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# ABC of prescribing exercise as medicine: a narrative review of the experiences of general practitioners and patients

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## ABSTRACT

**Background** Exercise prescribing can help patients to overcome physical inactivity, but its use in general practice is limited. The purpose of this narrative review was to investigate contemporaneous experiences of general practitioners and patients with exercise prescribing.

**Method** PubMed, Scopus, Science Direct and Cochrane reviews were reviewed using the terms 'exercise prescription', 'exercise prescribing', 'family practice', 'general practice', 'adults' and 'physical activity prescribing'.

**Results** After screening by title, abstract and full paper, 23 studies were selected for inclusion. Qualitative, quantitative and mixed-methods studies revealed key experiences of general practitioners and patients. Barriers identified included: physician characteristics, patients' physical and psychosocial factors, systems and cultural failures, as well as ambiguity around exercise prescribing. We present a synthesis of the key strategies to overcome these using an ABC approach: A: assessment of physical activity: involves asking about physical activity, barriers and risks to undertaking an exercise prescription; B: brief intervention: advice, written prescription detailing frequency, intensity, timing and type of exercise; and C: continued support: providing ongoing monitoring, accountability and progression of the prescription. Multiple supports were identified: user-friendly resources, workshops for doctors, guidelines for specific illnesses and multimorbidity, electronic devices, health system support and collaboration with other healthcare and exercise professionals.

**Discussion** This review has identified levers for facilitating exercise prescribing and adherence to it. The findings have been presented in an ABC format as a guide and support for general practitioners to prescribe exercise.

### Key messages

**What is already known**

- Significant morbidity and mortality are attributed to physical inactivity worldwide.
- Exercise is a well-described and time-tested medicine for treatment and prevention of illness.
- Exercise prescribing in general practice and across the medical disciplines is uncommon.

**What are the new findings**

- Patient, physician and systems barriers are outlined.
- A user-friendly approach is outlined: assessment, brief intervention and continued support.
- Supportive measures include educational resources and toolkits using electronic applications.

## INTRODUCTION

The concept of exercise as medicine is as ancient as the practice of medicine itself, with records dating over two millennia of physicians formally advising on exercise in India, Rome and Greece.[1] For over a century, Western medicine has favoured pharmacological or 'disease-centred' approaches and currently few physicians provide specific recommendations to their patients on exercise.[2] Physical inactivity is recognised as a global health problem,[3] and is considered to be the fourth major cause of death worldwide.[4] In most countries, the majority of adults do not meet physical activity guidelines (PAGL) and, tragically, millions of human beings die every year as a consequence of simply being inactive.[5] The financial fall-out of physical inactivity is enormous, with sedentary patients costing over US$1500 per patient per year more than active patients.[6] Conservatively estimated, the cost of physical inactivity to the global economy is INT$ 53.8 billion.[7] Hundreds of billions of dollars are spent on medications each year,[8] but exercising can be free of charge. Furthermore, exercise has the fortunate 'side effects' of promoting self-esteem and quality of life.[9]

International guidelines consistently state that the minimum dose of exercise for health benefits is 150 min of moderate intensity or 75 min of vigorous intensity physical activity (PA) per week.[10 11] Recent research has reported that even a smaller increase in exercise levels and less time spent sedentary was associated with reduced mortality, prompting the 'move more, sit less' message.[12] The

American College of Sports medicine have advocated that exercise levels be recorded as a vital sign by physicians at every patient visit and issued a 'call to action' to engage current and future physicians.[13] Reconceptualising exercise as a vital sign,[14 15] followed by a brief intervention, such as exercise prescription (EP), could act as an impetus for the patient in implementing behavioural change.[16]

Systematic reviews have recommended better quality studies of interventions for improving exercise levels,[17 18] but it seems that interventions conducted in primary care are generally cost effective,[19] and EP is among the most cost-effective intervention of those studied.[20] In terms of efficacy, promotion of exercise to sedentary adults in primary care can increase levels at 12 months.[21] Structured approaches to EP have been trialled with positive outcomes for PA levels.[22 23] In this context, it is disappointing that it continues to be "under-prescribed and under-utilised".[24] It seems that general practitioners (GPs) are receptive to promoting exercise, but 'individual and organisational barriers' must be overcome.[25] The authors are not aware of any study that has reviewed the literature reporting experiences and perspectives of GPs and patients in this regard. The aim of this study was to review contemporaneous published research to investigate those experiences and perspectives and specifically to (a) identify barriers to prescribing exercise; (b) to identify barriers to adhering to EPs and (c) to identify levers toward a process that may overcome them.

## METHODOLOGY

### Research question and context

The research team was mainly composed of clinicians with interest and experience in exercise as medicine. In our experience, advice and informal types of PA counselling are delivered daily by GPs and are neither documented nor followed up by EPs. Based on expert recommendations,[26 27] we defined an EP as having the following components: written, structured advice on exercise specifically detailing the recommended frequency, intensity, type, timing and progression of the regimen.

### Study design

A narrative literature review was decided as the most appropriate method to answer the research question as the narrative approach allows flexibility in both selecting research papers with different methodologies and population groups, as well as facilitating room for critique and reflection. As a group of clinicians, the researchers intended this study to be of practical use to fellow physicians who are reticent about prescribing medicine.

### Search strategy

Published studies from 2010 to present were included in the review. The following search engines were used: PubMed, Science Direct, Cochrane Database and Scopus. Combinations of the following search terms were employed: 'exercise prescription'; 'physical activity prescription'; 'family medicine'; family practice; 'general practice'; 'family physician' and 'adults'.

Studies were required to meet the following criteria for inclusion: original research conducted in family practice settings; involving EPs and adult populations; and were written in English. Exclusion criteria included: case reports, protocols and pilot studies; studies involving children; studies that did not involve written EPs; and studies reported in languages other than English.

### Study selection and investigation

Three authors reviewed the titles produced by the searches, all of which were tabulated. Any discrepancies around study selection were discussed among authors and a consensus was reached. Abstracts of selected studies were reviewed in a similar way and, finally, full texts were retrieved and reviewed by all three authors for inclusion. From these studies, the authors identified barriers to exercise prescribing and adherence, as well as levers to overcome them.

## RESULTS

Twenty-three studies were selected for review. The studies, summarised in table 1, involved: 6 trials[28–33]; 13 observational[34–46]; 3 qualitative[47–49]; and 1 mixed methods.[50] Studies originated in eight different regions: 7 from Canada[28 30 31 38 43 44 50]; 7 from Sweden[34 35 41 42 46 48 49]; 2 from New Zealand[36 47]; 2 from the UK[32 33]; 2 from France[37 39]; 1 each from the USA[29] and Australia[45] and a single study from 12 Latin-American countries.[40] Numbers of study participants ranged from 45[31] to 1023.[32] Follow-up of participants reported in the trials reviewed ranged from 3 months[30] to 3 years.[32]

The results are presented in three themes related to the research question regarding barriers to prescribing and adherence to EPs, as well as levers to overcome both. The themes included: (a) prescription and process factors; (b) physician factors and (c) patient factors. Table 2 outlines the factors that influence exercise prescribing.

### Prescription and process factors

Through this review, several modes of EP were described. Petrella *et al* conducted a 12-month randomised controlled trial (RCT) across Canada, reporting substantial improvements in fitness markers compared with baseline when patients received EP alone (control group) or EP plus counselling (intervention group), but no difference between the groups in terms of markers of physical fitness.[28] Importantly, the EP part of the intervention required minimal training for clinicians and could be delivered during a typical 15-minute appointment.[28] Furthermore, a Swedish intervention observational study investigated incorporating a referral system for EP, whereby the GP involves an exercise professional (physiotherapist or physical therapist) in the patient's care to increase EP.[35] In this instance, the professional assesses the context and the patient's needs, provides motivational interviewing and helps the patient to choose the

**Table 1** Overview of studies of exercise prescription in general practice since 2010 (n=23)

| Author, year<br>Study type, location | Title | Main components and outcomes |
|---|---|---|
| Petrella *et al*, 2010<br>RCT, Canada[28] | Improving aerobic fitness in older adults; effects of a physician-based exercise counselling and prescription program | Both intervention and control group showed improvements in PA levels compared with baseline, but there were no statistically significant differences between the two. |
| Leijon *et al*, 2010<br>Observational, Sweden[34] | Factors associated with patients self-reported adherence to prescribed physical activity in routine primary health care | Adherence to EP was 56% at 3 months and 50% at 12 months. Higher baseline PA levels and prescriptions that included home-based activities are associated with higher adherence. |
| Persson *et al*, 2010<br>Observational study, Sweden[35] | Simplified routines in prescribing physical activity can increase the amount of prescriptions by doctors, more than economic incentives only: an observational intervention study | Incorporating a referral system into EP whereby the GP involves other professionals in the patient's care increases the amount of EP. |
| Carroll *et al*, 2010<br>RCT, USA[29] | Computerized tailored physical activity reports A randomized controlled trial | An individually tailored PA programme increased PA compared with baseline at 6 months, but there was no significant difference to the control group. |
| Elley *et al*, 2011<br>Observational, New Zealand[36] | Cost-effectiveness of exercise on prescription with telephone support among women in general practice over 2 years | An intervention involving EP and telephone support from practice nurses can move people from less active to more active categories over 24 months and is cost effective. |
| Patel *et al*, 2011<br>Interviews, New Zealand[47] | General practitioners' views and experiences of counselling for physical activity through the New Zealand green prescription program | Generally, GPs were well disposed to EP. Strategies to save time included collaborating with dedicated exercise support counsellors and involving practice nurses. |
| Attalin *et al*, 2012<br>Survey, France[37] | Physical -activity prescription for obesity management in primary care: attitudes and practices of GPs in a southern French City | The majority of GPs had no training in EP. Lack of available validated tools followed by lack of time were the most important barriers for GPs. |
| Persson *et al*, 2013<br>Focus groups, Sweden[48] | Physical activity on prescription (PAP) from the General Practitioner's perspective – a qualitative study | Asking and advising about PA was considered acceptable and important but taking the extra step of prescribing it was not. GPs preferred to refer for EP. |
| Knight *et al*, 2014<br>RCT, Canada[30] | Prescribing physical activity through primary care: does activity intensity matter? | EP at different intensities improved cardiometabolic health markers. |
| Knight *et al*, 2014<br>Trial (non-randomised), Canada[31] | Health promotion through primary care: enhancing self-management with activity prescription and mHealth | EP plus remote monitoring technologies improved physiological outcomes and PA levels in groups that targeted sedentary behaviour, higher intensity PA and both. |
| Knight and Petrella, 2014<br>Mixed-method, Canada[50] | Prescribing physical activity for healthy aging: longitudinal follow-up and mixed method analysis of a primary care intervention | Physiological gains were maintained at 6 months. Participants reported that mHealth is an acceptable support. |
| Windt *et al*, 2015<br>Pre-test and post-test, Canada[38] | Can a 3-hour educational workshop and the provision of practical tools encourage family physicians to prescribe physical activity as medicine? A pre-post study | The proportion of GPs who reported EP activity rose significantly ($p<0.5$). |
| Lanhers *et al*, 2015<br>Cross-sectional survey, France[39] | General practitioners' barriers to prescribe physical activity: the dark side of the cluster effects on the physical activity of their type 2 diabetes patients | Patients that had lower perceived barriers to PA had better PA levels and better glycaemic control. GPs who perceived higher barriers to PA promotion tended to have patients who did less PA. |
| Arciniegas Calle *et al*, 2016<br>Pre-test and post-test, South America[40] | One-day workshop-based training improves physical activity prescription knowledge in Latin American physicians: a pre-test post-test study | Significant improvement in knowledge gain ($p<0.001$) was reported for doctors who attended a 1-day workshop on EP. |
| Joelsson *et al*, 2018<br>Focus group, Sweden[49] | Patients with chronic pain may need extra support when prescribed physical activity in primary care: a qualitative study | Participants reported lack of clarity about the nature and practical implementation of EP. |

Continued

**Table 1** Continued

| Author, year<br>Study type, location | Title | Main components and outcomes |
|---|---|---|
| Lundqvist *et al*, 2017<br>Observational, Sweden[41] | Physical activity on prescription (PAP), in patients with metabolic risk factors. A 6-month follow-up study in primary health care | EP was delivered by practice nurses mainly, including 1–2 support sessions during the 6 months. 73% of patients had improved PA levels at 6 months. |
| Rodjer *et al*, 2016<br>Observational, Sweden[42] | Physical activity on prescription (PAP): self-reported physical activity and quality of life in a Swedish primary care population, 2-year follow-up | The intervention involved a written EP and follow-up with an exercise professional. Significant improvements in PA were noted at 6 months and 12 months but not at 2-year follow-up. |
| Harris *et al*, 2018<br>RCT, England[32] | A pedometer-based walking intervention in 45- to 75-year-olds, with and without practice nurse support: the PACE-UP three-arm cluster RCT | Intervention with pedometer plus nurse or postal support improved PA levels significantly. The improvement was maintained at 3 years. |
| Fowles *et al*, 2018<br>Survey, Canada[43] | Exercise in medicine Canada physical activity counselling and exercise prescription training improves counselling, prescription, and referral practices among physicians across Canada | After a full training day, confidence was improved and barriers were overcome. At 3-month follow-up, physicians prescribing EP went from 20% to 74%. |
| O'Brien *et al*, 2018<br>Survey, Canada[44] | The effects of previous educational training on physical activity counselling and exercise prescription practices among physicians across Nova Scotia: a cross-sectional study | Physicians who had received training in PA counselling and PA prescription were more likely than physicians who had never attended, to advise their patients about PA. |
| Yaman and Atay, 2018<br>RCT, England[33] | The effect of exercise prescription of primary care physician on the quality of life in patients | Patients who received an EP reported better quality of life and had objectively measured physical function. The EP contained endurance, strength, balance and flexibility components. |
| Smith *et al*, 2018<br>Observational, Australia[45] | Prescription of physical activity in management of high blood pressure in Australian general practices | Most patients did not receive an EP. Those that did were more likely to engage and to consider PA to be important. |
| Lundqvist *et al*, 2019<br>Observational Sweden[46] | Which patients benefit from physical activity on prescription (PAP)? A prospective observational analysis of factors that predict increased physical activity | The most common EP was 30–45 min of moderate-intensity walking, 2–5 days per week. Physical and psychological factors were associated with better EP uptake. |

EP, exercise prescription; GP, general practitioner; PA, physical activity; RCT, randomised control trial.

type of exercise. A financial bonus was paid to participating practices when prescription targets were reached, but the impact of this factor was not reported.[35]

In an RCT with 1083 female participants, the EP was delivered by practice nurses and follow-up support was provided by exercise professionals (in this case, fitness instructors) via 5 telephone sessions over the course of 2 years.[36] Significant improvements in exercise levels were observed in the intervention group at 12 months and 24 months. The role of practice nurses in delivering EP was employed in another study by Lundqvist,[41] where the practice nurses also provided support sessions during the 6 months. The initial consultation involved elements of motivational interviewing, including an assessment of readiness to change, self-efficacy and PA preferences. PA levels improved among participants, but as this was an observational study with no control group, the results need to be interpreted with caution.[41] In another RCT with 179 older adult participants, patients who received an EP reported better quality of life and had improvements in objectively measured physical function.[33] GPs in both groups received theoretical training on exercise, but those in the intervention group received an extra 10 hours of training specifically on EP. Those GPs in the intervention group also received educational packs for their patients, but it was not clear what type of ongoing interaction between the GP and patient took place.[33]

## Patient factors

Objective data on factors that influenced patients' success with EPs were captured in an observational study,[46] involving 444 patients. Four factors correlated with better uptake of EP: (a) better self-efficacy and confidence in one's ability to undertake the EP; (b) lower body mass index; (c) better self-reported physical health and (d) lower exercise levels at baseline. However, outcomes were dependant on participant-recall, which may be a source of bias. Another Swedish observational study investigated patients' adherence to EP, reporting that patient adherence was 56% at 3 months and 50% at 12 months.[34] In this study, there was a strong positive association between baseline levels of PA and adherence to EP. Finally, a survey of 535 people with hypertension in Australia, found that

Table 2 Factors influencing exercise prescribing

| Factors and effect | Negative influencers | Positive influencers |
|---|---|---|
| Family physician | Lack of available validated tools[37]<br>Lack of time[37]<br>Perceived barriers to prescribing[39] | Training, eg, workshop and validated tools[33 37 38 40 43 44]<br>EP materials and training packs for patients[33] |
| Patient | Physically inactive at baseline[34]<br>Seasonality and weather[50]<br>Medical conditions[50]<br>Lack of purpose after the study ended[50]<br>Lack of clarity on the purpose of the EP and what is expected of them specifically[49] | Education and messaging from family physician[50]<br>Prevalence of comorbidity[45]<br>Higher levels of self-efficacy and confidence in one's readiness to change; lower BMI and lower baseline PA levels and those who had self-reported better health were more likely to attain improvements in PA levels[46] |
| Systems | There is no tradition of prescribing exercise in family practice[48] | EP deliverable in a 15-minute appointment[28]<br>Support from an exercise professional who provides motivational interviewing and some of the prescribing[35]<br>EP from a practice nurse[36]<br>Phone support from a exercise professional[36]<br>PA counsellor who would have the time and skills to help initiate and maintain PA[47]<br>Nurse prescriber and ongoing support[41]<br>Exercise coordinator to assist with motivation, goal setting, support and follow-up[42]<br>Postal support[32] |
| Prescription | | Contains higher proportion of home-based exercises[34]<br>Walking prescription carried out individually and in everyday life[46]<br>Preceded by motivational interviewing, including readiness to change, motivation, self-efficacy and PA preferences[41]<br>Use of mHealth, including pedometers[32 50]<br>EP for older adults should contain endurance, strength, balance and flexibility components[33]<br>Monthly renewal of prescription[33] |
| Cultural, society | | Building social networks to enable PA[50]<br>Better community infrastructure to provide opportunity[49] |

BMI, body mass index; EP, exercise prescription; PA, physical activity.

patients who received an EP were more likely to engage with exercise, compared with those who received none.[45]

Two studies specifically investigated patients' perspectives. Interview participants reported being confused about what EP is, why they were receiving it and how they should put it into action.[49] They suggested better infrastructure in the community to provide more opportunity to exercise. Knight *et al* conducted a follow-up study with 20 older adults who had participated in a trial of an intervention augmented by mobile health devices.[50] Participants cited seasonality, weather, medical reasons and lack of direction or support after the trial had finished as reasons for disengaging with EP. They found that mobile health devices were an acceptable support, in particular pedometers as they provided instant feedback with graphics. Some participants demonstrated insight into the impact of exercise on their health, with one saying, 'He told me to keep doing what I'm doing because I'm… really medicating myself with exercise'.[50]

## Physician factors

Lack of validated tools and time were cited as the most important barriers to EP by GPs responding to a survey in France, with only just over half of respondents in training for EPs.[37] A cross-sectional survey from France reported an association between negative perceptions held by GPs toward exercise promotion and their patients being less active.[39] A qualitative study of GPs in Sweden reported that most believed that this was not in their remit, citing huge workloads and lack of training, and suggesting that others, such as physiotherapists, were better placed for this work.[48] They believed that there was no tradition of exercise prescribing in their profession, but were open to a more collaborative approach, involving the healthcare systems and patients, with sharing of responsibility.[48] Another qualitative study of GPs, conducted in New Zealand, using one-to-one interviews, found a much more enthusiastic attitude towards EP.[47] The main barrier reported was time, and the support of an exercise professional with the expertise and protected time

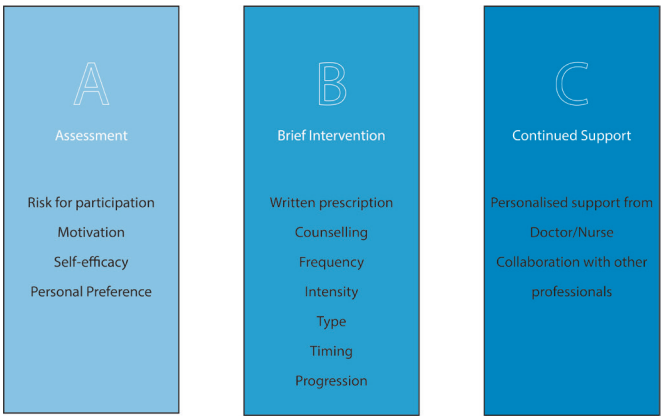


**Figure 1** The ABC (assessment, brief intervention and continued support) approach to exercise prescribing.

was the preferred enabler to provide ongoing support to patients.[47]

Four studies have reported on educational interventions for physicians. A survey by O'Brien *et al* reported that physicians who had training in exercise promotion (varying from 1-day workshops to postgraduate diplomas) were more likely to give advice but not to prescribe exercise, compared with those who had none.[44] Two other Canadian studies reported that, after attending a workshop, the percentage of physicians prescribing exercise rose significantly; however, the number of respondents to both surveys was very low.[38 43] A larger study across 12 South American countries reported higher levels of knowledge when tested immediately after the course compared with immediately before, in relation to EP.[40] These studies did not use a control group and did not report follow up-data.

### Synthesis

Synthesising the findings from the studies under review in the context of the research question, the authors propose the ABC approach to EP, illustrated in figure 1. The process commences with an assessment that could be carried out by a trained physician or practice nurse.[36 41] This initial 'assessment' includes risk stratification in relation to undertaking the EP, assessment of readiness to change and self-efficacy,[42] as well as exercise preference.[46] The second step is delivering the 'brief intervention' by a trained GP or practice nurse.[36 41] This should be tailored to the daily life of the individual[34 46] and should include written instructions on the frequency, intensity, type, timing and progression the EP.[33 46] It should be accompanied by clear explanations,[49] as well as practical strategies such as goal setting and motivational interviewing.[41 42] Each step should be deliverable in a 15-minute appointment.[28] The third step, 'continued support', involves a regular process conducted in-person or via telephone.[36] The support involves adjusting or 'renewing' the prescription[33] and offering motivation[29] and counselling,[28] and could be implemented by a physiotherapist, other exercise professional[35 36 41 42 47] or the GP or nurse.[36 41]

The process is enabled by practice-based supports, including: the availability of validated training and resources[33 37 38 40 43 44]; tools for assessment and prescription[37]; and the use of mHealth, including pedometers.[32 50] It involves a shift in thinking, including collaboration with exercise professionals[35 36 41 42 47] and re-orientating the general practice environment towards a culture of exercise promotion.[47 48] At a societal level, supports include developing infrastructure and peer networks.[49 50]

## DISCUSSION

This study has reviewed contemporaneous literature pertaining to EP in general practice, reviewing barriers and levers to overcome them from GPs' and patients' perspectives. The studies reviewed were heterogeneous, varying in objectives, methododology and size. The analysis has produced a clear synthesis of useful steps to consider when delivering an EP.

### Strengths and limitations

The narrative approach facilitated the investigation and synthesis of qualitative, quantitative and mixed-methods studies, allowing the authors to gain a deeper understanding of stakeholder experiences from multiple viewpoints. A broad search strategy ensured that a large number of studies were considered for the review; however, studies not in the English language and studies not published in peer-reviewed journals may have been omitted.

### Comparison to the literature

It has previously been suggested that the demand for pharmacological, as well as surgical interventions would be reduced if physicians were more proficient at prescribing exercise.[51] The mantra 'move, monitor and modify' has been used to convey the principles of EP,[51] while our study has introduced concepts such as prior assessment and ongoing support that go beyond this. EPs can be impactful, but its characteristics influence adherence.[23] Our findings suggest that not only the content of the EP, but the environment around it, the way it is delivered, the communication and messaging, ongoing support and counselling are all factors that influence adherence.

Thirty years ago, qualitative research reported that time, training and resource materials were the three major barriers to providing EP,[52] and these same barriers have been identified in this review.[37 47 48] Furthermore, a large survey revealed that GPs perceive a lack of knowledge of EP.[53] In this review, a study of lack of interest among some in attending EP-educational events[37] or engaging in EP was expressed by GPs.[48] These studies had very small sample sizes and were conducted in single regions, limiting their generalisability. Other research has found GPs more positively disposed, but in need of training, validated tools and collaboration with other exercise professionals,[54] including physiotherapists and

physical trainers (eg, gym instructors, specially trained exercise counsellors and personal trainers).

This review included studies of various types of EP, from walking only[33] to multicomponent,[46] and most studies had very little detail on the content of the EP. Researchers have recommended more standardised reporting on how the EPs are described.[55] The specific contents of an EP suggested by studies under review correspond with guidelines from the American College of Sports Medicine, which describe the FITT model as frequency, intensity, type and time in relation to exercise.[56] This review's finding that prescribed exercise should be home based as much as possible[34] and individually tailored to everyday life,[46] corresponds to previous research advising that exercise be fun and convenient.[57] The suggestions arising from this review are heavily focused on promoting self-efficacy and motivation, in line with behavioural psychology research where maintenance of behaviour is most influenced by self-efficacy for exercise and social support.[58] The strong finding of the need for GPs to collaborate with other professionals is validated by research that recommends collaboration between physicians and EP professionals, but also clearly delineated responsibility and leadership roles.[59]

A study involving over 500 doctors reported higher levels of EP among physicians who were more active,[60] and similar associations were reported among medical students.[61] Research suggests that physicians who 'practice what they preach' are more likely to counsel patients on PA exercise,[62] and urged them to become active role models, as opposed to 'dire warnings'.[63] Only 17% of Irish GPs surveyed said that they had training in EP, but 94% said that they would engage with it if they had training or knowledge of guidelines.[64] A recent review recommended that physicians receive education on PAGL, methods for prescribing exercise and barriers to compliance for patients.[65] It has been demonstrated that exercise promotion modules can be successfully incorporated into medical school curricula in Ireland and Britain[66 67] and that medical students who are taught about behavioural change feel more confident in applying it.[68]

This review highlighted the barrier of patients' confusion around the purpose and operation of the EP and the need for clear instruction and repeated consultations to overcome this.[49] Evidence-based recommendations for writing EP for patients have been published and advise individually tailored prescriptions, with a focus on presenting exercise as safe and non-threatening.[69] This review also found reticence among GPs, based on lack of tradition, as well as lack of knowledge and validated tools. Interestingly, almost 40 years ago researchers called for a protocol for EP that would be practical for patients to follow and for GPs to administer.[70] Digital support tools for this purpose exist that consider factors such as medication history, illness and physical fitness levels.[71] Furthermore, a 'cross-disease' EP has been proposed, along with advice on how it could be operated in primary care settings.[72] It is likely that the tools and knowledge are available, but what is lacking is awareness of their existence and the time, support and culture that is required to give them the impetus to use them.

### Recommendations for future research

In terms of education around EP, GPs must be consulted about the delivery and type of material. This should be followed by RCTs comparing different modalities to each other and to controls that report on objectively measured prescribing behaviour over time. Future research should seek the perspectives of patients and should seek to investigate the effects of EP over time, in RCTs with large numbers of participants with diverse socioeconomic and health profiles.

## SUMMARY/CONCLUSION

The reviewers have considered all the levers for improvement found in the literature and have presented them in an ABC format as a guide and support for prescribing exercise as medicine in general practice.

**Contributors** AO'R designed the study, organised the research team, conducted the literature search and analysis and designed the tables and figures. He contributed to all stages of the paper. MP was involved in conducting the literature search and analysis and was involved in all stages of the write-up. SD'S was involved in the literature search and in constructing the first draft of the paper. She contributed to all stages of the write-up process. VN was involved in the conception, review process, analysis and all stages of the write-up.

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