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Jes Bak Sørensen, Thomas Skovgaard & Lis Puggaard

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ORIGINAL ARTICLE

Exercise on prescription in general practice: A systematic review

JES BAK SØRENSEN[1,2], THOMAS SKOVGAARD[3] & LIS PUGGAARD[1]

[1]*Centre of Applied and Clinical Exercise Sciences, Institute of Sports Science and Clinical Biomechanics,* [2]*Research Unit for General Practice, and* [3]*Department of Health Promotion Research, Institute of Public Health, University of Southern Denmark, Denmark*

Abstract
'Exercise on Prescription' (EoP) is used for initiating physical activity among sedentary patients with signs of lifestyle diseases. EoP is personalized secondary prevention in primary healthcare. This review addresses EoP using a Health Technology Assessment perspective and aims to answer the following questions: (1) Does EoP increase physical activity level or physical fitness, and is more intensive EoP more effective than less intensive? (2) Is EoP acceptable and feasible in general practice? (3) Is EoP acceptable to and feasible for sedentary patients? (4) Is EoP cost-effective? EoP studies were searched using Medline thesaurus topic, Medline WinSPIRS, reference lists of recent reviews, and NLM Gateway Locator plus. A total of 22 studies were included in the review. Most studies reported moderate improvements in physical activity or physical fitness for 6–12 months. Among patients receiving EoP 10% more had improved physical activity level compared with controls and mean aerobic fitness was improved by 5–10% among EoP patients compared with controls. Little evidence existed in support of the hypthesis that more intensive EoP is more effective. EoP was acceptable and feasible to GPs and patients volunteering for EoP. However, little is known about non-completers, patients declining EoP, and GPs not highly motivated for using EoP. Only one study addressed health economic issues. It found EoP cost-effective, but comparisons with other interventions have not been performed. Even though most studies in this review presented favourable results for EoP there is a lack of evidence in several fields. In particular we lack high-quality studies evaluating EoP schemes that are sustainable in everyday use in general practice.

Key Words: *Exercise on prescription, exercise therapy, family practice, health technology assessment, systematic review*

Individually-based preventive recommendations aimed at improving lifestyle are commonly used in general practice [1]. However, there seems to be a limit to how much patients will change their lifestyle to reduce risk factors [2]. 'Exercise on Prescription' (EoP) interventions are used in general practice in several countries in an attempt to initiate a physically active lifestyle among sedentary patients with signs of lifestyle diseases. However, some believe that EoP interventions will require too many resources in primary care if applied to everybody at risk [3]. This review defines EoP as personalized secondary prevention located in primary healthcare involving the general practitioner (GP) or other primary healthcare staff. EoP involves more intensive intervention than just simple advice on physical activity by the GP. Furthermore, EoP focuses on populations of sedentary patients with signs of lifestyle diseases.

EoP has already been implemented in prevention and rehabilitation, and there is an urgent need to find evidence-based and effective EoP interventions. Evaluation of effectiveness should focus on improvements in level of physical activity and physical fitness, but should also identify feasible interventions for both GPs and patients and assess health economics. Limited knowledge exists on the effectiveness of different components of EoP interventions. Moreover, it is important to know whether a more intensive intervention (i.e. a higher number and frequency of intervention sessions) is more effective than a less intensive intervention.

Several reviews, including a Cochrane review, have dealt with interventions aiming to increase physical

Correspondence: Jes Bak Sørensen, Centre of Applied and Clinical Exercise Sciences, Institute of Sports Science and Clinical Biomechanics, University of Southern Denmark, Campusvej 55, DK-5230 Odense M, Denmark. E-mail: jbsorensen@health.sdu.dk

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activity in sedentary populations [4–11], but none has focused on EoP. Furthermore, feasibility and health economics have not been addressed in previous reviews. This review evaluates EoP from the perspective of a Health Technology Assessment: technology (effectiveness), organization (feasibility in general practice), patient (feasibility for patients), and health economics [12]. We aim to answer the following questions: (1) Does EoP increase physical activity level or physical fitness and are more intensive EoP interventions more effective compared with less intensive? (2) Is EoP acceptable and feasible in general practice? (3) Is EoP acceptable to and feasible for sedentary patients? (4) Is EoP cost-effective?

Material and methods

Search strategy

Medline was searched by means of thesaurus topics in May 2005 (1980–April 2005) and WinSPIRS Medline in July 2005 (1980–June 2005) using the search terms presented in Table I. Reference lists of recent reviews on promotion of physical activity were searched [4–11,13]. Further Medline searches were carried out along with a search in NLM Gateway Locator Plus. A total of 207 articles were identified (Table I).

Inclusion and exclusion criteria

The 207 articles were evaluated on the basis of the inclusion and exclusion criteria. Inclusion criteria were: (1) The target group was sedentary adult patients with signs of lifestyle diseases; (2) EoP was prescribed by the GP or other primary healthcare staff; (3) EoP included more than just simple advice (e.g. additional counselling, written material, telephone follow-up, supervised training); (4) studies were peer-reviewed and published in English; (5) for the assessment of effectiveness of EoP the studies were only included if they reported measurements of either physical activity or maximal oxygen uptake (VO_2max). Exclusion criteria were: (1) clinical study

Table I. Search strategy and reading and exclusion strategy.

Step	Search and reading	No. of references
	Medline thesaurus topic search	
1	Motor activity OR physical education and training OR exercise OR exertion OR exercise movement techniques	129,234
2	Prescriptions non-drug OR directive counselling OR counselling OR referral and consultation	53,776
3	Step 1 AND 2	515
4	Identified and included references after reading of title and abstract	86
	WinSPIRS Medline search	
5	Physical activity OR exercise	101,106
6	Counselling OR counseling OR referral OR prescription	81,981
7	Steps 5 AND 6	1,883
8	Identified and included after reading of title and abstract and checking for doublets from 'Medline thesaurus topic search'	46
	Reference lists of recent reviews	
9	Identified and included references	55
	Additional Medline searches	
10	Identified and included references	20
	NLM Gateway search	
11	Identified and included references	0
12	References identified (step 4+8+9+10+11)	207
	Reading	
	References identified	207
13	Exclusion based on abstract	50
14	Exclusion after reading of paper	126
15	Excluded due to less than 6 months of follow up	9
16	Included in the review	22

in a setting outside general practice; (2) multiple interventions (in this article focus is exclusively on physical activity); (3) institutionalized patients; (4) for the assessment of the effectiveness of EoP, studies with a follow-up of less than six months were excluded.

Reading and inclusion

After reading the abstracts of the articles 50 were excluded. The remaining 157 articles were read *in extenso* and 126 were excluded in accordance with the above-mentioned criteria. The most frequent reason for exclusion was that GPs were not directly involved in the intervention. Nine references on effectiveness were excluded because of follow-up shorter than six months. The remaining 22 articles were included in the review (see Table I). Twelve of these references related to the effect of EoP [14–25], seven had information about feasibility in general practice [21,26–31], three included the patient perspective [32–34], and one was related to health economics [35].

Assessment of study quality

Study quality was assessed for the 12 references relating to the effect of EoP. The focus was on the following areas: (1) Selection and representation of GPs and patients, (2) randomization of GPs and patients, (3) risk of 'carry over' effects, (4) number of patients lost to follow-up, and (5) incorporation of baseline level in the analysis, or use of 'intention-to-treat' analysis. Studies were evaluated as of high, medium, or low quality. A study was only rated as high quality if all areas were evaluated as good quality. Studies relating to feasibility and economics were submitted to quality assessment with less strict criteria. No studies were discarded due to low quality, but only three studies were rated as high quality [18,24,25].

Results

Effect of Exercise on Prescription

The level of physical activity was significantly increased for patients participating in EoP in half of the 12 studies [14–25], including one of the two high-quality studies that assessed physical activity [18]. In that study the proportion of patients in the EoP group reaching 2½ hours of physical activity per week was 15% compared with 5% in the 'no intervention' control group after 12 months [18]. In the other high-quality study 21% of patients in the EoP groups were physically active (defined as 30 minutes of moderate intensity exercise five times per week, or 30 minutes at high intensity three times per week) compared with 16% among controls after 24 months [25]. The difference was not reported as statistically significant for the total group of patients, but sub-analysis showed effects depending on the patient's sex and the intensiveness of the intervention. Two studies of medium quality [20,22] and two studies of low quality [21,23] did not report any statistically significant increase in physical activity after EoP. Three of these studies concluded that more intensive intervention was required to increase physical activity [20,22,23].

Aerobic fitness was only assessed in three studies [17,24,25]. A high-quality study reported maximal oxygen uptake (VO_2max) improvements of 14% among EoP patients and 3% among controls after 12 months (11% and 4% after six months) [24]. The other high-quality study reported an effect on VO_2max after 24 months among women (4–5% compared with controls), but no statistically significant difference between those receiving EoP and controls was found for men [25]. Both studies used a low-intensive intervention as control group. No studies of improvements in VO_2max have reported comparisons with a 'no intervention' control group.

The question of an intensive intervention being more effective than a less intensive intervention has been addressed in only a limited number of studies [17,23–25]. In one high-quality study an added 11% improvement in VO_2max was observed as a result of a more intensive intervention [24]. The less intensive intervention involved physical activity counselling, exercise guidelines, information on benefits of exercise, a list of local exercise facilities, and an exercise log. The more intensive intervention consisted of all the mentioned elements plus a step test, examples of exercise, a target heart rate for exercise, and recording of exercise heart rate in an exercise log. In the other high-quality study no clear picture could be drawn [25]. In women increasing intensity of the intervention appeared to be associated with increasing effects, but for men improvements were higher in the group subjected to moderately intensive intervention compared with the groups subjected to high- and low-intensive intervention.

Feasibility for general practice

Most studies dealing with the feasibility of EoP for general practice have targeted GPs volunteering for EoP schemes and have found that EoP is an acceptable tool for motivated GPs [21,26,28–31]. In the majority of studies feasibility was assessed only by means of questionnaires or interviews.

However, one study of volunteering GPs measured compliance with the EoP scheme and found that the majority of GPs gave the recommended advice to patients, and did the paperwork correctly [26]. Only one study used a large and representative sample of GPs. This study looked at an EoP scheme integrated in primary healthcare and measured compliance by means of a fax-back survey [27]. The study reported that two-thirds of the GPs had used the EoP scheme. However, 87% of the GPs who wrote EoP prescriptions in the month before completing the survey had written less than 10. One study reported that only 35% of GPs expected to be able to implement the EoP scheme without the support of the research staff [28]. In a recent population-based analysis of 6610 exercise referrals it was reported that only an estimated 4% of the 'at risk' population was referred to an EoP scheme [36]. If EoP schemes are to reach the entire 'at risk' population the majority of GPs must accept and use EoP. Therefore, it is vital to obtain knowledge on how to integrate EoP into routine healthcare. It has been concluded that current counselling on physical activity is less optimal than desired by the GPs themselves [37,38]. This underlined the need for EoP schemes that GPs can and will use.

The patient

Patient acceptance of EoP has also primarily been studied among motivated participants, and by means of qualitative interviews [32–34]. Patients taking part in EoP seem to enjoy it and gain from it (e.g. in terms of improved quality of life) [32–34]. Little is known about reasons for dropout and patients who are 'at risk' but decline EoP. However, the studies reviewed have identified a number of elements in the EoP schemes that might be of importance for compliance and successful lifestyle changes. It appears that EoP should involve an active patient role and GPs should use the time to convince patients that EoP is good and safe. A wide variety of different exercise offers is desirable, the exercise specialist should make the patients feel safe and support them, and EoP should be easily accessible [32–34]. Motivation appears to be the key factor and it may be of importance to make EoP available as an open offer when the patient is motivated for lifestyle changes [39]. Further studies of successful EoP may add essential knowledge for the designing of future EoP schemes.

Health economic perspectives

The only study to address health economics in relation to EoP concluded that EoP was cost-effective [35]. The analysis was based on data from a sustainable EoP scheme using telephone support and community-based leisure activities [18]. The price of one sedentary patient attaining at least 2½ hours of physical activity per week after 12 months was approximately €1050 [35]. Studies of physical activity interventions not directly involving the GP support the above-mentioned conclusion of cost-effectiveness. It has been suggested, however, that a lifestyle programme may be more cost-effective for increasing physical activity than a structured exercise programme [40]. To maximize cost-effectiveness the recruitment of patients has been identified as the most important aspect [41]. In addition to cost-effectiveness analyses both cost-utility and cost-benefit analyses should be carried out. It remains to be clarified as to whether EoP is a better way to use funds than other interventions or treatments dealing with the same type of health-related problems.

Concluding remarks

Comparison of interventions was complicated by different methods of measuring physical activity, different definitions of 'physically active', and choice of control group ('no intervention' or low-intensive intervention).

A number of the studies reviewed showed that EoP has a moderately positive effect on physical activity in approximately 10% of patients, and the mean value of VO_2max can be improved 5–10% compared with controls after 6–12 months. Little is known about lifestyle changes beyond one year. GPs volunteering for an EoP project are, on the whole, positive towards the concept, but few studies have involved a random sample of GPs and more critical measures of feasibility. This makes the results difficult to interpret and transfer to all GPs. It seems that EoP schemes are a positive experience for patients who participate. However, little is known about dropouts and those declining EoP. The only study addressing the economic aspects concludes that EoP is cost-effective and calculates a price of €1,050 per patient attaining 2½ hours of physical activity per week. The majority of studies in this review present positive results from various EoP schemes, but the amount of solid evidence is still rather limited, and at present it is unknown whether patients prefer EoP to other interventions. We need to examine whether EoP is a reasonable use of funds in the healthcare system, or if other types of interventions are better suited to change the lifestyle of the patient population.

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