



Self-selected exercise intensity for inactive hypertensive older women: a pilot study

Exercício em intensidade autosselecionada para mulheres idosas hipertensas inativas: um estudo piloto

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ABSTRACT

Self-selected exercise intensity (SSE) is a simple approach to encourage an active lifestyle. This study aimed to investigate whether a SSE session meet the recommended intensity for hypertension management (i.e. moderate-vigorous), and whether heart rate (HR), rating of perceived exertion (RPE) and affective responses are reproducible. Thirteen inactive hypertensive older women (age: 64.54 ± 4.16 years; blood pressure: 122.51/62.15 mmHg) performed two 30-minute SSE sessions outdoors. HR reserve (HRR), RPE and affective responses were assessed. Paired t-test, intraclass correlation coefficient (ICC) and typical error (TE) were used for the analyzes. Participants exercised at moderate-vigorous intensity (≥ 40% of HRR). No differences were found for HRR (56.46 ± 8.01% vs. 59.08 ± 10.57%), RPE (11.26 ± 1.14 vs. 10.98 ± 1.52) and affective response (3.47 ± 1.13 vs. 3.38 ± 1.23) (p > 0.05). RPE showed excellent reliability (ICC = 0.82; 95%CI: 0.42; 0.94; p = 0.003). There was a poor reliability for HRR (ICC = 0.40; 95%CI: -0.97; 0.82; p = 0.193) and affective responses (ICC = 0.19; 95%CI: -2.10; 0.76; p = 0.369). TE between sessions for HRR, RPE, and affective response were 8.11 bpm, 0.75 and 1.11, respectively. In conclusion, inactive hypertensive older women seem to meet the recommended intensity for hypertension management when they exercise at a self-selected pace and report it as light-moderate and pleasant. Despite only RPE, but not HR and affective response, has shown good reproducibility, the results seem to support the use of SSE as a simple approach to encourage an active lifestyle in this population.

Keywords: Exercise; Hypertension; Blood pressure; Physical exertion; Affect.

RESUMO

O exercício em intensidade autosselecionada (ELA) é uma abordagem simples para encorajar um estilo de vida ativo. Este estudo investigou se o ELA atende a intensidade recomendada para tratamento de hipertensão (i.e. moderada-vigorosa), e se a frequência cardíaca (FC), percepção de esforço (PSE) e resposta afetiva são reprodutíveis. Treze mulheres idosas hipertensas inativas (idade: 64,54 ± 4,16 anos; pressão arterial: 122,51/62,15 mmHg) realizaram duas sessões de ELA de 30 minutos ao ar livre. FC de reserva (FCR), PSE e resposta afetiva foram avaliadas. Teste t pareado, coeficiente de correção intraclass (CCI) e erro típico (ET) foram analisados. As participantes se exercitaram em intensidade moderada-vigorosa (≥ 40% da FCR). Não houve diferença na FCR (56,46 ± 8,01% vs. 59,08 ± 10,57%), PSE (11,26 ± 1,14 vs. 10,98 ± 1,52) e resposta afetiva (3,47 ± 1,13 vs. 3,38 ± 1,23; p > 0,05). A PSE apresentou excelente confiabilidade (CCI = 0,82; IC95%: 0,42; 0,94; p = 0,003). Houve baixa confiabilidade da FCR (CCI = 0,40; IC95%: -0,97; 0,82; p = 0,193) e resposta afetiva (CCI = 0,19; IC95%: -2,10; 0,76; p = 0,369). O ET foi de 8,11 bpm, 0,75 e 1,11 para FCR, PSE e resposta afetiva, respectivamente. Em conclusão, mulheres idosas hipertensas inativas parecem atender a intensidade recomendada para tratamento da hipertensão quando realizam ELA e relatam a atividade como leve-moderada e prazerosa. Embora apenas a PSE, e não a FCR e resposta afetiva, tenha mostrado boa reprodutibilidade, os resultados parecem suportar o ELA como uma abordagem simples para encorajar um estilo de vida ativo nessa população.

Palavras-chave: Exercício; Hipertensão; Pressão arterial; Esforço físico; Afeto.

Introduction

Hypertension accounts for 9.4 million deaths/year and affects 40% of adults¹ and ≥ 60% of older adults², mainly inactive individuals³. Efforts should be made to reduce blood pressure (BP) and its associated risk factors in older hypertensive adults to attenuate the risk of

cardiovascular events and mortality¹. Aerobic exercise is a cornerstone of non-pharmacological therapy for hypertension². Hypertension guidelines recommend 30-60 minutes of moderate-intensity aerobic exercise most days of the week for hypertensive individuals⁴ in order to reduce resting⁵ and ambulatory⁶ BP. However,

a home-focused epidemiological Brazilian study demonstrated that 71.4% of hypertensive older adults are physically inactive⁷.

Strategies to enhance participation and long-term adherence in regular physical exercise are needed in hypertensive population. Self-selected exercise intensity (SSE) is an alternative approach to formal exercise prescription to enhance participation due its psychological advantages, including higher perceived autonomy, self-efficacy, affective response, and lower perceived exertion⁸⁻¹⁰. Specifically regarding the affective response, hedonic theory supports the link between affective response and future exercise intentions⁹ and engagement¹¹. For example, Williams et al.¹² have found that a more positive affective response during a single moderate-intensity exercise session was associated with a higher physical activity level six and 12 months later. A systematic review conducted by Rhodes and Kates¹³ also supports the link between affective response during exercise and future physical activity behavior, which is postulated by hedonic theory. In addition, previous study have shown that exercise intensity recommended by physical activity guidelines is meet exercising at a self-selected pace⁴. However, this is not clear in hypertensive older women.

The antihypertensive effect of exercise is a result of physiological adjustments to repeated exercise sessions¹⁴. A single session of aerobic exercise at moderate-vigorous intensity elicit reduction of BP up to 24-hour post-exercise without any clinical symptomatic hypotension, which is called post-exercise hypotension (PEH)¹⁵. Recently, we have demonstrated that a SSE-session reduced 4.0 and 3.4 mmHg in ambulatory systolic BP in the awake and 20-hour periods, respectively, in inactive hypertensive older women¹⁶. In order to establish the clinical utility of the SSE for hypertensive older women, it is important to determine its reproducibility, especially regarding the exercise intensity recommended to this population.

Therefore, this study aimed to: i) assess whether two sessions of SSE meet the exercise intensity recommended by the physical activity guidelines in inactive hypertensive older women; and ii) to examine whether markers of exercise intensity (i.e. HR and RPE) and affective response are reproducible between two SSE sessions. We hypothesized that the participants would meet the exercise intensity recommended by the guidelines and that HR, RPE, and affective responses would be reproducible between two SSE sessions.

Methods

Participants performed the following procedures during a 4-week period: i) initial health screening and body composition assessment; ii) office and ambulatory BP measurements; iii) assessment of physical activity level; iv) maximal graded exercise test; v) two SSE sessions. The study was conducted from August 2016 to May 2017 at the Department of Physical Education, Federal University of Rio Grande do Norte, Brazil. The Institutional Ethics Committee approved the study (protocol: 1526048). Participants were informed about all procedures of the study and gave written informed consent.

Participants were screened in the first visit using the Physical Activity Readiness Questionnaire, medical history. Afterward they underwent a clinical examination where body weight (kg), height (m), resting heart rate (HR), and resting BP (mmHg) were measured. Resting HR was measured after 10 minutes of rest in a supine position in a calm and controlled room (24-26 °C degrees) using a HR monitor (Polar Electro®, RS800cx, Oy, Kempele, Finland). Office BP was measured in a seated position using an oscillometric device (Omron® HEM-780-E, Japan) after the resting HR measurement. The participant's body composition was assessed by the dual-energy X-ray absorptiometry (GE Healthcare Lunar Prodigy Advance®, USA). Lastly, an ambulatory BP monitoring device (CardioMAPA, Cardios®, Brazil) was placed on the non-dominant arm of the participants in order to assess their 24-hour ambulatory BP. Participants returned to the laboratory on the following day to remove the device, and they were fitted with a waist pedometer (Omron®, HJ-321 Tri-Axis Alvita, USA) to assess the number of steps/day over a 1-week period.

On the third visit after 1-week, participants returned to the laboratory to remove the pedometer and perform a maximal graded exercise test on a treadmill in order to determine their maximal HR (HR_{max}). The first and second SSE sessions were performed in the next two weeks separated by 7-10 days. All procedures were performed in the morning (between 7:00-8:15 a.m.). Participants were instructed to abstain from moderate-vigorous physical activity and caffeinated products in the days of the maximal graded exercise test and the SSE sessions. Additionally, participants were instructed to abstain from alcohol, to maintain their eating habits and sleeping pattern during the 24-hour period before the SSE sessions.

Thirteen participants were included in the final analysis. All participants were recruited from a previous study conducted by our research group, which was designed to investigate the acute effect of a single SSE session on ambulatory BP in inactive hypertensive older women ($n = 20$)¹⁶. After the end of this previous study¹⁶, all participants were invited to perform one additional SSE session in order to assess the reproducibility of HR, RPE, and affective response. Seven of them declined to participate of this present study. Previously, these participants were recruited from the university cardiology outpatient service of the Federal University of Rio Grande do Norte, Brazil. Inclusion criteria were: i) age from 60 to 75 years; ii) previous diagnosis of hypertension according to the Brazilian Guidelines on Hypertension; iii) currently taking antihypertensive medication; iv) no participation in exercise training programs in the last six months; v) being inactive; i.e. less than 7,500 steps/day¹⁷; vi) no known cardiovascular, metabolic, musculoskeletal or respiratory disease; vii) no musculoskeletal condition that limits the ability to exercise at moderate-vigorous intensity (i.e. knee arthritis or pain). Exclusion criteria were: i) pain/injury that limits the ability to exercise during the study; ii) changes in antihypertensive medication during the study; iii) electrocardiographic (ECG) alterations during the maximal graded exercise test suggested of heart disease.

Participants performed a maximal graded exercise test on a motorized treadmill to determine their HR_{max} and to exclude ECG alterations suggested of heart disease. A cardiologist conducted the test and the participants were continuously monitored with a 12-lead ECG. After a 2-minutes warm-up, an incremental ramp protocol was performed by the participants starting at a speed of 2.50 km/h without gradient and increasing 0.3 km/h and 1% grade every minute until volitional exhaustion. The participant's physical effort was assessed every minute using Borg's (6-20) RPE Scale¹⁸ and the BP was measured every minute and immediately following volitional exhaustion. Graded exercise test was considered maximal when the participant reached a RPE higher than 17 and a HR within ± 10 bpm of age-predicted maximal HR ($220 - \text{age}$). All participants exercised while taking their antihypertensive medications. Only the RPE was used as a criterion of volitional exhaustion for the participants taking beta-blocker. All participants were encouraged to reach their maximal effort during the test.

The pedometer (Omron®, HJ-321 Tri-Axis Alvita, USA) was individually adjusted for the participants using their stride length, weight and height according to the manufacturer's instructions. The number of steps per day $\leq 7,500$ was used as a criterion to classify the participants as 'inactive'¹⁷. Moreover, the number of steps per day performed at a moderate cadence (i.e. 60 steps/minute)¹⁷ at least 10 minutes continuously was recorded. This variable was recorded to certify that the participants walked ≤ 30 minutes per day at a moderate cadence (i.e. 1,800 steps) continuously or in bouts of at least 10 minutes.

Office BP (Omron® HEM-780-E, Japan) was measured in triplicate after 10 minutes of resting with 1-minute interval between each measure and the average value of the last two measures was recorded. An oscillometric device (CardioMAPA, Cardios®, Brazil) was placed on the participants' non-dominant arm to assess their ambulatory BP during 24-hours, according to the VI Brazilian guidelines for ambulatory BP monitoring¹⁹. The measures BP was programmed for every 15-minutes during awake and every 30-minutes during asleep.

SSE sessions were performed in the morning (between 7:00-8:15 a.m.) on a standard outdoor 400-m track. The temperature (27.0-27.5°C) and humidity (70-85%) were similar between the SSE sessions. Each participant was fitted with a HR monitor (Polar Electro®, Oy, Kempele, Finland) and they were instructed to regulate their own pace according to the following instruction: 'We would like that you exercise for 30-minutes at a pace of your own choosing. You can freely change the pace at any time during the exercise'. After a stretching routine, the participants warmed up for 5-minutes in order to adjust their pace. SSE sessions were performed individually. *Ad libitum* water intake was allowed. HR was continuously recorded throughout the SSE sessions and the participants reported their whole-body RPE using Borg's (6-20) RPE scale¹⁸ and basic affect using the Feeling Scale (-5/+5)²⁰ every 10-minutes.

Participants were instructed regarding the RPE scale¹⁸ and the Feeling Scale²⁰ use with verbal and memory anchoring at the screening visit and immediately before each SSE session. Perceived exertion was defined as the subjective intensity of effort, strain, and/or fatigue that the participants can feel during exercise¹⁸. The Feeling Scale²⁰ is an 11-point bipolar scale ranging from +5 to -5 (i.e. +5 = very good; +3

= good; +1 = fairly good; 0 = neutral; -1 = fairly bad; -3 = bad; -5 = very bad) commonly used to measure affect (feelings of pleasure/displeasure) during exercise, and it is recommended by the American College of Sports Medicine²¹. The participants received standard instructions regarding the FS according to Hardy and Rejeski²⁰. The RPE scale and FS were presented in a randomized order to the participants.

Data were tested for normality using the Shapiro-Wilk's test. Descriptive variables were expressed as mean \pm standard deviation (SD). As all data had normal distribution, heteroscedasticity was assessed using Pearson's product-moment correlation coefficient between the mean and absolute difference of the first and second SSE sessions. Heteroscedasticity is considered present if the Pearson's product-moment correlation coefficient is significant. Paired sample t-test was used to verify systematic error regarding to differences in mean values. Intraclass correlation coefficient (ICC) was used to verify reliability, and was considered as poor ICC < 0.40, as fair to good ICC between 0.40 and 0.75, and as excellent ICC \geq 0.75. As no variable presented heteroscedasticity, agreement was assessed using typical error (TE). A two-way (SSE sessions vs. time) repeated measures analysis of variance was used to compare HR, RPE and affective response between sessions. In the case of a sphericity assumption violation, the degrees of freedom were adjusted and reported using the Greenhouse-Geisser epsilon correction. Partial eta squared (partial η^2) was used to determine the effect size of the variance. Bonferroni's post hoc tests were used to adjust for multiple comparisons. A $p < 0.05$ was considered statistically significant. All data were analyzed using SPSS[®] version 25.0 for Windows (IBM, Inc., Chicago, IL, USA).

Results

Most participants were taking one antihypertensive medication (61%; $n = 8$) and (39%; $n = 5$) two or more medications. All participants presented controlled resting (< 140/90 mmHg) and 24-hour ambulatory (< 130/80 mmHg) BP levels (Table 1). All participants completed the two SSE sessions.

Figure 1A presents the individual average HR during the SSE sessions. Regarding HR, 77% ($n = 10$) of the participants exercised at a moderate (i.e. 40-59% of HRR) and 23% ($n = 3$) at a vigorous intensity (i.e. \geq 60% of HRR) during the first session, while on the second session, 46% ($n = 6$) exercised at moderate and 46%

Table 1 – Characteristics of the participants ($n = 13$) from Natal, Rio Grande do Norte, 2016-2017

Variables	Mean \pm SD or n (%)
Age (years)	64.54 \pm 4.16
Diagnosis of hypertension (years)	12.27 \pm 10.69
Body mass index (kg/m ²)	29.33 \pm 4.86
Body fat (%)	43.39 \pm 5.90
Resting SBP (mmHg)	122.51 \pm 12.45
Resting DBP (mmHg)	62.15 \pm 7.97
24-h ambulatory SBP (mmHg)	119.20 \pm 9.77
24-h ambulatory DBP (mmHg)	64.72 \pm 8.10
Resting heart rate (bpm)	61.15 \pm 8.33
Maximal heart rate at GXT (bpm)	154.54 \pm 16.79
Total steps (amount per day)	5.409 \pm 2.043
Continuous steps (\geq 10 min, \geq 60 steps/min)*	778.38 \pm 757.02
Antihypertensive medications	
Calcium channel blocker	3 (23%)
Diuretics	3 (23%)
Angiotensin receptor antagonists	8 (61%)
Beta-blocker	2 (15%)
Angiotensin converting enzyme inhibitor	1 (8%)

SBP = systolic blood pressure; DBP = diastolic blood pressure; GXT = graded exercise test.

*Amount of continuous steps at a pace higher than 60 steps per minute performed at least 10 minutes continuously per day.

($n = 6$) at vigorous intensity. There was no difference in the exercise intensity over 10, 20 and 30 minutes between first and second SSE sessions, respectively, [52.62 \pm 7.71 vs 54.00 \pm 10.14; 56.15 \pm 6.77 vs 59.46 \pm 10.75; 58.69 \pm 7.57 vs 63.85 \pm 12.12; $F(1.38, 16.57) = 3.75$; $p = 0.059$; partial $\eta^2 = 0.238$] – Figure 1B.

Figure 2A presents the individual average RPE during the SSE sessions. Regarding RPE, 62% ($n = 8$) reported light (i.e. < 12, Borg's RPE) and 38% ($n = 5$) moderate (i.e. 12-13, Borg's RPE) perceived exertion during both SSE sessions. There was no difference in the RPE reported over 10, 20 and 30 minutes between first and second SSE sessions, respectively [11.08 \pm 0.86 vs 10.46 \pm 1.45; 11.23 \pm 1.30 vs 11.00 \pm 1.78; 11.46 \pm 1.51 vs 11.46 \pm 1.56; $F(2.00, 24.00) = 1.32$; $p = 0.285$; partial $\eta^2 = 0.099$] – Figure 2B.

Figure 3A presents the individual average affect during the SSE sessions. All participants reported positive affect (i.e. \geq 1 on the Feeling Scale) during both SSE sessions. Specifically, 23% ($n = 3$) reported fairly good (i.e. between 1 and < 3 on the Feeling Scale) and 77% ($n = 10$) good or higher affect (i.e. \geq 3 on the Feeling Scale) during both SSE sessions. There was no difference in the affect over 10, 20 and 30 minutes between first and second SSE sessions, respectively [3.23

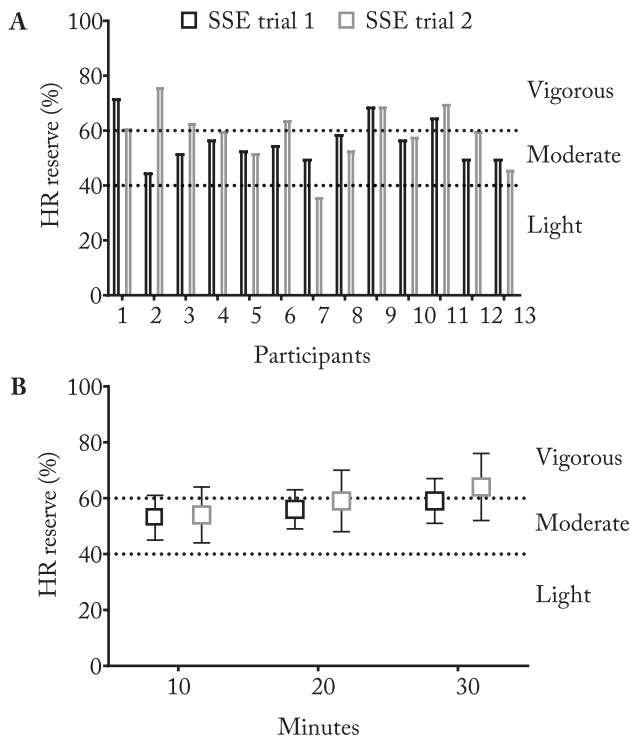


Figure 1 – Individual average heart rate (Panel A) and heart rate (Panel B) responses of the inactive hypertensive older women during the self-selected exercise intensity trials. Natal, Rio Grande do Norte, 2016-2017. HR = heart rate; SSE = self-selected exercise.

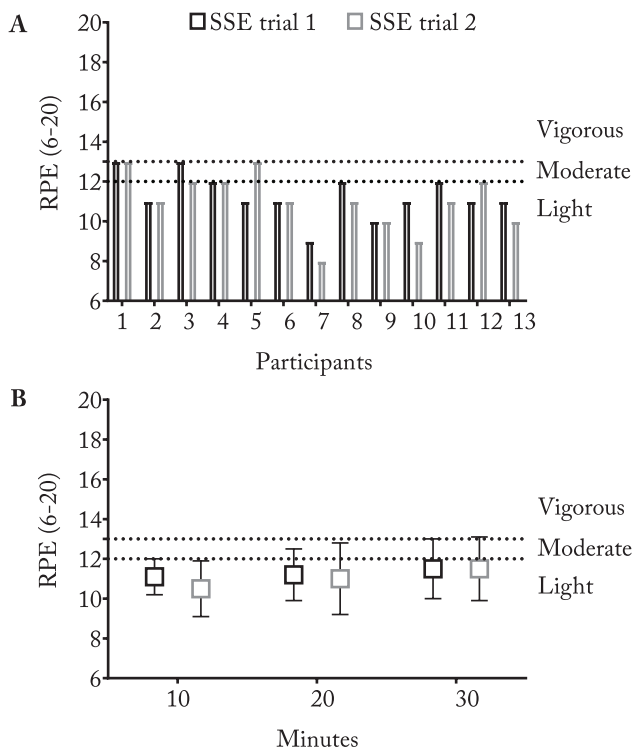


Figure 2 – Individual average perceived exertion (Panel A) and perceived exertion (Panel B) reported by the inactive hypertensive older women during the self-selected exercise intensity trials. Natal, Rio Grande do Norte, 2016-2017. RPE = rating of perceived exertion; SSE = self-selected exercise.

± 1.17 vs 3.46 ± 1.20 ; 3.69 ± 1.44 vs 3.31 ± 1.44 ; 3.46 ± 1.33 vs 3.38 ± 1.61 ; $F(2.00, 24.00) = 0.96$; $p = 0.398$; partial $\eta^2 = 0.074$] – Figure 2B.

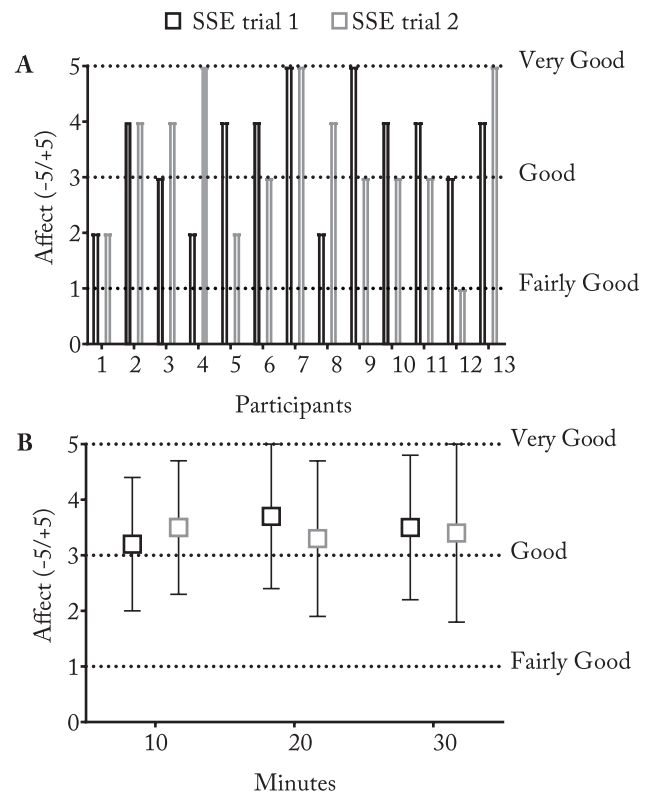


Figure 3 – Individual average affect (Panel A) and affect (Panel B) reported by the inactive hypertensive older women during the self-selected exercise intensity trials. Natal, Rio Grande do Norte, 2016-2017. SSE = self-selected exercise.

Table 2 presents the reproducibility results of HR, RPE and affective responses. Average HR, RPE, and affective responses were not different between the SSE sessions ($p > 0.05$). RPE presented excellent reliability ($ICC = 0.82$; $p = 0.003$). However, there were no reliability for HR ($ICC = 0.40$, $p = 0.193$) and affective responses ($ICC = 0.19$; $p = 0.369$). The typical error between the SSE sessions for HR, RPE and affect responses were 8.11 bpm, 0.75 and 1.11, respectively.

Discussion

The main findings of this study were: i) inactive hypertensive older women self-selected a moderate-vigorous intensity during the SSE sessions, meeting the recommendations of the physical activity guidelines; and ii) only the RPE presented reproducibility between SSE sessions. SSE sessions were reported as light-moderate (i.e., $RPE \leq 13$, “somewhat hard”). Despite the absence of good reproducibility for HR and affective respon-

Table 2 – Reproducibility parameters of heart rate, rating of perceived exertion and affective response during the self-selected exercise intensity trails in inactive hypertensive older women from Natal, Rio Grande do Norte, 2016-2017

	SSE trial 1	SSE trial 2	p	ICC (95% CI)	p	TE
HRR (%)	56.46 ± 8.01	59.08 ± 10.57	0.427	0.40 (-0.97 ; 0.82)	0.193	8.11
RPE (6-20)	11.26 ± 1.14	10.98 ± 1.52	0.350	0.82 (0.42 ; 0.94)	0.003	0.75
Affect (-5/+5)	3.47 ± 1.13	3.38 ± 1.23	0.851	0.19 (-2.10 ; 0.76)	0.369	1.11

HRR = heart rate reserve; RPE = rating of perceived exertion; ICC = intraclass correlation coefficient; CI = confidence interval; TE = typical error.

se between the SSE sessions, all participants exercised above 40% of HRR (i.e. moderate-vigorous) and reported positive affective (i.e., ≥ 1 , “good to fairly good”).

All participants exercised within the moderate-vigorous intensity (i.e. $\geq 40\%$ of HRR) as previously observed in middle-aged and older inactive adults and obese individuals during SSE sessions²². This exercise intensity is recommended by hypertension guidelines to improve health-related physical fitness, reduce BP and reduce additional cardiovascular risk factors⁴. Our finding regarding the RPE and affect seems to support the SSE as a simple exercise approach for inactive hypertensive older women whose present low adherence to physical exercise programs. Thus, our results could have relevance for a public health perspective, encouraging inactive hypertensive older women to meet the physical activity levels recommended in the current hypertension guidelines⁴. However, it is important to highlight that adherence to exercise programs is complex and multifactorial. Therefore, our results showed that SSE could contribute to improve exercise adherence considering specifically the RPE and affective response.

HR responses were not reproducible. Specifically, we did not observe significantly reliability of HR between the SSE sessions (Table 2), suggesting an intra-individual variability of the HR responses between the exercise sessions. This lack of reliability may have occurred because physical exercise is a psychobiological phenomenon, and the intra-individual variability of the physiological responses and adjustments could be explained by some psychological interpretations (e.g. familiarization and previous experience with exercise, self-efficacy, and body consciousness) in each SSE session among the participants. Regarding the inter-individual variability of the HR responses during SSE sessions, previous studies have confirmed this phenomenon²². However, we highlight that despite lack reliability of HR responses, all participants exercised within moderate-vigorous exercise intensity (56.5% and 59.1% of HRR) during both SSE sessions. Ad-

ditionally, SSE seems to be a simple and safe exercise approach for this population because typically the individuals self-select an exercise intensity below their ventilatory or lactate thresholds²², which is effective to improve health and fitness and mitigating the risk of musculoskeletal injury and adverse cardiovascular events, especially when it is performed without professional supervision. Therefore, we suggest that SSE should be encouraged in a public health perspective, which could reduce the economic burden of physical inactivity on the health-care system²³, seeing that expenditures for controlling hypertension in older adults is high and inversely associated with physical activity level and engagement in walking⁷.

RPE showed good reproducibility, and it has been described as the ‘single best indicator of the degree of physical strain’¹⁸. This response has been associated with a reproducible pacing strategy in different contexts²⁴. Recently, an integrative model²² has recognized the conscious sensation of fatigue (i.e. RPE responses) as a sensory representation resulting from the competition between the physiological and psychological drives. The relative weighting of these competing drives that are underpinned by the principle of homeostasis determine the decision-making process associated with pacing strategy selection²¹. Furthermore, when an individual is allowed to select the exercise intensity, there is a tendency to seek a pace close to their ventilatory threshold⁸⁻¹⁰ and this intensity has been associated with a constant RPE²⁵. It seems that the autonomy of self-selecting an intensity to exercise may establish a direct relationship of regulating these physiological and psychological parameters, allowing individuals to keep a stable perceived state in face of psychophysiological variations. Indeed, our results showed that RPE is a reliable response between the SSE sessions.

Further, participants reported a RPE as light (i.e. RPE ~11) during the SSE sessions. SSE attenuates the perceived exertion by allowing the individual to cognitively self-regulate their experience during exer-

cise, which may increase their perceived autonomy¹⁰. The different stimuli from an outdoor environment seems to reduce the internal attention focus (e.g. increased HR and breath) and increase the more externally focused attentional focus⁸. Recently, Krinski et al.⁹ showed that women with obesity presented lower RPE, higher dissociative attention and higher affective responses during outdoor SSE when compared to an indoor environment with a similar oxygen uptake and HR responses. Thus, it seems that there are psychological differences during outdoor SSE session, given that individuals report a lower RPE than expected for moderate-vigorous exercise intensity.

Regarding the feelings of pleasure/displeasure during the SSE sessions, we observed that although the participants reported both exercise sessions as pleasant, the magnitude of affective responses was not reproducible as demonstrated by a lack of reliability. Considering the pleasure and displeasure domains of the basic affect that can be assessed by the Feeling Scale, the participants were clearly able to distinguish these two domains, consistently reporting the SSE sessions as pleasant. However, it seems that the interpretation and assessment of the magnitude of the basic affect within the pleasure domain becomes a more complex task. Therefore, this conflict may generate affective responses that are not similar intra-individuals between SSE sessions, which may partially explain the lack of reliability for affective responses. Nonetheless, we believe that the affective responses may become more precise over time, with additional exercise training sessions and more familiarity with the Feeling Scale.

Both SSE sessions were pleasant. This can be partially explained by the magnitude of the metabolic stress imposed to the organism because, typically, the individuals self-select an exercise intensity below the anaerobic threshold²⁶. Previously, it was demonstrated that the SSE is defined by the maintenance of a stable and positive affective state, which is close but below the anaerobic threshold⁸. The feelings of pleasure and well-being seem to have a decisive role for engagement in the exercise programs when compared to the levels of information and knowledge about the benefits of physical activity²⁷. This is supported by the hedonic theory of motivation¹¹. Therefore, the recommendation of the SSE outdoors seems to be an interesting strategy for inactive hypertensive older women because it is an exercise approach pleasant, beyond to meeting the recommended physical activity⁴. In addition, it should

be noted that the participants of the present study showed high % of body fat (i.e. 43.39 ± 5.90), which characterizes them as obese. Obese individuals have a lower affective response than normal weight and overweight individuals from light to vigorous intensities²⁸. We have observed that even exercising at a moderate to vigorous intensity at a self-selected pace, the participants reported positive affective response, which could contribute to a better exercise engagement mainly in the first exercise sessions.

It should be noted that low tolerance to effort is one of the main causes for the lack of engagement in physical exercise programs by hypertensive population²⁹ and unpleasant experiences during exercise is commonly reported as a barrier by older adults³⁰. Therefore, our results seem to support the use of the SSE as a simple and safe approach to encourage an active lifestyle in inactive hypertensive older women. Future studies should investigate whether aerobic SSE interventions can elicit chronic BP-lowering effect, reduction in cardiovascular disease risk and improvements in cardiorespiratory fitness in hypertensive older adults.

Some limitations should be mentioned. First, only HR was monitored as an objective marker to characterize the intensity of the SSE sessions. Thus, it is not possible to characterize the sessions according to oxygen uptake and different metabolic domains (below, at or above the ventilatory threshold). Second, only two SSE sessions were performed to assess the reproducibility of the investigated variables. Lastly, this study involved a small sample of inactive hypertensive older women without other cardiovascular disease. Therefore, these findings may not be generalizable to other hypertensive populations. In conclusion, this pilot study suggests that inactive hypertensive older women without other cardiovascular disease seem to choose a moderate-vigorous intensity (i.e. $\geq 40\%$ of HRR) when they exercise at a self-selected pace. Further, it also suggests that their perceived exertion and affective response is light-moderate and pleasant, respectively. Despite the lack of reproducibility of the HR and affective response, all participants exercised within the HRR zone recommended by the physical activity guidelines for hypertension management and reported feelings of pleasure consistently. Future studies including a large and representative sample of hypertensive older women should be conducted in order to confirm (or not) our preliminary results.

Conflict of interest

The authors declare no conflict of interest.

Authors' contributions

Sócrates J, Macêdo GAD and Costa IBB contributed to conception of the study, acquisition, analysis, and interpretation, and drafted the manuscript. Browne RAV, Farias-Junior LF, Freire YA and Schwade D contributed to acquisition, analysis, and interpretation, and critically revised the manuscript. Brito LC and Elsangedy HM contribute to interpretation and critically revised the manuscript. Costa EC contributed to conception of the study, analysis, and interpretation, and critically revised the manuscript.

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