

Northumbria Research Link

Citation: Botton, Cíntia E., Santos, Lucas P., Moraes, Bruna G., Monteiro, Raíssa B., Gomes, Maria Laura B., Wilhelm, Eurico N., Pinto, Stephanie S. and Umpierre, Daniel (2022) Recruitment methods and yield rates in a clinical trial of physical exercise for older adults with hypertension—HAEL Study: a study within a trial. *BMC Medical Research Methodology*, 22 (1). p. 42. ISSN 1471-2288

Published by: BioMed Central

URL: <https://doi.org/10.1186/s12874-022-01535-7> <<https://doi.org/10.1186/s12874-022-01535-7>>

This version was downloaded from Northumbria Research Link: <http://nrl.northumbria.ac.uk/id/eprint/48504/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)

1 **Recruitment methods and yield rates** in a clinical trial of physical exercise for older
2 **adults with hypertension - HAEL Study: A study within a trial**

3

4 Cíntia E Botton^{1,2}, Lucas P Santos^{1,3}, Bruna G Moraes¹, Raíssa B Monteiro¹, Maria Laura
5 B Gomes⁴, Eurico N Wilhelm^{4,5}, Stephanie S Pinto⁴ and Daniel Umpierre^{1,2,3,6}

6

7 ¹Exercise Pathophysiology Research Laboratory, Hospital de Clínicas de Porto Alegre,
8 Clinical Research Center, Porto Alegre, RS, Brazil

9 ²National Institute of Science and Technology for Health Technology Assessment
10 (IATS), Hospital de Clínicas de Porto Alegre, Porto Alegre, RS, Brazil

11 ³Graduate Program in Cardiology and Cardiovascular Sciences, Universidade Federal do
12 Rio Grande do Sul, Porto Alegre, RS, Brazil.

13 ⁴Neuromuscular Evaluation Laboratory, Universidade Federal de Pelotas, RS, Brazil

14 ⁵Department of Sport, Exercise and Rehabilitation, Northumbria University, Newcastle
15 upon Tyne, UK

16 ⁶Department of Public Health, Universidade Federal do Rio Grande do Sul, Porto Alegre,
17 RS, Brazil

18

19 **Corresponding author**

20

21 Cíntia E Botton, Clinical Research Center, Hospital de Clínicas de Porto Alegre, Rua
22 Ramiro Barcelos, 2350, Porto Alegre, RS, Brazil

23 Telephone number: +55 51 3359.6332; Email: cintiaebotton@gmail.com

24

25

1 **Abstract**

2 **Background:** Although the prevalence of hypertension is high in older adults, clinical
3 trials' recruitment is a challenge. Our main aim was to describe the HAEL Study
4 recruitment methods and their yield rates. The secondary objectives were to explore the
5 reasons for exclusion and to describe the characteristics of participants enrolled.

6 **Methods:** This is a descriptive study within a trial. The HAEL Study was a Brazilian
7 randomized two-center, parallel trial, with an estimated sample of 184 participants. The
8 recruitment strategy was based on four methods: electronic health records, word of
9 mouth, print and electronic flyer, and press media. The yield rate was the ratio of the
10 number of participants who underwent randomization to the total number of volunteers
11 screened, calculated for overall, per recruitment method, study center and by age group
12 and sex. Also, we described the reasons for exclusion in the screening phase and for non-
13 enrolled participants, as well as the demographic characteristics of those enrolled. The
14 data are presented in absolute/relative frequencies and mean \pm standard deviation.

15 **Results:** 717 individuals were screened, and 168 were randomized over 32 months. The
16 yield rate was higher by word of mouth (30.1%) for the overall sample. However, press
17 media contributed the most (39.9%) to the absolute number of participants randomized in
18 the trial. The coordinating and participant centers differed in methods with the highest
19 yield ratios and absolute numbers of randomized participants. The main reason for
20 exclusion in the screening phase was due to physically active status in study seekers
21 (61.5%). Out of 220 participants included, 52 were non-enrolled mainly because did not
22 meet the eligibility criteria (26.9%). Most of the screened were women (60.2%), between
23 60-69 years (59.5%), and most of the randomized were caucasian/white (78.0%).

24 **Conclusions:** Multiple recruitment methods seem to have been an effective strategy. We
25 observed that approximately every four individuals screened, one was allocated to an

1 intervention group. Even so, there were limitations in reaching a representative sample of
2 Brazilian older adults with hypertension. Data show an underrepresentation of race and
3 age groups.

4 **Registration:** This SWAT was not registered.

5 **Keywords:** physical activity; randomized clinical trial; lifestyle intervention; recruitment
6 approaches.

7

1 **Background**

2

3 The prevalence of hypertension is rising globally[1]. Approximately 30% of the Brazilian
4 population has hypertension[2], and in older adults, the prevalence is twice as high[3].
5 Structured physical exercise, as a nonpharmacological intervention, brings about
6 cardiovascular health benefits, and is considered a cornerstone for hypertension
7 management[4–6]. Clinical trials are essential to understand the effectiveness of physical
8 activity as part of anti-hypertensive treatments, but few studies were designed and
9 exclusively included older adults with hypertension.

10 Although the global number of older individuals with hypertension is substantial, clinical
11 trials' recruitment success is not guaranteed. Identifying and recruiting research
12 participants is a common challenge among studies and is considered a determining factor
13 for trial success[7]. Especially in some settings, recruiting participants can be an
14 operational barrier to clinical trials, in particular those conducted in developing countries,
15 as financial costs associated with complex and lengthy administrative processes are an
16 additional barrier for trial completion[8]. In addition, the recruited sample is not always
17 representative, and the external validity of clinical trials remains a great challenge[7, 9].
18 Many recruitment strategies exist to reach out to research participants, and although some
19 previous studies tried to explore these in different fields[10–13], it is not clear what are
20 the most useful. The effectiveness of recruitment strategies depends on population's
21 factors, such as physical, demographic and clinical characteristics, as well as the trial
22 setting and type of intervention[14]. Hence, analyses of the yield rate of recruitment
23 methods may be highly informative for future studies[10, 11, 13], especially those
24 conducted in scenarios in which a low research budget is available.

1 To share challenges and outputs, our general purpose was to describe the recruitment
2 strategies for the Hypertension Approaches in the Elderly: a Lifestyle Study (HAEL
3 Study) conducted in southern Brazil. Our primary aim was to describe the yield rates,
4 calculated for overall, per recruitment method and study center, and by age group and
5 sex. Also, we calculated the crude recruitment output. Our secondary objectives were to
6 explore the reasons for exclusion throughout the screening phase and for non-enrolled
7 participants post consent signed. Finally, we describe the demographic characteristics of
8 the participants who underwent randomization.

9

10 **Methods**

11

12 *Study design*

13

14 This is a descriptive study within a trial (SWAT). We did not register the study previously,
15 although we had pre-planned to carry out this analysis and therefore collected all data
16 related to the recruitment phase. The participants consented to use the data asked during
17 the telephone screening and baseline assessment. The study was approved by the Ethics
18 Committee/IRB from the Hospital de Clínicas de Porto Alegre (CAAE:
19 62427616.0.1001.5327) and Universidade Federal de Pelotas (CAAE:
20 62427616.0.2001.5313).

21

22 *HAEL study (host study)*

23

24 This SWAT is nested within the Hael Study, which was a randomized, single-blinded,
25 multicenter, two-arm, parallel, superiority trial. The study was designed to evaluate the

1 efficacy of a combined aerobic and resistance exercise training program on reducing
2 blood pressure levels compared with a control group undergoing health education in older
3 patients with hypertension (≥ 60 years old). The study was prospectively registered
4 (Clinicaltrials.gov NCT03264443), and the complete protocol is published[15].
5 Recruitment data were collected at both centers where the study was conducted, located
6 in southern Brazil. The coordinator center (CC) was based in Porto Alegre, the largest
7 city in the state of Rio Grande do Sul, at the Hospital de Clínicas de Porto Alegre. The
8 participant center (PC) was based in Pelotas, the fourth most populous city in the Rio
9 Grande do Sul, located 168 mi from Porto Alegre, at the Universidade Federal de Pelotas.
10 The recruitment period was from August/2017 to March/2020. In the PC, the recruitment
11 ended in March/2019.

12

13 *Sample size*

14

15 All individuals who were screened for HAEL study eligibility by telephone were included
16 in this study. The HAEL study sample estimation, based on two studies[16, 17], was a
17 total of 184 participants (i.e., 92 per center), for providing power values of 0.79 and 0.92
18 to detect differences of 2.5 mmHg and 3.0 mmHg between the two groups mean values
19 for the 24-h systolic blood pressure, considering an expected standard deviation of 6.0
20 mmHg. A two-sided significance level of 0.050, obtained from a mixed-effects model fit
21 without the treatment-by-center interaction, was considered. More details about the
22 sample size calculation are in the HAEL study protocol[15].

23

24 *Eligibility criteria and reasons for exclusion*

25

1 In the telephone screening and after signing the consent form, for participants not
2 enrolled, the reasons for exclusion were counted either according to the eligibility criteria
3 or other reasons that were identified during the baseline test period. Inclusion criteria
4 were as follow: 1) Diagnosis of hypertension as assessed by a previous ambulatory BP
5 monitoring (no later than six months) or current use of antihypertensive drugs; 2) Age \geq
6 60 years old; 3) Unchanged pharmacological scheme for four weeks prior enrollment; 4)
7 Willingness to participate in either intervention group. Exclusion criteria included 12
8 characteristics which could increase the cardiovascular risk during exercise (e.g., cardiac
9 event within the 12 recent months) or modify (increasing or decreasing) intervention
10 adherence due to external factors. Additionally, the exclusion criterion “to be physically
11 active” was not described in the study protocol[15], but was considered in the eligibility
12 process. Those who performed ≥ 30 min of physical activity at moderate intensity, at least
13 three days/week, in the last three months before screening were excluded.

14

15 *Recruitment methods*

16

17 The recruitment strategy was based on four pre-planned approaches: 1) *Electronic health*
18 *records from public healthcare units*; 2) *Word of mouth*; 3) *Print and electronic flyer*; 4)
19 *Press media*. For the *electronic health records*, the lists of patients registered in one/two
20 basic care units of the public health system were accessed. The *word of mouth* method
21 comprises word-of-mouth referrals from friends, relatives, or professionals. Professional
22 referrals were considered when specialist professionals (i.e., cardiologists, gerontologists,
23 etc.) indicated the study. The *print and electronic flyer* method corresponded to
24 disseminating flyers with standard information about the research and contact. Flyers
25 were distributed in print on the streets, and flyer posters were hung in pharmacies and

1 grocery shops. Also, the flyer was released in digital format on social media (i.e.,
2 Facebook and Instagram) and WhatsApp Messenger. Finally, *press media* was a method
3 of recruitment through free advertisement in local and widely circulated newspapers.
4 During the telephone screening, potential participants were asked how they got to know
5 the study's recruitment to compute which method reached them. Although the same
6 approaches have been used in both centers, each center was free to decide which methods
7 would be prioritized.

8

9 *Participants demographic characteristics assessment*

10

11 Participants fulfilled questionnaires to self-identify their sex (i.e., man or woman),
12 race/ethnic group, and age in years. From the characteristics of the participants, the
13 categories of race/ethnic were created as follows: Caucasian/white, Black/Afro-
14 descendants, Asian, Indigenous, Other/mixed.

15

16 *Data analysis*

17

18 Descriptive statistical analyses were used to assess the study results. Continuous data are
19 presented as means and standard deviations. Categorical data are presented in absolute
20 and relative frequencies. We calculated the yield rate by the ratio of the number of
21 participants who underwent randomization to the total number of volunteers that were
22 screened (i.e., yield rate = individuals randomized/individuals screened). Firstly, we
23 calculated the overall yield rate of the trial. Secondly, we calculated the yield rate per
24 recruitment method and study center. Lastly, the yield rate was estimated per recruitment
25 method, stratified by age group and sex. In addition to the yield rate, we calculated the

1 crude recruitment output by the ratio of who underwent randomization per method to the
2 total number of participants randomized (i.e., crude recruitment output = individuals
3 randomized per each method / total of individuals randomized). Exclusion reasons were
4 counted for all contacts made in the telephone screening and for those who were not
5 enrolled in the study after signing the consent form. We had missing data because some
6 participants refused to answer the form completely during the telephone screening or due
7 to failure to complete it. The missing data were treated as undefined. All descriptive
8 analyses were generated in the software Microsoft Excel, 2016 (Microsoft Inc., Redmond,
9 WA, USA), and IBM SPSS Statistics version 21.0 (IBM SPSS Inc., Chicago, IL, USA).

11 **Results**

13 The study flowchart per recruitment method is described in Figure 1. Throughout the
14 study enrollment process, 717 individuals were telephone-screened for eligibility. On
15 average, over the 32 months of the study, 22 to 23 individuals were screened each month,
16 and five to six were randomized. Most individuals were screened by the CC (487; 67.9%)
17 compared to the PC (210; 29.5%), and 20 (2.7%) had an undefined center. Between
18 telephone screening and face-to-face interviews, 69.3% (CC, n= 326; PC, n=151;
19 undefined center, n=20) were excluded or declined to participate, and 220 (30.6%) signed
20 the consent form. Through baseline data collections and before allocation, 52 individuals
21 were excluded or declined to participate. In total, 168 participants were randomized, 119
22 (70.8%) in the CC and 49 (29.2%) in the PC.

23 For CC and PC, 244 (50.1%) and 36 (17.1%) individuals screened were reached by *press*
24 *media*, respectively. *Printed and electronic flyer* reached 139 (28.5%) and 14 (6.6%)
25 screened individuals, while *word of mouth* reached 92 (18.9%) and 50 (23.8%)

1 individuals for CC and PC, respectively. *Electronic health records* accounted for nine
2 individuals (1.8%) screened in the CC and 110 (52.4) in the PC.

3

4 <<FIGURE 1 HERE>>

5

6 *Demographic characteristics of enrolled participants*

7

8 For participants who underwent randomization, the overall sample age range was from
9 60 to 84 years old and most of them were women (61.9%) and caucasian/white (78%)

10 (Table 1).

11

12 <<TABLE 1 HERE>>

13

14 *Yield rate*

15

16 The overall yield rate was 23.4% (Figure 2). Separately, the yield rate was 24.4% for the
17 CC and 23.3% for the PC. Twenty and seven individuals had center and recruitment
18 method undefined, respectively, and were excluded from stratified yield rate analysis.

19 The yield rate per recruitment method was higher by *word of mouth* (30.1%) for the
20 overall study and by *printed and electronic flyer* for the CC (25.2%) and the PC (42.9%).

21 The lowest yield rate was by *electronic health records*.

22

23 <<FIGURE 2 HERE>>

24

25 *Yield rate per sex and age range*

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

For 10 and 13 individuals screened, sex and age, respectively, were undefined. Most of the screened individuals were women (432; 60.2%), compared to men (275; 38.3%). Relative to age range, 427 (59.5%) individuals ranged from 60 to 69 years, 221 (30.2%) from 70-79 years, 40 (5.6%) from 80-97 years and 16 (2.2%) were aged out of eligibility, between 42-59 years (Table 2). Thirteen individuals with undefined ages were not counted.

Press media was the method that most reached men (56.0%) and women (31.7%). For women, the method with the highest yield rate was *word of mouth* (32.4%), whereas for men, it was *printed and an electronic flyer* (28.0%). The lowest yield rate strategy was *electronic health records* for both women (15.3%) and men (3.4%). For the age groups of 60-69 years and 80-97 years, the *word of mouth* method had the highest yield rate (34.5% and 33.3%, respectively). The age group ranging from 70-79 years had the highest value with *printed and electronic flyer* (34.1%).

<<TABLE 2 HERE>>

Crude recruitment output per method

The method that contributed most to the total participants who underwent randomization was *press media* (39.9%) (Figure 3). Considering centers separately, for the CC also was *press media* (48.7%), while for PC was *word of mouth* (42.9%). The lowest crude output was *electronic health records* for the overall study (8.3%) and for the CC (0.8%). For the PC, *printed and electronic flyer* had the lowest crude recruitment output (12.2%).

1 <<FIGURE 3 HERE>>

2

3 *Reasons for exclusions*

4

5 Out of 497 (69.3%) individuals excluded between telephone screening and face-to-face
6 interview, 229 (46.1%) did not meet eligibility criteria. The main eligibility criteria that
7 caused exclusion were: 1) To be physically active (141; 61.5%); 2) Age < 60 years old
8 (15; 6.5%); 3) No diagnosis of hypertension assessed according to the study's criteria (12;
9 5.2%); 4) Myocardial infarction, revascularization procedures, deep vein thrombosis,
10 cerebrovascular events or pulmonary embolism (12; 5.2%). Eligibility criteria were
11 undefined for 15 individuals. Other exclusion criteria, such as cancer, heart failure,
12 pulmonary disease, kidney disease or neurological disease, unwillingness to participate
13 in either one or both of the intervention groups, excessive consumption of alcoholic
14 drinks, or another person from the same household/family participating in the study, were
15 less frequent (i.e., 1 to 6 individuals). Also, 58 (11.7%) individuals were not interested in
16 the study, 59 (11.9%) had pain or physical disability, and 55 (11.1%) had no time
17 available. Other reasons account for 4.4% of exclusions (n=22) and the reasons were
18 undefined for 46 (9.2%) participants.

19

20 *Reasons for non-enrollment*

21

22 After signing the consent form and at baseline data assessments, 52 (23.6%) of the 220
23 participants were not enrolled. Fourteen individuals (26.9%) did not meet the eligibility
24 criteria (i.e., one had individual plans to move to another city during the period of
25 participation; 10 had medical reports indicating moderate or high risk for exercise-related

1 events based on the initial maximal exercise test and clinical evaluation; three were
2 physically active). Seven individuals (13.5%) had different medical reasons for exclusion,
3 and eight (15.4%) were restrained from continuing the study due to the restrictions of the
4 COVID-19 pandemic. Five individuals (9.6%) had physical disability or pain, five (9.6%)
5 had no time available, and three were no longer interested in participating (5.8%). Other
6 reasons account for 9.6% (n=5) of exclusions, and five individuals (9.6%) had undefined
7 exclusion reasons.

8

9 **Discussion**

10

11 The general purpose of this study was to assess the recruitment strategy in the HAEL
12 study. We observed that approximately every four individuals screened, one was
13 allocated to an intervention group. The yield rate was higher with the *word of mouth*
14 (30.0%), but the *press media* had the highest crude recruitment output (39.8%). The
15 highest yield rate approaches were *printed and electronic flyer*, *word by mouth*, and *press*
16 *media*, in this order, for both centers separately. Oppositely, *electronic health records*
17 was the approach with the lowest yield rate.

18 Interestingly, *press media* was the main driver of absolute screening and recruitment at
19 the CC, which may be related to: (i) newspapers' reach in which the recruitment was
20 advertised; and (ii) especially due to a highly active support from the hospital's
21 communication division at the CC, which favored the contact with several newspapers.

22 To note, newspapers do not usually charge fees to advertise notes of study recruitment in
23 the state where the study was located. At the PC, the *electronic health records* method
24 contributed to many individuals being screened, which was apparently facilitated by

1 existing relationships between university researchers and health services professionals,
2 who were more readily engaged to identify potentially eligible individuals.
3 For the overall study sample, the method with the highest yield rate was *word of mouth*.
4 In addition, by assessing the crude randomization output, which ultimately makes the
5 necessary study sample to be completed, both *press media* and *word of mouth* were
6 important sample sources for CC and PC, respectively. Thus, consistent with previous
7 studies[13, 18], it was essential to use varied recruitment approaches to reach the
8 estimated number of individuals in our trial. We highlight that the *word of mouth* method
9 resulted in a high yield rate as well as crude recruitment output at the PC. This might
10 suggest referrals are relevant and a more effective approach than *press media* in smaller
11 cities.
12 Some recruitment approaches used in our trial, such as the use of *electronic flyers* or *press*
13 *media*, were implemented with little initial effort. However, all methods except *electronic*
14 *health records* required potential participants to take the initiative to contact the research
15 team. This could have biased the sample towards individuals highly motivated to exercise
16 or **healthy**, which may partly reduce the results' generalizability. Even using three widely
17 disseminated recruitment approaches (*press media*, *word of mouth*, *printed or electronic*
18 *flyers*), approximately 60% of the individuals screened were women and were between
19 60-69 years old (both sexes), whereas few individuals aged between 80-97 years were
20 screened (n=40) or randomized (n=6). The chance of having health complications and
21 limitations to participate in a clinical trial is greater as aging progresses. Furthermore,
22 older individuals may have more barriers (e.g., regarding willingness or commuting) to
23 take part in clinical trials[19]. Also, most of the randomized participants self-identified
24 as caucasian/white (78%), while a minority were black (16.7%). So, these data show an

1 underrepresentation of race and age groups that may not properly reflect the target
2 population[20, 21].

3 The yield rates from recruitment methods differed between sexes, with *word of mouth*
4 resulting in more women being randomized (nearly 1 out of 3), whereas *printed and*
5 *electronic flyer* resulted in more men (nearly 1 out of 4). It is noteworthy that even using
6 four recruitment methods, *press media* accounted for 56% of screened men. In age groups
7 of 60-69 and 80-97 years, the *word of mouth* method had the highest yield rate, whereas
8 *printed and electronic flyer* achieved higher rates among individuals between 70-79
9 years. To understand that methods vary regarding sex and age may be useful to targeted
10 recruitment in future studies.

11 Even using a 32-month recruitment period, the pre-trial calculated sample size (N = 184)
12 was not fully reached, lacking inclusion/randomization of 16 individuals. Based on the
13 CC yield rate (24.4%), roughly 65 additional individuals would need to undergo the
14 eligibility screening. Due to the COVID-19 pandemic, the trial was terminated after a
15 careful assessment that included external advice. However, other difficulties also made
16 the recruitment challenging. The PC found more barriers to carrying out the study and
17 ended the recruitment process sooner than expected. Apparently, barriers were mainly
18 related to the institutional contrasts to support clinical studies, infrastructure, and human
19 resources (team size). We reason that strategies specific to each study center and
20 recruitment monitoring could mitigate these barriers and reduce differences between
21 centers.

22 The number and restriction of eligibility criteria for clinical trials may limit
23 recruitment[22]. As an attempt to recruit a representative sample, we minimized
24 exclusion criteria to characteristics that would represent a risk factor for exercise. The
25 main reason for exclusion at telephone screening was due to individuals declaring to be

1 physically active, comprising 20% of the individuals seeking information about the study.
2 Other usual reasons for exclusion were the occurrence of pain, physical disability, and
3 not having time available. Even though the training program allowed some tailoring,
4 depending on the level of physical disability, individuals could not comply with protocol
5 fully, so this was listed as an exclusion criterion. Therefore, anticipating the main sources
6 of exclusions may help to design recruitment notes and objectively address such criteria
7 in eligibility screening.

8 Finally, almost 25% of the individuals who signed the consent form were non-enrolled.
9 Some individuals showed cardiovascular conditions identified only when the stress test
10 was performed. Other cases were individuals who omitted crucial information during the
11 face-to-face interview, such as being physically active or just leaving the study without
12 clarifying the reason. The non-enrollment of participants is routine in any trial, but it can
13 be disadvantageous as there is an investment of financial and human resources. So future
14 studies may try to refine the initial eligibility process, before baseline testing starts, to
15 avoid wasting resources.

16 The present study is not free of limitations. First, we have not estimated costs for each
17 method, which is important considering that many groups would face costs to advertise
18 in press media, which was not the case in our trial. Second, although we contrasted
19 methods between centers in this report, there were differences not exhaustively explored
20 regarding the opportunities to advertise the trial in each center. Third, although not related
21 to our methods, we experienced limitations in reaching a representative sample of
22 Brazilian older adults with hypertension. We speculate that with wider access to
23 *electronic health records* we would have reached greater diversity of participants,
24 however, this needs further assessment.

25

1 **Conclusions**

2 In summary, using multiple methods for participant recruitment contributed to reaching
3 older adults to participate in the HAEL Study, in which calls in *press media* and *word of*
4 *mouth* were valuable approaches in both study centers. However, none of the methods
5 had visible advantage to yield randomization of older (>70 years old) or black
6 participants. We believe that our experience can help future studies in the physical
7 exercise field, which need to recruit older adults with hypertension.

8

9 **List of abbreviations**

10

11 CC: coordinator center

12 HAEL: The Hypertension Approaches in the Elderly

13 PC: participant center

14

15 **Declarations**

16

17 *Ethics approval and consent to participate*

18 The study was approved by the Ethics Committee/IRB from the Hospital de Clínicas de
19 Porto Alegre (CAAE: 62427616.0.1001.5327) and Federal University of Pelotas (CAAE:
20 62427616.0.2001.5313). The study obtained written informed consent from all research
21 participants.

22

23 *Consent for publication*

24

25 Not applicable.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests. The funders had no role in the design of the study at any stage.

Funding

This work was financial supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq (grant number 429849/2016-8) and Fundo de Incentivo à Pesquisa e Eventos, Hospital de Clínicas de Porto Alegre - FIPE (number 2017-0044).

Authors' contributions

CEB, LPS e DU designed the study, analyzed the data, and drafted the manuscript; DU and SSP were the principal investigators of the study centers; CEB, LPS, BGM, RBM, ENW, MLBG took part in the recruitment screening and baseline assessments; All authors took part in the interpretation of the data, revised critically, and approved the final version of the manuscript.

Acknowledgments

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

We are grateful to our HAEL coworkers who have had recruitment activities (Larissa X N da Silva, Angélica T De Nardi, Lucinéia O Pfeifer, Lucas C A Helal, Nórton L Oliveira, Patrícia M Bock, Gustavo Z Schaun, Mariana S Häfele, Graciele F Mendes), to trial participants, and for the support received from the communication coordination of the Hospital de Clínicas de Porto Alegre (Ana Paula Foletto, Rodrigo Wenzel). CEB, LPS, ENW and DU are grateful for the research support they received individually during the study from National Institute of Science and Technology for Health Technology Assessment (IATS) – FAPERGS/Brazil, Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES, Brazil – Finance Code 001), and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq foundation).

References

1. Mills KT, Stefanescu A, He J (2020) The global epidemiology of hypertension. *Nat Rev Nephrol* 16:223–237
2. Picon RV, Fuchs FD, Moreira LB, Riegel G, Fuchs SC (2012) Trends in prevalence of hypertension in Brazil: a systematic review with meta-analysis. *PLoS One* 7:e48255
3. Picon RV, Fuchs FD, Moreira LB, Fuchs SC (2013) Prevalence of Hypertension Among Elderly Persons in Urban Brazil: A Systematic Review With Meta-Analysis. *American Journal of Hypertension* 26:541–548
4. Santos LP, Umpierre D (2020) Exercise, Cardiovascular Health, and Risk Factors for Atherosclerosis: A Narrative Review on These Complex Relationships and

- 1 Caveats of Literature. *Front Physiol* 11:840
- 2 5. Corso LML, Macdonald HV, Johnson BT, Farinatti P, Livingston J, Zaleski AL,
3 Blanchard A, Pescatello LS (2016) Is Concurrent Training Efficacious
4 Antihypertensive Therapy? A Meta-analysis. *Med Sci Sports Exerc* 48:2398–2406
- 5 6. MacDonald HV, Johnson BT, Huedo-Medina TB, Livingston J, Forsyth KC,
6 Kraemer WJ, Farinatti PTV, Pescatello LS (2016) Dynamic Resistance Training as
7 Stand-Alone Antihypertensive Lifestyle Therapy: A Meta-Analysis. *J Am Heart*
8 *Assoc.* <https://doi.org/10.1161/JAHA.116.003231>
- 9 7. Gul RB, Ali PA (2010) Clinical trials: the challenge of recruitment and retention of
10 participants. *J Clin Nurs* 19:227–233
- 11 8. Alemayehu C, Mitchell G, Nikles J (2018) Barriers for conducting clinical trials in
12 developing countries- a systematic review. *Int J Equity Health* 17:37
- 13 9. Anderson TS, Odden MC, Penko J, Kazi DS, Bellows BK, Bibbins-Domingo K
14 (2021) Characteristics of Populations Excluded From Clinical Trials Supporting
15 Intensive Blood Pressure Control Guidelines. *J Am Heart Assoc* 10:e019707
- 16 10. Effoe VS, Katula JA, Kirk JK, et al (2016) The use of electronic medical records for
17 recruitment in clinical trials: findings from the Lifestyle Intervention for Treatment
18 of Diabetes trial. *Trials* 17:496
- 19 11. Marsh AP, Lovato LC, Glynn NW, et al (2013) Lifestyle interventions and
20 independence for elders study: recruitment and baseline characteristics. *J Gerontol*
21 *A Biol Sci Med Sci* 68:1549–1558
- 22 12. Johnson EJ, Niles BL, Mori DL (2015) Targeted recruitment of adults with type 2

- 1 diabetes for a physical activity intervention. *Diabetes Spectr* 28:99–105
- 2 13. Conley S, O’Connell M, Linsky S, Moemeka L, Darden JW 4th, Gaiser EC, Jacoby
3 D, Yaggi H, Redeker NS (2020) Evaluating Recruitment Strategies for a
4 Randomized Clinical Trial with Heart Failure Patients. *West J Nurs Res*
5 193945920970229
- 6 14. Carroll JK, Yancey AK, Spring B, Figueroa-Moseley C, Mohr DC, Mustian KM, et
7 al. What are successful recruitment and retention strategies for underserved
8 populations? Examining physical activity interventions in primary care and
9 community settings. *Transl Behav Med.* 2011;1:234–51.
- 10 15. Umpierre D, The HAEL Study Group, Santos LP, et al (2019) The “Hypertension
11 Approaches in the Elderly: a Lifestyle study” multicenter, randomized trial (HAEL
12 Study): rationale and methodological protocol. *BMC Public Health.*
13 <https://doi.org/10.1186/s12889-019-6970-3>
- 14 16. Cornelissen VA, Smart NA (2013) Exercise Training for Blood Pressure: A
15 Systematic Review and Meta-analysis. *Journal of the American Heart Association.*
16 <https://doi.org/10.1161/jaha.112.004473>
- 17 17. Nolan RP, Floras JS, Harvey PJ, et al (2010) Behavioral neurocardiac training in
18 hypertension: a randomized, controlled trial. *Hypertension* 55:1033–1039
- 19 18. Ramsey TM, Snyder JK, Lovato LC, et al (2016) Recruitment strategies and
20 challenges in a large intervention trial: Systolic Blood Pressure Intervention Trial.
21 *Clin Trials* 13:319–330
- 22 19. Bloch F, Charasz N (2014) Attitudes of Older Adults to Their Participation in

1 Clinical Trials: A Pilot Study. *Drugs & Aging* 31:373–377

2 20. Sardar MR, Badri M, Prince CT, Seltzer J, Kowey PR (2014) Underrepresentation
3 of women, elderly patients, and racial minorities in the randomized trials used for
4 cardiovascular guidelines. *JAMA Intern Med* 174:1868–1870

5 21. Golomb BA, Chan VT, Evans MA, Koperski S, White HL, Criqui MH (2012) The
6 older the better: are elderly study participants more non-representative? A cross-
7 sectional analysis of clinical trial and observational study samples. *BMJ Open*
8 2:e000833

9 22. Van Spall HGC, Toren A, Kiss A, Fowler RA (2007) Eligibility criteria of
10 randomized controlled trials published in high-impact general medical journals: a
11 systematic sampling review. *JAMA* 297:1233–1240

12
13 **Titles and captions of figures and tables**

14 **Figure 1.** Flowchart of the recruitment process for the HAEL Study.

15 **Table 1.** Demographic and clinical characteristics of randomized participants.

16 **Figure 2.** Yield rate per recruitment method. CC= coordinator center; PC= participant
17 center.

18 **Table 2.** Yield rate per recruitment methods by sex and age group.

19 **Figure 3.** Crude recruitment output per recruitment methods. CC= coordinator center;
20 PC= participant center.

21
22