPE) was not related to any of the objective outcome variables. This shows that people do not perceive the intensity in the same way as the objective measures. Notably, it was difficult for participants to determine RPE for this program, since some exercises (e.g., sit-stand-sit) were more intense than others (e.g., standing on toes). In addition, participants continuously wore a soft mask during the exercises, which may have caused a "heavy" feeling in some people that may have influenced their perceived intensity. In addition, depressed people are less able to accurately perceive exercise intensity (Morgan, 1994). In 30% of the participants, depressive symptoms were assessed with the Geriatric Depression Scale (Yesavage, 1988) and Symptom Checklist-90 (Derogatis & Cleary, 1977). Within this group, RPE score correlated significantly with depressive symptoms (Spearman's rho = .72, $p < .01$; data not shown); we therefore argue that depressive symptoms may have influenced RPE; more depressive symptoms means higher perceived intensity.

The correlations between characteristics and the outcome variables show that BMI and systolic blood pressure are related to several outcome variables. People with higher BMI have lower cardiorespiratory fitness levels (Chen, Das, Barlow, Grundy, & Lakoski, 2010) than people with a lower BMI, which might cause them to perceive the exercises at higher intensity. However, people with a high BMI use a lower percentage of their VO_{2max} ($ml \cdot min^{-1} \cdot kg^{-1}$). This is probably caused by their high body weight; relative to their body weight people with high BMI use less oxygen per minute, while the absolute oxygen use is comparable as indicated by a nonsignificant relation between BMI and $\%VO_{2max}$ when expressed in L/min. Finally, systolic blood pressure is positively related to $\%VO_{2max}$ (in $ml \cdot min^{-1} \cdot kg^{-1}$ and L/min) and number of METs. People with high systolic blood pressure also have lower cardiorespiratory fitness levels (Chen et al., 2010). Therefore, the exercises seem to be more intense for their body than for people with lower systolic blood pressure. In contrast to people with high BMI, people with high blood pressure do not perceive the exercises as more intense than people with low blood pressure. This might be caused by their awareness; only 20% of people with high blood pressure are aware of it (Jonas, Nangia, Matin, Joshi, & Ughade, 2010).

There are several limitations in this study. First, all variables are descriptive and are shown as a percentage of the estimated maximum (VO_{2max} and HR_{max}) or as an estimation in METs. However, these percentages in VO_{2max} and HR_{max} might be underestimations due to the high proportion (32%) of participants who used β-blockers. In a population with a lower percentage of b-blocker users, the $\%VO_{2max}$

and $\%HR_{max}$ would probably be higher. These limitations, however, support the conclusion that these chair-assisted exercises are of at least moderate intensity. If possible, future research should determine VO_{2max} and HR_{max}, although this direct measurement is difficult in older adults (White, Fehlauer, Hanover, Johnson, & Dustman, 1998). Second, this study had a small sample size. However, there is no reason to assume that the results cannot be generalized since all continuous outcome variables show a normal distribution. Third, all participants were measured only once, so it is not known whether the intensity of these exercises remains comparable to the first time if performed more than once. Finally, this new program contains different exercises for upper limbs, body, and lower limbs, which are assumed to be endurance, strength, and balance exercises. Whether this program actually affects endurance, strength, and balance has not been examined. It is, however, more important that this program is of at least moderate intensity for healthy aging and that all exercises can be performed by many older people—with or without walking aids, with or without balance problems, with high or low fitness levels. Whether this program can be performed by people with cognitive impairment (MMSE < 23) is unknown and has to be examined.

A variety of people—living independently, in assisted-living communities, or in nursing homes—participated in this research. These participants were chosen to include a wide sample of cognitively healthy older adults with expected higher and lower fitness levels. It is clinically relevant that this exercise program can be performed by older adults with a sufficient intensity irrespective of their fitness level. The chair-assisted exercises of this study meet the intensity criterion for healthy aging (Chodzko-Zajko et al., 2009). The intensity of chair-assisted exercises is comparable to the intensity of walking in older people (Eggermont et al., 2006). It is known that walking may increase cognition, in particular executive functions (Kramer, Erickson, & Colcombe, 2006). We suggest that chair-assisted exercises might be beneficial for cognition too, particularly for those who are not able to walk anymore. Future research can examine the additional benefits of this program on cognition (e.g., executive functioning) and physical functioning (e.g., strength and balance).

Besides the possible cognitive and physical benefits, this chair-assisted program has practical benefits. First, chair-assisted exercises can be performed in a group with little risk of people disappearing from the instructor's field of view. Second, the exercises do not require the supervision of a person with special education, such as a physiotherapist, since the exercises are simple. Therefore, it is expected that most caregivers are suitable to supervise the exercises, which makes the exercise program very accessible. Third, it may be possible to instruct people by video, which would allow them to exercise at home, since the exercises can be performed anywhere. Finally, the exercises involve different muscle groups, include a variety of exercises that are recommended for older people (Chodzko-Zajko et al., 2009), and therefore appear a very suitable physical activity for this group.

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