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How to recruit inactive residents for lifestyle interventions: participants' characteristics based on various recruitment strategies

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Summary

Care Sport Connectors (CSCs) have been appointed to create a connection between primary care and physical activity (PA) sectors to stimulate inactive residents into becoming physically active. Adequate recruitment strategies are necessary to reach the intended target group in order to foster the sustainability of lifestyle interventions. The objective of this study is to explore PA behavior and health characteristics of the target group reached by CSCs and if these characteristics differ between participants when grouped based on how they were recruited. Participants from lifestyle interventions were included between September 2014 and April 2016 using a purposive sampling method. Participants were recruited through CSCs via public relations ($n = 135$), a personal letter ($n = 136$), or a referral ($n = 98$) and compared based on their PA level, health-related quality of life, motivation, self-efficacy, morbidity and health-related fitness. Scores were analyzed with a multi-level (mixed model) analysis measured before the intervention. The three groups were different in PA level ($p = 0.002$). The outcomes regarding health-related quality of life, motivation, and number of somatic disorders were also significantly different for the three groups, except for the categories of mental health ($p = 0.145$) and self-efficacy ($p = 0.464$). For all dimensions, the referral group scored the least favorable. The investment in time and money for an active recruitment strategy like referrals is worthwhile because it provides CSCs the opportunity to reach people who are inactive and at risk of chronic disease. Future studies are necessary to reveal the effect on PA levels and health in the long-term.

Key words: health promotion, primary care, physical activity, recruitment strategy, care sport connector

INTRODUCTION

Physical activity (PA) is an important determinant of health and a preventive factor for the development of many chronic diseases (U.S. Department of Health and Human Services, 1996; Balady *et al.*, 2000; Penedo and Dahn, 2005; Reiner *et al.*, 2013). Although PA can be seen as an individual behavior, it is also determined by

social and environmental factors (Bauman *et al.*, 2012; Dollman, 2018). Therefore, it is important to promote PA using an integrated approach wherein policy can play a necessary and stimulating role (McLeroy *et al.*, 1988; Bull *et al.*, 2004). For that reason, in the Netherlands, the Ministry of Health, Welfare, and Sports introduced Neighborhood Sport Coaches (in Dutch: *Buurtsportcoaches*) in 2012. Neighborhood Sport Coaches have the task of making a connection between the sport or PA sector and other health-related sectors to stimulate residents to become physically active.

A few of these Neighborhood Sport Coaches, the so-called Care Sport Connectors (CSCs), focus on the connection between the primary care and PA sectors. Previous results showed that CSCs have an important role in strengthening intersectoral collaboration (Smit *et al.*, 2020) and that CSCs collaborate with professionals from the primary care, PA and welfare sectors (Leenaars *et al.*, 2016b; 2017). The general idea is professionals in these sectors collaborate and implement lifestyle interventions, which are directed toward specific target groups. Eventually, these target groups self-manage their PA. When the target groups become more physically active, health outcomes improve. This is supported by review studies, showing that lifestyle interventions can be (modestly) effective in changing behavior (Kirk *et al.*, 2012; Lv *et al.*, 2017; Bergeron *et al.*, 2019; Grimmett *et al.*, 2019).

The way CSCs are employed is different in each municipality because there is no blueprint for CSC implementation. CSCs are working either within the PA sector or across multiple sectors with an integrated approach. The organization where the CSC professional is appointed has a major influence on the way in which the partners in the network interact and work together (Leenaars *et al.*, 2017). In the case of an integrated approach, primary care professionals mostly fulfill the role of referrer, where other professionals arrange the activity and ensure that the necessary preconditions are arranged to be able to carry out the interventions. In networks from CSCs who worked from the PA sector, primary care professionals help to implement CSCs' activities by fulfilling the role of instructor or arranging a fittest (Leenaars *et al.*, 2017). An integrated approach seems the most promising when it comes to organizing, supporting and implementing different kinds of activities for various target groups. This prospect may be decisive for the success of the lifestyle interventions because the recruitment of an insufficient number of participants is a well-known pitfall (Boutaugh, 2003; Peck *et al.*, 2008; Deakin University, 2012; Leenaars *et al.*, 2016a).

Optimal recruitment strategies are necessary to reach the intended target group (i.e. inactive adults with or at risk of a chronic disease) in order to foster the sustainability of lifestyle interventions and to decrease health inequalities by reaching persons with the highest burden of illness. Previous studies (Peck *et al.*, 2008; Carroll *et al.*, 2011; Deakin University, 2012; Jiwa *et al.*, 2012; Bonevski *et al.*, 2014; Leemrijse *et al.*, 2015) gave insight into various recruitment strategies to reach hard-to-reach target groups, such as partnering, advertising channels, incentives, and referrals. However, due to inadequate reporting and evaluation, the mechanism for achieving effective recruitment are unclear, especially for hard-to-reach groups (Cooke and Jones, 2017). There is a need for the comparison of different recruitment strategies regarding the representativeness of reached target groups (Glasgow *et al.*, 1999; UyBico *et al.*, 2007; Treweek *et al.*, 2010; Jiwa *et al.*, 2012) instead of only a reached percentage. It would be useful to describe socio-demographic, health-related, or clinical characteristics of the reached population and, if this is a representation of the target population (Glasgow *et al.*, 1999; UyBico *et al.*, 2007), to determine if a recruitment strategy is effective and successful. Therefore, this study focuses on the reached target group of lifestyle interventions whereby a CSC is involved. The objective of this paper is to reveal the PA behavior and health characteristics of the reached target groups of CSCs and if these characteristics differ between various recruitment strategies (i.e. public relations, personal letters and referrals). The information from this explorative study is helpful for CSCs and other health promotion professionals to be able to choose a suitable recruitment strategy to reach their intended target group of inactive adults with or at risk of a chronic disease.

METHODS

This explorative study is part of the larger project titled, 'Connecting Care, Sport, and PA', which is a multiple case evaluation study of 14 CSCs conducted in 9 municipalities spread over the Netherlands. The aim of that study is to get more insight into the function of CSCs (Smit *et al.*, 2015). The project consists of two trajectories: The first trajectory focuses on the intermediary target groups, specifically CSCs and professionals active in the primary care and PA sectors who implement lifestyle programs. The CSCs are expected to form health alliances by connecting professionals from different sectors and sustain the collaboration in these alliances. The second trajectory, which provides the input for this study, concentrates on health and PA behavior changes of the

participants of the lifestyle programs. Here, adults who participate in the lifestyle programs organized by professionals from the alliances of the first trajectory are the focus.

Participants

Participant recruitment occurred between September 2014 and April 2016. A purposive sampling method was used: participants were recruited if they took part in a lifestyle intervention, sports activity, or PA whereby a CSC was involved. CSCs indicated when a new lifestyle intervention or activity started and if it was possible to include participants in our study. The participants were divided into three groups based on the way they were approached to take part in the intervention or activity. The first group, the public relations (PR) group, consisted of participants who were approached through PR activities, such as flyers, social media, receiving the contact information of a CSC and word of mouth. The second group, the personal letter group, was recruited by a personal letter from a CSC. The home addresses were obtained from the population register of the municipality on the basis of age criteria. The third group, the referral group, consisted of participants who were directed by a professional (primary care, welfare or otherwise) to take part in an intervention or activity. The measurements for this study started 1 or 2 weeks before the start of the intervention.

Outcome measures

The PA level of a participant was measured via the Short Questionnaire to Assess Health-enhancing PA (SQUASH) (Ooijendijk *et al.*, 2007). SQUASH measures the amount of PA, by asking the mean time spent per day and the number of days per week that they carry out the following activities: commuting, PA at work or school, domestic work and leisure time. Scores were converted according to the PA guideline and the PA variable was dichotomized in order to decide if a participant met the guideline of 30 min of moderate to vigorous PA at least five times a week (Kemper *et al.*, 2000). Participants received a booklet with five questionnaires, the SQUASH, the health-related quality of life questionnaire (Rand 36) (Van der Zee and Sanderman, 1993), motivation (Breq-2) (Markland and Tobin, 2004), self-efficacy (SEE) (Resnick and Jenkins, 2000) on a five-point Likert scale and personal information questionnaire (age, gender, somatic disorders and to which recruitment strategy they responded).

In addition, participants did a fitness test to test their health-related fitness. The components of our fitness test are based on the Toronto Model (Bouchard and Shephard, 1994), whereby health-related fitness is divided into the following five factors: morphological, muscular strength and endurance, motor, cardio-respiratory fitness, and metabolic fitness. For each factor, suitable tests were selected based on their ability to test functional fitness. The tests were not too burdensome for older adults and people with (or with an increased risk of) a chronic disease and practical feasibility for the execution of the fitness test. Morphological factors, mass, height, fat percentage (measured using the Omron Body Fat Monitor BF306) and waist circumference were recorded respectively to the nearest 0.1 kg, 0.5 cm, 0.1% and 0.5 cm. Only mass and height were used to calculate body mass index (BMI). Shoulder, back and leg flexibility was tested using the Straight Leg Raise test (Rikli and Jones, 1999), the Back Scratch test (Rikli and Jones, 1999) and the Modified Schober test (Macrae and Wright, 1969), respectively. For each test, participants made three attempts. For the Modified Schober test and Straight Leg Raise test, the mean score was recorded. For the Back scratch test, the best attempt was recorded. The metabolic components blood pressure (measured while seated), cholesterol and glucose were measured using the Omron Omron M5-1 and the Accutrend Plus meter, in line with the protocol of punctures (Vilans, 2012). Muscular strength and endurance were measured with the Arm Curl, the Chair Stand test, and the Hand Grip Strength test (Rikli and Jones, 1999). For the latter, the JAMAR Hand Dynamometer was used, and participants had two attempts. Of the two attempts, the maximum score was noted. The Up and Go test (Rikli and Jones, 1999) was used to test agility, speed and dynamic balance for the motor functioning component. Scores were noted to the nearest 0.1 s. For the measurement of cardio-respiratory fitness, two tests were used: the 6-min Walk test (Wasserman *et al.*, 1987) and the Astrand test. The walk test was used for older adults (50+) and immigrants who are not used to cycling. To compare both scores, we used norm equations (Wasserman *et al.*, 1987; Beekman *et al.*, 2014; Myers *et al.*, 2017) to reveal the deviation from the norm for each participant as a percentage. Percentages from both norms were transformed to a z score.

All components of the functional fitness test were described in a protocol to make sure that each test leader performed the test identically. Each test leader was instructed by ES (first author), who was on site at 80% of the fitness tests. When she was absent, an instructed physiotherapist took over. After the fitness tests, all participants received the questionnaire and had three weeks to fill in the questionnaire. A reminder was sent after

two weeks. All participants provided informed consent and agreed to participate voluntarily.

Statistical analysis

Due to the hierarchical structure of our study, in which participants were clustered by each CSC, we used a multi-level (mixed model) analysis to test if characteristics of participants differ among the three groups that are demarcated by how they were recruited. For both linear and logistic models, we fit the data to a model with a random intercept and all other variables fixed. All outcomes except PA were treated as continuous and thus were outcomes in linear models. PA, treated as a dichotomous variable was modeled with a logistic regression. Outcome measures, except the score for PA behavior, were corrected for age and gender. Medication-related variables (i.e. blood pressure, cholesterol and blood glucose level) were also adjusted for associated medication use. The medical use variable was dichotomized into yes or no. A *p*-value of <0.05 was considered to be statistically significant based on a two-sided test. Sidak *post hoc* analysis was used to test for significant differences among the three groups. All analyses were performed using SPSS version 22.

RESULTS

In the end, 369 participants were included in our study. Thirty-three participants were excluded due to an unknown recruitment strategy. This exclusion was partly selective, as the population that was excluded were immigrants who found it hard to fill in the questionnaire due to language issues. We compared the groups, and they were not significantly different for BMI, blood pressure, strength and flexibility. After a year of recruitment-activities, it became noticeable that inclusion numbers were unequally distributed among the three groups. Therefore, we included three more CSCs, of which two recruited participants through the referral of professionals and the other mainly through PR. In total, 17 CSCs from 12 municipalities were included in our study. The participants of our study were recruited as follows: 98 participants through referral, 135 through PR and 136 through a personal letter. To get an insight into the number of included participants per CSC, we added a table in Supplementary Appendix S1. We also present the total reach of each CSC and their own perception as a percentage of which recruitment strategy they use to recruit participants. The numbers of reached participants are the self-reported numbers obtained in half yearly interviews with the CSCs (8) and give a global impression of the reach and recruitment strategy of each CSC.

Of the total sample, 71.3% were women, and the mean age was 61.8 years (SD = 14.11). The groups did not differ significantly in gender and age. The three groups had significantly different PA behavior (*p* = 0.002). The referred group, with 32.7%, had the least percentage of participants who met the PA guidelines compared with 45.2% and 60.3% of the PR and personal letter group, respectively. Unlike mental health (*p* = 0.145) and self-efficacy (*p* = 0.464), the other outcomes regarding health-related quality of life, motivation and the number of somatic disorders were also significantly different (*p* < 0.05) among the three groups. For all dimensions, the referral group scored least favorable.

The scores concerning health-related fitness were significantly different for waist circumference (*p* = 0.012); shoulder flexibility (*p* = 0.004); leg strength (*p* = 0.003); arm strength (*p* ≤ 0.001); speed, agility and balance (*p* ≤ 0.001); and endurance (*p* ≤ 0.004). Table 1 gives an overview of the scores for each group and the corresponding *p*-value.

Post hoc analysis showed that the referral group was significantly different from the other two groups for PA behavior, physical functioning, role limitation due to physical health, general health, health change, the number of somatic diseases, leg strength and arm strength. The referral group was significantly different than the PR group for motivation and differed from the personal letter group for vitality; waist circumference; shoulder flexibility; and speed, agility and balance. The results of the *post hoc* analysis are presented in Table 2.

DISCUSSION

The purpose of this study is to explore if the different recruitment strategies (i.e. PR, personal letters and referrals) would reach similar participants for lifestyle interventions and if these participants are representative of the CSCs' target group (i.e. inactive adults with or at risk of a chronic disease). Our results show that recruited participants differ across the three recruitment strategies. The PR group can be described as a group that was highly motivated to become more physically active. They scored for health-related quality of life within the normal range and were moderately fit. The personal letter group, recruited through a fitness test, experienced an overall good health-related quality of life and was in general fit. The referral group was less motivated to become physically active, experienced a lower health-related quality of life and was less fit compared

Table 1: Scores for physical activity behavior, health-related quality of life, motivation, self-efficacy, and health-related fitness per recruitment strategy (means and standard deviation)

	PR	Personal letter	Referral	*p*-value
Women, *n* (%)	111 (82.2%)	81 (59.6%)	71 (72.4%)	0.428
Age (years)	59.8 ± 14.9	67.9 ± 7.6	53.5 ± 16.9	0.821
Meets physical activity guideline n (%)[a]	61 (45.2%)	82 (60.3%)	32 (32.7%)[b]	0.002
Health-related quality of life (0–100)[c]				
Physical functioning	71.3 ± 25.0	79 ± 19.0	62.1[b] ± 23.9	
Social functioning	77.9 ± 23.6	85.4 ± 19.5	70.9 ± 24.2	
Role limitation physical	75.7 ± 37.3	81.8 ± 32.0	50.7[b] ± 44.8	
Role limitation emotional	80.2 ± 37.2	88.2 ± 27.3	67.1 ± 40.5	
Mental health	72.5 ± 18.6	76.9 ± 17.2	68.3 ± 19.4	
Vitality	62.5 ± 19.0	67.7 ± 18.3	53.3[d] ± 20.0	
Pain	73.2 ± 25.5	78.5 ± 20.4	62.5 ± 24.9	
General health	62.6 ± 15.7	65 ± 16.7	49.7[b] ± 16.9	
Health change	50.4 ± 17.7	51.3 ± 16.2	40.5[b] ± 18.6	0.005
Motivation (−25–19)[c]	9.0 ± 5.1	8.9 ± 5.3	6.5[e] ± 5.2	0.027
Self-efficacy (1–5)[c]	3.2 ± 0.8	3.1 ± 0.7	2.9 ± 0.7	0.464
Number of somatic diseases[f]	1.5 ± 1.8	1.6 ± 1.5	2.4[b] ± 2.1	0.007
Body mass index (kg/m^2)[f]	29.7 ± 5.4	27.7 ± 4.9	32.5 ± 6.9	0.050
Waist circumference (cm) [f]	97.1 ± 12.2	96.7 ± 12.9	107.3[d] ± 19.2	0.012
Fat percentage (%)[f]	38.0 ± 7.5	33.8 ± 8.4	40.4 ± 9.2	0.174
Glucose (mmol/l)[f]	5.7 ± 1.8	5.9 ± 1.6	5.7 ± 1.7	0.705
Cholesterol (mmol/l)[f]	5.5 ± 1.0	5.8 ± 1.0	5.2 ± 1.0	0.198
Blood pressure[f]				
Diastolic (mmHg)	84.9 ± 10,1	87.3 ± 10.0	82.9 ± 11.2	0.199
Systolic (mmHg)	135.9 ± 18.5	145.7 ± 17.9	135.3 ± 17.7	0.149
Shoulder flexibility (cm)	8.7 ± 10.0	8.3[b] ± 9.2	11.8 ± 11.2	0.004
Leg flexibility (degrees)	81.5 ± 14.7	74.9 ± 15.3	83.9 ± 15.0	0.834
Back flexibility (cm)	20.8 ± 2.3	20.3 ± 1.6	20.5 ± 1.9	0.333
Leg strength (*n*)	12.8 ± 4.1	13.7 ± 3.2	11.8[b] ± 3.8	0.003
Arm strength (*n*)	15.4[b] ± 4.6	17.7[b] ± 4.1	15.2[b] ± 5.9	<0.001
Hand grip strength (kg)	59 ± 18.3	65.4 ± 20.0	59.5 ± 23.2	0.124
Speed. agility and balance (sec)[f]	7.3 ± 2.6	5.8[b] ± 1.5	7.4 ± 2.0	<0.001
Endurance (*z*)	−0.3 ± 0.9	0.5 ± 0.8	−0.4[d] ± 1.0	0.003

The data represents the means of each score with the corresponding standard deviation. Scores were adjusted for age, gender, and medication for medication related variables (blood pressure, glucose, cholesterol).

[a]Guideline of 30 min of moderate to vigorous PA, at least five times a week (Kemper *et al.* 2000).

[b]Significantly different from the other two recruitment strategy groups.

[c]Total possible score on the scale.

[d]Significantly different from the personal letter group.

[e]Significantly different from the PR group.

[f]A lower score represents a higher level of fitness.

to the other two groups. Overall, we can conclude that the group with participants who were referred by a professional score less auspiciously than the other two groups, and represented the desired target group most. Although each recruitment strategy reached participants belonging to the desired target group, the referral group reached the most inactive adults with or at risk for a chronic disease.

Previous studies showed that PA levels, fitness and health-related quality of life decrease with age (Van der Zee and Sanderman, 1993; Rikli and Jones, 1999; Nelson *et al.*, 2007; Hallal *et al.*, 2012; RIVM, 2014). Therefore, it is striking that participants recruited by referral were the youngest, least likely to be meeting PA guidelines, least fit, and reported the lowest levels of health-related quality of life. However, (perceived) health is a strong predictor of and has a positive correlation with PA levels and fitness (Suni *et al.*, 1998; Malmberg *et al.*, 2002; de Hollander *et al.*, 2015). From this point of view, it is reasonable that participants who

Table 2: *Post hoc* analysis for the three recruitment strategies

	Recruitment strategy	n (%)	Odds ratio (95% CI)			p-value		
			PR	Personal letter	Referral	PR	Personal letter	Referral
Meets physical activity guideline (n)	PR (reference)	61 (45.2%)						
	Personal letter	82 (60.3%)	2.0 (0.1–1.3)				0.026	
	Referral	32 (32.7%)	0.6 (0.3–1.1)				0.113	
		Mean^a (95% CI)	Mean difference (95% CI)			p-value		
			PR	Personal letter	Referral	PR	Personal letter	Referral
Physical functioning	PR	69.6 (62.1–77.1)	—	—	—	—	—	—
	Personal letter	77.8 (67.2–88.3)	8.1 (−5.6–21.9)	—	—	0.373	—	—
	Referral	60.2 (52.6–67.9)	−9.4 (−18.4 − −0.3)	−17.5 (−30.9 − −4.1)	—	0.039	0.007	—
Social functioning	PR	76.7 (70.4–83.1)	—	—	—	—	—	—
	Personal letter	82.4 (72.0–92.0)	5.7 (−7.3–18.7)	—	—	0.565	—	—
	Referral	70.1 (63.5–76.8)	−6.6 (−15.5–2.3)	−12.3 (−24.7−−0.2)	—	0.210	0.054	—
Role limitation physical	PR	69.4 (56.0–80.7)	—	—	—	—	—	—
	Personal letter	80.2 (63.4–97.0)	10.8 (−11.8–33.5)	—	—	0.511	—	—
	Referral	49.4 (47.6–61.3)	−20.0 (−35.3 − −4.6)	−30.8 (−52.7 − −8.9)	—	0/006	0.004	—
Role limitation emotional	PR	73.9 (62.5–85.3)	—	—	—	—	—	—
	Personal letter	86.1 (69.5–102.6)	12.2 (−9.4–33.8)	—	—	0.400	—	—
	Referral	64.9 (52.9–76.8)	−9.0 (−23.5–5.4)	−21.2 (−42.5−0.0)	—	0.348	0.051	—
Vitality	PR	61.7 (56.5–66.8)	—	—	—	—	—	—
	Personal letter	65.2 (56.9–73.4)	3.5 (−7.7–14.6)	—	—	0.745	—	—
	Referral	54.8 (49.4–60.1)	−6.9 (−14.3–0.5)	−10.4 (−20.7 − −0.0)	—	0.078	0.049	—
Pain	PR	71.2 (64.3–78.1)	—	—	—	—	—	—
	Personal letter	75.6 (65.7–85.6)	4.4 (−9.3–18.1)	—	—	0.788	—	—
	Referral	62.5 (55.3–69.8)	−8.7 (−18.3–0.9)	−13.1 (−26.5−−0.3)	—	0.087	0.056	—
General health	PR	62.3 (58.6–66.0)	—	—	—	—	—	—
	Personal letter	65.0 (57.9–72.1)	2.7 (−6.3–11.6)	—	—	0.703	—	—
	Referral	49.6 (45.4–53.9)	−12.7 (−19.1 − −6.3)	−15.3 (−23.3 − −7.4)	—	0.000	0/001	—

(continued)

Table 2: (Continued)

	Recruitment strategy	n (%)	Odds ratio (95% CI)		p-value	
Health change	PR	49.6 (45.3–54.0)	—	—	—	—
	Personal letter	51.5 (45.6–57.5)	1.9 (−7.0–10.8)	—	0.916	—
	Referral	40.5 (35.7–45.4)	−9.1 (−16.2 − −2.0)	−11.0 (−20.0 − −2.1)	0.007	0.012
Motivation	PR	9.1 (7.8–10.5)	—	—	—	—
	Personal letter	8.7 (6.8–10.6)	−0.5 (−3.2–2.3)	—	0/953	—
	Referral	6.8 (5.3–8.2)	−2.4 (−4.4 − −0.3)	−1.9 (−4.6–0.8)	0.017	0.237
Number of somatic diseases (n)[b]	PR	1.7 (1.4–2.1)	—	—	—	—
	Personal letter	1.6 (0.5–2.7)	−0.1 (−1.2–0.9)	—	0.925	—
	Referral	2.9 (2.5–3.3)	1.2 (0.6–1.8)	1.3 (0.5–2.2)	<0.001	0.004
Waist circumference (cm)[b]	PR	100.5 (95.5–105.4)	—	—	—	—
	Personal letter	95.9 (89.0–102.7)	−4.6 (−13.6–4.4)	—	0.513	—
	Referral	105.6 (100.5–110.6)	5.1 (−0.6–10.8)	9.7 (0.9–18.5)	0.093	0.026
Shoulder flexibility (cm)	PR	11.4 (8.7–14.1)	—	—	—	—
	Personal letter	6.0 (2.2–9.8)	−5.4 (−10.7 − −0.7)	—	0.046	—
	Referral	13.4 (10.5–16.2)	2.0 (−1.9 − −5.8)	7.3 (2.1–12.6)	0.524	0.004
Leg strength (n)	PR	12.7 (11.5–13.9)	—	—	—	—
	Personal letter	14.1 (12.5–15.8)	1.4 (−0.8–3.6)	—	0.297	—
	Referral	11.3 (10.1–12.5)	−1.4 (−2.9–0.4)	−2.9 (−5.0 − −0.7)	0.060	0.005
Arm strength (n)	PR	15.0 (13.4–16.7)	—	—	—	—
	Personal letter	18.3 (16.0–20.5)	3.3 (0.4–6.1)	—	0.020	—
	Referral	13.4 (11.8–15.1)	−1.6 (−3.3–0.2)	−4.8 (−7.6 − −2.1)	0.089	<0.001
Speed, agility and balance (sec)[b]	PR	7.5 (6.9–8.1)	—	—	—	—
	Personal letter	5.6 (4.7–6.5)	−1.9 (−3.0 − −0.8)	—	<0.001	—
	Referral	7.9 (7.2–8.5)	0.4 (−0.4–1.1)	2.3 (1.2–3.3)	0.559	<0.001
Endurance (z)	PR	−0.3 (−0.6 − −0.1)	—	—	—	—
	Personal letter	0.2 (−0.2–0.7)	0.5 (−0.7–1.1)	—	0.100	—
	Referral	−0.5 (−0.9 − −0.2)	−0.3 (−0.6–0.1)	−0.8 (−1.4 − −0.2)	0.250	0.003

Scores were adjusted for age, gender, and medication for medication related variables (blood pressure, glucose, cholesterol).

[a]Estimated means.

[b]A lower score represents a higher level of fitness.

were referred scored lower on PA level and fitness because they also suffer from more somatic diseases and experience a lower health-related quality of life. The percentage of participants who received referrals that meet the PA guidelines (32%) is lower than the Dutch mean of 44% for people with lower experienced health (de Hollander *et al.* 2015). Whereas the percentage of the PR group who meet the PA guideline (45%) is lower to the Dutch mean of 55%, the percentage of the personal letter group who meet that criteria is 60%, which is higher but not as high as that of healthy older adults in the Netherlands, of whom 84% meets the PA guideline (de Hollander *et al.*, 2015).

We can make a distinction between active and passive recruitment. Active recruitment refers to having direct interaction with potential participants via person-to-person contact (Estabrooks *et al.*, 2017). Passive recruitment involves no direct interaction and can be in the form of flyers and websites, for example (Estabrooks *et al.*, 2017). Passive recruitment strategies, such as PR and personal letters, combined with the use of the population register of a municipality reach a greater amount of people with less effort. Previous studies showed that passive recruitment strategies were more cost efficient (Lee *et al.*, 1997; Estabrooks *et al.*, 2017) and had a high percentage of enrollment in a lifestyle intervention after screening (Lee *et al.*, 1997). In the case of passive recruitment, the assumption is made that people decide themselves if they belong to the addressed target group. This assumption holds if we look at the enrollment rates. However, our study and previous studies (Lee *et al.*, 1997; Cooke and Jones, 2017; Estabrooks *et al.*, 2017) showed that active recruitment strategies such as referral reach more vulnerable and representative participants according to the defined target group or participants with a higher BMI (Yancey *et al.*, 2001). People who were refereed had a lower BMI at the start of the lifestyle intervention, and this difference should be taken into account with the offered lifestyle intervention. Passive recruitment strategies more often reach participants with a higher socio economic status and who are more physically active (Martinson *et al.* 2010; Cooke and Jones, 2017). Therefore, several authors recommend that strategies should be clearly designed to target specific populations, e.g. by targeting specific demographic characteristics such as ethnicity (Cooke and Jones, 2017; Lion *et al.*, 2019) and that a combination of passive and active recruitment strategies, including digital tools (e.g. e-mail, websites) should be used in promoting PA (Bergeron *et al.*, 2019).

New professions, like CSCs, will be assessed mostly on reach; therefore, it is understandable to choose less time-consuming passive recruitment strategies that have a higher reach. However, health inequalities will become bigger if we do not reach the most vulnerable residents (i.e. inactive persons with or at risk of a chronic disease). One can argue that each recruitment strategy will reach a certain number of vulnerable residents, but this reasoning will have consequences for lifestyle interventions. Participants have various PA levels, clinical characteristics and motivation. The referral group had the lowest motivation for becoming physically active and was less fit compared to the other groups. Participants from the PR group had the highest motivation to become physically active. The personal letter group was most fit. Participants who are less fit may not feel comfortable in a group-based PA program or cannot handle the intensity of the activity, which will lead to drop-outs (Sabiston *et al.*, 2009; Penn *et al.*, 2013; Kluge *et al.*, 2014). Therefore, it would be a good investment to focus on an active recruitment strategy and the way in which partners in the network interact and work together. This tactic takes time, and CSCs are dependent on other professionals to execute an active recruitment strategy. For that reason, CSCs need support to create a sustainable collaboration structure and should be assessed rather on the type of participants they reach. Furthermore, it would be helpful if CSCs are assigned in advance a specific target group instead of being given a general role description, which was what was available at the time of this study. A previous study revealed that an integrated approach for the embedding of the CSC function, in which CSCs collaborate with primary health care professionals, is helpful for establishing a referral system with primary care professionals (Leenaars *et al.*, 2017).

Future studies should reveal if CSCs who use an integrated approach reach a higher proportion of representatives of the target group. In addition, future studies should focus on reasons why fewer participants enroll in a lifestyle intervention after active recruitment and what are more tailored recruitment strategies. Alongside this, process evaluation is necessary, wherein drop-outs, regular assessment of the fitness of new recruits and maintenance are monitored in the long-term.

Strengths and limitations

This study provides an in-depth insight into the reach of CSCs, to get an idea of the representativeness of their reach regarding the defined target population (i.e. inactive adults with or at risk of a chronic disease). Our results are helpful for CSCs and their supervisors to determine which recruitment strategy is suitable for their

context. However, there are a few limitations that we have to consider for the interpretation of these results. Our sample was dependent on practical issues, so we cannot guarantee representativeness, a matter which is also visible in the non-proportionate delivery of participants per CSC. However, a full check was hard to establish because CSCs do not monitor their recruitment adequately. Not all participants who were reached were included in the monitor, and not all included participants in the monitor started with a lifestyle intervention. On the other hand, our study represents a real practical situation and thereof a good exploration. However, an explorative study does not test or confirm a hypothesis. For an explorative study, it is enough to present effect and variation sizes. *P*-values and a 95% confidence interval are very informative and provided in this study because it gives the possibility to compare the explorative results with other results.

CSCs offered different lifestyle activities, sports and PA. These activities were mentioned within the recruitment strategy and could have influenced the choice to participate or not. However, almost all activities were a combination of various sports and were offered in a group setting. An exception is the personal letter group, who were offered specific sports activities, in addition to the various sports offered in a group setting.

We used various measurements for this study captured with a self-administered questionnaire. The chosen questionnaires are commonly used and extensively tested for validity and reliability (Van der Zee and Sanderman, 1993; Resnick and Jenkins, 2000; Markland and Tobin, 2004; Ooijendijk *et al.*, 2007). A limitation is that each questionnaire or even item might be over- or under-estimated by the respondent. Another remark must be made about the endurance test. We had to use two different kinds of tests due to the variation in participants. We used norm equations (Wasserman *et al.*, 1987; Beekman *et al.*, 2014; Myers *et al.*, 2017) to determine how participants' scores deviate from the norm as a percentage. These norm scores were used to compare participants in the different groups. These norms are set for healthy adults and give the opportunity to demonstrate their prognostic characteristics across healthy and diseased populations. And for this study, it gave an insight into the representativeness of the reached participants regarding the defined target population.

CONCLUSION

With this study, we meet the need for comparison of different recruitment strategies regarding the representativeness of reached target groups. Our explorative study showed that recruitment strategies reach different target groups. Participants who received referrals from a professional were least likely to be meeting PA guidelines and reported the lowest levels of health-related fitness. The investment in time and money for an active recruitment strategy is worthwhile because it gives the opportunity to reach people who are inactive and at risk for a chronic disease. Future studies are necessary to reveal long-term benefits of active recruitment into PA interventions on PA and health.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Health Promotion International* online.

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ETHICS APPROVAL

This study has been approved by the Medical Ethical Review Committee: CMO Regio Arnhem-Nijmegen (file number 2013–492).

REFERENCES

Balady, G. J., Berra, K. A., Golding, L. A., Gordon, N. F., Mahler, D. A., Myers, J. N. *et al.*, (2000) *ACSM's Guidelines for Exercise Testing and Prescription*, 6th edn. Lippincott Williams & Wilkins, United States of America.

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., Martin, B. W. *et al.* (2012) Correlates of physical activity: why are some people physically active and others not? *Lancet*, **380**, 258–271.

Beekman, E., Mesters, I., Gosselink, R., Klaassen, M. P. M., Hendriks, E. J. M., van Schayck, O. C. P. *et al.* (2014) The first reference equations for the 6-minute walk distance over a 10 m course. *Thorax*, **69**, 867–868.

Bergeron, C. D., Tanner, A. H., Friedman, D. B., Zheng, Y., Schrock, C. S., Bornstein, D. B. *et al.* (2019) Physical activity

communication: a Scoping Review of the Literature. *Health Promotion Practice*, **20**, 344–353.

Bonevski, B., Randell, M., Paul, C., Chapman, K., Twyman, L., Bryant, J. et al. (2014) Reaching the hard-to-reach: a systematic review of strategies for improving health and medical research with socially disadvantaged groups. *BMC Medical Research Methodology*, **14**, 42.

Bouchard, C. and Shephard, R. J. (1994) Physical activity fitness and health: the model and key concepts., In Bouchard, C., Shephard, R.J. and Stephens, T. (eds), *Physical Activity Fitness and Health: International Proceedings and Consensus Statement*. Human Kinetics, Champaign, IL, pp. 77–88.

Boutaugh, M. L. (2003) Arthritis Foundation community-based physical activity programs: effectiveness and implementation issues. *Arthritis and Rheumatism*, **49**, 463–470.

Bull, F. C., Bellew, B., Schöppe, S. and Bauman, A. E. (2004) Developments in National Physical Activity Policy: an international review and recommendations towards better practice. *Journal of Science and Medicine in Sport*, **7**, 93–104.

Carroll, J. K., Yancey, A. K., Spring, B., Figueroa-Moseley, C., Mohr, D. C., Mustian, K. M. et al. (2011) What are successful recruitment and retention strategies for underserved populations? Examining physical activity interventions in primary care and community settings. *Translational Behavioral Medicine*, **1**, 234–251.

Cooke, R. and Jones, A. (2017) Recruiting adult participants to physical activity intervention studies using sport: a systematic review. *BMJ Open Sport & Exercise Medicine*, **3**, e000231.

Deakin University, Centre for Physical Activity and Nutrition Research (2012) *Identifying Effective Strategies to Increase Recruitment and Retention in Community-Based Health Promotion Programs*. Deakin University's Centre for Physical Activity and Nutrition Research, Burwood Victoria.

de Hollander, E. L., Milder, I. E. and Proper, K. I. (2015) *Beweeg-en Sportgedrag Van Mensen Met Een Chronische Aandoening of Lichamelijke Beperking*. RIVM, Bilthoven.

Dollman, J. (2018) Social and environmental influences on physical activity behaviours. *International Journal of Environmental Research and Public Health*, **15**, 169.

Estabrooks, P., You, W., Hedrick, V., Reinholt, M., Dohm, E. and Zoellner, J. (2017) A pragmatic examination of active and passive recruitment methods to improve the reach of community lifestyle programs: the Talking Health Trial. *International Journal of Behavioral Nutrition and Physical Activity*, **14**, 7.

Glasgow, R. E., Vogt, T. M. and Boles, S. M. (1999) Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *American Journal of Public Health*, **89**, 1322–1327.

Grimmett, C., Corbett, T., Brunet, J., Shepherd, J., Pinto, B. M., May, C. R. et al. (2019) Systematic review and meta-analysis of maintenance of physical activity behaviour change in cancer survivors. *International Journal of Behavioral Nutrition and Physical Activity*, **16**, 37.

Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., et al. (2012) Global physical activity levels: surveillance progress, pitfalls, and prospects. *The Lancet*, **380**, 247–257.

Jiwa, M., Dadich, A., Sriram, D., Ngune, I. and Lotriet, J. (2012) Effective recruitment strategies in primary care research: a systematic review. *Quality in Primary Care*, **20**, 115–123.

Kemper, H. C. G., Ooijendijk, W. T. M. and Stiggelbout, M. (2000) Consensus over de Nederlandse norm voor gezond bewegen. *Tijdschrift Voor Gezondheidswetenschappen*, **78**, 180–183.

Kirk, S. F. L., Penney, T. L., McHugh, T.-L. F. and Sharma, A. M. (2012) Effective weight management practice: a review of the lifestyle intervention evidence. *International Journal of Obesity*, **36**, 178–185.

Kluge, M. A., LeCompte, M. and Ramel, L. (2014) "Fit and Fabulous": mixed-methods research on processes, perceptions, and outcomes of a yearlong gym program with assisted-living residents. *Journal of Aging and Physical Activity*, **22**, 212–225.

Lee, R. E., McGinnis, K. A., Sallis, J. F., Castro, C. M., Chen, A. H. and Hickmann, S. A. (1997) Active vs. passive methods of recruiting ethnic minority women to a health promotion program. *Annals of Behavioral Medicine*, **19**, 378–384.

Leemrijse, C. J., de Bakker, D. H., Ooms, L. and Veenhof, C. (2015) Collaboration of general practitioners and exercise providers in promotion of physical activity a written survey among general practitioners. *BMC Family Practice*, **16**, 96.

Leenaars, K., Smit, E., Wagemakers, A., Molleman, G. and Koelen, M. (2016a) The role of the care sport connector in the Netherlands. *Health Promotion International*, **33**, 422–435.

Leenaars, K. E., Florisson, A. M., Smit, E., Wagemakers, A., Molleman, G. and Koelen, M. A. (2016b) The connection between the primary care and the physical activity sector: professionals' perceptions. *BMC Public Health*, **16**, 1001.

Leenaars, K. E., Smit, E., Wagemakers, A., Molleman, G. and Koelen, M. A. (2017) Exploring the impact of the care sport connector in the Netherlands. *BMC Public Health*, **17**, 813.

Lion, A., Vuillemin, A., Thornton, J. S., Theisen, D., Stranges, S. and Ward, M. (2019) Physical activity promotion in primary care: a Utopian quest? *Health Promotion International*, **34**, 877–886. doi: 10.1093/heapro/day038

Lv, N., Azar, K., Rosas, L. G., Wulfovich, S., Xiao, L. and Ma, J. (2017) Behavioral lifestyle interventions for moderate and severe obesity: a systematic review. *Preventive Medicine*, **100**, 180–193.

Macrae, I. and Wright, V. (1969) Measurement of back movement. *Annals of the Rheumatic Diseases*, **28**, 584–589.

Malmberg, J. J., Miilunpalo, S. I., Vuori, I. M., Pasanen, M. E., Oja, P. and Haapanen-Niemi, N. A. (2002) A health-related fitness and functional performance test battery for middle-aged and older adults: feasibility and health-related

content validity. *Archives of Physical Medicine and Rehabilitation*, **83**, 666–677.

Markland, D. and Tobin, V. (2004) A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology*, **26**, 191–196.

Martinson, B. C., Crain, A. L., Sherwood, N. E., Hayes, M. G., Pronk, N. P. and O'Connor, P. J. (2010) Population reach and recruitment bias in a maintenance RCT in physically active older adults. *Journal of Physical Activity and Health*, **7**, 127–135.

McLeroy, K. R., Bibeau, D., Steckler, A. and Glanz, K. (1988) An ecological perspective on health Promotion Programs. *Health Education Quarterly*, **15**, 351–377.

Myers, J., Kaminsky, L. A., Lima, R., Christle, J. W., Ashley, E. and Arena, R. (2017) A reference equation for normal standards for VO2 max: analysis from the Fitness Registry and the Importance of Exercise National Database (FRIEND Registry). *Progress in Cardiovascular Diseases*, **60**, 21–29.

Nelson, M. E., Rejeski, W. J., Blair, S. N., Duncan, P. W., Judge, J. O., King, A. C., *et al.*; American Heart Association. (2007) Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation*, **116**, 1094–1105.

Ooijendijk, W., Wendel-Vos, W. and Vries, S. D. (2007) *Advies Concensus Vragenlijsten Sport en Bewegen*. TNO Kwaliteit van Leven, Leiden.

Peck, L. E., Sharpe, P. A., Burroughs, E. L. and Granner, M. L. (2008) Recruitment strategies and costs for a community-based physical activity program. *Health Promotion Practice*, **9**, 191–198.

Penedo, F. J. and Dahn, J. R. (2005) Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, **18**, 189–193.

Penn, L., Dombrowski, S. U., Sniehotta, F. F. and White, M. (2013) Participants' perspectives on making and maintaining behavioural changes in a lifestyle intervention for type 2 diabetes prevention: a qualitative study using the theory domain framework. *BMJ Open*, **3**, e002949.

Reiner, M., Niermann, C., Jekauc, D. and Woll, A. (2013) Long-term health benefits of physical activity–a systematic review of longitudinal studies. *BMC Public Health*, **13**, 813.

Resnick, B. and Jenkins, L. S. (2000) Testing the reliability and validity of the self-efficacy for exercise scale. *Nursing Research*, **49**, 154–159.

Rikli, R. E. and Jones, C. J. (1999) Development and validation of a functional fitness test for community-residing older adults. *Journal of Aging and Physical Activity*, **7**, 129–161.

RIVM (2014). *Een gezonder Nederland-Volksgezondheid Toekomst Verkenning 2014*. RIVM, Bilthoven

Sabiston, C. M., McDonough, M. H., Sedgwick, W. A. and Crocker, P. R. E. (2009) Muscle gains and emotional strains: conflicting experiences of change among overweight women participating in an exercise intervention program. *Qualitative Health Research*, **19**, 466–480.

Smit, E., Leenaars, K., Wagemakers, M., Molleman, G., Koelen, M. and van der Velden, J. (2015) Evaluation of the role of Care Sport Connectors in connecting primary care, sport, and physical activity, and residents' participation in the Netherlands: study protocol for a longitudinal multiple case study design. *BMC Public Health*, **15**, 510.

Smit, E., Leenaars, K., Wagemakers, A., van der Velden, K. and Molleman, G. (2020) Perceptions of care sport connectors' tasks for strengthening the connection between primary care, sports and physical activity: a Delphi study. *International Journal of Integrated Care*, **20**, 2.

Suni, J. H., Oja, P., Miilunpalo, S. I., Pasanen, M. E., Vuori, I. M. and Bos, K. (1998) Health-related fitness test battery for adults: associations with perceived health, mobility, and back function and symptoms. *Archives of Physical Medicine and Rehabilitation*, **79**, 559–569.

Treweek, S., Mitchell, E., Pitkethly, M., Cook, J., Kjeldstrøm, M., Johansen, M. *et al.* (2010) Strategies to improve recruitment to randomised controlled trials. *Cochrane Database Systematic Reviews*, **2**, MR000013.

U.S. Department of Health and Human Services (1996). *Physical Activity and Health: A Report of the Surgeon General*. Department of Health and Human Services, Centers for Disease Control and Prevention, National Centre for Chronic Disease Prevention and Health Promotion, Atlanta, GA.

UyBico, S. J., Pavel, S. and Gross, C. P. (2007) Recruiting vulnerable populations into research: a systematic review of recruitment interventions. *Journal of General Internal Medicine*, **22**, 852–863.

Van der Zee, K. and Sanderman, R. (1993) *RAND-36*. Northern Centre for Health Care Research, University of Groningen, Groningen, the Netherlands.

Vilans (2012). *Protocollenboek Voorbehouden en Risicovolle en Overige Handelingen*. Vilans, Utrecht.

Wasserman, K., Hansen, J. E., Sue, D. Y., Whipp, B. J. and Froelicher, V. F. (1987) Principles of exercise testing and interpretation. *Journal of Cardiopulmonary Rehabilitation and Prevention*, **7**, 189.

Yancey, A. K., Miles, O. L., McCarthy, W. J., Sandoval, G., Hill, J., Leslie, J. J. *et al.* (2001) Differential response to targeted recruitment strategies to fitness promotion research by African-American women of varying body mass index. *Ethnicity & Disease*, **11**, 115–123.