



Physical activity on prescription (PAP):

Study of efficiency and patients' experience of the method

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**Thesis for the degree of Master of Public Health Sciences
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HÁSKÓLI ÍSLANDS

Hreyfiseðill:
Mat á árangri og upplifun sjúklinga á meðferðinni

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Ritgerð til meistaragráðu í lýðheilsuvísindum

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Ágrip

Bakgrunnur: Hreyfiseðill er nýlegt meðferðarform í íslenskri heilbrigðisþjónustu, sem miðar að því að auka hreyfingu sjúklinga og um leið minnka einkenni langvarandi sjúkdóma eða minnka lyfjanotkun. Erlendar rannsóknir hafa sýnt fram á árangur þessa meðferðarforms í formi aukinnar hreyfingar ásamt bættum heilsutengdum lífsgæðum. Árangur þessa meðferðarforms hefur lítið verið rannsakaður á Íslandi.

Markmið: Meginmarkmið rannsóknarinnar var að meta árangur af hreyfiseðilsmeðferð á Íslandi. Ennfremur var markmiðið að meta vikulega hreyfingu þátttakenda fyrir og eftir hreyfiseðilsmeðferðina ásamt því að skoða upplifun þátttakenda á stuðningi á meðan meðferðinni stóð.

Aðferð: Saminn var 36 spurninga listi með það að markmiði að meta virkni hreyfiseðilsins og alhliða upplifun handhafa hreyfiseðilsins af meðferðinni. Listinn var sendur til allra hreyfiseðilsþega sem fengu meðferð á Íslandi frá mars 2013 til maí 2014 (N=399) með netpósti ásamt krækju á vefslóð þar sem listinn var hýstur. Lýsandi tölfraði var reiknuð til þess að meta bakgrunn og aðra þætti þátttakenda. Tíðni og hlutföll voru reiknuð fyrir þær útkomur sem settar voru fram í markmiðum rannsóknarinnar ásamt því að kíkvaðrat próf voru framkvæmd til þess að meta mun á milli hópa út frá bakgrunni.

Niðurstöður: Svarshlutfall rannsóknarinnar var 42% (169/399). Meirihluti þátttakenda (52%) jók vikulega hreyfingu sína á tímabilinu; hlutfall þátttakenda sem hreyfðu sig sjaldan eða aldrei minnkaði úr 79% fyrir hreyfiseðilsmeðferðina í 42% eftir meðferðina. Hlutfall þátttakenda sem mátu andlega líðan sína slæma fór úr 47% fyrir meðferðina í 15% eftir hana, en hlutfall þeirra sem mátu líkamlega líðan sína slæma stóð í nokkurn vegin í stað ($p = 0.67$). Þeir þátttakendur sem voru virkir í atvinnulífinu eða töldu sig í góðri fjárhagsstöðu voru líklegri en aðrir hópar auka við hreyfingu sína. Meirihluti þátttakenda (78%) taldi sig upplifa nægan stuðning frá Hreyfistjóra á meðan hreyfiseðilsmeðferðinni stóð.

Ályktanir: Niðurstöðurnar benda til þess að íslenska útgáfa hreyfiseðilsins hafi jákvæð áhrif á sjúklinga með því að auka vikulega hreyfingu, ásamt því að hvetja til jákvæðra breytinga á andlegri líðan. Þá virðist stuðningur frá fagmönnum vera fullnægjandi. Niðurstöðurnar styðja við áframhaldandi notkun hreyfiseðilsins í íslenskri heilbrigðisþjónustu.

Abstract

Background: Physical activity on prescription (PAP), with the aim to increase patient's physical activity and at the same time decrease symptoms or cure disease and decrease drug intake, is a relatively new treatment option in Icelandic health care. Studies have shown physical activity prescriptions to be successful especially by increasing physical activity and making positive changes in health related quality of life. Research is scarce on the Icelandic model of physical activity on prescription but it is essential to investigate the efficiency of the method and the patients' experience of going through the process.

Aim: The overall aim of this study was to investigate the efficiency of physical activity on prescription in Iceland. Further, the aim was to assess participants' level of physical activity and mental and physical wellbeing before and after their physical activity prescription and also their perceived support during PAP.

Methods: A 36 item study-specific questionnaire was created to assess the total experience of going through a physical activity prescription. The internet-based questionnaire was sent with a link with the secure location of the survey to all patients (N=399) receiving physical activity on prescription from March 2013 - May 2014. Descriptive statistics were used to determine the characteristics of the participants. Frequencies and proportions were calculated for all outcomes of interest and further, Chi-square tests were conducted to assess differences between proportions.

Results: A total of 169 (42%) answered the questionnaire. The majority of participants (52%) increased their number of weekly physical activity sessions following PAP; the proportion of participants never or seldom engaging in physical activity decreased from 79% before PAP to 42% after PAP. The proportion of participants experiencing poor mental wellbeing decreased from 47% before PAP to 15% after PAP, while the proportion experiencing poor physical wellbeing remained similar ($p=0.67$). Participants who were employed and in good financial status, were more likely to increase their physical activity than other subgroups. The majority of participants (78%) perceived sufficient support from their physical activity coordinator during their PAP period.

Conclusion: Our results indicate that the Icelandic form of PAP has a positive effect on health by increasing weekly physical activity as well as encouraging positive changes in mental wellbeing. The professional support offered during PAP seems to be sufficient. Therefore, we believe our results support further usage of physical activity prescriptions in Icelandic health care.

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List of abbreviations

PAP: Physical activity on prescription

GP: General Practitioner

MET: Metabolic equivalent

SES: Socioeconomic status

RPE: Rating of perceived exertion

Introduction

Being physically active is an important factor of a healthy and balanced lifestyle (1). Studies have shown that individuals who are physically active have a lower risk of developing heart disease (2) various types of cancer (3) and type 2 diabetes. Also, physical activity is known to have a positive effect on depression (4). Despite this knowledge, physical inactivity and a sedentary lifestyle have increased in the past decades (5) and currently, physical inactivity is one of ten leading risk factors for premature death in the world (6). In Iceland, more than 50% of the population in all age groups tend to be sedentary during leisure-time (7). More than 50% of the youngest age group (18-44 years old) in the study *Health and Wellbeing of Icelanders* engaged mostly in sedentary activities during leisure-time. In all, 40% engaged in some sort of physical activity, from very easy (20%) to quite strenuous (10%) activities a few times a week (7). Older age groups had larger proportions of people engaging in leisure-time physical activities, with 52% for 45-66 year olds and 58.6% in the oldest age group engaging on some sort of physical activities during leisure-time. In Europe more than half of individuals 15 years and older, never engage in any physical activity (8).

Physical activity on prescription, in its simplest form, is the promotion of physical activity within the health care sector with the aim of preventing or decreasing symptoms of disease. In recent decades, physicians have been coming more aware of the therapeutic benefits of physical activity and its necessity for a balanced and healthy lifestyle (9). In later years, facing increased sedentation and disease which can be contributed by lack of physical activity, physical activity prescriptions are becoming more common. In New Zealand, trials of written physical activity advice (e.g. prescriptions) vs. oral advice found written advice to be more effective in increasing physical activity amongst patients (10). In the '80s and '90s, physical activity prescription commenced in Sweden with gradually increasing prescriptions (even though the method is still underused) and with good results (11). The current Icelandic model is formed according to the Swedish method. Physical activity prescriptions were first introduced in Icelandic health care in 2006 with mixed results. Following a trial period in 2011, the current form of physical activity on prescription was implemented, where physicians in primary health care, at hospitals and specialist clinics can prescribe physical activity and refer patients to physical activity coordinators who carry out the treatment. As this approach is relatively new in Icelandic health care, it is important to monitor the effects of treatment and patients' experience of it.

The PAP treatment is a publicly funded treatment in Iceland and the long-term aim is to include the treatment as an active part of Icelandic health care. The goal is that physical activity on prescription will be an active and standard part of health care just as drug prescriptions are. This essay will focus on the efficiency and patients' experience of this treatment method.

1 Physical activity

1.1 Definition of physical activity

Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure varying continuously from low to high and is correlated with physical fitness (12, 13). Importantly, exercise is a subcategory of physical activity. Exercise is defined as planned, structured, repetitive and purposive physical activity where the goal is maintenance or an improvement of one of more factors of physical fitness (12). Physical fitness is by definition a collection of factors, health or skill related, that people need to achieve by undertaking physical activity and in that sense, exercise. Health related factors such as cardiorespiratory endurance, muscular strength and flexibility and skill related factors like balance, speed, coordination and reaction time reside within physical fitness (12).

Physical activities are normally divided into aerobic activities and muscular strengthening activities. The aim of aerobic activities is to increase heart rate and build stamina. Activities such as brisk walking, cycling and dancing are good sources of aerobic activities (13). Muscular strengthening activities aim at building muscle tissue and increasing strength, these activities can include weight lifting or strength exercises with one's own body weight e.g. push ups, sit ups and squats (13).

The intensity of physical activity is often defined by the term Metabolic equivalent or MET. The MET is a physiological measure of the energy expenditure of physical activity where one MET is equivalent to energy expenditure of 1.2 Calories. For example, sedentary or calm activities such as sitting, driving, reading and strolling are classified as 1-3 METs (1 being total rest). Moderate intensity physical activity is defined as 3-6 METs, including activities like vigorous housework, brisk walking and golf. Vigorous intensity physical activity is defined as any activity measured as 6 METs or more. Jogging, swimming and any other physical activity increasing heart rate and leading to shortness of breath are categorised as being vigorous physical activity (14-16).

Another way of defining physical activity intensity is the BORG RPE scale of perceived exertion (17, 18). It determines individuals' self-perceived effort during physical activity by evaluating shortness of breath and ranges from level 6 indicating no exertion at all to 20 indicating maximum exertion (a level no one should exercise at). To define further, calm activities defined, as 1-3 MET would be equivalent to level 8 to 10 on the BORG RPE scale. Moderate physical activity (3-6 MET) is equivalent to levels 11-13 on the BORG RPE scale and finally vigorous activity (6 MET and above) compares to levels 14 – 16 on the BORG RPE scale. As the BORG scale is a self-perceived item and does not rely on heart rate, it proves to be a useful tool to determine the intensity level of physical activity for people not used to engaging in exercise or physical activities or using beta blockers as medication (17-19).

1.2 Levels of physical activity needed to achieve physical benefits

Generally, a linear relationship has been found between duration and intensity of physical activity and physical fitness (2). Despite that, weekly moderate physical activity consisting of 150 minutes is likely to feel like a bold goal for the sedentary individual.

A common way of thinking that people often are susceptible to, is to think of things in binary terms such as *all or nothing* ("*dichotomous thinking*") (20) - that if daily recommendations are not met,

it would be just as well to skip physical activity all together. It is therefore important to note that even though the optimal amount of weekly physical activity is at least 150 minutes, less physical activity does indeed have positive effects and is important for health. For example, one study found that even 15 minutes of physical activity a day or 90 minutes a week reduces all-cause mortality by 14% (21). Further, individuals who are physically active, but do not meet the official recommendations, decrease risk of coronary heart disease although the risk reduction is smaller than with those meeting the recommendations (22). Individuals engaging in physical activity but not meeting the recommended amount of weekly physical activity have 20% lower risk of all cause-mortality compared to sedentary people. This relationship grows stronger by increased level of physical activity, with people exercising 1 or 2 times the minimum have 31% lower risk of all-cause mortality, 2 to 3 times the minimum have 37% lower risk of all-cause mortality but this relationship reaches a threshold at 3 to 10 times the minimum with 39% less risk of mortality. Training beyond 10 times the minimum physical activity advised results in 31% less risk of all-cause mortality (2). It is therefore important to remember that physical activity not meeting the recommended daily amount is helpful in reducing all cause-mortality which emphasizes the idea that all physical activity is valuable even in smaller amounts than globally recommended.

1.3 Physical activity and psychological benefits

In addition to physical benefits, there are strong indications that physical activity itself also has a positive effect on psychological wellbeing (1, 4, 23-27). In a Swedish study, researchers compared the relationship of self-reported level of physical activity and measured physical fitness with depression, anxiety and symptoms of burnout among 177 individuals. Main results were that no association was between measured physical fitness and depression, anxiety and symptoms of burnout. However, there was an association between self-reported physical activity and symptoms of depression, anxiety and burnout, more specifically, those reporting regular physical activity had a more favourable mental health profile than those reporting less physical activity (25).

In another study, the relationship between cardiorespiratory fitness and burnout was measured. Participants with low cardiorespiratory fitness were more susceptible to stress and burnout with 38% of participants reporting high levels of burnout and 23% reporting clinical levels of burnout. Likewise, those with high cardiorespiratory fitness were more resilient to stress and burnout with 23% of high respiratory fitness participants reporting high burnout and 11% reporting clinical levels of burnout (24). Relating to that, health care workers and social insurance officers in Sweden, with low levels of stress and good mental health reported higher levels of physical activity than those reporting low levels of physical activity who namely reported high levels of stress and high mental problems (23). In a cross sectional study an association was found between the amount of weekly physical activity and mental health. Those engaging on 2.5 to 7.5 hours of weekly physical activity had significantly better mental health than those engaging in either less or more weekly physical activity (28). Further, extensive evidence has been found for the benefits of physical activity for people experiencing anxiety (26) and also that increased physical activity and exercise has an antidepressant effect (4).

1.4 Factors affecting engagement in physical activity

As previously described, prevalence of physical inactivity is high, or around 50% (7, 8). Socioeconomic factors are known to explain variations in engagement in regular physical activity, i.e. those who are unemployed, receiving sickness benefits or are in a poor financial situation engage less often in regular physical activity (29). A recent Swedish study found that both men and women with higher education level (3 years or more of higher education e.g. University), supervisors, active on the job market and in satisfactory financial status were more likely to engage in regular physical activities and exercise compared to people with less education, unemployed, being employees and in poor financial status (30). Cleland et al. found that upward social mobility (e.g. people gaining higher level of education than their parents) and a stable high socioeconomic position were associated with increases and higher self-reported physical activity and fitness (31). In addition, in a systematic review of 28 cross-sectional studies and 5 longitudinal studies, Gidlow et al. concluded that those sitting at the top of the socioeconomic strata had a considerably higher prevalence of leisure-time physical activity compared to those at the bottom. The stratification of socioeconomic level was based on education and income, meaning those ranking at the top had a higher education level and a higher income (32).

Looking more closely at what distinct factors affect participation in physical activity, Borodulin et al. (33) found barriers to leisure-time physical activity varied by social groups, such as age, employment status and economic status. Lack of time was a barrier to physical activity for groups such as individuals active on the work market, for people with families and children and also for younger persons. Consequently, time was less likely to be a barrier for single people without children, unemployed and the older age groups compared to younger age groups (45-64 years old men and 35-64 years old women, compared to 25-34 years old women). Financial expenses as barriers for physical activity had a connection to household income and employment status, as low income households and unemployed persons had higher odds of finding expenses barriers for physical activity compared to employed people (33).

Socioeconomic status (SES) has an effect on health and health behaviours (34) and conditions such as obesity, depression, hypertension and diabetes are more common in low SES groups (35-37), all conditions that can be prevented or treated with physical activity (14). Unemployed people seem to be physically inactive (38) but higher SES status, e.g. higher education status and higher family income level are positively associated with physical activity (39) and individuals having lower levels of household income have lower levels of recreational walking than those coming from households with medium or high income (40).

Differences in leisure-time physical activities with low SES groups can be explained by individual, social and environmental factors where for example low household and area level income has a negative effect on recreational walking, together with low education level which can decrease self-efficacy (40). Lack of financial resources can contribute to the inadequate uptake of low SES groups in leisure-time physical activity as well as stressful events or comparison of social status which can lead to personal frustration and therefore decrease the likelihood of leisure-time physical activity (41). Helgadottir et al. (42) assessed physical activity patterns with accelerometers amongst patients with

mild to moderate depression and anxiety disorders and found that the persons were sedentary for 9.1 hours on average, almost all their time spent awake. Anxiety and depression is a common comorbidity with obesity (36, 43), which in turn is common among low SES groups. This could all in all present a vicious cycle, which could in turn be broken by increasing physical activity and therefore decreasing symptoms of depression and stress, and therefore increase resilience to stress (1, 14, 24).

1.5 Public health guidelines for physical activity

Public health recommendations indicate that a combination of strength conditioning, endurance training and metabolic training is optimal. Further guidelines (5) for physical activity indicate that adults (age 18-64) should get at least 150 minutes of moderate-intensity physical activity (BORG RPE level 11-13) or 75 minutes of vigorous-intensity (BORG RPE level 11-13) throughout the week with muscle strengthening activities advised at least twice a week for major muscle groups (15). Recommendations from the Icelandic Directorate of Health (44) state that adults should engage in moderate-intense physical activity for at least 30 minutes on daily bases, with the possibility of those 30 minutes being broken into shorter bouts of time of at least 10 minutes. Ultimately, the total daily period of activity should be at least 30 minutes. According to both the Icelandic and the global recommendations, children (18 years old and younger) should be vigorously active for at least 60 minutes daily, while older adults (65 years and older) are recommended to be physically active for 30 minutes daily with medium effort level. The same recommendations apply for older adults as for younger adults but an additional recommendation for balance and fall prevention exercises and strength training are recommended three times a week and for people with poor mobility (45) especially to prevent osteoporosis. Physical activity recommendations emphasize that when recommending physical activity amongst older people and patients 50 - 64 years old recommendations should be similar as the general recommendations state, but with some adjustments. Activities aimed at increasing or maintaining flexibility, balance and muscle strength as well as sedentary behaviour reduction, should be a part of the physical activity promotion (46).

When deciding on frequency and intensity of the physical activity it is important to consider the individual's state of health. Individuals with low aerobic fitness level should start their physical activity regime easy, for example with easy walking and strength training with low resistance (14) and then gradually increasing the effort levels until recommended guidelines are met.

1.6 Physical activity for patients and physical activity as treatment

As previously discussed, it is evident that the minority of the European and thus the Icelandic population meet official recommendations for weekly doses of physical activity. Insufficient physical activity is one of ten leading risk factors for premature death according to WHO (6). In fact physical inactivity and a sedentary lifestyle have increased through the years and now physical inactivity is the fourth leading risk factor for death after high blood pressure, tobacco use and high blood glucose (6). Physical activity has proved to have positive effects on disease (1) as well as serving as a prevention as physically active people are less likely to develop various diseases (1-3).

Therapy based on physical activity is in many cases as effective as conventional drug therapy and in some cases the most effective treatment available with the fewest side effects (1, 14). In a review from 2006, Pedersen and Saltin gathered evidence-based information on the effects of regular physical activity on various diseases, its benefits as treatment or when used as a part of treatment and which quantity, intensity and sort of physical activity is the most useful to deal with specific conditions. 18 different diseases were selected based on their general prevalence and also their need for physical activity therapy. In the review they included suggestions for specific training methods and it serves therefore not only as an evidence based text but also as a practical one (1). They demonstrated thoroughly for each and every disease the background and prevalence of the disease, the evidence for the effect of physical activity on the disease, the optimal type and amount, possible mechanisms effecting the disease, prescriptions and contradictions (1). For example, the review indicated that there is substantial evidence for treating hypertension with physical activity and by lowering blood pressure by 20 mmHg for systolic and 10 mmHg for diastolic blood pressure; risk of cardiovascular death can be halved. Also, physical activity has the greatest effect on those in the biggest need of improvement. The decrease in blood pressure lasts for 8 to 10 hours after physical activity session which positively accounts for much of the day, and therefore daily aerobic physical activity at moderate intensity (3-6 METs) is advised (1). When prescribing physical activity for people with hypertension, the prescription needs to be individualised and consideration taken to comorbidities. Those measuring blood pressure of a higher than 180/105 mmHg should begin with pharmacotherapy. Also, heavy strength training is not advised as are short bouts of vigorous physical activity (1).

Insulin resistance causes glucose intolerance which can lead to diabetes. Factors such as obesity, dyslipidaemia and hypertension are common amongst those with insulin resistance. Evidence for the effect of physical activity combined with dietary modification is well established. Aerobic exercise of moderate intensity for a longer period of time joint with strength training with light weights and many repetitions appears to be most helpful for insulin resistance. Therefore, daily 30 minutes of moderate physical activity should be prescribed. As with the hypertension the prescription needs to be individualised and comorbidities need to be taken into account (1).

The Public Health Agency of Sweden has published FYSS, *Physical activity in the prevention and treatment of disease*, a book commonly used by health care workers prescribing physical activity to patients (14). As in Pedersen and Saltin's review, a group of diseases are analysed and the effect physical activity has on them and what amount and kind of physical activity is suitable for treatment. According to the guidelines represented in FYSS, different diseases require different physical activity plans. When treating a patient with depression the exercise advised is at a higher difficulty level than with the patient with hypertension, aerobic training at Borg scale 12-14 (moderate to high intensity), and strength training with heavier loads, 2-3 sets with 8-12 repetitions and 9 weeks need to be given for the therapy to show effects (47). Evidence is not as definite regarding anxiety, but all physical activity appears to lower anxiety levels, as well as those showing higher fitness levels appear to have lower anxiety levels (14). According to FYSS, the prescription should therefore be according to the personal interests of the patient, duration as is with public recommendations and with the emphasis of

starting at low intensity and gradually building up stamina and increasing effort (14). However, evidence is quite certain when it comes to obesity, weight loss is only achieved by negative calorie balance. Therefore, an hour day of physical activities is advised for overweight and obese people with emphases on aerobic exercise combined with strength training. Also it is important to increase physical activity in daily life, by cutting down sitting time and increasing standing time, parking further away from ones destination etc. (1, 14, 48).

Evidently physical inactivity is common, as discussed previously in this essay, even though there is great awareness of the positive effects regular physical activity has on physical wellbeing by decreasing all-cause and premature mortality and having positive effect on psychological wellbeing. Low SES groups are more susceptible to inactivity and diseases attributable to lower activity levels are more common among low SES groups. Also an association is between depression and anxiety and very low activity levels. Physical activity promotion in general health care could therefore provide a platform for reaching out to inactive people.

2 Physical activity on prescription

2.1 Physical activity on prescription in different countries

Worldwide, physical activity prescriptions in primary health care are becoming more common and have been available for some years in countries such as New Zealand, Denmark, Sweden, Finland, Norway, the USA and the UK (49-52). In general, the aim of all physical activity prescriptions is the same, namely to target disease and symptoms by increasing physical activity and exercise. Implementation varies between countries, from having a physician referring a patient straight to an exercise regime group or a health care worker (physician, registered nurse, psychologist or physiotherapist) prescribing certain physical activities to a patient to a general physician (GP) referring a patient to a physical activity coordinator which in turn guides the patient through his physical activity prescription with the set-up of a plan and support.

In the UK, exercise referral schemes normally involve a GP referring a patient to an exercise class specially targeted at the patient's specific disease and symptoms (53). These schemes are only available to certain patient groups, explicitly patients who are sedentary or inactive and have diagnoses or are at increased risk of stroke, chronic heart failure, lower back pain and depression (53). Research has not been entirely encouraging relating to the effectiveness of exercise referral schemes in the UK, in some cases reporting only slight to moderate long term increases in physical activity and not showing substantial evidence of increased physical fitness (54-56).

In New Zealand, the "Green prescription" is the available source of physical activity promotion in primary health care. Green prescriptions are issued to patients by GPs and nurse practitioners who then refer patients to a Green Prescription support person. This person provides the patients with support 3-4 months at a time (57). The prescription is available for all patients, but are mostly issued to individuals with heart disease, in need of weight management, suffering from diabetes or mental health issues (58). It usually comprises of a written prescription and a plan for increased physical activity which can both have time based or pedometer based goals (59, 60). By adhering to the Green Prescription patients have shown good results by increasing their physical activity and health related quality of life (10, 61-63). Lawton et al. conducted a randomised controlled trial on physically inactive women aged 40 – 74 years, getting a physical activity prescription. The intervention consisted of a brief counselling of physical activity (7-13 minutes) and a written prescription for 30 minutes of moderately vigorous walking on 5 days of the week. A nurse provided on average 5 telephone calls over a period of 9 months with an additional consultation at a primary health care clinic 6 months after the initial intervention. The control group received usual care from their primary health care centre. Their main outcome of interest was the proportion of women achieving 150 minutes of physical activity a week at 12 and 24 months after the initial intervention and also their health related quality of life along with weight and waist circumference. The key results were that the intervention group increased their physical activity more than the control group at 12 and 24 months, and also, their median minutes of weekly physical activity was greater than with the control group. Also, physical functioning scores and mental health scores in the quality of life measures were also significantly better in the intervention group at 12 and 24 months (63). In another New Zealand study, (cluster randomised

controlled study) on sedentary patients recruited from primary health care centres, the intervention group (n=451) received the Green prescription while the control group (n=427) received usual care. Results showed that the intervention group increased their physical activity and quality of life more than the control group at 12 month follow up. The intervention group had also lowered their blood pressure more than the control group (61).

In the USA, *The Exercise is medicine* initiative has been available since 2007 and was established by the American Medical Association and the American College of sport and exercise. The purpose of the initiative is, as with other physical activity promotions in primary health care, to heighten awareness of physical activity as an accepted part of therapy (64). Following this initiative, the *Exercise is Medicine* solution was introduced which is a standardised approach for assessing and prescribing physical activity in primary health care (65). A study conducted in Tennessee found participants taking part in an Exercise is Medicine program, increased their physical activity significantly more than the control group (66). Further, the aim is to make the initiative and solution global and it has already made presence in Russia, Brazil, China, Australia, South Africa, Germany and Canada amongst other countries (51).

In Scandinavia, physical activity prescriptions have been available in Sweden, Denmark and Norway for more than a decade (49) and have proved to increase physical activity and health related quality of life (27, 67-70).

2.2 Physical activity on prescription in Sweden

The Swedish method of physical activity on prescription is the role model for the Icelandic model. In Sweden, some form of written physical activity prescriptions has been available since the 1980's but implementation of the current national physical activity prescriptions standard began in 2001 (49). The basic model of physical activity on prescription in Sweden complies of a patient centred interview and an individualised physical activity plan. Prescribed activities are most often everyday activities and home based activities all in accordance to the needs of the patient (29) As county councils are required by the state of Sweden to offer physical activity on prescription they have the liberty to adapt the basic model to their own requirements (29), but always staying true to the basic model.

Research on physical activity on prescription in Sweden has shown positive results. Lena Kallings has studied the effect of physical activity on prescription quite extensively. In her studies, she has found the majority or 65% of patients adhere fully to their prescription (71, 72). Patients more or less increase physical activity in everyday life, gaining and increasing wellbeing, although only a low percentage of participants meet public health recommendations for physical activity (71). Kallings et al. have also found positive changes in patients' health related quality of life (27). In one study (n=1846 at 12 month follow up), adherence to PAP was associated with increased age, higher activity levels at the beginning of PAP, having home based activities prescribed instead of facility based activities and being prescribed PAP due to diabetes and high blood pressure (73).

It is also important to pay attention to those patients not adhering to therapy and find what characterises those patients, as adherence is essential for the success of the therapy. In a Swedish cohort study (n=4867), Leijon et al., found younger age groups tended to show less adherence to

treatment than the older age groups. The same results were found for those with low activity levels at the beginning of a PAP. Groups having been issued facility based activities (for example aerobic classes or gym based weight lifting) instead of home based activities, showed less adherence. Additionally, economic factors tended to be an issue with young PAP receivers, lack of time for patients with hypertension and low motivation for overweight patients (72).

Further, in a study assessing the effects of the physical activity on prescription on the health related quality of life with inactive people aged 67-68 years old researchers found that participants made positive changes in health related quality of life by going through the physical activity prescription (68). Finally, in a study on the effects of physical activity on prescription and motivational interviewing on exercise time with 31 participants with mild to moderate hypertension, participants increased their minutes of weekly exercise from less than 60 minutes to a mean of 300 minutes per week, and lowered their blood pressure substantially (69).

2.3 Physical activity on prescription in Iceland

The installation of physical activity on prescription in Iceland began in Reykjavik and vicinity as a trial project in 2011 with a grant from the Ministry of Welfare. It is now publicly funded and has been available in primary health care of the capital area (Reykjavik and vicinity), in the Akureyri primary health care (in Northern Iceland) as well as nearly all health care units in Iceland since June 2014. When a patient receives *Physical Activity on Prescription* from a physician, the patient is referred to a physical activity coordinator, who is always a physiotherapist working within a local primary health care centre. Additionally, since the beginning of 2016, independent specialist MDs, physical activity coordinators working in Reykjalundur rehabilitation centre and the National University Hospital are included in the project. It is also on the agenda make physical activity on prescription available at the Akureyri Hospital (74).

2.4 The delivery of the Icelandic model of physical activity on prescription

When a patient has received PAP from a physician, it is valid for 12 months with a new dosage cycle released every three months. Thus, the PAP is revised in cooperation of the physical activity coordinator and the PAP receiver every three months and a decision to continue or stop the PAP is made. Research suggests 6 months is the optimal length of PAP to increase physical activity (27).

In an hour-long session, the physical activity coordinator interviews the PAP receiver using the motivational interview technique (75) and performs a 6 minute walking test (76) to determine the safe intensity for physical activity for the PAP receiver to start with, depending on the disease diagnosis and patient's health. The aim of the motivational interview is to gather information on where interest and motivation for physical activity lies, their physical activity, disease and injury history as well as the patient's attitude towards physical activity as means of therapy. This is done to single out an activity that the patients can imagine themselves doing and where in the phase of behaviour change according to the transtheoretical model of behaviour change (77) they are situated in order to increase the likelihood of good adherence to therapy and finally an increase in physical activity behaviour.

As patients are often in poor physical shape due to prolonged periods of inactivity or illness, it is important to find out their cardiac state of health and how much physical activity intensity is safe for the patient. Therefore, a six-minute walking test is conducted where patients walk as far and as fast as they can for six minutes. Blood pressure and oxygen saturation are measured before and after the test to see how the body responds to physical activity. The test measures at once all the systems involved during exercise, including cardiovascular systems, pulmonary systems and more, although it does not give separate information on the function of each system (76). The 6-minute walking test provides information on the current physical status of the patient, the submaximal level of functional capacity as the patients choose their own intensity (76). It thus gives the physical activity coordinator a valid picture of at what frequency and intensity it is safe to build a physical activity plan on.

The prescribed physical activity plan is set up according to the patient's diagnoses, interests and physical status. As discussed previously it is important to individualise the physical activity plan and therefore the physical activity prescription. Physical activity coordinators use the Swedish physical activity prescription manual FYSS where the most common diseases are described and the evidence based effect of physical activity on each disease is defined (78). To begin with, a 12-week plan for physical activity, with intensity decided according to the BORG RPE scale of perceived exertion, is drawn up. In Iceland, Internet based software is used to keep track of adherence to therapy and for some of the communication between the physical activity coordinator and the patient. It is also seen as a tool for the patient and physical activity coordinator to keep track of therapy adherence. All activity sessions are registered in the database by logging onto the database, coordinating with a Run-keeper app (79), or dialling a special telephone number which automatically registers the session on the database.

Based on the above the patient starts following their PAP. The physical activity coordinator monitors the adherence to therapy through the Internet based software and if the patient has not been active for some time the physical activity coordinator contacts the patient to enhance motivation. Also if a patient is adhering to the prescribed activities and is doing well the physical activity coordinator contacts the patient to compliment for good work. If the patient's therapy adherence goes below 70% per week, the internet based software sends an automatic reminder through email to the participants.

2.5 Research on the Icelandic physical activity on prescription model

Research on the Icelandic model is quite limited. Two small studies have been conducted as parts of final theses at the University of Iceland and the Reykjavik University. First, physiotherapists Inga Dagmar Karlsdóttir and María Kristín Valgeirsdóttir (80) conducted a study among 43 GPs (with response rate of 47%) and 139 patients (with response rate 22%), with the aim to determine the experience and results from using PAP in Iceland with both GPs and patients. Adherence to therapy was of special interest and whether physical activity frequency had changed amongst patients. Also, they conducted an assessment of the physical benefits from the procedure and if attitude towards physical activity had changed. Their main findings indicated that success from PAP was satisfactory with 55% of patients reporting better health and a more positive attitude towards physical activity. The study also reported 48% of the participating GPs to be positive towards the programme and 67% believed the treatment to be a realistic treatment option within the sector. On the other hand, GPs

were not active enough in prescribing PAP and found communication with the physical activity coordinator to be lacking.

In another BS final thesis from 2015, Laufey Ásta Guðmundsdóttir conducted both a quantitative and qualitative study amongst 239 GPs (response rate 38%), with the aim of finding information about GPs' attitudes towards PAP. Her main results indicated that GPs in Iceland generally had a positive attitude towards PAP and the only matter found to be correlated to the GP's attitude was their own physical activity level, indicating that if a GP was not physically active he himself did not prescribe PAP as often as the physically active GP. Also they found that PAP needed to be more prominent within society and the primary health care and it would be of help to be reminded about it more often (81).

A cost effectiveness study has been conducted with the results that implementing PAP into Icelandic health care is of economic benefit (82).

3 Summary

Insufficient physical activity and a sedentary life style is one of the leading risk factors for premature death in the world. Strong bulk of literature indicates that it increases incidence of diseases such as obesity, hypertension and depression while increased physical activity has a positive and therapeutic effects on many illnesses from metabolic syndrome to back pain and anxiety. All physical activity has positive effects (even though in small quantities) on health and lowers risk for premature death and increases quality of life by reducing stress and increasing physical and mental wellbeing. In an attempt to incorporate physical activity as a medical treatment in the health care sector, physical activity on prescription has been implemented in many countries around the world. The programs have showed various results ranging from being successful in increasing physical activity, quality of life and decreasing symptoms to not showing concrete evidence for increase in physical activity behaviour and a decrease in symptoms. In Iceland, physical activity on prescription has been available in its current form since March 1st 2013. Previous to that, physical activity on prescription had undergone a trial period, which showed positive results. The current model still has not been studied, so evidence regarding the efficiency of the model does not exist. It is thus important to gather information from patients receiving physical activity on prescription here in Iceland and to evaluate their experience. That is important for further work on the physical activity on prescription model in the Icelandic health care system and also adding to the literature regarding physical activity promotion in health care settings worldwide.

4 Study Aims

The aim of this study was to evaluate the self-reported experience of patients in the greater Reykjavik area and Akureyri - North Iceland, who received a physical activity prescription (PAP) from their GP at some point in the period from March 1st 2013 to May 31st 2014. These patients were the first to undergo the current Icelandic physical activity on prescription therapy model. Specific aims of the study were:

1. To explore potential change in weekly physical activity sessions from before the physical activity on prescription to after the physical activity on prescription according to participants' characteristics and symptoms.
2. To investigate participants' self-reported change in physical wellbeing and mental wellbeing from before to after prescribed physical activity treatment.
3. To obtain information about the participants' perceived support from physical activity coordinators and general practitioners (GPs) during the physical activity on prescription.

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Article

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Physical activity on prescription (PAP): Study on efficiency and patients' experience of the method

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Abstract

Aims: Physical activity on prescription (PAP) was first introduced in its current form in Iceland in 2013.

Previous research has indicated PAP to increase physical activity and health related quality of life. In this study, we aimed to describe patients' change in weekly physical activity following PAP by their characteristics and further, to assess change in mental and physical wellbeing and perceived support during PAP.

Methods: An internet-based survey was conducted among all persons (N=399) who received PAP from March 2013 to May 2014 in Iceland. The questionnaire included measurements on reasons for prescription, number of weekly physical activity sessions, perceived support, mental wellbeing, physical wellbeing along with a number of other factors measuring the experience of receiving PAP.

Results: A total of 169 (42%) answered the questionnaire. The majority of participants (52%) increased their number of weekly physical activity sessions following PAP; the proportion of participants never or seldom engaging in physical activity decreased from 79% before PAP to 42% after PAP. The proportion of participants experiencing poor mental wellbeing decreased from 47% before PAP to 15% after PAP, while the proportion experiencing poor physical wellbeing remained similar ($p=0.67$). Participants who were employed and in good financial status, were more likely to increase their physical activity than other subgroups. The majority of participants (78%) perceived sufficient support from their physical activity coordinator during their PAP period.

Conclusion: The study results indicated that the current form of PAP used in Icelandic primary health care has a positive impact on patient health by increasing physical activity and mental wellbeing. The professional support offered during PAP seems to be sufficient. Our results support further use of physical activity prescriptions in the Icelandic health care system.

Key words

Physical activity, mental, physical, wellbeing, prescription.

Introduction

Physical inactivity is one of ten leading risk factors for death(1). In Iceland, less than 45% of the population engage in physical activity of some sort during leisure-time(2), which is similar to figures

reported elsewhere in Europe (3). Physical activity is an essential part of a healthy lifestyle and has therapeutic effects on many diseases and symptoms (4).

Physical activity prescriptions (PAP) in primary health care, with the aim to prevent disease and decrease or treat symptoms of disease, are becoming more common and have been available for some years in countries such as New Zealand, Denmark, Sweden, the USA and the UK (5-7).

For PAP to be effective, it is crucial for the patient to increase physical activity and adhere to the prescribed activities. Studies have shown that patients getting physical activity prescriptions (PAP) generally increase their physical activity (8-10), increase their health related quality of life (8), and make significant improvements in mental health (8, 11, 12).

In a Swedish study (13), 65% of participants reported adherence to treatment, while 19% reported partial adherence and 16% reported non-adherence, but studies have found economic factors, low motivation and lack of time to be reasons for non-adherence (14, 15).

To our knowledge, research is scarce considering professional support during PAP. Despite that, a UK systematic review found that support from treatment providers amongst others was a facilitator for treatment adherence and future increase in physical activity (16).

PAP is a new treatment option in Iceland. It was first available in its current form on March 1st 2013 at the majority of primary health care centres in the Reykjavik capital area and in the Akureyri in North Iceland. Icelandic research concerning the current method available is limited. The aim of this study was to evaluate self-reported experience of receiving a PAP. More specifically, to assess potential change in the number of weekly physical activity sessions from before the PAP to after the PAP according to participants' characteristics and symptoms. Also, we investigated participants' self-reported change in physical wellbeing and mental wellbeing from before to after the PAP and their perceived support from physical activity coordinators and general practitioners (GPs) during the PAP program.

Methods

Setting

According to the PAP program in Iceland, when a patient receives PAP he is referred to a physical activity coordinator, i.e. a physiotherapist working within a local primary health care centre. In an hour-long session, the physical activity coordinator interviews the patient and performs tests to determine the suitable PAP plan. The coordinator then supports the patient throughout the PAP period by following up on treatment adherence through the PAP internet based software and by contacting the patient by phone and email. The software is a web based tool and database used for outlining the patients prescribed physical activity and for keeping track of the treatment adherence, as patients register their physical activity sessions online. The software gives the physical activity coordinator an opportunity to follow the patients' adherence and keep track of their communication. Patients are registered in the database by their emails.

In Iceland, PAP is valid for 12 months and every three months, the physical activity coordinator, in cooperation with the PAP receiver, revises the physical activity plan, goals and motivation, and a

decision to continue or stop the PAP is made. Existing research suggests that the optimal length of a PAP is 6 months as that time frame is likely to induce behaviour change (8).

Study base

The study base consisted of all individuals (N=399) who received a PAP as treatment from their general practitioner (GP) within one of 11 primary health care centres offering PAP as treatment in Reykjavík (the greater capital area) or Akureyri, in the period of 1st March 2013 through 31st May 2014. At the time, individuals who received PAP were patients whose GP felt they would benefit from increased physical activity. Reasons such as hypertension, depression, anxiety, arthritis, obesity and pain were common reasons for PAP.

Procedure

An invitation to participate in the study was sent by email to all members of study base, on January 22nd 2015, with an introduction letter and a secure link to a web-based questionnaire. Two reminders and thanking letters were sent by email 10 and 17 days after the initial invitation to participate. Time elapsed from the termination of participants' PAP until questionnaire administration varied from 20 months to being currently following their PAP. Answers from participants with an active PAP were included in all analyses.

The questionnaire was anonymous and answers were not traceable to individual participants. Researchers had no access to participants' person identifiable information such as names, social security numbers or email addresses. The PAP software administrator sent all emails. The questionnaire was located on a secure server hosted by the School of Health Sciences, University of Iceland. The RedCap research software (17) was used for programming of the questionnaire and data gathering.

Measures

The questionnaire contained 36 question items, including questions about weekly number of physical activity sessions, duration of physical activity sessions, reasons for prescription, physical wellbeing, mental wellbeing, support from physical activity coordinators and GPs during the PAP, adherence and belief in one's ability to follow the prescription. Furthermore, questions on background information including age, sex, education, and occupational and financial status were included. The questionnaire also included questions on other factors such as sedentary habits, change in drug use and quality of life but this information was not used in this study.

The main outcomes of interest were the change from before to after PAP in participants' self-reported number of weekly physical activity sessions, physical wellbeing and mental wellbeing. In addition, self-reported PAP adherence, attitudes towards physical activity and belief in one's ability to follow the PAP were considered, along with participants perceived support from their physical activity coordinator and GP during the PAP.

Participants weekly physical activity session rate was measured with the questions: "Did you exercise or engage in physical activity before receiving PAP?" and "Do you currently exercise or

engage in physical activity?” Both questions had the response alternatives: never, seldom or irregularly, once a week, 2-3 times a week, 4-5 times a week, 6-7 times a week or more often than 7 times a week.

Based on these question items, we created a new dichotomized variable to capture change in weekly physical activity session rate from before to after the PAP with the values: “no increase” (i.e. no change in physical activity or physical activity sessions not exceeding once a week) and “increase” (weekly physical activity sessions increased to 2-3 times a week, 4-5 times a week, 6-7 times a week, more often than 7 times a week). Also, based on these questions, participants’ current physical activeness was defined into “active” and “inactive”. An active participant engaged in physical activity sessions 2-3 times a week, 4-5 times a week, 6-7 times a week or more often than 7 times a week but an inactive participant engaged in physical activity or exercise seldom or irregularly, once a week or never.

Duration of physical activity sessions was measured with the question: “When you engage in physical activity or exercise, for how long does each session last?” Response alternatives were: 0-15 minutes, 15-30 minutes, 31-45 minutes, 46-60 minutes, 61 minute or more.

Physical and mental wellbeing were measured with the questions: “If you think about the time before and after the PAP, how do you rate”: a) your physical wellbeing *before* you began PAP? b) Your mental wellbeing *before* you began PAP? c) Your physical wellbeing *after* you finished your PAP? and d) your mental wellbeing *after* you finished your PAP? Response alternatives were: very good, good, neither good nor poor, poor, very poor, which were recoded into: good, neither good or poor, and poor.

Support from participant’s physical activity coordinator and GP during the PAP period was measured with six statements: a) I felt that I got enough support from the physical activity coordinator during the period, b) I felt that I had enough access to the physical activity coordinator during the period, c) The physical activity coordinator telephoned me sufficiently often, d) I managed to maintain a good relationship with my physical activity coordinator, e) I got the best possible support during the period, and f) I got good follow up from my GP. Response alternatives were: strongly agree, somewhat agree, neutral, disagree somewhat and strongly disagree. Answers were categorised into: agree, neutral and disagree. A new variable representing overall support was calculated as a mean score of each of the initial response alternatives from all the statements indicating support.

Reason for the PAP was measured with the question: What is your main reason for receiving the physical activity on prescription? Response alternatives were a list of various diseases or disease symptoms (e.g. hypertension, mood disorders and being overweight), with an option to mark primary reason.

Attitude towards physical activity was measured with the question: What was your attitude towards physical activity before PAP? Response alternatives were: very positive, positive, neither positive nor negative, negative, very negative. Answers were categorised into: positive, neither and negative.

Length of PAP was measured with the question: “For how long did your PAP last?” Response alternatives were: 1-3 months, 4-6 months, 7-9 months, 10-12 months and 12 or more. Answers were categorised into: 1-3 months, 4-6 months, 6 months or more.

Whether participants still had an active PAP was measured with the question: "Do you currently have an active PAP?" with the response alternatives: yes, no, unsure.

Participants' belief of their adherence to PAP was measured with the question: "Before you started, did you have the belief you would follow the PAP through?" Response alternatives were: very much, rather much, neither, rather little, and very little. Answers were categorised into: much, neither and little. Adherence was measured with the statement: "I managed to follow my PAP plan". Response alternatives were: strongly agree, agree, neither agree or disagree, disagree and strongly disagree. The answers were dichotomized into: adherence (strongly agree, agree) and non-adherence (neither agree or disagree, disagree, disagree strongly).

Sex was measured with the question: "What is your sex?" with response alternatives: female, male, neither/other.

Education was measured with the question: "What is your education?" Response alternatives were: uncompleted compulsory education, completed compulsory education, completed upper secondary education, completed university education, other/do not want to answer and not stated. Answers were categorised into: completed compulsory education, completed upper secondary education, completed university education and uncompleted compulsory education/other/not stated.

Occupational status was measured with the question: "What is your status on the labour market?" Response alternatives were: working full time, working part time, unemployed, retired, disabled/on sick leave, on maternity/paternity leave, studying, in rehabilitation/on rehabilitation pension and other/not stated. Answers were categorised into: working full/part time, unemployed, retired/disabled, other.

Age was measured with the question: "What is your age?" Response alternatives were: 18-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65-74 years and 75 years and older. Answers were categorised into: 18-34 years, 35-54 years, 55 years and older.

Data analysis

We used descriptive statistics to explore the characteristics of the study participants and calculated frequencies and proportions for all outcomes of interest. Further, we conducted chi square tests to assess differences between proportions of participants who increased and did not increase physical activity within variables: age, sex, occupational status, education, financial status, self-reported main reason for PAP, length of PAP, attitude towards physical activity prior to treatment, previous activity level, mental wellbeing and physical wellbeing prior to treatment, treatment adherence belief, self-reported treatment adherence and support with 95% confidence level and p-values <0.05 indicating significantly unequal proportions. Also chi square tests were conducted for differences in weekly physical activity session level and mental and physical wellbeing pre and post PAP according to given reason for PAP with 95% confidence intervals and p values <0.05 indicating unequal proportions. R-statistical software was used for data analyses (18).

Ethical issues

Permission for the study was obtained from the National Bioethics Committee (ref: VSN 14-077-afg). The study was also announced to the Data Protection Authority. Participants gave their informed

consent by answering the questionnaire and submitting their final answers. They were informed that they could withdraw or discontinue their participation at any time.

Results

In total, 51% (204/399) agreed to participate in the study. Of those invited to participate, 42% (169/399) completed questions regarding physical activity. At the time of the questionnaire administration, 15% of participants had an active PAP, 78% had completed their PAP, and 5% did not know if they had completed their PAP. Table 1 displays demographics and patient characteristics of the study participants. Of 169 participants, the majority or 55% belonged to age group 35-54 and 67% were female. Reported main reasons for PAP were overweight 28%, arthritis 16%, pain 11% and mood disorders, diabetes and cardiovascular disease with 8% respectively. The proportion of participants reporting more than one reason for PAP was 80%. Most of the participants, 79%, were inactive before the PAP.

Weekly physical activity sessions

As shown in Figure 1, 79% of the participants engaged never or seldom in physical activity before their PAP changing to 42% ($p<0.05$) after. In line with this, the proportion of participants engaging in 2-3 weekly activity sessions increased from 15% to 31% from before to after PAP ($p<0.05$), while the proportion engaging in 4-5 weekly sessions increased from 5% to 20% ($p<0.05$) and 2% to 7% ($p<0.05$) for those engaging in 6 weekly sessions or more. Duration of each physical activity session post PAP was 15-30 minutes for 23% of the participants, 31-45 minutes for 36% of the participants, and 46-60 minutes for 27% of the participants.

Increased physical activity

Table 2 shows increased weekly activity sessions post PAP according to various factors. In all, 52% of participants increased their weekly physical activity sessions compared with 48% who did not increase their number of weekly physical activity sessions. Individuals active on the labour market and with good financial status were more likely to increase their weekly activity than other subgroups, $p<0.05$. Also, Chi square significance tests showed that participants using PAP for 6 months or more were more likely to increase their physical activity than their counterparts who used PAP for a shorter period. In all subgroups a larger proportion of participants increased their physical activity than did not. Also showing significant differences between proportions was treatment adherence.

Physical wellbeing

The proportion of participants experiencing good physical wellbeing increased from 34% before PAP to 47% post PAP ($p<0.05$). Further, regarding poor physical wellbeing as shown in figure 1, the proportion of participants went from 18% before PAP to 16% post PAP ($p>0.05$). The proportion of participants reporting neither good nor poor physical wellbeing went from 48% before PAP decreasing to 37% post PAP ($p<0.05$).

Mental wellbeing

As for mental wellbeing, 28% of the participants reported good mental wellbeing before PAP, which increased to 57% post PAP ($p<0.05$). Similarly, as shown in figure 1, the proportion of participants reporting poor mental wellbeing decreased from 47% before PAP to 15% post PAP ($p<0.05$).

Analyses on change in the proportion of participants reporting good mental wellbeing within different disease groups (based on given primary reason for PAP) showed 19% of arthritis patients reporting good mental wellbeing before PAP, increasing to 52% post PAP ($p=0.07$). The proportion of participants with cardiovascular disease reporting good mental wellbeing changed from 50% to 43% after ($p=0.7$). Of patients reporting mood disorders the proportion was 7% before, changing to 36% after PAP ($p=0.06$) while overweight patients changed from 33% before PAP to 54% after PAP ($p<0.05$). Proportions for those reporting diabetes or pain as primary reason for PAP changed from 36% to 78% ($p<0.05$) and 18% to 65% ($p<0.05$), respectively.

Support from physical activity coordinator.

As Figure 2 shows, 71% of all participants agreed to having had sufficient support from physical activity coordinator (68% of all female and 75% of all male). Subgroups especially in agreement of this statement were participants who had completed compulsory education 78%, completed upper secondary education 74% and participants completing university education 65%. Of participants reporting cardiovascular disease as primary reason for PAP, 85% claimed to have had good support, as well as 54% of participants with mood disorders and 60% of overweight participants. The majority or 94% of participants in the labour market thought they got sufficient support from physical activity coordinator compared to 29% of unemployed.

Discussion

Overall, 52% of the participants increased their number of weekly physical activity sessions and 37% went from being almost totally sedentary to engaging in physical activity at least two or three times a week. During the time period, mental wellbeing increased but similar changes were not observed for physical wellbeing. Also, participants generally agreed to having good support and follow up during the treatment.

Increased physical activity

The change in physical activity is in line with previous research indicating that physical activity prescriptions increase physical activity with participants (8, 12, 19-21). It can be difficult to change one's lifestyle and research has found previous behaviour often is the best prediction for future behaviour (22). It is therefore important to stress the significance of the decrease of sedentariness for 37% of the group, as all physical activity has been found to lower risk of all-cause mortality (23) even though the increase in physical activity did not meet global recommendations in all cases.

We found that participants with employment or in good financial status increased their physical activity more than other subgroups and none of the unemployed participants increased their

physical activity during their PAP. Although the unemployed were a small proportion of the total participants, it raises considerations, as previous research has shown leisure-time physical activity to be less common among low socioeconomic status (SES) groups than high SES groups (24). Structured physical activity prescriptions are believed to have a potential for enhancing physical activity among long term unemployed persons (25). This implies that unemployed patients and those in poor financial status may need more support and attention from physical activity coordinators. Financial concerns should also be taken into account, as research has shown costs of physical activity to be an obstacle for unemployed people (26, 27). It would be valuable to conduct further research with participants in low SES groups to evaluate which factors in the Icelandic model of PAP they mark as being obstacles to their increasing physical activity.

Support

Participants generally perceived good support from their physical activity coordinator. Support in physical activity treatments has previously been shown to be important for long term increase in physical activity (16) and is therefore a crucial factor to maintain in the Icelandic PAP.

Treatment adherence

Adherence to long-term chronic illness therapies such as for diabetes mellitus or even lifestyle therapies such as smoking cessation were on average 50% in 2003 (28). In our study, 69% reported adherence to the treatment which is slightly more than in Kallings et al.'s study, where adherence was reported to be 65% after six months of treatment (13).

Physical and mental well-being

A positive change in mental wellbeing was evident for many participants. This is in line with studies showing physical activity having a positive impact on mental health, including anxiety, depression (4, 29, 30) and playing a role in increasing resilience to stress (31) and decreasing symptoms of burnout (32).

Of some concern is that overall physical wellbeing remained similar throughout the period. The main purpose of PAP is to improve physical wellness and decrease disease symptoms. Kallings et. al (8) found a slight but statistically non-significant increase in the bodily functioning component of the SF-36, while other studies have not found consistent positive changes in physical fitness or other factors relating to physical wellbeing (20). This indicates that future research on the physical components of PAP should be more disease specific rather than focusing on physical wellness as a whole.

Strengths and limitations

This study is the first Icelandic study to approach solely the patients getting PAP from their GP. Strength to the study is that the study base was a well-defined cohort, as all patients in Iceland

receiving PAP at a certain time period were invited to participate. Another strength is that the study was designed to gather specific information from PAP receivers and therefore provides appreciated knowledge.

However, some limitations to the study should be noted. Firstly, the response rate was relatively low, which increases the possibility of non-response bias, as we do not know if and how non-responders were different from responders, e.g. in terms of frequency of physical activity. Secondly, the participants' symptoms or weekly physical activity might be overestimated or underestimated due to recall bias as time lapsed from termination of the PAP for some participants was up to 20 months and information was gathered through self-report. Thirdly, we observed that participants increasing their weekly physical activity sessions tended to be those reporting good adherence, perceiving adequate support and seeing positive changes in mental wellbeing, so the positive association might be exaggerated. And finally, the measurements of the questionnaire were mostly single-item measures (e.g. on mental wellbeing), therefore they were not validated or standardised.

Conclusion

Our study adds to the literature available on physical activity prescriptions in primary health care and supports previous results that physical activity prescriptions are likely to increase physical activity (8, 12, 19-21). We found that most participants reported PAP encouraged an increase in physical activity and provided positive changes in mental wellbeing. Positive changes in physical wellbeing were not as pronounced indicating disease specific measurements required for future research. Support provided from professionals during the treatment period was satisfactory to the majority of participants. Our results therefore, based on patients' experience, encourage further use of the current model of PAP in the Icelandic health care system.

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Table 1. Characteristics of participating patients issued with physical activity on prescription (PAP) from March 2013 to May 2014.*

	Physical activity before PAP		
	Total n	Inactive n (%)	Active n (%)
Total	169	133 (79)	36 (21)
Age, years			
18-34	24	19 (79)	5 (21)
35-54	90	72 (80)	18 (20)
55+	48	37 (77)	11 (23)
Missing	7		
Sex			
Female	108	82 (76)	26 (24)
Male	53	45 (85)	8 (15)
Missing	5		
Occupational status			
Working full time/part time	96	78 (81)	18 (19)
Unemployed	7	7 (100)	0
Retired/disabled	35	28 (80)	7
Other	24	15 (63)	9 (37)
Missing	7		
Education level completed			
Compulsory	40	34 (85)	6 (15)
Upper secondary	57	45 (79)	12 (21)
University	55	40 (73)	15 (27)
Uncompleted compulsory/other/not stated	24	15 (63)	9 (37)
Missing	7		
Financial status			
Good	51	37 (61)	14 (39)
Reasonable	62	47 (76)	15 (24)
Bad	46	42 (91)	4 (9)
Not stated	3	2 (67)	1 (33)
Missing	7		
Main reason for PAP			
Pain	18	13 (72)	5 (28)
Arthritis	27	19 (70)	8 (30)
Cardiovascular	14	12 (86)	2 (14)
Mood disorders	14	13 (93)	1 (7)
Overweight	47	38 (81)	9 (19)
Diabetes	14	12 (86)	2 (14)
Other	35	26 (74)	9 (26)
More than one reason for PAP			
Yes	122	97 (80)	25 (20)
No	42	33 (79)	9 (21)
Missing	5		
Duration of PAP, months			
0-3	48	39 (81)	9 (19)
4-6	58	42 (72)	16 (28)
6+	60	49 (70)	11 (30)
Missing	3		
Active PAP			
Yes	25	18 (72)	7 (28)
No	132	106 (80)	26 (20)
Unsure	9	7 (78)	2 (22)
Missing	3		

*Based on activity level prior to treatment start. Activity level is divided into active (engaging in physical activity sessions at least 2-3 times a week) and inactive (no or irregular physical activity sessions).

Table 2. Increased physical activity following physical activity on prescription (PAP) in Iceland, by characteristics of participating patients.

	Increased physical activity			
	Total	No (%)	Yes (%)	P-value
	N=169	n=81 (48)	n= 88 (52)	
Age, years				
18-34	24	12 (50)	12 (50)	1
35-54	90	44 (48.9)	46 (51.1)	0.96
55+	48	19 (39.6)	29 (60.4)	0.19
Missing	7			
Sex				
Female	108	52 (48.1)	56 (51.9)	0.77
Male	53	23 (43.4)	30 (56.6)	0.41
Missing	5			
Occupational status				
Working full-/part time	96	37 (38.5)	59 (61.5)	<0.05*
Unemployed	7	7 (100)	0	-
Retired/Disabled	35	17 (48.6)	18 (51.4)	1
Other	24	14 (58.3)	10 (41.7)	0.54
Missing	7			
Education level completed				
Compulsory	40	15 (37.5)	25 (62.5)	0.16
Upper secondary	57	28 (49.1)	29 (50.9)	1
University	55	24 (43.6)	31 (56.4)	0.42
Uncompleted	10	8 (80)	2 (20)	0.11
compulsory/Other/Not stated				
Missing	7			
Financial status				
Good	51	18 (35.3)	33 (64.7)	<0.05*
Reasonable	62	30 (48.4)	32 (51.6)	0.9
Bad	46	24 (52.2)	22 (47.8)	0.88
Not stated	3	3 (100)	0	
Missing	2			
Self-reported main reason PAP				
Pain	18	11 (61.1)	7 (38.9)	0.48
Arthritis	27	11 (40.7)	16 (59.3)	0.44
Cardiovascular	14	6 (42.9)	8 (57.1)	0.79
Mood disorders	14	7 (50)	7 (50)	1
Overweight	47	21 (44.7)	26 (55.3)	0.56
Diabetes	14	6 (42.9)	8 (57.1)	0.79
Other	35	19 (54.3)	16 (45.7)	0.74
Length of PAP, months				
0-3	48	28 (58.3)	20 (41.7)	0.31
4-6	58	30 (51.7)	28 (48.3)	0.75
6+	60	21 (35)	39 (65)	<0.05*
Attitude towards physical activity prior to treatment				
Positive	113	52 (46)	61 (54)	0.45
Negative	10	6 (60)	4 (40)	0.75
Neither	39	17 (43.6)	22 (56.4)	0.52
Previous activity level				
Inactive	133	61 (45.9)	72 (54.1)	0.37
Active	36	20 (55.6)	16 (44.4)	0.62

Increased physical activity				
	Total	No (%)	Yes (%)	P-value
Mental wellbeing prior to treatment				
Good	45	19 (42.2)	26 (57.8)	0.37
Poor	76	36 (47.4)	40 (52.6)	0.73
Neither	40	20 (50)	20 (50)	1
Physical wellbeing prior to treatment				
Good	56	25 (44.6)	31 (55.4)	0.50
Bad	29	18 (62.1)	11 (37.9)	0.27
Neither	78	33 (42.3)	45 (57.7)	0.21
Belief treatment adherence				
Much	119	56 (47.1)	63 (52.9)	0.58
Little	18	10 (12)	8 (44.4)	0.81
Neither	78	33 (42.3)	45 (57.7)	0.21
Self-reported treatment adherence				
Adherence	111	38 (34.2)	73 (65.8)	<0.05*
Non adherence	49	36 (73.5)	13 (26.5)	<0.05*
Perceived support, mean				
Much	102	46 (45.1)	56 (54.9)	0.37
Little	31	20 (64.5)	11 (35.5)	0.15
Neither	23	6 (26.1)	17 (73.1)	<0.05*

*P value indicates significantly unequal proportions within subcategories.

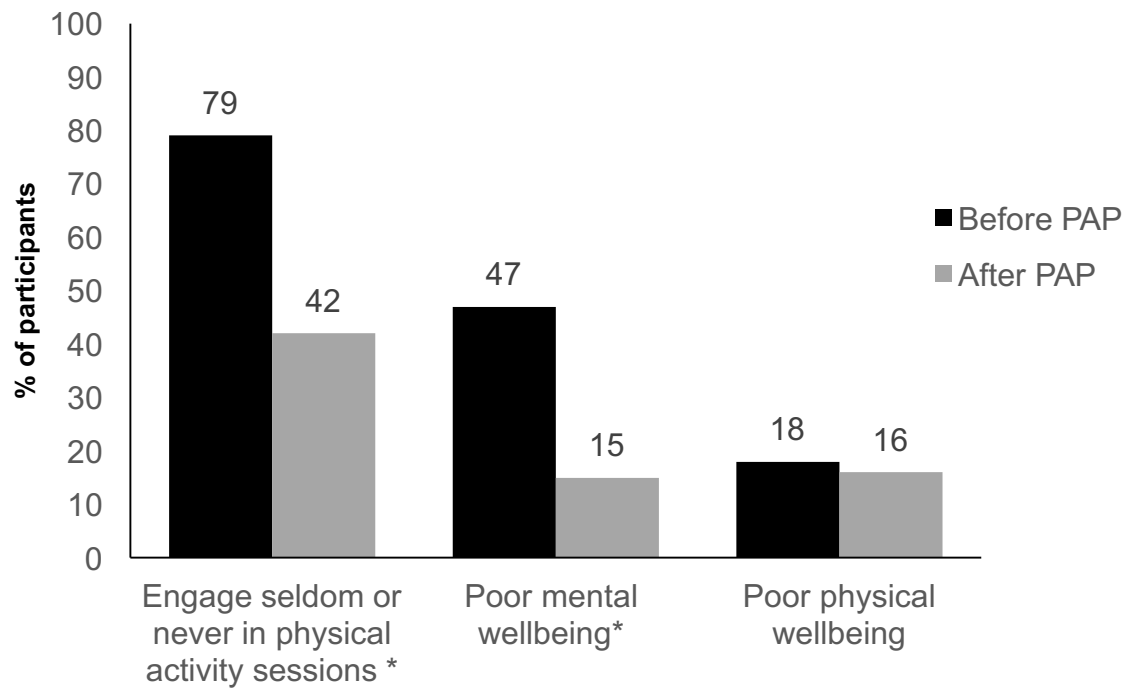


Figure 1. Proportions of participants before and after physical activity on prescription (PAP), who engage seldom or never in physical activity, have poor mental wellbeing and poor physical wellbeing.

* Indicates significant difference between proportions $p < 0.05$.

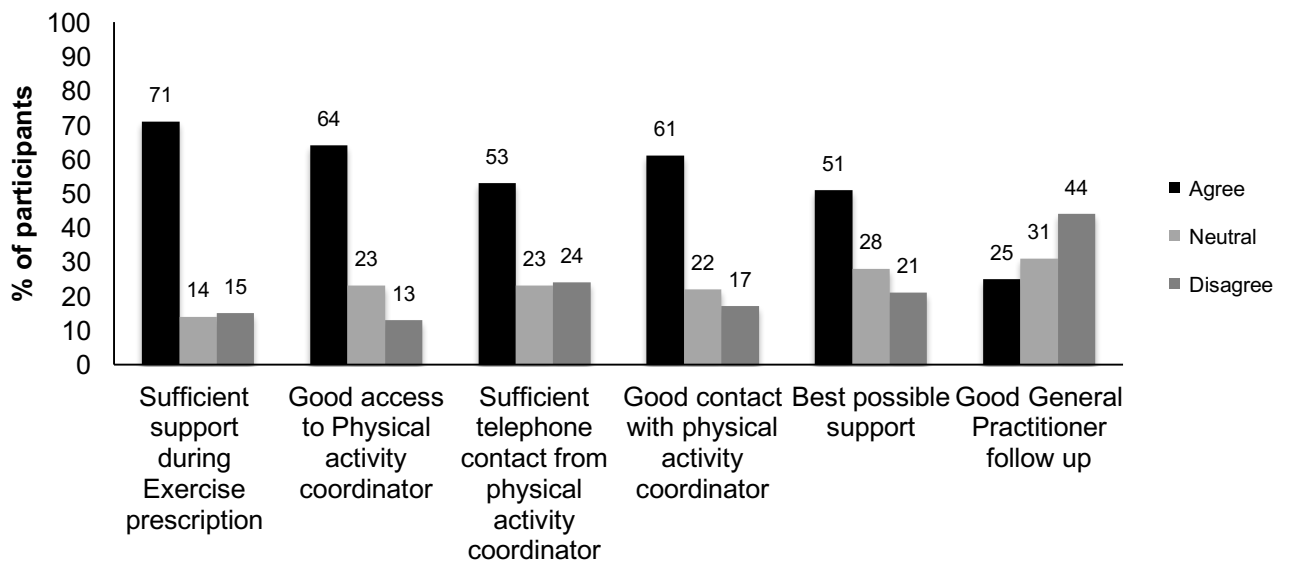


Figure 2. Perceived support from physical activity coordinators and general practitioner during physical activity prescription (PAP).

