European Journal of Public Health, 1–10

https://doi.org/10.1093/eurpub/ckae015

Pharmacists' involvement in physical activity promotion in community pharmacy: a systematic review

Ruben Viegas [1], Ana Barbosa [2,3], Romeu Mendes [2,3,4], Filipa Duarte-Ramos[1], Filipa Alves da Costa [1]

1 iMED, Research Institute for Medicines, Faculty of Pharmacy, University of Lisbon, Lisboa, Portugal
2 EPIUnit—Instituto de Saúde Pública, Universidade do Porto, Porto, Portugal
3 Laboratório para a Investigação Integrativa e Translacional em Saúde Populacional (ITR), Porto, Portugal
4 Unidade Local de Saúde de Trás-os-Montes e Alto Douro, Vila Real, Portugal

Correspondence: Ruben Viegas, iMED, Research Institute for Medicines, Faculty of Pharmacy, University of Lisbon, Av. Prof. Gama Pinto, 1649-003 Lisboa, Portugal, Tel: +351 217 946 400, Fax: +351 217 946 470, e-mail: rubenviegas23@gmail.com

Background: Physical activity (PA) promotion in healthcare systems is one of the priority areas highlighted by the World Health Organization, which recognizes that progress has been slow largely due to a lack of awareness and investment while requiring a system-based approach. Community pharmacies are one of the health structures that are more easily accessible to populations, thus constituting an ideal venue for developing health promotion activities. This research aimed to describe PA-enabling interventions developed in community pharmacies by pharmacists. **Methods:** An electronic search was performed in PubMed, Scopus, Web of Science, Cochrane and reference lists of the different papers until June 2023. Studies were eligible if performed in community pharmacies by pharmacists, focused on interventions aimed at increasing PA levels and if at least one PA-specific outcome was measured at two different time points. **Results:** We identified 7076 publications in the initial search, plus 31 records identified through backward citation tracking from relevant studies. After an initial screening, 236 were selected for full-text analysis. Of the 29 selected papers, 10 presented a low risk of bias for the measurement of PA levels. PA outcomes were generally self-reported outcomes where the change in terms of the percentage of individuals considered active or who increased PA because of the intervention. **Conclusion:** Several interventions to improve PA through community pharmacies were found although with a high level of heterogeneity and with only few with a low risk of bias. More targeted research that aims to capture PA levels and support the training of healthcare professionals is needed.

Introduction

Physical activity (PA) is one of the contributors to the reduction of disease burden and has several benefits, ranging from improved cardiovascular conditions to improvements in mental health.[1] Although benefits are clear, there is still a global tendency for individuals not to fulfil the minimum of 150 min of moderate-intensity PA per week recommended by the World Health Organization (WHO),[2] as more than 80% of adolescents and 27% of adults worldwide do not meet WHO's recommended levels of PA.[3]

To tackle the problem of inactivity, there is a clear need for a multi-sectoral and multidisciplinary approach, considering education, health and policy.[4] This effort is highlighted by the WHO Global Action Plan for PA by stressing the need to strengthen healthcare systems to conduct effective actions to increase PA and have the capacity to assess their impact.[5] However, only 40% of countries surveyed in the last WHO global status report on PA reported having evidence-based national protocols or standards for managing physical inactivity through a primary care approach.[3]

PA counselling in healthcare settings has been developing in the last few years and includes brief interventions in primary care.[6] Brief counselling can take only a few minutes and lead to improved health outcomes and should, therefore, be expanded to other settings and providers within primary care for faster attainment of the WHO's targets.[7,8]

Pharmacists are trusted healthcare professionals widely distributed across territories, reaching people with lower access to care and providing different types of services, encompassing screening, management, and referral.[9] Even though this health promotion role, in general, is well documented, more training on PA-specific aspects is needed to support more PA promotion, including the capacity for consistently measuring outcomes.[10]

Thus, the purpose of this systematic review is to understand which interventions are being developed in the community pharmacy setting by pharmacists to improve the populations' PA levels.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 statement was used for this systematic review.[11] The protocol of this systematic review is outlined in PROSPERO with the reference number CRD42021286592.

Eligibility criteria

We included studies that described PA interventions delivered by pharmacists in community pharmacies, which measured at least one PA outcome at at least two different time points. We excluded studies that did not include PA as an outcome, studies that included multiple interventions but did not provide separate data on PA, and

studies conducted in pharmacies but not delivered by pharmacists. We excluded studies where the focus was pharmacy students or interns.

Information sources

A comprehensive electronic search for relevant studies was conducted in PUBMED, Scopus, Web of Science and Cochrane Library by two authors (RV and AB) from inception until June 2023. We did backward citation tracking on the included studies to find additional references.

Search strategy

The key search terms were pharmacy, pharmacist, exercise, PA, promotion, advice, counsel, evaluate and monitor. The entire search strategy is included in Supplementary appendix S1. No search restrictions were applied.

Selection process

The search results were independently screened by two authors (RV and AB) according to predefined steps. In the first step, the articles were screened by title and abstract. In the second step, articles of interest were selected for full-text reading and chosen for inclusion. Disagreements between authors were resolved by consensus. DeepL® software was used to translate articles as needed.

Data collection process

Two authors (RV and AB) independently evaluated each selected article. Then, the extracted data was compared. Two other authors (RM and FAC) reviewed the data for additional accuracy. No analysis of subgroups or subsets was performed.

Data items

We considered information regarding study characteristics (first author, year of publication, study design, country and the number of pharmacies and pharmacists, and population included); intervention type (intervention type and duration); and PA outcomes (type of PA outcome and change reported).

Risk of bias assessment

Two researchers (RV and AB) independently applied the critical appraisal tools of RoB 2: a revised tool for assessing the risk of bias in randomized trials.[12] Each item was rated with 'high risk', 'some concerns' or 'low risk' in five different domains: (i) bias arising from the randomization process, (ii) bias due to deviations from intended interventions, (iii) bias due to missing outcome data, (iv) bias in measurement of the outcome and (v) bias in selection of the reported result. A summary of the selected studies can be found in table 2.

Synthesis methods

Studies that matched the inclusion criteria were included were summarised regarding its characteristics, the aspects of the intervention that covered PA counselling and the PA outcome measured in each study.

Results

Study selection

We identified 7076 publications in the initial search, plus 31 records identified through backward citation tracking from relevant studies. The number of duplicates removed was 2508, leaving 4599 studies screened for title and abstract. From those, 245 were selected for full-text reading and 29 were included in the qualitative appraisal (figure 1). The articles were published in English, Japanese and Spanish (with abstracts in English) between 2004 and 2022.

Study characteristics

Of the 29 studies included, 10 were randomized controlled trials (RCTs)[13–22] and 19 were quasi-experimental studies,[23–41] as presented in table 1. Six studies were from Australia,[14,19,29,33,36,39] and five from the USA.[15,24,27,31,34] We found two studies in the UK,[25,26] Egypt[16,18] and Thailand.[35,37] All the remaining studies were from different countries: Canada,[13] France,[17] Germany,[21] Ghana,[28] Greece,[32] Iran,[20] Italy,[40] Japan,[38] Nigeria,[23] Norway,[22] Turkey[30] and Spain.[41]

Participants

In the selected studies, on average, 219 ± 13 participants (range: 13–1092) were recruited from an average of 19 ± 1 pharmacies. In these studies, an average of six pharmacists participated in the intervention. All studies included both male and female participants (average of 56 ± 19% female), except for one of the studies that exclusively focused on female participants[18] and another on male participants,[26] because they targeted specific conditions that are sex-related (i.e. breast and prostate cancer). Participants were, on average, 57 ± 7.9 years old. Around a quarter of the included studies included healthy individuals. From the remaining, the most common conditions targeted were diabetes, followed by hypertension. Other less common conditions included dyslipidaemia, and overweight or obese patients.

Studies with a low risk of bias

In total, we identified 10 studies with a 'low risk of bias'. In the study of Al Hamarneh and colleagues, pharmacists provided verbal advice on improving PA by increasing aerobic exercise. After the intervention, there was an improvement in self-reported exercise frequency in patients in the intervention groups compared with the control group (19.3% vs. 8.2%; $P < 0.001$).

Another study by Aslani et al.[14] showed how pharmacists supported patients in completing a multi-part questionnaire and provided lifestyle change support. PA was measured through one adapted survey tool, where 0 meant 'no exercise' and 5 = 'more than 10 h of exercise a week'. The control group patients did not increase their overall amount of exercise, whereas those in the intervention group did so significantly after an intervention with the pharmacist.

Doucette et al.[15] presented results on how pharmacists provided an intervention to review self-care behaviours and follow-up, including PA recommendations. Pharmacists registered the information on the average of days per week engaging in two separate exercise self-care activities. Although this outcome improved in the intervention group, the difference between groups was not significant.

The study by Farag Mohamed et al.[16] focused on an educational component comprising pictorial posters of diabetes mellitus and its complications and a non-pharmacological component in the form of lifestyle changes, including physical exercise, which consisted of walking at least three times weekly for 30 min. Exposure to intervention did not significantly increase PA from light or no PA to moderate activity (23.6% for control vs. 45.0% for intervention).

In the study by Gautier et al.,[17] they explained how pharmacists can use text messages to engage with patients regarding PA levels. This intervention allows tailoring patient levels of PA so messages can be sent on the sports theme to be adapted according to the patient's needs. There was no significant change in the International Physical Activity Questionnaire (IPAQ) at 3 and 6 months.

The study by Ibrahim et al.[18] focused on a health coaching programme for women with breast cancer. For this study, participants were considered highly active if they were engaged in moderate-

Table 1 Characteristics of the included studies

Author, year, ref	Study design	Country, number of pharmacies and pharmacists	Population included	Type of intervention	Intervention duration	PA outcome	PA outcome change
Aguwa et al., 2008[23]	Before and after	Nigeria, 1 pharmacy, 4 pharmacists	24 hypertensive patients	Lifestyle counselling. Advised on increasing aerobic exercise	5 months	Self-reported PA: the percentage of patients who indulged in aerobic exercise three times a week	46% at baseline; 92% after intervention ($P = 0.001$)
Al Hamarneh et al., 2017[13]	RCT	Canada, 56 pharmacies, N/A	573 adults with diabetes: 287 control and 286 interventions	Education and discussion on cardiovascular risk factors (including PA)	3 months	Self-reported PA: percentage of patients who increased PA	Changes in IG vs. CG 19.3% vs. 8.2%; $P < 0.001$)
Aslani et al., 2011[14]	A repeated-measures randomized controlled study	Australia, 38 pharmacies, 17 pharmacists	97 healthy adults: 48 interventions, 49 control	A multi-part questionnaire and recommendations focusing on lifestyle habits	3 months	Self-reported PA: adapted survey with item on PA (0 = no exercise, 5 = more than 10 h of exercise a week)	CG—time 1: 2.73 95% CI (2.53–2.92); time 2: 2.51 95% CI (2.33–2.69); time 3: 2.89 95% CI (2.66–3.12). IG—time 1: 2.63 95% CI (2.43–2.83); time 2: 3.39 95% CI (3.21–3.57); time 3: 3.12 95% CI (2.88–3.36)
Doucette et al., 2009[15]	An RCT	USA, 7 pharmacies N/A	66 patients with >7% HbA1c (31 intervention, 35 control)	Review of self-care behaviours and follow-up including PA recommendations	12 months	Self-reported PA: mean days per week engaging in two separate exercise self-care activities (±)	Change from baseline: CG 0.10 ± 1.65, IG 0.58 ± 2.06; ($P = 0.31$)
Farag Mohamed et al., 2021[16]	Cross-over cluster randomized control trial	Egypt, 10 pharmacies, N/A	100 T2DM patients with >7% HbA1c	Educational component in PA: walking at least three times weekly for 30 min	6 months	Self-reported PA: percentage of patients that increased PA	Exposure to intervention increased PA from light or no PA to moderate activity (23.6% for CG vs. 45% for IG)
Gautier et al., 2021[17]	Randomized, comparative study	France, 144 pharmacies, N/A	509 patients with diabetes: 260 SMS group and 249 control group	Daily text messages with educational content on PA. PA levels were profiled to adapt SMS to patients' needs	3 months	IPAQ score in MET-min per week	Changes in IPAQ from 0 to 3 months: CG 295.4 ± 8061, IG 162.5 ± 6707 Changes in IPAQ from 0 to 6 months: CG: −47.2 ± 6306, IG −1096 ± 6306
Hui-Callahan et al., 2013[24]	Before and after study	USA, 1 grocery of a chain pharmacy, 5 pharmacists	13 participants with diabetes	A programme booklet that contained information about self-care behaviours and allowed to log them	12 weeks	Self-reported PA: Self-reporting booklet, with exercise (times per week), exercise (min per day) and record exercise (times per week)	Exercise (times per week): 1.3 ± 1.2 to 3.4 ± 1.8 ($P = 0.002$); exercise (min per day): 16.5 ± 17.9 to 31.5 ± 19.6 ($P = 0.019$); and recorded exercise (times per week): 0 to 2.7 ± 2.5 ($P = 0.003$)
Ibrahim et al., 2021[18]	Randomized controlled study	Egypt, 12 pharmacies, N/A	232 females with breast cancer	Health coaching programme including PA increase goals	12 weeks	Self-reported PA (low, moderate, high) presented as percentage of participants with high PA	CG: baseline 15.38, after intervention 16.23 ($P = 0.86$) IG: baseline 13.91, after intervention 53.04 ($P = 0.01$)

(continued)

Table 1 Continued

Author, year, ref	Study design	Country, number of pharmacies and pharmacists	Population included	Type of intervention	Intervention duration	PA outcome	PA outcome change
Jolly et al., 2011[25]	Pharmacy was one of the eight arms of the RCT—considered before and after	UK, 1 pharmacy, N/A	70 obese or overweight patients	Monthly health education sessions including messages on PA	12 weeks	Self-reported PA: using IPAQ (measured as kcal/week and minutes/week)	+2885 kcal spent per week ($P < 0.001$); MVPA +73 min/week; and walking +1 min/week
Krass et al., 2007[19]	A multisite, control vs. intervention, repeated-measures design	Australia, 56 pharmacies, N/A	289 patients with diabetes (149 intervention and 140 control)	Lifestyle education including information focusing on increasing PA	6 months	Self-reported PA: percentage of participants that exercised three or more times per week	Change from baseline: IG 54–62% ($P = 0.07$); CG 53–54%
Lemanska et al., 2019[26]	This was a non-randomized, single-group feasibility study	UK, 9 pharmacies, N/A	116 men who completed treatment for prostate cancer	Men received tailored home-based exercise with an educational DVD, booklet, pedometer and resistance exercise bands	6 months	Objective PA: wrist-worn accelerometers (ActiWatch V.4.0) and used to calculate weekly time spent in MVPA, independent of the pharmacy assessments	At baseline, men spent on average 245 ± 250 min in MVPA per week. This increased significantly by 34 ± 152 min ($P = 0.018$) at 3 months and by 14 ± 220 min ($P = 0.509$) at 6 months
Lenz and Monaghan, 2011[27]	Before and after study	USA, 1 pharmacy, 4 pharmacists	15 adults with hypertension and/or dyslipidaemia	Support with lifestyle medicine goals, and assistance with behaviour change strategies	12 months	Self-reported PA: percentage of patients that meet national PA guidelines	At baseline, 67% met PA guidelines. After intervention, 80% consistently exercised and achieved PA guidelines (>150 min/week)
Marfo and Owusu-Daaku, 2016[28]	Before and after intervention study	Ghana, 3 pharmacies, 5 pharmacists	170 participants clients at risk for hypertension	Health education including recommendation to exercise three times per week	6 months	Self-reported PA: participants who did not exercise or who exercised less than 30 min per day, in <3 days were coded as 'no exercise'	75% were physically inactive at baseline and 43% inactive post intervention ($P = 0.012$)
McNamara et al., 2015[29]	PAART CVD trial intervention—before and after study	Australia, 10 pharmacies, 12 pharmacists	56 patients aged 50–74 years, with medication for dyslipidaemia or high BP	Five individual sessions on reduction of CVD risk (recommendation to increase exercise)	6 months	Self-reported PA: percentage of patients who were active at least once a week	Changes in PA: maintenance of PA levels for (39%) and further increasing PA for 13 (24%)
Okuyan et al., 2021[30]	Before and after study	Turkey, 13 pharmacies, N/A	52 older adults	Patient education and counselling service using supportive materials about lifestyle changes	3 months	Self-reported PA: percentage of patients that are active	Change from baseline - 42.3% baseline vs. 44.2% at final assessment ($P > 0.05$)
Olenak and Calpin, 2010[31]	Before and after study	USA, 1 pharmacy, N/A	239 adults with no history of chronic heart disease	Patient education and lifestyle recommendations: increasing PA levels to at least 30 min most days of the week	6 months	Self-reported PA: percentage of patients that changed PA behaviour	Percentage change from baseline (yes): 50% patients with MetS; 39% patients without MetS
Peletidi and Kayyali, 2021[32]	Before and after study	Greece, 20 pharmacies, 21 pharmacists	117 adults without any diagnosed risk conditions	Weight reduction management programme, including a log to register PA	10 weeks	Self-reported PA: Percentage of participants engaging in PA and minutes of PA per week	Baseline: 43.6%, 248.53 (82.7) min/week After intervention: 54.7 %, 230.94 (83.06)

(continued)

Table 1 Continued

Author, year, ref	Study design	Country, number of pharmacies and pharmacists	Population included	Type of intervention	Intervention duration	PA outcome	PA outcome change
Peterson et al., 2010[33]	Before and after study	Australia, 14 pharmacies, 3 pharmacists	556 healthy adults over 30 years old	Education and verbal counselling from the pharmacist about CVD risk factors, including regular PA	3 months	Self-reported PA: Percentage that reported increase in exercise	31.8% reported increased exercise after intervention
Pinto et al., 2012[34]	Before and after study	USA, 5 pharmacies, 6 pharmacists	228 patients with diabetes	Patients were educated on lifestyle choices (including exercise)	12 months	Self-reported PA: percentage of patients with favourable change in hours per week of self-reported exercise	6 months: +31.17 h/week ($P=1.00$). 12 months: +44.12 h/week ($P=0.42$)
Pongwecharak and Treeranurat, 2011[35]	Before and after study	Thailand, 1 pharmacy, 3 pharmacists	150 participants with prehypertension or hypertension.	Verbal advice and an education pamphlet on CVD risk factors	3 months	Self-reported PA: percentage of individuals with 'Inadequate physical exercise (≤30 min three times weekly)	Baseline: 46.7%; follow-up: 43.3%; $P=0.55$
Sarayani et al., 2018[20]	Two-armed RCT	Iran, 1 pharmacy, 1 pharmacist	100 patients with type 2 diabetes	Education session on lifestyle changes and follow-up telephone calls	9 months	Self-reported PA: 'the number of days of the previous week' that patient exercised: median (IQR)	CG: Baseline 1.5 (3.0), 3-month 2.0 (3.1), 9-month 2.0 (3.0) IG: Baseline 1.0 (3.5), 3-month 3.5 (2.0), 9-month 3.5 (3.0)
Schmiedel et al., 2015[21]	Cluster RCT	Germany, 40 pharmacies, N/A	1092 people with diabetes (530 intervention and 562 control).	Three appointments with individual counselling and five educational group sessions were combined	12 months	Self-reported PA: change in PA (h/week) mean (±)	Change in PA (h/week): CG: −0.23 ± 1.72; IG: 0.31 ± 1.63
Singh et al., 2021[36]	Before and after study	Australia, 1 pharmacy, 2 pharmacists	20 adults with poorly controlled hypertension	Health coaching sessions focusing on hypertension including change in PA behaviours	3 months	Stages of change model, presented as a mean value of the scale (1–5)	Changes in PA: CG: 3.30 ± 0.54 to 3.60 ± 0.47 ($P=0.18$). IG: 3.05 ± 0.61 to 4.05 ± 0.41 ($P=0.01$)
Sookaneknun et al., 2004[37]	A randomized, before and after controlled group study	Thailand, 1 pharmacy, 1 pharmacist	235 adults with hypertension	Advice on lifestyle habits assessment and change, including a leaflet and a dairy to record exercise	6 months	Self-reported PA: percentage of patients who participated in regular exercise	IG (57%), CG (39%); ($P=0.012$)
Suzuki et al., 2019[38]	Non-randomized before and after study	Japan, 23 pharmacies, N/A	17 healthy adults	Lifestyle recommendations and goal setting	3 months	Self-reported PA: percentage of people exercising at least once a week	Baseline: 100% not exercising; after intervention: 41% not exercising
Svendsen et al., 2018[22]	Multi-centre parallel three-arm, 8-week RCT	Norway, 50 pharmacies, N/A	582 healthy participants; 198 alert/advice group, 185 advice-only group and 199 control group	Advice on health-related behaviours to reduce CVD risk verbally (only alert group) and in the form of an intervention brochure	8 weeks	Self-reported PA: change in median minutes of moderate to vigorous PA per week using VISA-FFQ	Advice/alert 151.6–166.0 min/week ($P=0.28$), advice-only 154.3–211.5 min/week ($P=0.53$), CG 159.5–188.9 min/week ($P=0.26$)

(continued)

Table 1 Continued

Author, year, ref	Study design	Country, number of pharmacies and pharmacists	Population included	Type of intervention	Intervention duration	PA outcome	PA outcome change
Um et al., 2015[39]	Before and after study	Australia, 8 pharmacies, 1 pharmacist	22 overweight or obese participants	Recommendation of following the national PA guidelines	3 months	Self-reported PA: times per week doing more than 30 min per week and vigorous PA more than 20 min per week—median (IQR)	Moderate PA: baseline 2.0 (0–3.0); final 3.0 (3.0–5.0) Vigorous PA: baseline 0 (0); final 0.5 (0–2.0)
Villarini et al., 2015[40]	Before and after study	Italy, 2 pharmacies, N/A	186 healthy adults aged 45 or more	Participants received a booklet with recommendations to prevent MetS, including increasing PA	6 months	Self-reported PA: Daily PA Index (DPAI). At least 30 min/day = 1, Lower than 30 min/day = 0	DPAI baseline: mean 0.27 ± 0.58; follow-up: mean 0.30 ± 1.01; $P = 0.32$
Zaragoza-Fernández, 2012[41]	A randomized, prospective, experimental study	Spain, 3 pharmacies, N/A	143 adults with hypertension	Telephone calls including a face-to-face interview at month 1—recommendation to exercise more	2 months	Self-reported PA: percentage of people that improved PA;	Change in the IG, 79% positive, 4% no change and 10% negative (7% lost)

Notes: ±, Standard deviation; CG, control group; CVD, cardiovascular disease; DPAI, Daily Physical Activity Index, HbA1c, glycated haemoglobin; IG, intervention group; IQR, interquartile range; MetS, metabolic syndrome; MET-min, metabolic equivalent per minute; MVPA, moderate to vigorous physical activity; PA, physical activity; SMS, short message services; T2DM, type 2 diabetes mellitus.

intensity PA for ≥300 min/week. The percentage of individuals engaging in high PA 3 months after the end of the coaching programme on the active and control arms was 52.17% vs. 17.09% ($P = 0.002$).

The study done by Krass et al.[19] included diabetes self-management and lifestyle information focusing on increasing PA. The percentage of participants that exercised three or more times per week increased after intervention [intervention group 54–62% ($P = 0.07$); control group 53–54%].

A study by Sarayani et al.[20] focused on education sessions on lifestyle changes and follow-up telephone calls to patients. Self-reported PA, through the median number of days of the previous week that the patient exercised, was significantly higher at month 9 follow-up in the intervention group ($P < 0.05$).

Schmiedel's study[21] highlighted the effects of an intervention consisting of three appointments with individual counselling and five educational group sessions for more than 1000 people living with diabetes. PA measured in hours per week improved significantly more by 0.5 h/week among participants in the intervention group.

The last study in this group of studies was a three-arm RCT by Svendsen et al.[22] with a group that received advice on health-related behaviours to reduce cardiovascular disease risk verbally and in the form of an intervention brochure (alert/advice group), an advice-only group and a control group. The change in median minutes of moderate to vigorous PA per week was collected using the VISA-FFQ questionnaire. There was no difference in PA between the groups.

Studies with some concerns or a high risk of bias

The remaining 19 studies had some concerns or a high risk of bias. Most studies provided interventions focusing on lifestyle counselling aiming at changing behaviours and increasing PA,[23,25,27–31,33,34,36–39] and some used booklets as support materials[24,32,35,40] or additional telephone calls.41

Regarding the PA outcomes measured by the different studies, most of them were self-reported PA levels, ranging from a percentage of patients who met a recommendation[23,27–33,35,37,38,41] or measures of an amount of PA[24,25,34,39] (e.g. hours per week). Other studies used different outcomes related to PA, such as the stages of change model[36] or compiled tools from validated scales and incorporated them into their studies.[40]

One interesting study in this group done by Lemanska et al.[26] consisted of one intervention that was focused mainly on PA promotion, and PA was the primary outcome measured with objective methods. This study included a tailored home-based exercise schedule with an educational DVD, a booklet, a pedometer and resistance exercise bands. Results seem promising as at baseline, men spent on average 245 min of moderate to vigorous PA per week, which increased significantly by 34 min ($P = 0.018$) at 3 months and by 14 min ($P = 0.509$) at 6 months.

Risk of bias in the included studies

The assessment of the study quality in the included studies is shown in table 2. The tool considers randomization as an essential quality component (domain 1), implying that all quasi-experimental studies can never be rated with high quality. Thus, table 2 highlights that only 10 of the 29 studies evaluated were considered high quality due to their randomized design. The concerns about the nature of the interventions that are not randomized include the influence of the pharmacists in measuring the outcomes and some deviations from the intended interventions delivered by pharmacists. A summary of the selected studies can be found in table 2.

Table 2 Risk of bias in the included studies

Study ID	D1	D2	D3	D4	D5	Overall
Aguwa 2008[23]	-	-	!	-	!	-
Al Hamareh 2017[13]	+	+	+	+	+	+
Aslani 2011[14]	+	+	+	+	+	+
Doucette 2009[15]	+	+	+	+	+	+
Farag 2021[16]	+	+	+	+	+	+
Gautier 2021[17]	+	+	+	+	+	+
Hui-Callahan 2007[24]	-	-	+	!	!	-
Ibrahim 2021[18]	+	+	+	+	+	+
Jolly 2011[25]	+	!	+	+	+	!
Krass 2007[19]	+	+	+	+	+	+
Lemanska 2019[26]	-	+	+	!	+	-
Lenz 2011[27]	-	!	+	+	+	-
Marfo 2016[28]	-	!	+	!	+	-
McNamara 2015[29]	-	!	+	!	+	-
Okuyan 2021[30]	-	!	+	!	+	-
Olenak 2010[31]	-	!	+	+	+	-
Peletidi 2021[32]	-	+	+	+	+	-
Peterson 2010[33]	-	!	+	!	!	-
Pinto 2012[34]	-	!	+	+	+	-
Pongwecharak 2011[35]	-	+	+	+	+	-
Sarayani 2018[20]	+	+	+	+	+	+
Scimiedel 2015[21]	+	+	+	+	+	+
Singh 2021[36]	-	!	+	+	+	-
Sookakenunk 2004[37]	!	!	+	+	+	!
Suzuki 2019[38]	-	!	+	!	+	-
Svendsen 2018[22]	+	+	+	+	+	+
Um 2015[39]	-	+	+	+	!	-
Villarini 2015[40]	-	+	+	!	+	-
Zaragoza 2012[41]	+	+	+	!	!	!

+ Low risk; Some concerns; - High risk; D1 Randomization process; D2 Deviations from the intended interventions; D3 Missing outcome data; D4 Measurement of the outcome; D5 Selection of the reported result

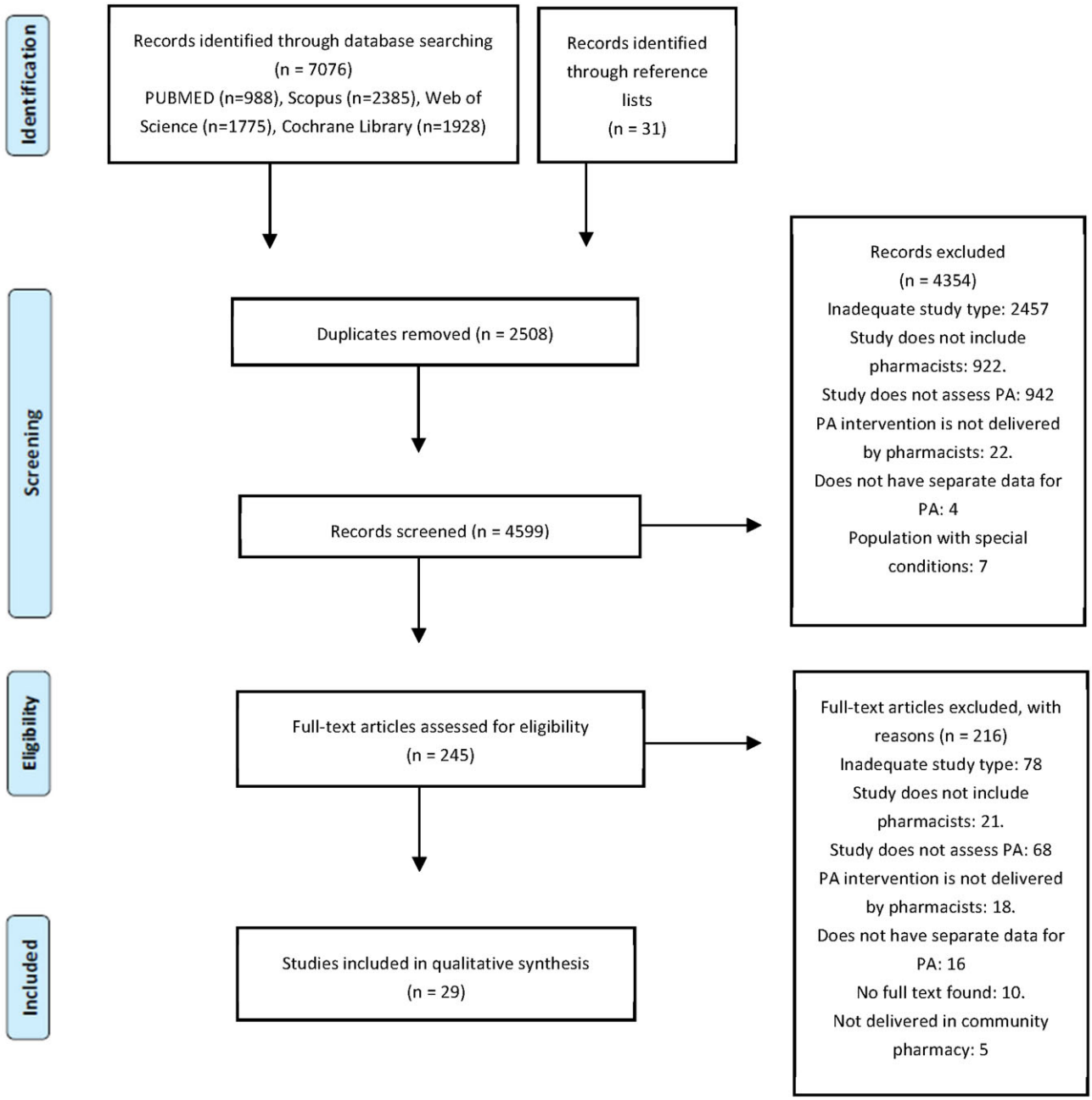

Figure 1 PRISMA Systematic review flowchart.

Discussion

To our knowledge, this is the first systematic review addressing specifically PA outcomes in interventions delivered in community pharmacies by pharmacists. In general, PA promotion interventions focused on health education and included recommendations to increase PA. PA outcomes were generally self-reported outcomes expressed as a percentage of individuals considered active or who increased activity due to the intervention.

The interventions delivered by pharmacists were generally not specific to PA but encompassed different lifestyle measures. This leads to a lack of specific understanding if the changes noted in PA levels were directly related to the advice given by the pharmacists on increasing PA levels or if the behaviour change focused on the main outcome, such as improving cardiovascular risk[22] or diabetes outcomes,[13] was the main reason for the difference in PA outcomes.

Almost all studies used self-reported measures for PA measurement, such as a percentage of patients who met a PA recommendation (e.g. 55% of participants reached 50 min/week), such as the study by Farag Mohamed[16] where exposure to intervention increased participants' PA levels from light or no PA to moderate activity. Self-reported outcomes might not provide a solid reference for policymakers and other stakeholders on the value of the intervention and are subject to reporting bias, leading to disparities between self-reported and objective outcomes.[42]

The advantage of using validated tools like IPAQ is that they can be used widely at the population level. However, it might not be the best outcome measure in small-scale intervention studies.[43] PA outcomes are often not measured in health services or interventions in pharmacies, especially more objective outcome measures.[44] Studies that focus on objective PA measures using accelerometry, such as in the exploratory work of Lemanska et al.,[26] can be an important step for future research in this area if the study design can be improved.

Using support strategies and tools can also allow pharmacists to engage in more conversations, as time and other priorities seem to be a constraint.[10] Text messages[17] or phone calls[20] can be easy to

use, useful and adaptable to the patients' needs. Booklets and other materials can also provide a clue to start a conversation and leave more time for patients to explore the resources on their own.[22]

One important note is that of the 10 studies with a low risk of bias, 7 focused on people living with diabetes.[13,15–17,19–21] Different types of PA have an inverse association with the risk of type 2 diabetes,[45] which may partly be mediated by reduced adiposity, leaving a strong incentive for further studies using PA interventions for this specific population group.

Some of these interventions might be more easily scalable in the real world, such as interventions focusing on brochures and verbal advice and using simple questionnaires to collect data.[22] Others that use accelerometry (1 in 29 studies in this review)[26] might be more expensive and difficult to implement at a wider level but might positively impact the rigour of measuring PA levels. Unlike the self-reported methods, these are not subject to reporting bias or forgetfulness despite being usually more expensive and sometimes harder to use.[46] Objective measures are growing because of technological advances, but full implementation of these methodologies in PA studies is still far from being a current practice.

Pharmacies are already providing a variety of services within the scope of health promotion, many of which include the collection of outcomes from their patients (e.g. glycated haemoglobin). Furthermore, patients positively perceive the value these interventions have for their conditions.[47] The addition of services focusing on PA would fit into the scope of practice of community pharmacists and provide an additional opportunity for pharmacies to engage with their customers. Further, pharmacists are aware of the importance of PA promotion and are motivated to engage in this type of initiative, providing a ready-to-engage workforce to support the healthcare system.[10]

Limitations

Most studies included in this systematic review were not RCTs and provided limited evidence on the impact these interventions can have, despite the broad search strategy used. Further, the heterogeneity of PA outcomes is a barrier to exploring these findings. Also, a limitation of the present systematic review is the possibility of a high risk of bias, as expressed by the low score in most of the studies on the critical appraisal tool. Blinding in this type of study is difficult to achieve at the pharmacy level, which could be overcome by blinding the assessors or using a clustered design.

Considering the limitations of the selected studies, longer follow-up periods and larger samples are needed for interventions to be tested in community pharmacies. Further, as most interventions included a general approach to lifestyle while including PA, more detailed interventions focusing only on PA and objective PA measurements could improve our understanding of the feasibility of these interventions when conducted in community pharmacies.

Conclusion

This study enabled the identification of several interventions to improve PA through community pharmacies, even though there is a high level of heterogeneity and only around one third of the studies have a low risk of bias, which does not allow us to take strong conclusions.

Community pharmacies and pharmacists are a key part of healthcare systems and play a promising role in becoming part of a primary healthcare system that actively promotes PA. Additional efforts and investments are needed to develop and publish more targeted research to capture PA levels. Moreover, providing support for the education and training of all primary care healthcare professionals is a key to the delivery of effective interventions.

Supplementary data

Supplementary data are available at *EURPUB* online.

Funding

R.V. was supported by the Portuguese Foundation for Science and Technology, through grant number SFRH/BD/13164/2022. .

Conflicts of interest: None declared.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

Key points

- Pharmacists provide educational interventions to patients about lifestyle changes to reduce general risk factors, including advice on increasing PA.
- Advice on PA is usually very general, and more structured interventions are lacking in this area.
- Further training of pharmacists and the provision of structured guidelines for this type of intervention might prove to be effective in increasing PA levels.
- PA outcomes were mostly self-reported and differed greatly in how they were presented.
- More objective measures for PA in healthcare systems can improve the measurement and monitoring of this outcome in the future.

References

1 Pedersen BK, Saltin B. Exercise as medicine—evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand J Med Sci Sports* 2015;25(Suppl 3):1–72.

2 Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med* 2020;54:1451–62.

3 World Health Organization. *Global Status Report on Physical Activity 2022*. Geneva: WHO, 2022.

4 Reis RS, Salvo D, Ogilvie D, et al.; Lancet Physical Activity Series 2 Executive Committee. Scaling up physical activity interventions worldwide: stepping up to larger and smarter approaches to get people moving. *Lancet* 2016;388:1337–48.

5 World Health Organization. *Global Action Plan on Physical Activity 2018–2030: More Active People for a Healthier World*. Geneva: World Health Organization, 2018.

6 Mendes Z, Guedes S, Guerreiro JP, et al. Autovigilância da doença e qualidade de vida dos doentes diabéticos: estudo observacional em farmácias comunitárias. *Rev Port de Saúde Pública* 2016;34:11–9.

7 Sallis R. Developing healthcare systems to support exercise: exercise as the fifth vital sign. *Br J Sports Med* 2011;45:473–4.

8 World Health Organization. *Integrated Brief Interventions for Noncommunicable Disease Risk Factors in Primary Care: The Manual: BRIEF Project*. Copenhagen: World Health Organization Regional Office for Europe, 2022.

9 Agomo CO, Ogunleye J, Portlock J. A survey to identify barriers in the public health role of community pharmacists. *J Pharm Health Serv Res* 2016;7:253–61.

10 Viegas R, Godinho CA, Romano S. Physical activity promotion in community pharmacies: pharmacists' attitudes and behaviours. *Pharm Pract (Granada)* 2021;19:2413.

11 Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71.

12 Sterne JAC, Savović J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ* 2019;366:l4898.

13 Al Hamarneh YN, Hemmelgarn BR, Hassan I, et al. The effectiveness of pharmacist interventions on cardiovascular risk in adult patients with type 2 diabetes: the multicentre randomized controlled R(x)EACH trial. *Can J Diabetes* 2017;41:580–6.

14 Aslani P, Rose G, Chen TF, et al. A community pharmacist delivered adherence support service for dyslipidaemia. *Eur J Public Health* 2011;21:567–72.

15 Doucette WR, Witry MJ, Farris KB, McDonough RP. Community pharmacist-provided extended diabetes care. *Ann Pharmacother* 2009;43:882–9.

16 Farag Mohamed H, Allam MM, Hamdy NA, et al. A community pharmacy-based intervention in the matrix of type 2 diabetes mellitus outcomes (CPBI-T2DM): a cluster randomized controlled trial. *Clin Med Insights Endocrinol Diabetes* 2021;14: 11795514211056307.

17 Gautier JF, Boitard C, Michiels Y, et al. Impact of personalized text messages from pharmacists on medication adherence in type 2 diabetes in France: a real-world, randomized, comparative study. *Patient Educ Couns* 2021;104:2250–8.

18 Ibrahim OM, El-Bassiouny NA, Dergham EA, et al. The effectiveness of pharmacist-based coaching in improving breast cancer-related health behaviors: a randomized controlled trial. *Pharm Pract (Granada)* 2021;19:2563.

19 Krass I, Armour CL, Mitchell B, et al. The Pharmacy Diabetes Care Program: assessment of a community pharmacy diabetes service model in Australia. *Diabet Med* 2007;24:677–83.

20 Sarayani A, Mashayekhi M, Nosrati M, et al. Efficacy of a telephone-based intervention among patients with type-2 diabetes; a randomized controlled trial in pharmacy practice. *Int J Clin Pharm* 2018;40:345–53.

21 Schmiedel K, Mayr A, Fießler C, et al. Effects of the lifestyle intervention program GLICEMIA in people at risk for type 2 diabetes: a cluster-randomized controlled trial. *Diabetes Care* 2015;38:937–9.

22 Svendsen K, Telle-Hansen VH, Mørch-Reiersen LT, et al. A randomized controlled trial in Norwegian pharmacies on effects of risk alert and advice in people with elevated cardiovascular risk. *Prev Med Rep* 2018;12:79–86.

23 Aguwa CN, Ukwe CV, Ekwunife OI. Effect of pharmaceutical care programme on blood pressure and quality of life in a Nigerian pharmacy. *Pharm World Sci* 2008; 30:107–10.

24 Hui-Callahan BC, Luder HR, Frede SM. Impact of the pay-for-performance-for-patients program for diabetes management. *J Am Pharm Assoc (2003)* 2013; 53:644–7.

25 Jolly K, Lewis A, Beach J, et al. Comparison of range of commercial or primary care led weight reduction programmes with minimal intervention control for weight loss in obesity: lighten up randomised controlled trial. *BMJ* 2011;343:d6500.

26 Lemanska A, Poole K, Griffin BA, et al. Community pharmacy lifestyle intervention to increase physical activity and improve cardiovascular health of men with prostate cancer: a phase II feasibility study. *BMJ Open* 2019;9:e025114.

27 Lenz TL, Monaghan MS. Implementing lifestyle medicine with medication therapy management services to improve patient-centered health care. *J Am Pharm Assoc (2003)* 2011;51:184–8.

28 Marfo AF, Owusu-Daaku FT. Evaluation of a pharmacist-led hypertension preventative and detection service in the Ghanaian community pharmacy: an exploratory study. *Int J Pharm Pract* 2016;24:341–8.

29 McNamara KP, O'Reilly SL, George J, et al. Intervention fidelity for a complex behaviour change intervention in community pharmacy addressing cardiovascular disease risk. *Health Educ Res* 2015;30:897–909.

30 Okuyan B, Ozcan V, Balta E, et al. The impact of community pharmacists on older adults in Turkey. *J Am Pharm Assoc (2003)* 2021;61:e83–e92.

31 Olenak JL, Calpin M. Establishing a cardiovascular health and wellness program in a community pharmacy: screening for metabolic syndrome. *J Am Pharm Assoc (2003)* 2010;50:32–6.

32 Peletidi A, Kayyali R. Evaluation of pharmacy-led weight management service to minimise the risk of cardiovascular disease. *J Pharm Policy Pract* 2021; 14:54.

33 Peterson GM, Fitzmaurice KD, Kruup H, et al. Cardiovascular risk screening program in Australian community pharmacies. *Pharm World Sci* 2010;32:373–80.

34 Pinto SL, Bechtol RA, Partha G. Evaluation of outcomes of a medication therapy management program for patients with diabetes. *J Am Pharm Assoc (2003)* 2012; 52:519–23.

35 Pongwecharak J, Treeranurat T. Lifestyle changes for prehypertension with other cardiovascular risk factors: findings from Thailand. *J Am Pharm Assoc (2003)* 2011; 51:719–26.

36 Singh HK, Kennedy GA, Stupans I. A pharmacist health coaching trial evaluating behavioural changes in participants with poorly controlled hypertension. *BMC Fam Pract* 2021;22:35.

37 Sookaneknun P, Richards RM, Sanguansermsri J, Teerasut C. Pharmacist involvement in primary care improves hypertensive patient clinical outcomes. *Ann Pharmacother* 2004;38:2023–8.

38 Suzuki R, Suzuki T, Kikuchi C. [Improvements in Lifestyle from a Lifestyle Consecutive Self-Review at a Pharmacy]. *Yakugaku Zasshi* 2019;139:1047–54.

39 Um IS, Krass I, Armour C, et al. Developing and testing evidence-based weight management in Australian pharmacies: A Healthier Life Program. *Int J Clin Pharm* 2015;37:822–33.

40 Villarini M, Lanari C, Barchiesi L, et al. Effects of the "PreveDi" lifestyle modification trial on metabolic syndrome. *Ann Ig* 2015;27:595–606.

References 41–47 are available in the Supplementary Material.