



ORIGINAL ARTICLE

# Effectiveness of a supervised physical activity programme on physical activity adherence in patients with cardiovascular risk factors<sup>☆</sup>



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## KEYWORDS

Physical activity;  
Physical activity referral scheme;  
Prescription;  
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Quality of life

## Abstract

**Introduction:** Physical activity referral schemes (PARS) in primary care centres increase the level of physical activity (PA) in the general population. However, few studies assess PA adherence after interventions. This study aimed at: (i) to assess PA adherence after a six-month PARS, and at 12-months (after six months of a follow-up period without intervention), (ii) and to assess the impact of PARS on health-related quality of life (HRQL) in patients with cardiovascular risk factors (CVRF).

**Materials and methods:** Longitudinal design. A total of 323 patients with  $\geq 2$  CVRF, in contemplative stage of change, from 27 primary care centres in Catalonia, were referred during 2010–2011 to a six-month PARS (three sessions/week of 60 min of moderate-intensity PA (MPA)). PA level and HRQL were analysed at baseline, at six-months, and at 12-months follow-up measurement, with the International Physical Activity Questionnaire (short version), and the SF-12, respectively.

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**Results:** Out of the total number of patients (323), 75% ( $n = 242$ ;  $62.6 \pm 8.5$  years; 75% women) completed the PARS, with a mean attendance of 84.1%. A six-month PARS increased PA level, especially MPA and improved HRQL ( $p < 0.01$ ). At 12-months, the number of physically inactive patients remained lower than baseline; MPA level decreased, and the positive effects on HRQL were retained, especially in social functioning (26.4), physical functioning (18.2), and emotional component (18.3) ( $p < 0.01$ ).

**Conclusions:** A six-month PARS decrease the number of inactive patients and improves PA level and HRQL. Improvements in physical functioning, social functioning, and emotional component were retained up to one year. PARS appear to be an adequate treatment to improve the health of patients with CVRF.

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## PALABRAS CLAVE

Actividad física;  
Programa de  
prescripción de  
actividad física  
supervisada;  
Prescripción;  
Adherencia;  
Atención primaria;  
Calidad de vida

## Eficacia de un programa de actividad física supervisada en la adherencia a la actividad física en pacientes con factores de riesgo cardiovascular

### Resumen

**Introducción:** Los programas de prescripción de actividad física supervisada (PPAFS) aumentan el nivel de actividad física (AF) en la población general. Sin embargo, pocos estudios evalúan la adherencia a la AF después de las intervenciones. Este estudio evalúa: a) la adherencia a la AF después del PPAFS y en el 12.º mes, y b) el impacto de los PPAFS sobre la calidad de vida (CVRS) en pacientes con factores de riesgo cardiovascular (FRCV).

**Material y métodos:** Diseño longitudinal. Un total de 323 pacientes con 2 o más FRCV, en la estado contemplativo del cambio, se derivaron desde centros de atención primaria de Cataluña, en 2010–2011, a PPAFS de 6 meses (3 sesiones/semana de 60 min de AF intensidad moderada). El nivel de AF y la CVRS fueron analizados al inicio, a los 6 meses y al 12.º mes de seguimiento con el Cuestionario Internacional de Actividad Física (versión corta) y el SF-12, respectivamente.

**Resultados:** El 75% de los pacientes ( $n = 242$ ;  $62,6 \pm 8,5$  años; 75% mujeres) completaron el PPAFS (asistencia media del 84,1%). Los PPAFS aumentan el nivel de AF y mejoran la CVRS ( $p < 0,01$ ). A los 12 meses, el número de pacientes físicamente inactivos sigue siendo inferior a los datos basales, el nivel de AF disminuye pero se mantienen los efectos positivos en la CVRS, especialmente en la funcionalidad social (26,4), la funcionalidad física (18,2) y el componente emocional (18,3) ( $p < 0,01$ ).

**Conclusiones:** Los PPAFS aumentan el nivel de AF y mejoran la CVRS mostrando ser un tratamiento adecuado para mejorar la salud de los pacientes con FRCV.

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## Introduction

Physical activity (PA) is a therapeutic and preventive tool for numerous chronic diseases. Globally, physical inactivity causes 6% of cardiovascular disease, 7% of type II diabetes, 10% of breast cancer, 10% of colon cancer and 9% of premature mortality.<sup>1</sup> The burden of chronic diseases and its resultant cost could be mitigated through a lifestyle medicine, based on including lifestyle behaviour changes.

PA prescription and physical activity referral schemes (PARS) in primary care have been shown to be effective in increasing PA level among general population.<sup>2,3</sup> In Catalonia a pilot study showed that a three-month PARS based on primary care was sufficient to cause changes in lifestyle from an increased level of PA.<sup>4</sup> Moreover, Garcia et al. have shown that PA prescription was effective in improving control of risk factors and decreasing cardiovascular risk.<sup>5</sup>

Furthermore, health care providers are in a good position to promote an increase in PA among general population. First

because many individuals do contact their physicians each year, in Catalonia, 92.7% of the population visit a health provider once a year<sup>6</sup>; and second, because health care providers are the preferred source of health information among the general population<sup>7</sup> and patients trust them.

The Department of Sports and the Department of Health of the Government of Catalonia established in 2007 the Plan of Physical Activity, Sport and Health (PAFES).<sup>8</sup> The PAFES is a strategy created by the Catalan Government, with the objective to reduce high levels of sedentary behaviours among adult population through the promotion of an active and healthy lifestyle. PAFES is based on the prescription of PA from primary care professionals with the involvement of PA from primary care professionals that is offered locally.

The PAFES developed three levels of counselling: (a) PA's brief advice, (b) PA assessment and prescription (through healthy walking routes) and (c) PARS (six-month of an exercise programme, lead and supervised by a PA professional in a sport facility).

PARS were designed especially for inactive patients presenting cardiovascular risk factors (CVRF). The main objective of PARS was to get the most inactive patients to adhere to the current PA recommendations, i.e. accumulate a minimum of 150 min/week of moderate-intensity PA (MPA).<sup>9</sup>

Although several studies has shown the effectiveness of a PA intervention based on primary care, there is a lack of evidence regarding their long-term effectiveness in maintaining PA adherence after the finalization of the intervention.<sup>3,10,11</sup>

This study has two aims: (i) to assess PA adherence at 6-month of PARS and at 12-month follow-up (six-months after the PARS) and (ii) to assess the impact of PARS on health-related quality of life (HRQL) in patients with CVRF.

## Materials and methods

Longitudinal descriptive study based on a sample of patients from 27 primary care centres of Catalonia, which have been referred by their health professional (primary care physician or nurse) to a PARS during 2010–2011.

### Participants

The inclusion criteria for PARS were inactive adults  $\geq 45$  years old in the contemplative stage of change (intention to start being physically active in the next 6 months)<sup>12</sup> and with two or more CVRF as follows: diagnosed with hypertension (140/90 blood pressure mmHg or treatment with antihypertensive drugs), diagnosed with type II diabetes, a body mass index (BMI)  $\geq 25$  kg/m<sup>2</sup> and/or diagnosed with dyslipidemia. The health professionals excluded anyone with a medical condition that contraindicates exercise according to the PEFS Guide.<sup>13</sup> The health professionals recruited patients who met any of these criteria during their routine visits and consultation and sports medicine doctors assessed the referred patients to exclude those who presented any contraindication to initiate the exercise programme.

A total of 32 groups of maximum 15 participants ( $N = 323$ ) of 45–80 years were referred by the health professional to PARS. Participants gave informed consent to participate in the study. This study was approved by the Clinical Research Ethics Committee of Sports Administration of the Catalan Government.

### Intervention

PARS consisted in a supervised exercise programme of three sessions of 60 min weekly, combining moderate intensity aerobic activity (MPA), muscular endurance of the major muscle groups with use of equipment (dumbbells and elastic bands) and flexibility. The exercise programme was lead and supervised by a PA professional previously trained. Patients must pay a little fee to participate in the programme.

### Measurements and follow-up

Participants were assessed at baseline, at six-months after PARS and at 12-months follow-up assessment. At baseline

and at six-month of PARS, the questionnaires were self-administered and at 12-month of follow-up patients were interviewed by telephone.

The first outcome measure was the change in self-reported PA level using the shorter version of the International Physical Activity Questionnaire (IPAQ) and validated in the Catalan language.<sup>14,15</sup> The questionnaire consists of five questions on the frequency and duration of vigorous-intensity PA (one that requires hard physical effort and makes you breathe much harder than normal), moderate-intensity PA (one that requires moderate physical effort and breathe a little stronger than normal), and walking time. It allows to classify individuals according to their level of adherence to current PA recommendations: (1) do not engage in MPA, (2)  $<150$  min/week of MPA or (3)  $\geq 150$  min/week of MPA.

Two variables were created for PA level. The first, classified subjects according to the minutes that they engage in MPA: (1) do not engage in MPA, (2)  $<150$  min/week of MPA or (3)  $\geq 150$  min/week of MPA. A second variable was created by counting the MPA time plus the time spent walking: (1) do not engage in MPA or walking (2) performed  $<150$  min/week of MPA or walking, or (3)  $\geq 150$  min/week of MPA or walking.

The second outcome measure was the assessment of the self-perceived HRQL by the SF-12.<sup>16</sup> It includes 12 questions and generates a health profile of the eight dimensions: physical functioning, physical role limitation, body pain, general health, vitality, social function, emotional role limitation and mental health. It can be summarized into two summary components, physical and mental. The number of response options ranges from three to six and each question is given a value which is then transformed onto a scale from 0 (worst score) to 100 (best). Scores have a mean of 50 with a standard deviation of 10, so values above or below 50 indicates a better or worse health, respectively, than the general population.

Adherence to PARS was assessed using an attendance list at the exercise sessions and was translated into average percentage of attendance in the programme.

### Data analysis

A descriptive analysis of the baseline characteristics of PA level and HRQL was run. The mean and the standard deviation were calculated in quantitative variables and percentages for qualitative variables. The normal distribution of numerical variables was analyzed using the Kolmogorov–Smirnov test. The Student's *t*-test was used for paired data in order to assess the evolution of intra-group dependent variables before and after the programme; when the distribution of the variables was not normal Wilcoxon test was used. Changes in the different variables, between pre-, post- and at 12 months follow-up assessment, was analysed with the Friedman test.

Statistical significance was set at  $p < 0.05$ . Statistical analysis was performed using SPSS version 18.0 (SPSS Inc., Released 2009. PASW Statistics for Windows Version 18.0, Chicago: SPSS Inc.).

## Results

### Baseline data

The level of uptake to the intervention was of 75%. Of the 323 participants, 242 completed the PARS. The mean age of the sample was  $62.6 \pm 8.5$  years (from 45 to 80 years) and females were more prevalent among the sample (74%).

Baseline data showed that some participants already reported some type of PA: 41.6% of the sample engaged in walking activity for  $\geq 150$  min weekly and 30.6% accumulated  $\geq 150$  min/week of MPA. Significant differences were found at baseline in gender and age variables. Males engaged in more MPA than females ( $p = 0.039$ ) and adults (45–64 years) were more likely to engage in MPA than older adults (65–80 years) ( $p = 0.038$ ).

### Post-intervention data

Mean attendance to PARS sessions was of 84.1%. Table 1 shows pre- and post-intervention values of the variables related to PA level and HRQL. PARS increased by 39.6% the proportion of patients who engaged in  $\geq 150$  min/week ( $p < 0.001$ ), mainly due to an increase of MPA, since no significant differences were found in walking or vigorous-intensity PA time. At the end of the programme, males were more active at MPA (86% versus 65%) than females ( $p = .005$ ). No significant differences were found between PA levels with gender, age or attendance to PARS.

HRQL increased in all dimensions, both physical and emotional summary components ( $p < 0.01$ ), especially in social functioning (5.9), physicals (6.7) and in the emotional component (8.9) ( $p < 0.01$ ) (Table 1).

Regarding the dropouts, 16.5% of them out during PARS and 7.9% were missed due to changes in contact address or non-responders. The main reasons for dropout were the worsening of a disease and the perception of more pain. Droppers were predominantly female, slightly younger than the average ( $58.9 \pm 1.3$  years versus  $62.6 \pm 8.5$  years), more likely to perceive poor health (72.7% versus 60.0%) and were slightly more active than the rest of the sample (average total PA min/week:  $576.8 \pm 612.1$  versus  $473 \pm 493.6$ ).

### Follow-up data

PA adherence at 12-months was assessed in a sub-study of 101 patients. After six months of follow-up without intervention, MPA decreased and no changes were observed in walking time. The number of physically inactive patients remains lower than the baseline (34.3% versus 50%), showing a decrease of 15.7% (Table 2).

The positive effects on HRQL were retained up to six months after the finalization of the intervention, especially in social functioning (26.4), emotional component (18.3) and physical functioning (18.2) ( $p < 0.01$ ) (Table 2).

The main reason for not following with the exercise prescription after the 6 months-PARS was the lack of continuity in the same exercise groups.

## Discussion

The present study shows the first set of results of one of the PA prescription programmes of PAFES. This study extends the knowledge on PA adherence at long-term (six months after the completion of the intervention) and the impact of a PARS on quality of life in patients with CVRF. It is important to assess PA programmes based on health promotion to understand its success or failure and justify its implementation.

The three major findings of this study were that (i) a six-month PARS significantly increases PA level in patients with CVRF, (ii) adherence to PA decreases at 12-month assessment and (iii) a six-month PARS improves HRQL up to one year, especially on emotional component, social and physical functioning.

Most of the participants of the present study were females and adults  $>60$  years old. Those who dropped out during the intervention were predominantly females. This is in line with a systematic review showing that being female and increasing age were found to be consistent predictors of higher levels of uptake of PARS<sup>17</sup> and being male and increasing age were found to be consistent predictors of higher levels of adherence to PARS.<sup>17,18</sup>

The presence of barriers to PA practice could explain some of the reason of dropouts.<sup>19,20</sup> Studies showed that for the older adults and patients with chronic disease, the onset or worsening of a disease is a major reason for leaving and not continuing with a PA intervention<sup>18,21</sup> together with the feeling of not being identified with the group, and feeling of being intimidated or isolated.<sup>20</sup> The present sample may have fewer long-term adherences to PA due to their condition as patients with CVRF and their older age. Moreover, females' reasons of non-adherence were predominantly family responsibilities and lack of spousal support. It is then necessary to address barriers such as pain or the lack of motivation or social support.

The adherence to PARS (mean attendance: 84.1%) was higher than the results of a systematic review which shows that 45% of the participants attended at least 75% of the programme sessions.<sup>17</sup> The six-month PARS increased up to 40% the proportion of patients who accumulated 150 min/week of MPA. A total of 70.2% achieved the active level ( $\geq 150$  min/week of MPA) after the completion of the intervention. No changes were found in walking time or VPA variables. These results may be explained by the high prevalence of walking habit already at the baseline assessment and the lack of including VPA in PARS' sessions because it was addressed to patients with CVRF.

Results of PA adherence at 12-month were consistent with previous random control trials and systematic reviews<sup>3,10,22,23</sup> in showing a decrease of changes attained during the intervention. Grandes et al. also showed that physicians were effective in increasing PA level among inactive patients during the initial six-months of an intervention but its effect decline at 12 and 24 months<sup>11</sup> if the prescription was not repeated over time.

Although PA level decreased at 12-month follow-up assessment, the percentage of inactive patients was lower than baseline (Table 2). The decrease of PA adherence at long-term may be explained by the lack of an ongoing

**Table 1** Changes in physical activity (PA) level and Health-related quality of life, pre- and post-intervention (n = 242).

Variables <sup>a</sup>	Pre	Post	Differences Wilcoxon test	p <sup>b</sup>
<i>Physical activity (min/week)</i>				
Total PA	496.5 ± 491.8	519.6 ± 412.9	2.2	0.027
Vigorous PA	41.2 ± 159.6	28.2 ± 131.4	ns	ns
Moderate PA (MPA)	154.7 ± 277.9	229.9 ± 202.5	5.8	<0.001
Walking	299.9 ± 324.5	261.4 ± 253.9	ns	ns
<i>Physical activity (days/week)</i>				
MPA	1.6 ± 2.2	3.0 ± 1.8	7.7	<0.001
Walking	4.1 ± 2.7	4.3 ± 2.5	ns	ns
<i>MPA and walking (n (%))</i>				
Physically inactive <sup>c</sup>	40 (16.6)	9 (4.0)	5.5	<0.001
Insufficiently active <sup>d</sup>	27 (11.2)	12 (5.0)		
Active <sup>e</sup>	175 (72.2)	219 (90.9)		
<i>MPA (n (%))</i>				
Physically inactive <sup>c</sup>	134 (55.4)	28 (11.6)	9.7	<0.001
Insufficiently active <sup>d</sup>	34 (14.0)	44 (18.2)		
Active <sup>e</sup>	74 (30.6)	170 (70.2)		
<i>Health-related quality of life (0–100)</i>				
General health	47.3 ± 15.9	50.8 ± 17.1	3.1	0.002
Physical functioning	74.0 ± 21.3	82.6 ± 22.1	6.7	<0.001
Role limitations, physical	73.0 ± 24.9	82.0 ± 23.4	5.1	<0.001
Bodily pain	68.1 ± 27.3	75.0 ± 27.6	3.6	<0.001
Vitality	71.7 ± 23.5	63.5 ± 22.3	4.5	<0.001
Role limitations, emotional	76.0 ± 23.1	83.2 ± 21.7	4.7	<0.001
Mental health	62.5 ± 12.7	76.6 ± 19.2	8.2	<0.001
Social functioning	80.6 ± 24.0	90.4 ± 20.8	5.9	<0.001
Physical component	68.7 ± 18.1	75.8 ± 18.2	6.6	<0.001
Emotional component	70.6 ± 13.3	80.3 ± 16.4	8.9	<0.001

ns: not significant.

<sup>a</sup> Data are presented as mean ± standard deviation or as numbers and percentages.<sup>b</sup> p < 0.05.<sup>c</sup> Do not engage in PA.<sup>d</sup> <150 min/week of PA.<sup>e</sup> ≥150 min/week of PA.

intervention. Despite all participants being offered access to the most appropriate PA sessions within the sport facility at the end of the intervention, most of them reported willing to continue exercising only with the same group and the same PA leader. It may suggest that a six-month PARS may be not be enough to maintain PA adherence at long-term if there is no continuity in the exercise groups but is effective in decreasing the number of inactive patients up to one year.

Behavioural programmes tailored to specific PA barriers and motivational factors together with receiving repeated PA prescription are warranted to maintain PA adherence after PA intervention.<sup>11</sup> More randomised control trials are needed in assessing PA adherence at long-term after a PARS in sedentary patients with chronic conditions.

Aside from health benefits from increased physical activity, PARS provide positive effects on quality of life, similar to results of previous studies.<sup>24–26</sup> Interestingly was the retention of the positive effects on perceived physical

functioning, social functioning and on the emotional component up to one year. These improvements are especially significant among elderly people. Firstly, because an improved physical functioning allows independence and autonomy in the elderly avoiding the risk of falling, considered as one of the leading causes of hospitalization and responsible for high healthcare costs.<sup>27,28</sup> Secondly, improvements in social functioning and in mental health may prevent elderly from the negative effects of increased risk of social exclusion and isolation.<sup>29</sup> Taking into account that mental and social well-being is an integral and essential component of health<sup>30</sup> PARS may have a greater impact in chronic ill patients.

Consistent with our findings, the last results from the overall implantation of the PAFES showed a decrease of sedentary behaviour in Catalan population from 2006 to 2013, especially in the target group of PARS, (a decrease of 20%) and adults aged 56–74 years old (a decrease of 34%).<sup>31</sup>

**Table 2** Changes in physical activity level and health-related quality of life, pre- and post-intervention and at 12-month of follow-up assessment ( $n = 101$ ).

Variables <sup>a</sup>	Pre	Post	6-Months follow-up	Differences $\chi^2$	$p^b$
<b>Physical activity (min/week)</b>					
Total PA	473 $\pm$ 493.6	533.5 $\pm$ 377.7	387.9 $\pm$ 345.5	11.3	0.003
Vigorous PA	54.8 $\pm$ 201.3	36.0 $\pm$ 156	19.6 $\pm$ 113	8.6	0.013
Moderate PA (MPA)	170 $\pm$ 294.3	233.1 $\pm$ 213	146.7 $\pm$ 203.3	20.0	<0.001
Walking	247.8 $\pm$ 235.3	243.7 $\pm$ 212.7	217.5 $\pm$ 200.2	ns	ns
<b>Physical activity (days/week)</b>					
MPA	1.9 $\pm$ 2.4	3.2 $\pm$ 2.0	1.9 $\pm$ 1.8	23.2	<0.001
Walking	4.2 $\pm$ 2.6	4.7 $\pm$ 2.5	3.9 $\pm$ 2.6	ns	ns
<b>MPA and walking (n (%))</b>					
Physically inactive <sup>c</sup>	14 (14.0)	4 (4.3)	12 (11.7)	28.7	<0.001
Insufficiently active <sup>d</sup>	9 (9.0)	7 (6.5)	17 (16.5)		
Active <sup>e</sup>	78 (77.0)	90 (89.1)	72 (71.8)		
<b>MPA (n (%))</b>					
Physically inactive <sup>c</sup>	51 (50.0)	19 (18.5)	35 (34.3)	30.3	<0.001
Insufficiently active <sup>d</sup>	19 (19.0)	14 (14.1)	28 (28.2)		
Active <sup>e</sup>	31 (31.0)	68 (67.4)	38 (37.9)		
<b>Health-related quality of life (0–100)</b>					
General health	48.8 $\pm$ 18.0	48.6 $\pm$ 15.7	48.8 $\pm$ 16.2	ns	ns
Physical functioning	73.0 $\pm$ 20.8	78.5 $\pm$ 23.4	82.8 $\pm$ 21.0	18.2	<0.001
Role limitations, physical	75.6 $\pm$ 23.7	76.6 $\pm$ 24.8	80.5 $\pm$ 25.5	ns	ns
Bodily pain	67.0 $\pm$ 27.4	70.4 $\pm$ 27.4	70.4 $\pm$ 29.3	ns	ns
Vitality	65.3 $\pm$ 23.0	67.6 $\pm$ 23.1	68.0 $\pm$ 24.5	ns	ns
Role limitations, emotional	76.5 $\pm$ 24.5	80.0 $\pm$ 22.2	84.2 $\pm$ 23.0	7.5	0.024
Mental health	69.3 $\pm$ 22.2	76.4 $\pm$ 19.0	74.0 $\pm$ 21.0	14.3	<0.001
Social functioning	80.6 $\pm$ 24.0	91.0 $\pm$ 20.2	90.4 $\pm$ 20.0	26.4	<0.001
Physical component	48.7 $\pm$ 13.8	50.1 $\pm$ 14.3	52.0 $\pm$ 14.0	ns	ns
Emotional component	55.3 $\pm$ 13.0	60.0 $\pm$ 12.0	59.0 $\pm$ 13.0	18.3	<0.001

ns: not significant.

<sup>a</sup> Data are presented as mean  $\pm$  standard deviation or as numbers and percentages.

<sup>b</sup>  $p < 0.05$ .

<sup>c</sup> Do not engage in PA.

<sup>d</sup> <150 min/week of PA.

<sup>e</sup>  $\geq 150$  min/week of PA.

Primary care interventions based on PA are equally cost-effective than drug interventions<sup>32</sup> and in most of the cases, could yield to more profound and sustainable gains in health than drugs.<sup>33</sup> In addition, existing randomised trials suggests that exercise and many drug interventions are often potentially similar in terms of their mortality benefits in the secondary prevention of cardiovascular diseases and prevention of diabetes.<sup>34</sup>

This research provides new information about PARS effectiveness in the Catalan primary care setting and it is important to consider that it was performed under real conditions with the consequent advantages and handicaps. The strengths of this study are based on the intervention itself, as it is part of a community programme lead by the Catalan Sports Council and the Department of Health of the Government of Catalonia. Furthermore, it is one of the first primary care-based PA programme in Catalonia extending the knowledge of PA benefits in general population with chronic conditions.

We have some limitations in the study. First, the use of subjective assessments may over/under-estimated results.

Secondly, the use of two types of questionnaires administered, by telephone interviews and self-administered may have influenced the validity of the response. The small sample size and the sampling can introduce a number of biases and the results can only be extrapolated as normative to the population under study.

In conclusion, our results showed that PARS are effective and easily practicable method for increased PA and quality of life in routine primary care patients. In addition, PARS promote increased PA in a wide part of the population who otherwise are hard to reach or have a low motivation for lifestyle changes. This type of exercised intervention empowers the changes. This type of exercised healthy PA programmes in sport facilities and healthy community opportunities to engage sedentary people to be more physically active.

Future research should investigate the impact of the PAFES programme on PA level from primary care providers and on patients' counselling and recruitment rates.

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## Conflict of interest

Authors declare that they do not have any conflict of interests.

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