The ‘miracle cure’: how do primary care physicians prescribe physical activity with the aim of improving clinical outcomes of chronic disease? A scoping review

Jane Thornton , Taniya Nagpal, Kristen Reilly, Moira Stewart, Robert Petrella

ABSTRACT

Objectives To identify how primary care physicians (PCPs) prescribe physical activity for patients with chronic disease, and to determine characteristics of physical activity interventions with improved clinical outcomes of chronic disease.

Design A scoping review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews 2018 was completed.

Data sources Four bibliographic databases (Medline, EMBASE, SPORTDiscus, CINAHL) and four grey literature/unpublished databases (Proquest, National Institute for Health and Care Excellence, Canadian Health Research Collections, Clinical Trials) were searched from inception to 7 March 2022.

Eligibility criteria for selecting studies Studies involving PCP-delivered physical activity prescriptions or counselling for participants with a chronic disease or mental health condition, which reported clinical outcomes were included. Opinion papers, news and magazine articles and case reports were excluded, as were studies in which a physical activity intervention was provided for primary prevention of chronic disease, prescribed by healthcare providers or researchers other than PCPs, or for healthy participants without chronic disease.

Results An initial search identified 4992 records. Fifteen studies met inclusion criteria. Characteristics of physical activity prescriptions that improved clinical outcomes included: personalised advice; brief intervention; behavioural supports (handouts and/or referrals) and physician follow-up. Reported adverse events were rare. Research gaps include optimal timing and length of follow-up, and the long-term and cost-effectiveness of interventions.

Summary/Conclusion Several characteristics of physical activity counselling by PCPs for patients with chronic disease may improve clinical outcomes, although research gaps remain. Studies exploring the effectiveness of physical activity prescription for individuals with chronic conditions are urgently needed.

INTRODUCTION

According to WHO, physical inactivity is the fourth leading risk factor for death worldwide. Inactivity exposes an individual to a similar health risk as smoking and obesity. Strong evidence for the therapeutic use of physical activity in several chronic diseases continues to emerge; including but not limited to, metabolic syndrome-related disorders, heart and pulmonary disease, rheumatoid and osteoarthritis, cancer and mental health conditions.
health disorders such as depression. For this reason, physical activity has been called ‘the miracle cure’.

Primary care physicians (PCPs) have an important role to play, as approximately 80% of individuals visit their doctors every year and prefer to get health information directly from their PCP. Physician counselling to increase physical activity levels in otherwise healthy, sedentary individuals is effective but underused due to lack of time, training or belief that patients will engage. What is less well known is how PCPs currently prescribe physical activity for patients with chronic conditions, and which key characteristics are associated with an improvement in clinical outcomes.

The objective of this scoping review was to identify key characteristics of physical activity prescriptions by PCPs, which result in improved clinical outcomes of chronic disease. A secondary objective was to identify research gaps in the area. The primary outcomes of interest were the key characteristics of interventions that included physical activity prescriptions by PCPs and improvement in clinical outcomes. Secondary outcomes included the role of the PCPs in each aspect of the intervention, the clinical outcomes themselves and the presence of any serious adverse events.

METHODS

This scoping review was completed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). We followed the frameworks of Arksey and O’Malley and Levac et al to systematically identify relevant literature and extract themes pertaining to the research objectives and identification of evidence gaps.

Eligibility criteria

We included studies involving PCP-delivered physical activity prescriptions or counselling for participants with a chronic disease or mental health condition, which reported clinical outcomes. The search was not restricted by year, geographical location, study setting or design, participant age, gender or sex or language; however, only articles in English were included in the review. Systematic reviews and meta-analyses, scoping reviews, guidelines and grey literature were eligible for inclusion. Opinion papers, news and magazine articles and case reports were not included. Studies in which a physical activity intervention was provided for primary prevention of chronic disease, prescribed by healthcare providers or researchers other than PCPs, or for healthy participants without chronic disease were excluded.

Information sources

We conducted the search in four bibliographic databases (Medline; EMBASE; SPORTDiscus; CINAHL) and four grey literature/unpublished databases (Proquest Dissertations and Theses; National Institute for Health and Care Excellence; Canadian Health Research Collections; Clinical Trials) in August 2021 and updated on 7 March 2022.

Search

The search strategy was constructed to answer the research question: ‘What is known about how physical activity prescriptions are delivered by PCPs for patients with chronic disease and what are the key characteristics associated with improved clinical outcomes of chronic disease?’ We built the search architecture (online supplemental file 1) based on a preliminary search of published articles and in consultation with a research librarian.

Selection of sources of evidence

We collated all identified records into Endnote (X8) and removed duplicates using an automatic feature. Two reviewers evaluated all titles and abstracts (JT, TN). Selected articles were reviewed in full for further inclusion by two independent reviewers (JT, TN); in cases of disagreement, a third reviewer was involved (RP). Details of the search process are reported in a PRISMA-ScR flow diagram (figure 1).

Data items and charting process

Articles selected for inclusion underwent data extraction onto a standard Excel spreadsheet. One reviewer extracted the data (JT, TN) and a second reviewer (JT, TN) confirmed data for accuracy. The following data were extracted from included studies: publication details; primary health outcome evaluated; participant characteristics (sample size, sex/gender, age, chronic condition); intervention description; PCP role; main results for health outcomes and any reported adverse events.
Synthesis
We employed a narrative approach to synthesise findings. Extracted data were assessed descriptively and a thematic summary developed grouping the articles based on effect of the physical activity intervention on the clinical outcomes (eg, improvement, no change, etc). We identified characteristics pertaining to the PCP’s role in studies reporting improved clinical outcomes. We then identified evidence gaps and areas for future research.

RESULTS
Our initial search yielded 4992 articles, and after removing duplicates, we screened 4764 titles and abstracts. We identified 81 full texts, and 15 studies were eligible for inclusion (figure 1). Of these, 5 were observational and 10 were randomised controlled trials. Seven studies were mixed interventions incorporating diet-related or general healthy lifestyle components in addition to physical activity. Chronic conditions reported in the studies included obesity, dyslipidaemia, hypertension, type 2 diabetes and metabolic syndrome. Clinical outcome measures included anthropometrics (waist circumference, body mass index), blood pressure, cholesterol, glycated haemoglobin, triglycerides, sodium, carotid artery distensibility, global cardiovascular risk and general and mental health scores. Study characteristics, role of the PCP and a summary of study findings are found in online supplemental table 1.

Characteristics of PCP-led physical activity prescriptions for patients with chronic disease
Physical activity prescription interventions in the 15 studies included descriptions of the type of advice (personalised or generic), type of intervention (brief or in-depth counselling), the use (if any) of behavioural supports and follow-up (if any).

Type of advice
Personalised advice
In 12 of the 15 studies, the PCP provided a personalised physical activity prescription, by identifying participant barriers, goals and readiness for change; and establishing specific amounts, intensities and types of physical activity. In seven studies, PCPs also assessed baseline clinical outcomes relevant to cardiorespiratory fitness (eg, activity levels, cardiovascular risk assessment, anthropometric measurements, blood pressure and fasting glucose levels).

1. Stage of/Readiness for change identification: in 9 of the 15 studies, the PCP considered patients’ readiness for change when tailoring the physical activity prescription. Stage of change assessment is a specific step within the Patient-centred Assessment and Counselling for Exercise (PACE) protocol for brief counselling delivered by the PCP, which was employed in four studies and involves assigning patients to one of three groups: precontemplation, contemplation/preparation or action/maintenance. Understanding a patient’s readiness for change and/or resolving their ambivalence towards change is also a core component of motivational interviewing (MI)-based interventions.

2. Barrier and facilitator identification: identifying the existing and/or potential personal barriers to physical activity perceived by patients as well as developing strategies to overcome them was another component of personalisation in eight studies.

3. Goal setting: individualised goal setting (ie, personal goals set by patients guided by the PCP) was included in eight studies as a component of an established protocol such as PACE or MI.

4. Amount, intensity and type of physical activity: ten studies involved personalising the amount (ie, duration in number of minutes), frequency (ie, number of times per week), intensity (moderate, vigorous) and/or type of physical activity. In one case, patients were encouraged to achieve a preset (ie, not personalised) amount of physical activity, typically based on national guidelines. In seven studies, PCPs specified (moderate) intensity of physical activity.

Finally, PCPs in four studies based the type of activity on the basis of patient preference.

Generic advice
van Sluijs et al noted the lack of intervention effect in their study could be attributed to providers not tailoring their counselling to individual stages of change. In three studies the PCP provided generic advice, all of which resulted in no change or mixed outcomes.

Type of intervention
Six of the 11 studies which reported improvements in clinical outcomes included brief physical activity counselling. Brief intervention in these cases involved physical activity counselling from 2 to 10 min via the PACE protocol. One study, using the Swedish Physical Activity on Prescription (PAP) protocol, involved brief counselling by the PCP with other healthcare professionals delivering longer counselling sessions.

Use of behavioural supports
In 7 of the 15 studies, patients were provided printed educational tools and resources by their PCP. Four interventions included a printed physical activity prescription. Two studies included providing referrals for personal trainers or fitness programmes. Four studies incorporated self-monitoring, or the recording of physical activity behaviours (eg, time, place, duration, etc).
Table 1  Physical activity prescription characteristics in studies with improved outcomes (n=11) and no change or unclear change in outcomes (n=4)

<table>
<thead>
<tr>
<th>Study; chronic disease focus</th>
<th>Positive change in outcomes</th>
<th>No change or unclear change in outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aizawa et al 21; MS</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Avram et al 22; MS</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bertozzi et al 30; OB</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Bolognesi et al 28; DL</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bóveda-Fontán et al 25; DL</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>De Greef et al 23; T2D</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Filippi et al 26; HT</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Lohmann et al 29; OB</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Miura et al 32; HT</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Olsson et al 33; HT</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Volger et al 34; OB</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Chambers et al 24; OB</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>van Sluis et al 25; D</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Serrano Ripoll et al 36; CVD</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

| Personalisation             | ✓                           | ✓                                      |
| Stage of/Readiness for change identification | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Barrier and facilitator identification | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Goal setting                 | ✓                           | ✓                                      |
| Amount of physical activity  | ✓                           | ✓                                      |
| Intensity of physical activity | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Type of activity             | ✓                           | ✓                                      |
| Intervention type            | ✓                           | ✓                                      |
| Brief intervention           | ✓                           | ✓                                      |
| Motivational interviewing    | ✓                           | ✓                                      |
| Unspecified lifestyle counselling | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Behavioural supports         | ✓                           | ✓                                      |
| Printed prescription         | ✓                           | ✓                                      |
| Printed handouts             | ✓                           | ✓                                      |
| Referrals to allied health   | ✓                           | ✓                                      |
| Self-monitoring              | ✓                           | ✓                                      |
| Physician follow-up          | ✓                           | ✓                                      |
| In-person                    | ✓                           | ✓                                      |
| Telephone                    | ✓                           | ✓                                      |
| Mailed letter                | ✓                           | ✓                                      |

✓=performed by PCP, •=performed by another member of the research team. Chronic disease population studied: CVD, D, DL, HT, MS, OB, T2D. CVD, cardiovascular disease; D, depression; DL, dyslipidaemia; HT, hypertension; MS, metabolic syndrome; OB, obesity; T2D, type 2 diabetes.
etc in a log or journal. Patients were instructed to keep a general activity record, notes detailing type, duration and obstacles that arose, or daily step counts.

Follow-up
In 8 of the 15 studies, the PCP provided follow-up assessments, reminders or information sessions. Some interventions included a combination of in-person and phone call follow-up or a ‘booster session’. In two studies, PCPs mailed a letter to reinforce physical activity advice.

Characteristics of interventions in studies with improved clinical outcomes
Among the 11 studies reporting improvements (table 1), all included a personalised physical activity prescription, and 7 included a PCP-delivered brief intervention. Seven provided behavioural support and eight included in-person follow-up.

Characteristics of interventions in studies with no or unclear change in clinical outcomes
The two studies reporting no change in outcomes involved limited interaction with the PCP and/or generic advice (eg, general letter from PCP about physical activity, one follow-up at 4 weeks). Of the four studies with no or unclear change in outcomes, only one included personalisation of any kind by a PCP, and none included self-monitoring.

Adverse events
Two of the 15 studies reported adverse events associated with physical activity. One fitness assessment that included a maximal exercise test was stopped because a participant felt unwell. In another study, a participant was hospitalised, however it was unclear whether this was a result of the intervention. Although not reported as adverse events, one study reported a lack of adherence to the physical activity prescription at 10 weeks due to ‘interruptions to the established routine’, which included illness and injury (sometimes attributed to exercise sessions).

DISCUSSION
PCPs prescribe physical activity for patients with chronic conditions involving a number of characteristics which may improve physical and mental health outcomes. Findings from this review are in line with literature outlining the essential role that PCPs play in identification of patients at risk of chronic disease (eg, cardiovascular disease) and providing long-term follow-up. When PCPs are engaged in physical activity prescription and follow-up this may also have considerable influence on patients’ health-related behaviours. PCPs providing physical activity advice can also play an important societal and public health role due to frequent contact with large segments of the population, especially those with poorer health, lower socioeconomic status and/or who are older.

Characteristics of physical activity prescriptions by PCPs in studies with improved clinical outcomes
Based on the findings of this review, four characteristics of PCP-led physical activity prescriptions or counselling in the subset of studies with improved clinical outcomes include: personalised advice; brief intervention; behavioural supports and follow-up (box 1). By contrast, when an intervention did not produce its expected improvement, study authors attributed this to low PCP involvement (eg, recruitment only) or lack of personalised advice.

Personalised advice
In settings with patients with chronic disease, physical activity interventions should be tailored to individual needs and preferences, consistent with other studies examining patient preferences on physical activity counselling. This personalisation includes identifying stage of and readiness to change, barriers and facilitators, goal setting and determining amount, type and intensity of physical activity. These findings are consistent with the broader literature, where personalisation can also include individualised framing of prescriptions to achieve the patient’s immediate health and functional goals (eg, avoiding surgery, reducing pain symptoms, managing health conditions without medication, improving balance to reduce fall risk, improving mental health). Patients with depression and female patients may specifically benefit from personalised physical activity prescriptions.

Intervention type
In this review, we found that PCPs generally employed one of two intervention types: brief intervention or MI. Brief intervention involves less time than traditional MI and is an effective way of addressing one of the main barriers of PCPs delivering physical activity interventions: time constraints. Several existing protocols for physical activity prescription use brief interventions—including the PACE and Swedish PAP programmes. The PACE model may have a dual advantage as it minimises the duration of the intervention and improves the PCP’s knowledge and abilities at the same time. Individual counselling appeared to outperform group counselling for improvements in clinical outcomes—attributed to the patient-provider rapport.
Behavioural supports

Behavioural supports include printed physical activity prescriptions, patient education handouts, activity logs and referrals to allied health. Patient handouts are low-cost educational tools that are effective in improving patient care and outcomes.66 67 They may also provide benefit for physicians who experience time constraints. Others have emphasised the need for readability and accessibility,48 49 particularly for physical activity resources. By referring patients to allied health professionals, PCPs may benefit from sharing the ‘workload’ of assessments and personalised consultations.92

Follow-up

Follow-up appeared to increase patients’ motivation and adherence. This is consistent with findings that patients expect their PCP to address physical activity regularly.39 Follow-up by a PCP may include reminders of the initial prescription, assessment of physical activity goals and health outcomes measurement. Optimal timing, type and length of follow-up is yet to be determined, although most studies included 3–6-months follow-up appointments.22 24 29 50

Knowledge gaps

We identified several knowledge gaps (box 1). In this review, studies investigated physical activity prescription involving four common chronic conditions, yet there are >25 chronic conditions in which physical activity can play a role in prevention and treatment.51 While physical activity interventions in primary care are cost-effective, knowledge gaps include effectiveness and comparative costs of interventions in chronic disease settings.34

It is possible that studies incorporated additional elements of personalisation, behavioural supports or follow-up within the intervention which were not described in sufficient detail. There was a large variation in intervention design (role of PCP, type, frequency of involvement, duration of the intervention and follow-up), for example, length of follow-up for the study outcome measurement varied from 24 weeks to 54 months. Long-term effectiveness is unknown.

Finally, information pertaining to the intervention agents and their involvement within the study was often lacking and, in some cases, made it challenging to draw conclusions regarding the role of PCPs. Guidelines such as the Template for Intervention Description and Replication checklist can improve the quality of reporting and increase potential replication.92

Strengths and limitations

A strength of this study is the use of an appropriate design for this topic; the scoping review design is suited to the multifaceted interventions and real-world implementation messages that we sought. A second strength is the focus on PCPs which restricts generalisability but increases applicability to a larger population of patients, as not all patients have access to allied health practitioners or research teams. A limitation of the studies reviewed may be their incompletely known quality; they may be prone to response bias (eg, those who are already fit being more likely to participate and have better outcomes) and lack of control groups. A limitation of scoping reviews in general is the inability to determine the effectiveness of the interventions and assessing the quality of studies is not possible. With multifactorial lifestyle interventions, it is impossible to directly attribute changes to physical activity components, and further research investigating physical activity as a standalone intervention is eagerly anticipated.

CONCLUSION

Physical activity counselling by PCPs for patients with chronic disease includes several characteristics which may improve clinical outcomes, although research gaps remain. These characteristics include personalised advice, brief intervention, behavioural supports and follow-up. The field is ripe for research into many more chronic conditions as well as research evaluating effectiveness of interventions. Positive results will enhance fidelity and confidence for patients and providers alike, and facilitate physician engagement, remuneration and training requirements. Given the frequency of contact with large segments of the population living with chronic disease, studies exploring the effectiveness of physician-led physical activity prescription for individuals with chronic conditions are urgently needed.

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Contributors JT developed the idea and wrote the first draft, JT and TN conducted the search and evaluated the studies. RP acted as third reviewer when needed. KR and MS provided expertise in qualitative analysis. MS and RP provided study oversight. All authors were responsible in editing the manuscript and final approval of the submission.

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REFERENCES


8 Godfle F. The miracle cure. The BMJ 2019;368.


12 Exton-Sanderson D. Patterns and predictors of a doctor visit in the first 12 months by medical specialty, number of visits, educational attainment level, sex and age. Available: http://appsso.eurostat.ec.europa.eu/nui/


46 Bortz K. Flu vaccine uptake improves with educational handouts in waiting room - ProQuest. Infectious Disease in Children 2019;32:16 https://www.proquest.com/docview/2277341178?pq-origsite=g scholarly&fromopenview=true
49 Thomas JD, Flay BR, Cardinal BJ. Are physical activity resources Understandable as disseminated? a meta-analysis of readability studies. Quest 2018;70:492–518.
Supplementary File 1

Search Architecture. We conducted the search in four bibliographic databases (Medline; EMBASE; SPORTDiscus; CINAHL) and four grey literature/unpublished databases (Proquest Dissertations and Theses; NICE; Canadian Health Research Collections; Clinical Trials). The search was not restricted by year, geographical location, study setting or design, participant age, gender, or sex or language; however only articles in English were included in the review. Systematic reviews and meta-analyses, scoping reviews, guidelines, and grey literature were eligible for inclusion. Opinion papers, news and magazine articles, and case reports were not included. Studies in which a physical activity intervention was provided for primary prevention, prescribed by healthcare providers or researchers other than PCPs, or for participant groups without chronic disease or mental health conditions were excluded.

Database search strategies. Search performed on 29 August 2020 and updated 7 March 2022. March 7, 2022 by TN.

<table>
<thead>
<tr>
<th>Database</th>
<th>Search Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medline</td>
<td>(Fitness or strength* or exercis* or &quot;motor activity&quot; or &quot;physical activity&quot; or endurance or kinesiotherap*) AND (primary medical care/ or primary health care/ or clinical practice/ or exp general practice/ or private practice/ or Physicians, Primary Care/ or General Practitioners/ or hospitalists/ or physicians/ or physicians, family/) AND (counseling/ or directive counseling/ or motivational interviewing/ or distance counseling/ or exp Prescriptions/)</td>
</tr>
<tr>
<td>EMBASE</td>
<td>(fitness/ or exp kinesiotherapy/ or &quot;physical activity, capacity and performance&quot;/ or exp exercise/ or exp physical activity/) AND (exp primary medical care/ or exp general practi*) AND (counseling/ or directive counseling/ or motivational interviewing/ or patient counseling/ or patient guidance/ or prescription/ or ecounseling)</td>
</tr>
<tr>
<td>CINAHL</td>
<td>MH &quot;Exercise+&quot;) OR (MH &quot;Therapeutic Exercise&quot;) OR (MH &quot;Physical Fitness+&quot;) OR (MH &quot;Motor Activity&quot;) AND (MH &quot;Primary Health Care&quot;) OR (MH &quot;Physicians, Family&quot;) OR (MH &quot;Hospitalists&quot;) OR (MH &quot;Pediatricians&quot;) OR (MH &quot;Physicians, Emergency&quot;) OR (MH &quot;Physicians, Sports Team&quot;) AND (MH &quot;Motivational Interviewing&quot;)</td>
</tr>
</tbody>
</table>
| Sport Discus | DE "PHYSICAL fitness" OR DE "ANAEROBIC exercises" OR DE "ASTROLOGY & physical fitness" OR DE "BODYBUILDING" OR DE "CARDIOPULMONARY fitness" OR DE "CARDIOVASCULAR fitness" OR DE "CIRCUIT training" OR DE "COMPOUND exercises" OR DE "EXERCISE tolerance" OR DE "ISOLATION exercises" OR DE "LIANGONG" OR DE "MUSCLE strength" OR DE "PERIODIZATION training" OR DE "PHYSICAL fitness -- Genetic aspects" OR DE "PHYSICAL fitness for children" OR DE "PHYSICAL fitness for girls" OR DE "PHYSICAL fitness for men" OR DE "PHYSICAL fitness for older people" OR DE "PHYSICAL fitness for people with disabilities" OR DE "PHYSICAL fitness for women" OR DE "PHYSICAL fitness for youth" OR DE "SPORT for all") AND ((DE "PRIMARY care (Medicine)") OR (DE "FAMILY medicine")) AND DE "PHYSICIANS (General practice)"

| Grey Literature Searches: | “Physical Activity” AND “Primary Care” AND Counseling/Counselling

Proquest Dissertations and Theses; NICE; Canadian Health Research Collections; Clinical Trials |
Table 1. Characteristics of PCP-led physical activity prescriptions for patients with chronic disease

<table>
<thead>
<tr>
<th>Author, Year, Location</th>
<th>Study Design</th>
<th>Length of Intervention</th>
<th>Follow up; with whom</th>
<th>Sample Size, Chronic Condition and Sex/Gender</th>
<th>Brief Study Description – PCP Role</th>
<th>Personalized or Generic Intervention</th>
<th>Primary Health Outcome</th>
<th>Main Health Outcome Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avram et al., 2011, Romania</td>
<td>RCT</td>
<td>18 months with outcomes measured at study end.</td>
<td>Every 6 months in person and once a month over the phone; PCP</td>
<td>253 (133 IG, 120 UC), high cardiometabolic risk Age: IG-55.6; UC-56.5 IG-62% male, 38% female; UC-64% male, 36% female</td>
<td>PCP provided lifestyle counselling and a monthly follow up call for 18 months. PCPs also received counselling training from a team including a cardiologist, diabetologist, and PT.</td>
<td>Personalized: PCP provided 3 90-minute visits to discuss lifestyle habits (diet, PA, weight control).</td>
<td>Weight</td>
<td>Positive Change: Significant decrease in risk profile (decreased waist circumference and weight) in IG.</td>
</tr>
<tr>
<td>Boveda-Fontan et al., 2015, Spain</td>
<td>RCT</td>
<td>1 year with assessments at 2, 4, 8 and 12 months.</td>
<td>2, 4, 8 and 12 months; PCP</td>
<td>277 (107 IG, 120 UC), uncontrolled dyslipidemia Age: IG-52.83; UC-52.84 IG-42% male, 58% female; UC-35% male, 65% female</td>
<td>PCPs delivered MI or general recommendations to reduce unhealthy habits into their already scheduled appointments.</td>
<td>Personalized: Patients in the IG received general recommendations (same as UC), as well as an MI approach to increase daily PA.</td>
<td>Lipid levels</td>
<td>Positive Change: After 12 months, total cholesterol levels, LDL-cholesterol, and triglycerides improved from baseline in IG. More patients achieved target lipid control in IG than UC.</td>
</tr>
<tr>
<td>Bolognesi et al., 2006, Italy</td>
<td>RCT</td>
<td>5-6 months with assessments at study end.</td>
<td>5-6 months by mail or by phone; Counsellor.</td>
<td>96 (48 IG, 48 UC), obesity IG-46% male; 44% female; UC-37% male, 63% female</td>
<td>PCP assessed BMI, recruited participants., provided brief counselling and PA recommendations using PACE protocol.</td>
<td>Personalized: PCP determined stage of change using PACE assessment tool and provided PA recommendations.</td>
<td>BMI and abdominal girth</td>
<td>Positive Change: After 6 months, BMI and abdominal girth significantly decreased in IG.</td>
</tr>
<tr>
<td>De Greef et al., 2011, Belgium</td>
<td>RCT</td>
<td>12 weeks with outcomes measured at study end.</td>
<td>12 weeks; PCP.</td>
<td>67 (24 UC, CBT 22, CBT+PCP counselling 21), type 2 diabetes Age: 67.4 61% male, 29% female</td>
<td>PCPs delivered 3 15-minute PA counselling sessions, plus 3 90-minute CBT sessions to increase activity.</td>
<td>Personalized: PCP helped set PA goals using pedometer. Participants assigned to group counselling discussed behaviour change strategies with a clinical psychologist</td>
<td>Cholesterol, waist circumference, HbA1c</td>
<td>Positive Change: Participants who received PCP counselling had a decrease in waist circumference and HbA1c, and lower increase in total cholesterol.</td>
</tr>
<tr>
<td>Study Code</td>
<td>Study Design</td>
<td>Time Frame</td>
<td>Follow up</td>
<td>Study Population</td>
<td>Study Intervention</td>
<td>Study Findings</td>
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<tr>
<td>Miura et al., 2004, Japan</td>
<td>RCT</td>
<td>24 weeks</td>
<td>Every 4 weeks; PCP and counselor.</td>
<td>57 (18 PA Prescription+PCP Counselling, 20 PA Prescription, 19 Matched-UC), hypertension</td>
<td>PCP provided counselling sessions via PACE+ protocol at baseline and follow up.</td>
<td>Blood pressure, percent body fat</td>
<td>Positive Change: Decrease in systolic blood pressure in the IGs. Body fat percentage and sodium were higher in the IGs.</td>
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<td>Olsson et al., 2015, Sweden</td>
<td>RCT</td>
<td>6 months, with assessments at baseline and 6 months.</td>
<td>6 months; Physical activity counselor</td>
<td>101 (47 IG, 54 UC), obesity</td>
<td>UC received written PA advice. IG received the advice and a 30-minute counselling session with a PCP trained in MI who provided PA advice by using the FIIT framework to provide a prescription. Both groups received a letter from the PCP with their PA prescription.</td>
<td>SF-36 scores and mental component summary scores</td>
<td>Positive Change: Significant improvement in general health (SF-36 scores) and mental health scores in the IG after 6 months.</td>
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<td>Volger et al., 2013, USA</td>
<td>RCT</td>
<td>2 years</td>
<td>Every 3 months; PCP and medical assistants.</td>
<td>390 (131 Brief, 129 Enhanced, 130 UC), obesity and at risk for MS</td>
<td>All participants received 7-minute brief lifestyle counselling from a PCP. IGs met monthly for 2 years with a medical assistant for further counselling. Enhanced group had options for meal replacements and medication.</td>
<td>Weight loss</td>
<td>Positive Change: Both IGs lost more weight than the UC group, the enhanced group lost significantly more weight.</td>
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| Aizawa et al., 2009, Canada | OBS | 24 weeks with outcomes measured at 8 and 24 weeks. | Follow up at 8 weeks and 24 weeks; PCP and research staff | 63 (29 without MS, 34 with MS), pre-hypertensive and/or pre-diabetes. | PCP provided individually customized lifestyle prescriptions for aerobic exercise and a Mediterranean-style diet. Prescriptions were provided PA prescription via STEP. Intensity determined by heart rate. PCP recommended | Central artery stiffness | Positive Change: Carotid artery dispensability significantly increased, with improvements in MS components (BP, }
provided by the Step Test Exercise Prescription, which uses stepping time (20 times stepping with 9.5cm step) and heart rate to predict maximal oxygen uptake and 75% or predicted VO\(_2\)max, and stage of change model. MS components and carotid artery stiffness was measured at baseline and after 24 weeks of intervention.

<p>| Bertozzi et al., 2004, Italy | OBS | 7 months, with outcomes measured at study end | 47% male, 53% female | PCP provided brief counselling using PACE to increase PA. | Motivation to increase PA. Secondary outcomes: BMI, and abdominal circumference decreased. | Positive Change: After 7 months, BMI and abdominal circumference decreased. |
| Filippi et al., 2017, Italy | OBS | Approximately 54 months. Participants were randomly selected to be seen on 12 pre-determined working days. | 7 months (median); unclear if with PCP. 145, at risk for obesity Age: 51.6 38% male, 62% female | PCP assessed motivational level towards PA and then provided advice to increase PA. | Total cholesterol and global cardiovascular risk decreased in IG as compared to matched-UC. | Positive Change: After 54 months, total cholesterol and global cardiovascular risk decreased in IG as compared to matched-UC. |
| Lohmann et al., 2010, Denmark | OBS | 18 months with outcomes measured at 3, 6, 8, 12, 15, and 18 months. | 127, type 2 diabetes 58% male, 42% female | Two fitness consultations every 3 months. One consultation included a fitness assessment and the second was MI with a PCP to review the assessment results. | HDL-cholesterol, HbA1c levels increased, and HbA1c levels were unchanged and low. | Positive Change: HDL cholesterol levels increased, and HbA1c levels were unchanged and low. |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Duration</th>
<th>Follow Up</th>
<th>Allocation</th>
<th>Intervention</th>
<th>Follow Up</th>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chambers et al., 2000, UK</td>
<td>RCT</td>
<td>1 year with outcomes measured at study end.</td>
<td>No follow up</td>
<td>386 (UC 94, PA booklet 99, PA booklet+PT session 97, PA booklet+PT session+group fitness 96), One of the following: ischemic heart disease, stroke, hypertension or diabetes</td>
<td>UC received no PA-related information, PA booklet group received a booklet with information about the benefits of PA, PA booklet+PT session received the booklet about the benefits of PA and a fitness assessment with a PT, bookket+PT session+group fitness received the same benefits of PA booklet, a fitness assessment with a PT and access to 4 group fitness sessions. For all IGs, the booklet discussing PA benefits was sent with an accompanying letter encouraging PA from the PCP.</td>
<td></td>
<td>SF-36</td>
<td>No change: Social functioning and bodily pain deterioration was reported in the UC group only, whereas no change of trends towards improved scores were observed in the IGs.</td>
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<tr>
<td>van Sluijs et al., 2005, Netherlands</td>
<td>RCT</td>
<td>1 year with outcomes measured at baseline, 8 weeks, 6 months and 12 months.</td>
<td>4 weeks; PCP</td>
<td>396 (IG 191, 205 UC), hypercholesterolemia, or NIDDM or hypertension</td>
<td>Using PACE, PCPs (or nurse) provided a 10-minute counselling session. IG received telephone counselling after 2 weeks (with a PA counsellor), a follow up with the PCP after 4 weeks, and a booster call after 8 weeks after the second visit.</td>
<td></td>
<td>BMI and waist circumference</td>
<td>No change: No change in BMI and waist circumference increased in the IG.</td>
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<td>Serrano Ripoll et al., 2015, Spain</td>
<td>RCT</td>
<td>1 year, with outcomes measured at 6 and 12 months</td>
<td>6 and 12 months; PCP</td>
<td>273 (140 IG, 133 UC), mild-moderate depressive symptoms</td>
<td>PCPs provided a written prescription to improve health behaviours, including going for daily walks. UC received a less</td>
<td></td>
<td>Beck Depression Inventory scores</td>
<td>Unclear/Mixed: At 12 month follow up, both groups had decreased depressive symptoms, with no differences between groups.</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Duration</td>
<td>Sample Size</td>
<td>Intervention</td>
<td>Primary Outcomes</td>
<td>Unclear/Mixed</td>
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<td>Lord &amp; Green, 1995, UK</td>
<td>OBS</td>
<td>1 year</td>
<td>10 weeks, 6 and 10 months; Community health and fitness officer.</td>
<td>419, at risk for cardiovascular disease 25% male, 68% female, 7% unknown</td>
<td>Pilot included optional exercise classes (e.g., dance, swimming, walking, bowling) for 3 sessions per week for 10 weeks. PCPs provided referral and indicated on the referral if there are any exercises that were contraindicated for the patient.</td>
<td>Generic: PCP assessed whether patient would be eligible for scheme and provided referral to the program. Primary outcome was adherence. Participants could indicate their main reason for wanting to join the program and outcomes were assessed accordingly. The most common goal was weight loss.</td>
<td>Adherence to the program was low with only 20% attending classes for 10 weeks. Adherence to follow up was low, of those who returned for follow up and adhered to the 10-week program (n=44) average weight loss was 1kg and there was a 4 beat or more decrease in resting heart rate. Clinical or statistical significance were not reported.</td>
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Mean age is presented. Sex/gender percentages are presented as reported by authors.

BMI – Body mass index; FIIT – Frequency, intensity, time, type; IG – Intervention group; MI – Motivational interviewing; MS – Metabolic syndrome; NIDDM - Non-insulin-dependent diabetes mellitus; PACE - patient-centered assessment and counseling for exercise; PCP - Primary care provider; PT – Physiotherapist; PA – Physical activity; SF-36 – 36-Item Short Form Survey; UC – Usual care