

Minna Aittasalo

Promoting Physical Activity of Working Aged Adults with Selected Personal Approaches in Primary Health Care

Feasibility, Effectiveness and an Example
of Nationwide Dissemination



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Esitetään Jyväskylän yliopiston liikunta- ja terveystieteiden tiedekunnan suostumuksella
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kesäkuun 6. päivänä 2008 kello 12.

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UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2008

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STUDIES IN SPORT, PHYSICAL EDUCATION AND HEALTH 128

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JYVÄSKYLÄ 2008

Editors

Harri Suominen

Department of Health Sciences, University of Jyväskylä

Irene Ylönen, Marja-Leena Tynkkynen

Publishing Unit, University Library of Jyväskylä

Cover picture UKK Institute

URN:ISBN:978-951-39-3296-1

ISBN 978-951-39-3296-1 (PDF)

ISBN 978-951-39-3254-1 (nid.)

ISSN 0356-1070

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Jyväskylä University Printing House, Jyväskylä 2008

ABSTRACT

Aittasalo, Minna

Promoting physical activity of working aged adults with selected personal approaches in primary health care. Feasibility, effectiveness and an example of nationwide dissemination.

Jyväskylä: University of Jyväskylä, 2008, 125 p.

(Studies in Sport, Physical Education and Health,

ISSN 0356-1070; 128)

ISBN978-951-39-3296-1 (PDF), 978-951-39-3254-1 (nid.)

Finnish summary

Diss.

The *primary aim* of this study was to evaluate the feasibility and effectiveness of selected personal approaches to promote leisure time physical activity (LTPA) of working aged adults in primary health care. Three interventions were conducted in Southern Finland involving 35 health care units, 99 health care practitioners and 644 eligibility screened participants aged 18 to 65 years with no specific medical indication to increase LTPA.

Intervention 1 was conducted in occupational health care (OHC) and the employees (N=155) from nine companies were randomly assigned to two experimental (EXP) and control groups (CON). In the first EXP group individual face-to-face counseling alone was implemented by occupational nurses. In the second EXP group face-to-face counseling was supported by fitness testing conducted by a physiotherapist. In CON only data collection was carried out. Four counseling sessions were implemented during the 12-month intervention.

Intervention 2 took place in 24 health center and OHC units, where the physicians (N=67) were allocated randomly to EXP or CON. The group of each patient (N=265) was, therefore, physician-dependent. The approaches compared with usual care (CON) were Physical Activity Prescription by physicians during one routine appointment and self-monitoring of LTPA with a pedometer and LTPA log followed by mailed personalized feedback.

In intervention 3, which was implemented in municipal maternity and child health care, the clinics (N=6) signed up for EXP or CON. Thus, the group of the pregnant (N=132) and postpartum women (N=92) was determined by the clinic. In EXP individual face-to-face counseling supported by an option for supervised group exercise once a week was provided by the public health nurses. The number of counseling sessions was five for eight to 37 weeks' gestation in pregnant participants and for two to ten months after delivery in postpartum participants. In CON usual care was delivered.

The components of the feasibility evaluation were integrity, participant responsiveness, applicability to routine health care practices and safety. The evaluation was based on questionnaires and /or interviews for practitioners and participants and on documents used in the interventions. In the effectiveness evaluation, short (2 months), mid (6 months) or long-term (> 6 months) differences in LTPA between EXP and CON were examined with questionnaires, pedometers or 7-day logs depending on the intervention.

According to the feasibility results integrity and participant responsiveness were high and the approaches proved safe and applicable to routine health care appointments. As to the effectiveness results, Physical Activity Prescription by physicians showed both short- and mid-term benefits in health centers and OHC compared with usual care. The findings regarding self-monitoring were also encouraging, but only in the short-term. In maternity care, individual face-to-face counseling supported by optional group exercise proved effective in long-term while in child health care no changes in LTPA were observed. Individual face-to-face counseling with or without fitness testing were not beneficial in OHC compared to data collection only.

The *secondary aim* of the study was to evaluate the nationwide dissemination of one of the approaches, Physical Activity Prescription. Dissemination was carried out with a multiorganisational program, the Physical Activity Prescription Program (PAPP). Evaluation was based on the RE-AIM framework (www.reaim.org) with five dimensions: **R**each, **E**ffectiveness, **A**doption, **I**mplementation and **M**aintenance.

Reach was assessed by the number of prescriptions requested. The indicator of effectiveness was the change in physicians' practices from 2002 to 2004 in asking patients' physical activity habits and the indicator for adoption the change in the frequency of using prescription or other written material in physical activity counseling. The questions related to these indicators were added to the annual surveys of the Finnish Medical Association to all its member physicians in 2002 (N=16692) and in 2004 (N=17170). Maintenance was described by the number of local prescription projects and visibility in national health promotion documents. Process evaluation was used to assess implementation. According to the results, PAPP succeeded in all dimensions but effectiveness and adoption.

In summary, the personal approaches examined were feasible in their original settings and target groups. The findings on effectiveness were less consistent. In light of this study and the literature on comparable studies in other countries, the strongest support is for the short-term effects of Physical Activity Prescription by physicians and for self-monitoring with a pedometer and a LTPA log followed by mailed feedback. Very little or inconsistent literature is available to support the other approaches. Thus, the results are limited to this study until determined by further research.

Dissemination of Physical Activity Prescription by physicians at national level did not succeed in all dimensions. Extending the duration and putting more emphasis on local efforts might have improved both effectiveness and adoption.

This study was among the first in Finland on the feasibility, effectiveness and dissemination of personal approaches to promote physical activity in primary health care. More research is therefore needed to determine the generalizability of the findings and also to specify whether some of the approaches are more feasible or effective than others.

Keywords: physical activity, health promotion, health education, physical activity counseling, primary health care, feasibility, effectiveness, dissemination

*To my children
Juho and Aino*

Author's address Minna Aittasalo
Urho Kaleva Kekkonen (UKK) Institute for Health
Promotion Research
P.O. Box 30
FIN-33501 Tampere, Finland

Supervisors Adjunct Professor Seppo Miilunpalo
Tampere University, Finland
Kiipula Education and Rehabilitation Center
Janakkala, Finland

Professor Lasse Kannas
Department of Health Sciences
University of Jyväskylä, Finland

Professor (Emeritus) Jukka Laitakari
Department of Health Sciences
University of Jyväskylä, Finland

Reviewers Professor Fiona Bull
BHF National Centre for Physical Activity and
Health
School of Sports and Exercise Science
Loughborough University, UK

Associate Professor Mireille van Poppel
Department of Public and Occupational Health
EMGO Institute
VU University Medical Center
Amsterdam, The Netherlands

Opponent Professor Adrian Bauman
School of Public Health
Faculty of Medicine
University of Sydney, Australia

ACKNOWLEDGEMENTS

This study was carried out at the UKK Institute for Health Promotion Research in Tampere, Finland in collaboration with the University of Jyväskylä.

In 1999 Adjunct Professor Seppo Miilunpalo, D.Med.Sci., recruited me to initiate an intervention on the effectiveness of health-related fitness tests in physical activity counseling. Thank you, Seppo, for giving me this opportunity and providing me with further tasks which made this dissertation possible. I am also grateful to you for your supervision throughout the process although I know it must have needed additional efforts after leaving the UKK Institute.

I wish to thank all the other co-researchers in the interventions: Jaana Suni, Ph.D., in intervention 1, Adjunct Professor Katriina Kukkonen-Harjula, D.Med.Sci., in intervention 2 and Adjunct Professor Mikael Fogelholm, D.Sc., Tarja Kinnunen, M.Sc., and Professor Riitta Luoto, D.Med.Sci., in intervention 3. Without your support I would not have succeeded. Special thanks to Katriina for taking over Seppo's tasks in intervention 2 and traveling around Southern Finland with me to train the participating physicians and receptionists. We were always in the right place at right time, thanks to Katriina's map reading! I thank Katriina also for sharing her expertise in a very encouraging way and providing me with numerous research articles related to the dissertation themes. Special thanks also to Jaana for her inspiring and genuine personality.

My warmest thank you to Matti Pasanen, M.Sc., for his most valuable help in statistical issues in all the interventions. Without his help I would have been lost in the "jungle of data". Thank you also to Mr. Ismo Lapinleimu and Ms. Päivi Viitanen for all the help in data feeding and to Päivi also for the graphical illustrations of the dissertation and the nicest time we had sharing the working room for a while. Many thanks also to Katriina Ojala, M.Sc., with whom we developed physical activity material for pregnant and postpartum women. I also wish to thank Ms. Tuula Äyräväinen for editing much of the counseling material for the interventions and for helping me in preparations related to the dissertation examination. Much appreciation to Ms. Outi Ansamaa and Birgitta Järvinen, M.A., of the UKK library for providing me with all the literature needed in different phases of the dissertation process.

Participation in the 4-year Physical Activity Prescription Program between the interventions proved very educational for me and I am still able to draw on the experience. For that I want to thank the co-members from the collaborating organizations Tita Ström, Mika Pyykkö, Annukka Alapappila, Jyrki Komulainen, Santero Kujala, Tor Jungman and Kaarina Laine-Häikiö. As one of the co-authors of the evaluation report many thanks to Timo Ståhl, Ph.D., the former project coordinator of the program.

I want to express my greatest gratitude to my supervisors from the University of Jyväskylä: Professor Jukka Laitakari for giving feedback on the manuscript although already retired and tied up with other interests and Professor Lasse Kannas, who joined "the team" after Jukka retired for the firm guidance through the final stages of the dissertation process.

My sincere appreciation to the official reviewers Professor Fiona Bull, Ph.D., and Associate Professor Mireille van Poppel, Ph.D., for their most valuable comments on the dissertation manuscript. I am especially thankful to Fiona for her constructive suggestions, which truly helped me to improve the dissertation.

Warmest thank you to Virginia Mattila, M.A., for editing the English language of the dissertation as well as of most of the articles. Thank you also to Ms. Pirjo Koikkalainen from the University of Jyväskylä for preparing the layout of the dissertation.

I am very grateful to all the health care providers and subjects, who participated in the interventions. Without their efforts this dissertation would not have been accomplished.

During the whole dissertation process I have been working in the UKK Institute. My greatest appreciation to the whole staff for creating an atmosphere where the work has never felt an obligation but a privilege. A special thank you to my fellow researcher Erja Toropainen, M.Sc., for patiently listening and commenting both the problems and successes related to the interventions and dissertation process. Thank you also to Adjunct Professor Ritva Nupponen, Ph.D., who has always been ready to share her expertise and wisdom in a very supportive way.

I thank the Ministry of Social Affairs and Health, the Ministry of Education, Juho Vainion Säätiö, Urheiluopistosäätiö and Helena ja Kauko Rastaa Rahasto for funding the interventions and the Finnish Work Environment Fund and Urheiluopistosäätiö for funding the final phase of the dissertation.

A warm thank you to my dearest brother Esa-Jussi, with whom I have had many fruitful discussions on scientific values and principles, which gave me strength to push forward again. I am extremely grateful to my parents, Leena and Juhani, who have always supported me in all the choices I have made in life. Many thanks to my friends Liisa and Susanna for being interested in my work by frequently inquiring the date of the examination. I guess you never believed it would come ... Thank you also to my friend Sari, who has persistently dragged me jogging and thus taken care of my physical and also mental well-being.

I dedicate this dissertation to my children, Juho and Aino, who have during this process always succeeded in transferring my thoughts from work to other important purposes in life. With their busy schedules, they have also taught me in abundance of punctuality and organizational skills. Finally, I want to thank my dear husband and best friend Ossi for sharing the joys and worries in relation to this dissertation as well as to all the other things that we have been experienced during these years together. I could not have had better support from home than what you have given to me.

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ORIGINAL ARTICLES

This study is based on the following articles published in or submitted to international scientific journals. They are referred in the text with their Roman numbers I-V:

- I Aittasalo, M., Miilunpalo, S., Suni, J. 2004. The effectiveness of physical activity counselling in a work-site setting. A randomized, controlled trial. *Patient Education and Counseling* 55, 193-202.
- II Aittasalo, M., Miilunpalo, S. 2006. Offering physical activity counselling in occupational health care - does it reach the target group? *Occupational Medicine* 56, 55-8
- III Aittasalo, M., Miilunpalo, S., Kukkonen-Harjula, K., Pasanen, M. 2006. A randomized intervention of physical activity promotion and patient self-monitoring in primary health care. *Preventive Medicine* 42, 40-6.
- IV Aittasalo, M., Pasanen, M., Fogelholm, M., Kinnunen, T., Ojala, K., Luoto, R. Physical activity counseling in maternity and child health care - a controlled trial. (Submitted).
- V Aittasalo, M., Miilunpalo, S., Ståhl, T., Kukkonen-Harjula, K. 2007. From innovation to practice: initiation, implementation and evaluation of a national physician-based physical activity promotion programme. *Health Promotion International* 22, 19-27.

ABBREVIATIONS

CON	control group
EXP	experimental group
HCP	health care practitioners
LTPA	leisure time physical activity
MHC	municipal health center
MON	self-monitoring group
OHC	occupational health care
PACE	Physician-based Assessment and Counseling of Exercise
PAPP	Physical Activity Prescription Program
PREX	Physical Activity Prescription group
RE-AIM	framework for evaluating health promotion and health education interventions

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ORIGINAL ARTICLES

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1 INTRODUCTION

There is increasing scientific evidence of the benefits of physical activity in the prevention, treatment and rehabilitation of major public health diseases (Bauman 2004, Kesäniemi et al. 2001, Pate et al. 1995, U.S Department of Health and Human Services 1996). Nevertheless, only about half of the adult population in most developed countries fulfills the physical activity recommendation for health (Fogelholm et al. 2007b, Pate et al. 1995, Vaz de Almeida et al. 1999,).

As a consequence, physical activity has become an important part of the clinical practice guidelines concerning, for example, the prevention and treatment of high blood pressure and type 2 diabetes. This has emphasized the role of health care in the promotion of physical activity (Ministry of Social Affairs and Health Finland 2000, 2001, U.S Department of Health and Human Services 1996). The task has been pointed especially at primary health care merely because its duties under the law to promote public health by preventing diseases but also because its services can reach a substantial number of people who are insufficiently physically active and who could gain health benefits from physical activity. Thus, this setting provides the opportunity to target not only those with specific medical conditions but also those at risk for health problems in the future.

In primary health care, health education is the primary strategy of health promotion (Green and Kreuter 1999, p. 19). At personal level, health education most commonly aims at changing individual's health-related knowledge, attitudes, motivations and ultimately behavior (Liedekerken 1990, p. 30-36). The actions and approaches used in health education vary greatly between and within the professional groups. For example, according to a survey conducted in 56 randomly selected health centers in Finland, brief advice is the most

frequently used approach among physicians while physiotherapists use more comprehensive approaches such as fitness testing and written instructions for home-based exercise. (Miilunpalo et al. 1995). Thus, there is a mixture of approaches used in primary health care (Douglas et al. 2006, Laitakari et al. 1997, Melillo et al. 2000).

During the last decade several efforts have been made, especially in the U.S., UK, Canada, New Zealand and Australia, to reach consensus about the best practices to promote physical activity in primary care. Numerous interventions on the effectiveness of various approaches have been conducted. According to rough estimates, an increase of 10 to 25 percent in the frequency of physical activity can be achieved with personal approaches aiming at behavior change at individual level. The impact on physical activity duration or intensity, however, is less clear. (Marcus and Forsyth 1999). There is also still insufficient evidence to claim that one approach is superior to another especially in achieving long-term positive effects in primary care (U.S. Preventive Services Task Force 2002, Smith 2004). Furthermore, information on the feasibility of the approaches is very limited (Eden et al. 2002, Whitlock et al. 2002). It has been pointed out that it is unlikely that "one size fits all" referring to the fact that multiple approaches are needed to promote physical activity among various categories of populations (Harrison et al. 2005). The generalizability of the findings on the effectiveness of the approaches has also been questioned (Tulloch et al. 2006). The results may not be valid in contexts different from the original ones and therefore the evaluation should be repeated in each particular context.

Until today, although not successful in determining the best practices, the interventions have helped to determine the critical components of physical activity promotion in the health care setting. They have been outlined in several reports (e.g. Cavill et al. 2006, Estabrooks and Glasgow 2006, Jacobson et al. 2005, Marcus et al. 1998, Taylor et al. 2004). They are considered the minimum requirements for effective physical activity promotion and the basis for recommended practices. Practical illustrations to help to incorporate the core principles into real health care situations have also been developed (e.g. Goldstein et al. 2004, Laitakari and Asikainen 1998). Recommended practices should, furthermore, be widely adopted to have health impacts at the population level (Owen et al. 2006).

Recently, there has been concern that a large gap persists between the minimum requirements and current practices (Green et al. 2006). It has been argued that one reason for the gap may be that the approaches suggested for clinical practice have usually been examined in optimal conditions and cannot be applied to real life settings (Dzewaltowski et al. 2004). The weak external validity of the interventions has been claimed to impair the potential of the approaches to be disseminated into real world conditions (Green and Glasgow 2006). Another reason has been that, regardless of the external validity issues, the dissemination of new approaches has been poorly resourced (Bodenheimer et al. 2005, Lewando-Hundt and Al Zaroo 2004, Rabin et al. 2006). In other

words, not enough funding has been provided for promoting diffusion or dissemination of new approaches based on recommended practices. Until now, the majority of studies have focused on establishing effectiveness and setting clinical guidelines. It seems that health promoters and experts have long recognized the importance of dissemination but it has been only recently that the need for dissemination studies regarding promotional actions has been expressed more intensively.

In Finnish primary health care the role of occupational health care, maternity and child health care and outpatient visits to physicians are of specific importance in physical activity promotion. They can reach the most vulnerable groups, target their efforts according to the needs and offer services which are accessible free of charge. However, only few studies have been published aiming at increasing physical activity through personal approaches in Finnish primary health care. In the study by Miilunpalo (1989) the effects of individual physical activity counseling supplemented with fitness testing was examined in two municipality samples (N=194 and N=38). In both of them, at least one follow-up visit with the opportunity for fitness retesting was offered. The findings showed that self-reported physical activity increased as a result of counseling, but only modest improvements were discovered in fitness test results. Intensive counseling supported by fitness testing was therefore not recommended as a standard procedure in promoting physical activity in health care setting especially due to the high resource demands.

Other Finnish studies do not yield additional information on the feasibility and effectiveness of the approaches. For example, the study by Hirvensalo et al. (2003) retrospectively examined whether receiving physical activity advice from a health care professional was related to exercise participation among elderly people. The Finnish Diabetes Prevention Study (DPS) by Tuomilehto et al. (2001), which focused on reducing the incidence of type 2 diabetes, reported the combined effects of physical activity and dietary guidance. The interventions conducted in worksite settings have primarily been targeted at improving work ability or reducing work-related musculoskeletal problems with exercise regimens (e.g. Nurminen et al. 2002, Perkiö-Mäkelä 1999, Pohjonen and Ranta 2001, Sjögren et al. 2005).

To summarize, more studies are needed on the feasibility, effectiveness and dissemination of personal approaches to promote physical activity in primary health care in Finland as well as in other countries.

2 AIM OF THE STUDY

The purpose of this study was to produce more scientific evidence about the feasibility, effectiveness and dissemination of personal approaches to promote physical activity of working aged adults in Finnish primary health care.

This was achieved by

- 1) examining the feasibility and effectiveness of four selected personal approaches to promote LTPA in primary health care settings (I-IV)
- 2) evaluating nationwide dissemination of one of the approaches (V)

For feasibility and effectiveness, two randomized controlled interventions and one non-randomized controlled intervention were conducted during the period 2000–2005 in primary health care units in Southern Finland. For dissemination, a multi-organizational program (Physical Activity Prescription Program) was evaluated. The overview of the interventions and publications of the study are shown in Figure 1.

Intervention 1

Individual face-to-face counseling with and without fitness testing in occupational health care 2000–2002

Article I: Aittasalo M, Miilunpalo S, Suni J. The effectiveness of physical activity counselling in a work-site setting. A randomized, controlled trial. *Patient Education and Counseling* 2004;55:193–202.

Article II: Aittasalo M, Miilunpalo S. Offering physical activity counselling in occupational health care – does it reach the target group? *Occupational Medicine* 2006;56:55–8.

Intervention 2

Physical Activity Prescription by physicians and self-monitoring with a pedometer and a logbook in health centers and occupational health care 2002–2004

Article III: Aittasalo M, Miilunpalo S, Kukkonen-Harjula K, Pasanen M. A randomized intervention of physical activity promotion and patient self-monitoring in primary health care. *Preventive Medicine* 2006;42:40–6.

Intervention 3

Individual face-to-face counseling supported with optional supervised group exercise in maternity and child health care 2003–2006

Article IV: Aittasalo M, Pasanen M, Fogelholm M, Kinnunen T, Ojala K, Luoto R. Physical activity counseling in maternity and child health care – a controlled trial. Submitted.

Program evaluation

Physical Activity Prescription Program (PAPP) 2001–2004

Article V: Aittasalo M, Miilunpalo S, Ståhl T, Kukkonen-Harjula K. From innovation to practice: initiation, implementation and evaluation of a physician-based physical activity promotion program in Finland. *Health Promotion International* 2007;22:19–27.

FIGURE 1 Overview of the interventions and publications of the study.

3 REVIEW OF THE LITERATURE

3.1 Definitions of the study concepts

3.1.1 Health promotion, health education and the personal approach

In the Ottawa Charter (WHO 1986) health promotion is defined as “a process of enabling people to increase control over, and to improve, their health”. Several other definitions have also been introduced resulting, according to Coombes and Thorogood (2004, p. 4), from the large variety of definitions of health. Rootman et al. (2001, p. 10) have listed the definitions of health promotion they consider to be among the most important. They conclude that in most of them the ultimate goal or outcome is health or well-being but there is considerable variation in objectives, processes and activities. However, they further summarize that the primary criterion for health promotion is the extent to which it empowers individuals or communities in the enabling process. In this context disease prevention, too, can be carried out in a health promoting way. This is in line with a recent Finnish publication on the concepts of health promotion (Savola and Koskinen-Ollonqvist 2005).

In most health promotion definitions it is acknowledged that both behavior and environment affect health (Bartholomew et al. 2006, p. 9). Green and Kreuter (1999, p. 27) define health promotion as “the combination of educational and ecological supports for actions and conditions of living conducive to health”. They introduce two approaches to health promotion: ecological and educational (Green and Kreuter 1999, p. 19). By ecological approach they mean the interaction of behavior and environment whereas the educational approach merely represents health education aiming “primarily at the voluntary actions people can take on their own part, individually or

collectively, for their own health or the health of the others and the common good of the community". The role of the educational approach is to provide a favorable ground for changing social structures and ecologies. Thus, health education includes not only actions for changing behavior at individual level but also actions at organizational, policy, economic, environmental, media and community level (Glanz et al. 2002, p. 9). Health education is an essential and major component of health promotion (Tones and Tilford 2001, p. 2) and can be considered as the primary strategy of health promotion (Green and Kreuter 1999, p. 19).

A strategy can be seen as a combination of methods, approaches, and techniques that may be used to affect determinants of behavior (Green et al. 1980, p. 86) or a way of organizing, operationalizing and delivering the intervention methods (Bartholomew et al. 2006, p. 19). Hence, several methods are needed to form a strategy. In the strategy of health education, methods are theory-based techniques to influence behavior or environmental conditions (Bartholomew et al. 2006, p. 19).

Laitakari and Miilunpalo (1998) present information-giving, social planning, goal-setting, peer support and relapse prevention as examples of health education methods. They moreover suggest that the level on which the methods are applied – personal, interpersonal, population at large, civic activity, organizational, institutional – affects the selection of approaches. For example, at personal level two primary approaches, individual counseling and mail or telephone contacts are introduced. The primary goal of the approaches at the personal level is to promote individual behavior change while the approaches at other levels focus more on widespread behavior change including social network, environment, community norms, as well as policies and legislation (King 1998).

3.1.2 Models explaining physical activity

Gochman (1997, p. 3) has defined individual health behavior as "those personal attributes such as beliefs, expectations, motives, values, perceptions, and other cognitive elements; personality characteristics, including affective and emotional states and traits; and overt behavior patterns, actions and habits that relate to health maintenance, to health restoration, and to health improvement". Many models have been developed to explain the determinants of different health behaviors at individual level. The ultimate purpose has been to find the best way to change the behaviors in more healthy direction. The models, which have received empirical support in physical activity are Health Belief, Protection Motivation, Reasoned Action, Planned Behavior, Operant Conditioning, Social Cognitive, Decision Theory, Relapse Prevention and Motivational Interviewing and the principle of "Stages of Change" in the Transtheoretical Model (Marcus et al. 1996). The more specific features of the models have been outlined in Table 1. Some determinants consistently associated with physical activity have been recognized. They include social support, past adult exercise, self-efficacy,

expected benefits, perceived barriers, intention to exercise, exercise enjoyment and moderate-intensity exercise (Marcus and Forsyth 1999).

TABLE 1 Features specific to the most common behavioral models applied to physical activity. Adopted from Marcus et al. (1996).

Model	Specific feature
Health Belief	Four types of beliefs influence health behaviors: perceived susceptibility to develop health problems, perceived impact of the health problem to individual's life, beliefs about the benefits of physical activity, benefits versus costs of physical activity
Protection Motivation	Four cognitive processes predict physical activity: perceived severity of negative event, perceived vulnerability to the negative event, perceived benefits of physical activity, individual's belief in their ability to engage in physical activity (self-efficacy).
Reasoned Action	Individual's intention to perform physical activity will predict whether physical activity is actually performed. Intention is comprised of two factors: individual's attitude (benefits and costs) and social factors (support from family, friends etc.) toward physical activity.
Planned Behavior	Previous added with perceived behavioral control; individual's perceived ability to engage physical activity vary across situations and depends on resources, opportunities and skills.
Operant Conditioning	Exercise can be modified by using antecedents, consequences and self-management techniques.
Social Cognitive	Environment and personal factors interact bi-directionally as determinants of physical activity.
Decision Theory	Relates to the comparison of perceived benefits and costs of being physically active.
Transtheoretical Model	Integrates current behavioral status with a person's intention to maintain or change their pattern of behavior. The core of the model is the 5 stages of readiness to change.
Relapse Prevention	Individual's ability to maintain a new behavior is influenced by the ability to cope with relapses.

Regarding behavior change, one of the frequently used models in physical activity is the Transtheoretical Model (Prochaska and DiClemente 1983), which integrates prevailing behavioral status with the intention to maintain or change behavior. The model was originally developed for promoting smoking cessation and merely attempts to explain how, rather than why, behavior change happens (Adams and White 2003). The essential part of the model is the construct of stages, which indicates the readiness for behavioral change, "stages of change". In physical activity six stages are introduced: precontemplation, contemplation, preparation, action, maintenance and termination (Prochaska and Velicer 1997) (Table 2). Ten social and psychological processes are thought to be important in

transition through the stages (Adams and White 2005). The relapses are part of the change process making it circulatory but the probability of their occurrence varies according to the stage. A systematic review on the effectiveness of the stage-matched interventions applied to physical activity found no evidence for an effect on the level of physical activity (van Sluijs et al. 2004a).

TABLE 2 Stages of behavior change in physical activity (Prochaska and Velicer 1997).

Stage	Definition
Precontemplation	No intentions to make changes within the next 6 months.
Contemplation	Intention to change behavior within the next 6 months.
Preparation	Intention to change behavior within the next month + plans for action. Suitable target group for physical activity promotion.
Action	The change has been adopted but it has lasted less than six months.
Maintenance	The change has been maintained more than six months mostly by avoiding relapses
Termination	The change has been adopted so well that there is no fear for relapses. Unrealistic for most people.

No single model, however, has been proved to be sufficient to explain human behavior (Green and Kreuter 1999, p.154, Marcus et al. 1996, Marcus et al. 1998). Physical activity may also be too complex a behavior for creating one single theory with measurable components (Bauman et al. 2002). Green et al. (1980) developed a broader framework where the theories underlying the various models can be applied to planning and evaluating health promotion programs. The framework attempts not to explain behavior change but merely to provide a structure for applying different theories so that the most appropriate intervention strategies can be identified and implemented (Carlson Gielen and McDonald 2002).

According to the framework, health behavior comprises three determinants: predisposing, enabling and reinforcing factors (Green et al. 1980, p. 71). In identification and intervention both the behavioral and ecological (environmental) aspects are considered. Predisposing factors include, for example, knowledge, attitude, beliefs and values and can either strengthen or weaken the motivation for behavior. Enabling factors represent the skills and resources necessary to perform a health behavior and can thus either facilitate or act as a barrier to health behavior. Reinforcing factors are related to the positive or negative feedback received from the behavior. The determinants have been applied to physical activity in Figure 2.

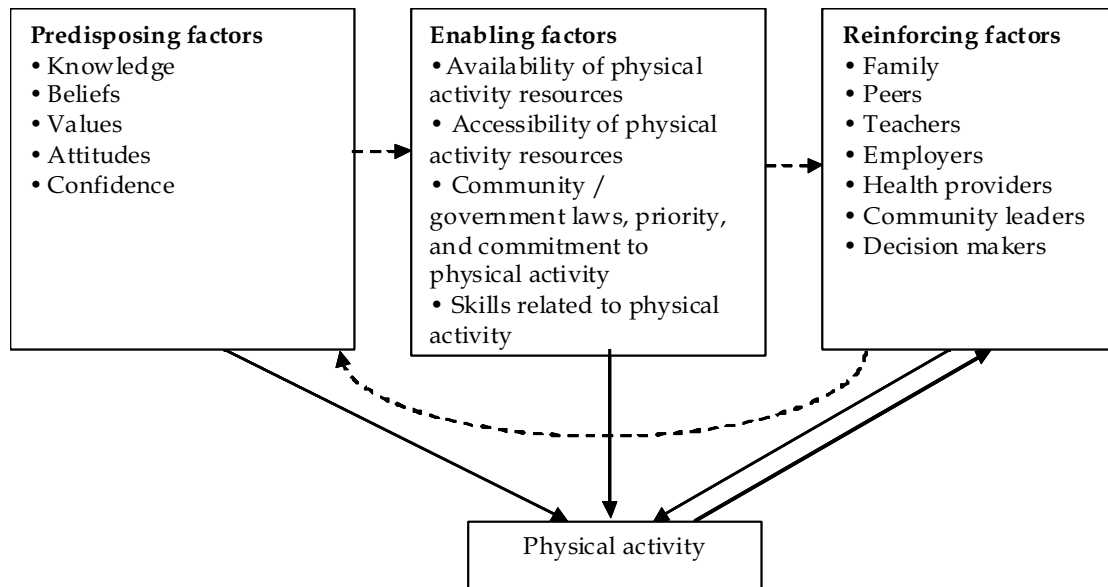


FIGURE 2 Factors determining physical activity behavior. Modified from Green et al. (1980)

Laitakari and Miilunpalo (1998) incorporate in a practical way the Stages of Change model and Green's determinants of behavior. They state that predisposing, enabling and reinforcing factors dominating vary according to the stage of adoption: in the early stages the most relevant determinants are predisposing factors while in the later stages enabling and reinforcing factors become more dominant. They also propose a variety of promotional methods related to the different determinants.

3.1.3 Physical activity recommendations for health

Physical activity can be defined as "bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level" (U.S. Department of Health and Human Services 1996). Until the 1990's physical activity and exercise were considered synonymous and their main objective was to improve cardiorespiratory fitness. In 1990 it was stated for the first time in the official recommendations that the quantity and quality of exercise needed to attain health-related benefits may differ from what is recommended for gaining fitness benefits (ACSM 1990). Thus, a need to publish a statement for physical activity deriving health benefits was acknowledged. To develop and maintain cardiorespiratory fitness it was recommended that healthy adults should be engaged in moderate to very heavy-intensity aerobic exercise (60–90% of maximum heart rate) for 20–60 minutes continuously 3 to 5 times weekly. For muscular fitness 8–12 repetitions of 8–10 exercises on at least twice a week was considered minimum. This recommendation remained almost unchanged in the 1998 revision (ACSM 1998).

In 1995 the fitness-oriented recommendation was complemented with a recommendation on the types and amounts of physical activity needed for

health promotion and disease prevention (Pate et al. 1995). The main message was that less intensive physical activity performed with higher frequency can be beneficial to health especially by decreasing the mortality rate and the risk for coronary heart disease. By summing up the evidence it was concluded that in adults the positive health effects were achieved by accumulating 30 minutes or more (continuous or bouts of 8–10 minutes) of moderate-intensity physical activity corresponding to brisk walking on most days of the week (Pate et al. 1995, U.S. Department of Health and Human Services 1996). In Finland, The UKK Institute for Health Promotion Research became the primary advocate of the recommendation and the first edition on health enhancing physical activity was published in co-operation with The Ministry of Education and The Ministry of Social Affairs and Health Finland in 1996 (Vuori 1996). The new edition of the book was published in 2005 (Fogelholm and Vuori 2005).

The decreased intensity requirements and the option for accumulating short bouts broadened the concept of traditional exercise and widened the variety of “acceptable” physical activity patterns from fitness oriented modes to modes which could be integrated into everyday life such as walking to work, gardening and household activities. In this sense, the access to physical activity was improved. The adherence to physical activity with high frequency may also be better than to physical activity with high intensity (Perri et al. 2002).

The physical activity recommendation for health was updated in 2007 (Haskell et al. 2007). Regarding general adult population the updated recommendation identified five days per week as the recommended minimum, incorporated vigorous-intensity physical activity and muscle-strengthening activities into the recommendation, specified that moderate and vigorous-intensity activities are complementary, stated that the recommended activity is in addition to routine activities of daily living and defined a 10 minute bout as the minimum length of short bouts.

In addition to general recommendations, several other statements concerning physical activity in various diseases or age groups have been released. Recently, criticism has been voiced that there are too many messages on physical activity and they are not consistent, limiting their acceptance by the general public and health practitioners. To decrease the possible confusion two alternatives have been suggested: 1) targeting progressive recommendations according to audience’s current physical activity patterns or 2) base the recommendations on the internal response of the individual, such as heart rate, breathlessness and ratings of perceived exertion (RPE). (Shephard 2004). Also, practical illustrations have been developed to clarify the contents of the general messages. One of them is the “physical activity pie” introduced by the UKK Institute for Health Promotion Research (Fogelholm et al. 2005). It aims to demonstrate that the benefits for health or fitness are not mutually exclusive and the health benefits can be achieved with different combinations of physical activity adjustable to the individual’s abilities, preferences, possibilities and needs. The “Physical Activity Pyramid” (e.g. Martin et al. 2003) is another example of such illustrations.

Due to the broader perspective, exercise is nowadays generally considered one of the subcategories of physical activity (Howley 2001, U.S. Department of Health and Human services 1996). In fact, physical activity can now be defined as "Both exertion during routine daily activities and exercise for the sake of enhancing fitness" (Jacobson et al. 2005). The context in which physical activity occurs is often used for more specific categorization. The most common categories are occupational, household, transportation or leisure time. Leisure time physical activity (LTPA) can further be divided into subcategories such as competitive sports, recreational activities and exercise training. (U.S. Department of Health and Human Services 1996). A classification for promotional purposes has also been developed (Marttila et al. 1998). It includes five categories: occupational activity, lifestyle activity, recreation activity, fitness activity and sport activity. The latter is further divided into subcategories "sports as a hobby" and "competitive sports".

In Finland, questions on physical activity have been included in several population-based studies. Due to the differences in eliciting physical activity, none of them exclusively is able to show the proportion of Finns meeting the physical activity recommendation for health. In a recent publication the information from the population studies on lifestyle, commuting and leisure time activities has been brought together (Fogelholm et al. 2007b). As a result, it was roughly estimated that 35–40 percent of working aged Finns are insufficiently physically active for their health.

3.1.4 Primary health care

According to Glanz et al. (2002, p. 12) health education is particularly relevant in six major settings: schools, communities, worksites, homes, consumer marketplaces and health care sites. The primary health care setting is considered of special importance because it provides an opportunity to reach a substantial number of people (Campbell et al. 1994).

The World Health Organization (WHO 2003) defines primary health care as a set of principles and core activities which have clear imperatives for 1) reducing excess mortality of poor marginalized populations, 2) reducing the leading risk factors to human health, 3) developing sustainable health systems and 4) developing an enabling policy and institutional environment. The set of principles, core activities and strategic imperatives are proposed in the 1978 Declaration of Alma-Ata (WHO 1978). From the health promotion point of view among the most critical principles is "Address the main health problems in the community, providing promotive, preventive, curative and rehabilitative services".

In Finland, primary health care services include prevention of diseases, medical examinations and screening, maternity and child health care, school, student and occupational health care, dental health care, medical care, home nursing, rehabilitation, mental health services with certain qualifications and ambulance service. These services are provided by municipal health centers.

(Ministry of Social Affairs and Health 2004). In 2005 there were altogether 257 health centers maintained by one municipality or a federation of municipalities (www.kunnat.net). In addition to outpatient services, most of the health centers also have a ward for inpatients. Outpatient services at health centers, the visits to maternity or child health clinics, appointments with a public nurse, and laboratory and X-ray examinations are free of charge. Also, persons under 18 years of age are not charged for the services. Otherwise, a single or annual payment can be charged up to an annual ceiling of 590 Euros. (Ministry of Social Affairs and Health 2004).

The subsidy system regarding Finnish primary health care was reformed in 1993 reducing central governmental control and increasing the autonomy of municipalities to organize their primary health care services. As a result, an option to purchase services from private sector providers also became possible. (Häkkinen 2005). By 2002, this had been most commonly utilized in the field of physiotherapy, surgery, occupational health care and laboratory services (Ministry of Social Affairs and Health 2004). In this respect, services similar to those provided in municipal health centers but delivered by business enterprises can be included in primary health care. Thus, primary health care refers to the services allocated to the municipal health centers but also provided by private clinics.

The provision of health counseling is greatest in the occupational health care and maternity and child health care (Miilunpalo et al. 1995) and therefore, the practices should be especially developed there. However, outpatient visits to physicians play an important role in health counseling because they are visited especially by those exposed to health risks.

Occupational health care

The traditional task of occupational health care (OHC) has gradually widened from the prevention of work-related diseases and accidents to health promotion. In Finland, employers are obligated by the Occupational Health Care Act (amended in 2001) to provide all their employees with preventive health care. Arranging medical care and other health services is voluntary. Thus, all employees in Finland, also those with health risks, are within the services of preventive OHC.

The services are easily accessible because they are free of charge to all employees. The employers are reimbursed for 50 percent of the occupational health care costs by the Social Insurance Institution. The employers may provide the services through municipal health centers, independently or by purchasing them from a private OHC clinic. (Ministry of Social Affairs and Health 2004).

Most employers offer the services of a physician and a public health nurse. Physiotherapy and psychology services are the next most frequently offered. Practically all public health nurses and 86 percent of the physicians are specialized in occupational health care. (Pirainen et al. 2003). OHC has, therefore, expertise in producing services that meet the needs of employees.

Recently, it seems that the importance of linking OHC to physical activity promotion has been advocated more in Finland. For example, during 2007, two separate publications on the topic were released (Fogelholm et al. 2007a, Aura and Sahi 2007).

Maternity and child health clinics

Practically all pregnant and postpartum women use the municipal maternity and child health care services in Finland (Hakulinen-Viitanen et al. 2005). In the maternity clinics the recommended number of visits is 11–15 for primiparous women and 7–11 visits for women with earlier deliveries (Viisainen 1999). In the child health clinics the recommended number of checkups during the child's first year is 10 and the total number of visits is 16 before school starts at the age of 7 years (Ministry of Social Affairs and Health 2004). In both maternity and child health clinics most of the scheduled visits are made to a public health nurse.

For the continuity of the services, the maternity and child health clinics are usually combined and may be located in the health center. However, especially in large municipalities, there may be several clinics to make the services more accessible. In that case, the clinics may also be situated elsewhere than in health centers.

Due to the high attendance rates and accessibility of the services and to the individuality and continuity of the contacts, maternity and child health care clinics provide an optimal context for promoting physical activity not only among pregnant and postpartum women but also among young children and entire families.

Outpatient visits to physicians

The health centers offer consultations with physicians for both acute and non-acute health problems and examinations. The physicians are mainly general practitioners or specialized in general medicine or occupational medicine (The Finnish Medical Association 2006). Approximately half of the health centers follow a population-based system, in which a team of physicians and nurses is responsible for a geographically specified population (Häkkinen 2005). As with maternity and child health care, depending on the size of the municipality, the services may be provided in one single health center or be distributed to several units.

In 2006, approximately 60 percent of the Finnish population in different age groups used physicians' outpatient services and the average number of visits per patient was 2.6 ([www.stakes.fi/tilastot/avohoidon lääkärikäynnit ja lääkäriin potilaat ikäryhmittäin](http://www.stakes.fi/tilastot/avohoidon_lääkärikäynnit_ja_lääkäriin_potilaat_ikäryhmittäin)). However, fewer than 30 percent of physicians' appointments include counseling on physical activity (Miilunpalo et al. 1995). Similar findings have been presented in international studies (Anis et al. 2004, Podl et al. 1999). This indicates that physicians' consultations are underused reserve in physical activity promotion.

3.1.5 Feasibility

In intervention evaluation, feasibility involves the question of whether the intervention can be replicated in a given setting. It then includes costs as well as non-monetary resources such as expertise, training required for intervention staff, interest, and cultural considerations. (Jackson and Waters 2005). Some consider feasibility a synonym for applicability, which questions how the intervention could be implemented in a setting regardless of the outcome and suggest that the attributes of feasibility are intervention-specific (Wang et al. 2006).

However, the feasibility of the approaches used in health promotion seem much more unclear. Most commonly, as in the studies by Albright et al. (2000), Jimmy and Martin (2005), Long et al. (1996), Pinto et al. (1998) and van Sluijs et al. (2004), feasibility represents the acceptability and usability of the approaches and is elicited from health care providers by questionnaires or interviews. Some approaches to feasibility, especially physician referrals to physical activity, include patient participation, views and compliance (e.g. Gidlow et al. 2005, Jimmy and Martin (2005), Pinto et al. 1998, Wormald et al. 2004).

Four components suitable for evaluating the feasibility of the approaches rather than entire interventions can be drawn from the guidelines on conducting systematic reviews (Jackson and Waters 2005): 1) integrity, 2) participant responsiveness, 3) applicability and 4) safety. *Integrity* can be seen as a precondition for the approach to be effective: The odds of having any effects are small if the approach is not implemented as intended. *Participant responsiveness* is essential because without participants being satisfied with the approach or experiencing benefits from it the changes in physical activity behavior may less likely to happen. *Applicability* represents the practitioner's view of the acceptability and suitability of the approach to the routine practices and may enhance the dissemination of the approach. *Safety* is self-evidently included, especially if the participants are vulnerable to adverse events.

3.1.6 Effectiveness

In health promotion and education, effectiveness can be defined as "the extent to which the intended effect or benefits that could be achieved under optimal conditions are achieved in practice" (Green and Kreuter 1999, p. 505). Similarly, according to Jackson and Waters (2005), effectiveness studies provide information about the effects of an intervention under real world conditions while efficacy is determined under more ideal conditions, such as laboratories (Estabrooks and Gyurcsik 2003, Jackson and Waters 2005, Tones and Tilford 2001, p. 119). Effectiveness can also be defined as the extent to which the program objectives have been achieved whereas efficacy refers to relative effectiveness, indicating how well the program has succeeded compared to another program (Tones and Tilford 2001, p.116).

Commonly, the objectives of health education are related to health behavior change (Liedekerken 1990, p.18). Green and Kreuter (1999, p. 234) consider that the changes in the determinants of behavior and behavior itself are the immediate impacts of health education and therefore call this level of evaluation “impact evaluation” (Figure 3). The changes in health or quality of life are presumed to follow after behavior change (Green and Kreuter 1999, p. 232; Whitlock et al. 2002) and this level of evaluation is called “outcome evaluation” (Green and Kreuter 1999, p. 234; Tones and Tilford 2001, p. 125).

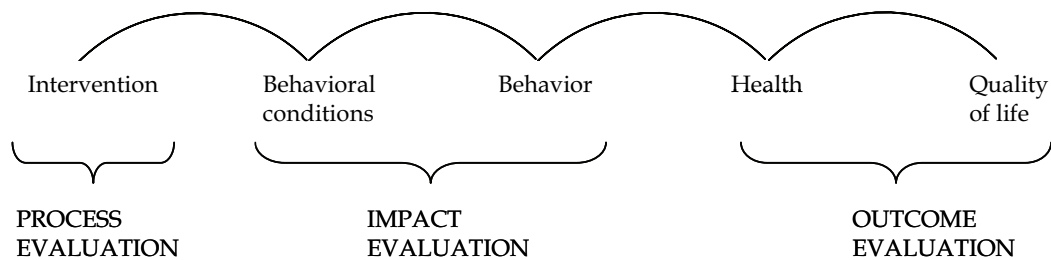


FIGURE 3 Levels of evaluation in health education. Modified from Green and Lewis (1986) and Liedekerken (1990)

The objectives are put into measurable form with *indicators*. According to Green and Lewis (1986, p. 69) indicators are “observable phenomena that are inferred measures of concepts or constructs”. In other words, indicator is a measurable phenomenon which illustrates the effects of the intervention. Different *criteria* can be used to determine the success of an intervention (Liedekerken 1990, p. 33). Green and Lewis (1986, p. 174) call these criteria standards of acceptability. When comparing an experimental group against a control group, the term “normative standard” is used because the measures of impact taken on one group are the norm against which the measures on the other group are compared. In the comparison, a statistical significance test may be used as the criterion. (Green and Lewis 1986, p. 174).

The next step is to *measure* how well the selected criteria are fulfilled. For an outcome measure to be credible it has to be valid, reliable, and appropriately sensitive. Validity of the measure means the extent to which it measures what it is intended to measure. Reliability of a measure is the extent to which the measure produces the same results when used repeatedly to measure the same thing. It may vary according to the sample of respondents and the circumstances of measurement. Generally reliability coefficients of .90 or above are considered good for keeping measurement error small. Sensitivity of the measure is the extent to which the values on the measure change when there is a change or difference in what is being measured. (Rossi et al. 2004, p. 218–22).

Selecting the *time-scale* is one of the most critical points of effectiveness evaluation – some of the effects may occur almost immediately and some only after longer period of time (Liedekerken 1990, p. 45). Thus, measuring effects at the wrong time point can lead to misinterpretation of the results. As an example,

Liedekerken (1990) presents the so called "dropping off" phenomenon in health education related to smoking, diet behavior and drug abuse: the effects are seen clearly immediately after intervention but "after a while people revert back to their old behavior".

The intensity and time-scale of the effects can also vary between individuals (Green and Johnson 1996). According to the model of Diffusion of Innovations by Rogers (2003, p. 281), after introducing a new innovation or practice, the distribution of adoption among the population follows the shape of the normal curve and the population can be categorized into "innovators", "early adopters", "early majority", "late majority" and "laggards" on the basis of their innovativeness (Table 3).

TABLE 3 Adopter categories (Rogers 2003).

Category	Characteristics
Innovators	2.5% of population; venturesome, launch the new idea in the system, a gatekeeper in the flow of new ideas
Early adopters	13.5% of population; respected, make judicious decisions, put their stamp of approval on a new ideas
Early majority	34% of population; deliberate, adopt new idea just before the average member, location makes them an important link in the diffusion process, seldom lead
Late majority	34 % of population; skeptical, adopts new ideas just after the average member, pressure of peer is needed for adoption
Laggards	16% of population; traditional, suspicious and cautious in adopting innovations, are often isolates in the social system

Furthermore, as shown in Figure 4, the rate of adoption follows an S-shaped curve. These principles of adopting innovations also apply to the adoption of new behavior in a population or social system (Green and Kreuter 1999, p. 179). As a result, the effects of health education should be examined at several time points.

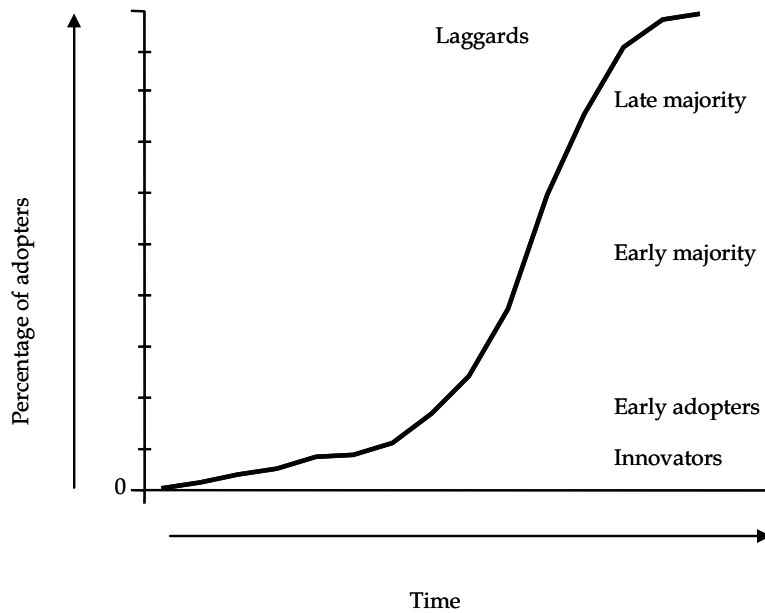


FIGURE 4 Rate of adoption regarding new innovation (Rogers 2003, p. 272–81)

3.1.7 Dissemination

Dissemination is something someone does to make potential adopters aware and favorably disposed towards the innovation (Bartholomew et al. 2006, p. 132). It can also be defined as “the transfer of new programs and practices” (King et al. 1998a) or the process of communicating information through defined channels in order to reach various target groups (Bauman et al. 2006). Sometimes a difference is made between the terms dissemination and diffusion (Rogers 2003, p. 6). Dissemination most commonly refers to a process with directed and managed efforts to spread an innovation and diffusion to more spontaneous and unaided adoption of practices (Davis and Taylor-Vaisey 1997, Rogers 2003, p. 6).

It is generally acknowledged that the body of knowledge concerning the dissemination of new ideas or innovations lies in the model of Diffusion of Innovations by Rogers (2003). In addition to classification of adopters and rate of adopting an innovation, which were introduced in Table 3 and Figure 4, five attributes of innovations are introduced that influence their dissemination. They are 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability and 5) observability (Rogers 2003, p. 219). To summarize, the dissemination is more likely to succeed if the innovation is perceived to be superior and compatible with current practice, easy to understand and to try out and produces visible results. Berwick (2003) introduces seven rules for disseminating innovations specifically in health care: 1) search for sound innovations, 2) search and support innovators, 3) invest in early adopters, 4) make the activity of early adopters observable, 5) enable reinvention, 6) create slack for change and 7) lead by example.

In the dissemination process five stages have been identified: knowledge, persuasion, decision, implementation, and confirmation (Rogers 2003, p. 169). One purpose of the stages is to help in understanding the role of different communication channels or dissemination strategies at each stage (Rogers 1983, p. 197). The selection of dissemination strategies and methods is affected by the arena (policy, practice, users) in which it is being aimed at (Lewando-Hundt and Al-Zaroo 2004). Training, journal publications, new information techniques, personal face-to-face contacts, participation in decision-making structures and collaborative programs are widely used strategies in changing health care clinicians' practices (King et al. 1998a).

3.2 Current practices to promote physical activity in primary health care

In this section the current physical activity promotion in Finnish primary health care is first described. The results are then reflected against the findings in other countries. Finally, supplementary information obtained from studies conducted in other countries is presented although it may not be applicable as such in Finland. The information may, however, bring about issues which may also be valuable in Finnish primary health care.

In Finland, the provision and practices of health counseling in primary health care rely heavily on one survey conducted in 56 randomly selected health centers in 1987 and involving physicians (N=211), nurses (N=214) and physiotherapists (N=156) (Laitakari et al. 1989).

According to the survey, health professionals' attitudes towards promoting physical activity were favorable (Laitakari et al. 1989). However, the favorable attitudes seemed not to be reflected health care professionals' practices: only 13 percent of physicians', 31 percent of nurses' and 48 percent of physiotherapists' contacts included physical activity counseling (Miilunpalo 1989). The provision of physical activity seemed thus dependant on provider type (Miilunpalo et al. 1995).

The setting also affected the provision of counseling. Among physicians, physical activity was most often discussed in occupational health care and among nurses in maternity health care (Miilunpalo 1989, Miilunpalo et al. 1995). In more recent survey of approximately 12 000 physicians, discussions on physical activity were still most common in occupational health care (Ståhl et al. 2004). Regarding other health professionals, no comparable data on current situation are available. However, the study by Piirainen et al. (2004), which was based on public health nurses' self-reports, indicates that physical activity is often discussed in maternity and health care contacts.

Advice on physical activity was more frequent in patients with health risks, the time spent on patient contact was positively related to the likelihood of raising physical activity issues and the probability of physical activity

discussions increased with the number of individual patient's visits (Miilunpalo 1989). The latter could be explained by the fact that knowing the patient makes it easier to raise the subject. In the more recent study, age and gender differences in physical activity counseling were also observed: female and older physicians discussed physical activity more often than men and younger physicians (Ståhl et al. 2004).

According to the 1987 survey, among all the professionals, brief advice was the most common method in promoting physical activity. The average time for discussion was 6 minutes for physicians, 12 minutes for nurses and 13 minutes for physiotherapists. The time comprised approximately one half of the nurses' and one third of the physicians' and physiotherapists' entire appointment time (Miilunpalo 1989). Among physicians, brief advice still seems the most common method (Ståhl et al. 2004).

Furthermore, the practices were quite expert-centered and were mostly connected to the treatment or prevention of diseases. Values not related to health were not widely used in facilitating behavior change. (Laitakari et al. 1997). It seems that these findings are still valid: in a study by Poskiparta et al. (2006), where 129 dietary and physical activity counseling sessions between 17 patients and their nurses and physicians were videotaped, similar problems still dominated. Also, in a study by Pirinen (2007), where the health counseling practices of 20 occupational nurses were videotaped, high expert-centeredness was discovered. Nevertheless, patients seem to appreciate physical activity counseling in health care setting (Ståhl et al. 2004, Talvi et al. 1999).

In the 1987 survey the practices varied across the professional groups and individual practitioners. Also, the use of formalized instruments was rare. (Laitakari et al. 1997). Physicians seldom gave specific advice on physical activity or used written material to support verbal communication. Moreover, referral to other health care personnel or exercise specialists was rare. In comparison with physicians and nurses, physiotherapists seemed to use the widest variety of methods, such as skills training and visual models. (Miilunpalo et al. 1995). It was also shown that the longer the contact time, the greater the proportion of using conversation as a counseling method instead of brief advice (Miilunpalo 1989).

The findings on physical activity counseling in Finnish primary health care are in line with results reported in other countries, mostly in the U.S. They also indicate that the attitudes of the professionals towards physical activity counseling are favorable (Douglas et al. 2006, Lawlor et al. 1999) and that the importance of physical activity for health is well-acknowledged (Lawlor et al. 1999, McAvoy et al. 1999, Rogers et al. 2002) but that the provision of physical activity counseling is generally low, 16–20 percent in physicians (e.g. Anis et al. 2004, Lin et al. 2005, Podl et al. 1999). As in Finland, physical activity counseling appears more frequent among other health professionals than physicians (Douglas et al. 2006, Hopkins et al. 2005), is targeted most often at patients at risk (Eakin et al. 2007, Lawlor et al. 1999, Ma et al. 2004, Podl et al. 1999, Wee et al. 1999) and is more probable during longer visits (Ma et al. 2004, McKenna et

al. 1998). Similarly, established patient relations seem to facilitate counseling (Wee et al. 1999) although there are contradictory studies showing that counseling on exercise may be more frequent with new patients (Anis et al. 2004, Beaudoin et al. 2001). Furthermore, the use of formalized instruments is rare (Devereaux Melillo et al. 2000) and at least among physicians, written material or referrals are seldom utilized (Bull et al. 1997, Glasgow et al. 2001). Like the Finnish experiences, counseling also seems to lack patient-centeredness (Douglas et al. 2006) especially in goal setting (Parry 2004) but the patients seem still to appreciate physical activity counseling (Harting et al. 2006, Pinto et al. 1998, Richmond et al. 1996).

Plenty of supplementary information not available in Finland can be also obtained from studies conducted abroad. Interestingly counseling on physical activity was found to be more frequent in private sector clinics than in primary health centers in a retrospective chart review of 1339 patients in the U.S. (Hopkins et al. 2005). The authors considered patient demographics and productivity requirements as primary reasons but saw lower numbers of patients per hour and higher billing expectations in private clinics as other possible explanations for more frequent counseling.

It has also been discovered that the personal exercise habits of the health practitioner may be associated with the frequency of physical activity promotion (Abramson et al. 2000, Brotons et al. 2005, McKenna et al. 1998) and that physicians' characteristics, such as appropriate weight, being a non-smoker and negotiativeness, may affect patients' willingness to comply with exercise recommendations (Harsha et al. 1996).

The most frequently mentioned barrier for not promoting physical activity has been shown to be lack of time, especially among physicians (Abramson et al. 2000, Ainsworth and Youmans 2002, Brotons et al. 2005). Other common barriers found among others than physicians, are lack of counseling skills and lack of confidence in promoting behavior change among patients (Ainsworth and Youmans 2002, Walsh et al. 1999, Yeager et al. 1996). There may also be insufficient knowledge about the current physical activity recommendations for health among both nurses and physicians (Devereaux Melillo et al. 2000, Douglas et al. 2006, Walsh et al. 1999) as well as among other practitioners (Douglas et al. 2006). This may partly result from the fact that physical activity as a beneficial management, for example, for cardiovascular disease is less mentioned in medical journals than the more traditional treatments (Dupen et al. 1999). Among many practitioners, the educational material has been felt to be insufficient for physical activity promotion (Douglas et al. 2006).

In summary, there are no systematic practices in promoting physical activity in the Finnish or other health care contexts and the practices vary across settings, professional groups and individual practitioners. Moreover, current practices lack patient-centeredness, which has been presented as one of the most important factor from the effectiveness point of view (Bull et al. 1999, Dunn et al. 1998, Nupponen 1998, Smith et al. 2000).

3.3 Feasibility and effectiveness of personal approaches to promote physical activity in primary health care

The purpose of this review is to link this study to earlier research on the feasibility and effectiveness of personal approaches to promote physical activity in primary health care. As OHC is considered as part of primary health care in Finland, worksite studies involving approaches suitable for OHC's practices are also included. To provide information which is comparable to this study studies involving working aged participants with no specific medical reasons for increasing physical activity are reviewed.

The approaches are situated under subheadings which describe the common features of the approaches. The subheadings are 1) individual face-to-face communication, 2) individual face-to-face communication supported by functional elements, 3) facilitation of physical activity with self-monitoring and 4) telephone, e-mail and Internet-based approaches. Regarding especially pedometer-based and mediated approaches, community or population studies are also referred to mainly to complement the information on effectiveness with feasibility aspects. For the same reason a few studies involving older adults are included.

Both original articles and reviews are included to broaden the perspective. The articles were retrieved by using the key concepts related to each particular approach and by combining them with the Boolean operator "AND" in PubMed. The reference lists of the articles retrieved have also been utilized. The search was regularly updated with the most recent publications during the writing process of the thesis. The last update covering all the approaches was done in the fall of 2007. However, some articles discovered after that have also been included.

3.3.1 Individual face-to-face communication

According to Miilunpalo et al. (1995) *brief advice* in face-to-face situations is the most commonly used approach in Finland to promote physical activity in primary health care. According to more recent studies this also applies to the current situation (Poskiparta et al. 2006, Ståhl et al. 2004). Brief advice turns into a more intensive form of communication, counseling, if it is goal-oriented and client-centered and is based on interpersonal interaction (Nupponen 1998). Most commonly it then involves a series of contacts.

The findings on the effectiveness of brief advice and counseling seem inconsistent: In some studies or subgroups intensive counseling with several contacts has been found more effective than brief advice (Estabrooks et al. 2003, Harland et al. 1999, Little et al. 2004, The Writing Group 2001) but promising results have also been obtained from interventions with brief advice only (Eakin et al. 2000, Steptoe et al. 1999). The latter finding gets some support from a recent randomized controlled trial conducted in the UK where the relative

effectiveness of three approaches with different intensiveness were examined at 10 weeks, 6 months and 1 year: physician's referral to a 10-week supervised group exercise program in a local leisure center (N=164), a 10-week instructor-led walking program (N=161) and tailored advice on physical activity including information on local exercise facilities (N=315) (Isaacs et al. 2007). According to the findings, all the approaches were able to increase physical activity but no between-group differences were discovered.

To sustain the positive effects achieved by brief advice or counseling, multiple strategies such as goal-setting, repeated visits, telephone contacts (Harland et al. 1999, Steptoe et al. 1999) and arranging follow-up (Glasgow et al. 2001, Hillsdon et al. 2005, King et al. 1998b, NICE 2006a, Simons-Morton et al. 1998) may be beneficial. According to Wankel et al. (1985) non-health-related goals may distinguish physical activity adherents from drop-outs and may be useful especially in facilitating continuation (Wankel 1993).

The findings on stage-matching or tailoring face-to-face communication are contradictory: In some studies (Eakin et al. 2000, Hillsdon et al. 2002) and reviews (Kahn et al. 2002, Petrella and Lattanzio 2002) tailoring has resulted in better effects than non-tailoring, but in other studies no such differences have been observed (Adams and White 2003, Naylor et al. 1999).

Written material seems to improve the effects of verbal communication (Kreuter et al. 2000a, Marshall et al. 2004, Swinburn et al. 1998). The use of tailored material especially is supported (Bull et al. 1999, Kahn et al. 2002, Kreuter et al. 2000b, Marcus et al. 1998, Marshall et al. 2003). According to Peterson and Aldana (1999) a tailored leaflet is more effective than a generic message. Leaflets which leave more flexibility to personal choices have been shown to be even more effective than face-to-face communication augmented with structured physical activity (Marcus et al. 1998). Using stage-matched printed material may also be more cost-effective than using "fit for all" material which was found in a study encouraging women to join a Pap Test Reminder Service (Paul et al. 2004). In a workplace setting, a written interactive material package based on the transtheoretical model of behavioral change was effective in increasing employees' walking in three large organizations compared to employees who did not receive the material at baseline (Mutrie et al. 2002). Similar results were obtained by Plotnikoff et al. (2007) although only among women employees when comparing stage-matched and standard material with a no-contact control group.

Physician referrals or prescriptions are the most common examples of written material tailored to personal needs. In recent years, programs related to physicians' referrals or prescriptions have been conducted in many countries. This is mostly due to the fact that physician services are used by the majority of populations yearly, in Finland by 82 percent (Helakorpi et al. 2004), but fewer than 30 percent of physician appointments include discussions about physical activity (Anis et al. 2004, Miilunpalo et al. 1995, Podl et al. 1999).

Examples of physician-based physical activity promotion programs are PACE (Physician-based Assessment and Counseling of Exercise) in the U.S

(Long et al. 1996), Green Prescription in New Zealand (Swinburn et al. 1998), Active Practice in Australia (Smith et al. 2000) and FaR (Fysisk aktivitet på recept) in Sweden (Kallings et al. 2007). The form of referral varies as does the amount of interaction skills required from the physicians. The effectiveness of the referrals or prescriptions used in the first three of the programs has been examined in the original health care settings (Calfas et al. 1996, Elley et al. 2003, Norris et al. 2000, Smith 2000). A summary of their results and of the most recent reviews (Cavill et al. 2006, Eakin et al. 2000, Hillsdon et al. 2005, Lawlor and Hanratty 2001, Marcus et al. 2006, Morgan 2005, Petrella and Lattanzio 2002, Sørensen et al. 2006) indicates that physician-based referrals can have at least short-term (≤ 8 weeks) effects on patients' physical activity. There are also indications of longer term effects (Elley et al. 2003). The PACE protocol has also been tested in The Netherlands, where it resulted in positive changes in some determinants of physical activity (Van Sluijs et al. 2005).

The feasibility of physician-based approaches has most commonly been evaluated by the physicians' compliance with the approach (Albright et al. 2000, Gribben et al. 2000, Long et al. 1996), by the ability of the approach to reach the potential patients (Harrison et al. 2005), by patients' views on the usability of the approach (Jimmy and Martin 2005, Sims et al. 2004) and by physicians' experiences of using the approach (Allenspach et al. 2007, Long et al. 1996, MacGregor et al. 2006, Swinburn et al. 1997, Van Sluijs et al. 2004b). According to a recent review patients consistently have a positive attitude towards the approach and it is generally well-accepted among physicians but the primary concern is the commitment of the physicians to the approach so that the majority of patients at risk could be reached (Sørensen et al. 2006). Most commonly, the main barrier among physicians to adopting the approach is lack of time (Eakin et al. 2005, Long et al. 1996, MacGregor et al. 2006).

In summary, no conclusive information on the benefits of brief advice or face-to-face counseling with or without stage-matching is yet available. However, tailored written material seems to improve the short-term impact of face-to-face communication but supportive actions are needed to sustain the effects. Physician-based referrals and prescription seem effective in short-term.

3.3.2 Individual face-to-face communication supported by functional elements

In the UK, referral by the physicians is supported by an opportunity to participate in a *planned exercise program* in a local leisure center (Department of Health, 2001). The few studies on the procedure show that by using the referral physical activity was increased among previously sedentary patients at eight months' (Stevens et al. 1998) and among all patients referred to exercise programs at six months' follow-up (Harrison et al. 2005). The patients' views on the referral were positive (Wormald and Ingle 2004) but the main problem was the poor attendance on exercise programs, which was partly "related to practical problems associated with attending leisure facilities" (Gidlow et al. 2005). In a

study conducted in the U.S. (N=132) both full subsidization of exercise costs and reporting on the compliance with the workouts to a third party by telephone increased adherence to physician-prescribed exercise program more than half subsidization and self-recording on compliance (Shepich et al. 2007). The results suggest that adherence to physician-prescribed exercise may be enhanced by financial incentives and personal support. According to Isaacs et al. (2007) referral to leisure centers did not cause more adverse effects than referral to advice or a walking group.

A similar scheme, Motion på recept, has been used in some parts of Denmark (Sørensen et al. 2007). It includes motivational counseling and group-based supervised training, where sedentary patients are referred by their general practitioner. The scheme comprises five counseling sessions over a period of ten months supported by 24 exercise training sessions over a period of four months. Scientific information on the feasibility and effectiveness of the scheme is not yet available.

Otherwise, using *group exercise* to support face-to-face communication in primary health care seems to be most common in rehabilitation or in promoting specific type physical activity among patients with medical conditions such as osteoporosis, cardiologic and pulmonary problems or low back pain. In an Australian study involving other than primary health care providers, pram walking groups were arranged for mothers of newborn babies to enhance peer support for physical activity (Watson et al. 2005). The group activity did not lead to desirable results. However, in an earlier review (Hillsdon et al. 2005) social support has been shown to be effective in supporting behavior change.

Free vouchers for local leisure centers have also been used to enhance face-to-face communication (Harland et al. 1999). According to the results, no additional effect of vouchers on physical activity was discovered compared with single or multiple contacts of motivational interviewing.

Accompanying *fitness assessment or tests* with physical activity promotion has been popular especially in workplace settings (Health Education Authority 1992) and has been proposed to be integrated into routine medical examinations, for example, in Canada (Jette and Quenneville 1992). In Finland, a specific testing protocol for promoting physical activity for health has been developed (Suni 2000). In health promotion, the purpose of fitness testing is to help the participants to identify their physical activity needs and to assist practitioners in targeting the actions for physical activity change. Therefore, individual feedback and an opportunity for retesting are often provided. In this sense, testing serves as a diagnostic and intervention procedure as well as educational tool (Jette and Quenneville 1992).

There are, however, only few studies about the effects of fitness assessment or testing on physical activity. In a study by Nutbeam and Catford (1985) conducted in a community setting in the UK and involving 380 volunteers, fitness testing resulted in an increase in physical activity levels among unfit participants at four-month follow-up. Fitness testing was also found to be an acceptable way of promoting physical activity. However, in the study by Godin

et al. (1987) implemented in Canada among randomly selected population in Quebec, fitness assessment had no benefits compared with health risk appraisal (Godin et al. 1987). A similar finding was obtained by Loughlan and Mutrie (1997), who compared the effects of conversation alone, information leaflet and fitness testing among hospital employees in the UK. They also concluded that fitness testing was an expensive approach to promote physical activity compared with conversation or an information leaflet.

A Finnish study using more functional and informative fitness tests showed that self-reported physical activity increased as a result of counseling but only modest improvements were discovered in fitness test results (Miilunpalo 1989). Intensive counseling supported by fitness testing was, therefore, not recommended as a standard procedure in promoting physical activity in the health care setting especially due to the high resource demands. However, the study did not include comparison with alternative approaches.

A more recent Dutch study by Proper et al. (2003a), conducted at a workplace, found that fitness testing with feedback was not able to change the behavioral stage of physical activity or to enhance the adoption of a more physically active lifestyle compared with the reference group. By contrast, although among elderly patients in Canada, Petrella et al. (2003) showed that counseling by physicians supported by an office-based step test (described in Petrella and Wight 2000) can produce significantly better results compared to counseling only. As to feasibility, no difference in perceived patient satisfaction was observed between the groups (Petrella and Wight 2000).

In summary, referral to local leisure centers in conjunction with face-to-face communication seems to encourage participants to increase their physical activity but similar consistency cannot be found regarding fitness testing. However, the number of studies on the effectiveness of fitness assessment in primary care is limited and the interpretation of the results is difficult because the contents of the testing procedures and supplementary actions vary across studies.

3.3.3 Facilitation of physical activity with self-monitoring

In recent years increasing interest has been expressed in the effectiveness of *self-monitoring* in promoting physical activity. Together with self-evaluation and self-reinforcement, self-monitoring is thought to help participants to develop their self-regulatory skills for behavior change. If applied to physical activity, at first, data on current physical activity is collected through self-monitoring. Then, self-evaluation is used in comparing the self-monitored data with some standard performance to judge the adequacy of current physical activity. Finally, self-reinforcement should take place to override the advantages of the current behavior with more powerful advantages of the behavior change (Tones and Green 2004, p.103–4).

The research on self-monitoring has targeted especially at the use of pedometers although encouraging results have also been published on the

physical activity diary (Speck and Looney 2001). However, the pedometer is simple to use, low cost and demands less staff resources than the approaches based on diary or face-to-face communication. Also, it gives immediate and direct feedback to the user and is quite reliable in measuring walking, which is the most common and accessible mode of physical activity for most people (Crouter et al. 2003). Furthermore, physical activity modes which are easily adapted to the everyday routine, such as walking, may be more sustainable than structured exercise (Dunn et al. 1998, Hillsdon et al. 1995, Jepson 2000).

The studies examining the effects of pedometer-based approaches on physical activity show positive results (Chan et al. 2004, Croteau 2004, De Cocker et al. 2008, Dinger et al. 2007, Gleeson-Kreig 2006, Merom et al. 2007, Richardson et al. 2005, Stovitz et al. 2005, Tudor-Locke et al. 2004). However, most of the findings are based on small and biased samples and the supplementary actions accompanying pedometer vary from email or telephone contacts to individual or group meetings, making the interpretation of the results complicated. A review in the UK concludes that the evidence for the effectiveness of pedometer-based interventions is equivocal (NICE 2006b). However, the most recent systematic review suggests that pedometer use is associated with significant short-term increases in physical activity (Bravata et al. 2007). The feasibility of pedometer-based interventions has been examined in only one of the above mentioned schemes (Dinger et al. 2007) showing, however, encouraging results (Dinger et al. 2005, Heesch et al. 2005).

Several pedometer-based physical activity promotion programs have been implemented at community, workplace or national level, for example, in the U.S. (Colorado On the Move, www.coloradoonthemove.org), Canada (Canada On the Move, www.canadaonthemove.ca) and Australia (10,000 Steps Rockhampton, www.10000steps.org.au). Some of them have been systematically evaluated and their effectiveness seems promising (Brown et al. 2006, Craig et al. 2006, Craig et al. 2007, Wyatt et al. 2004). The results on feasibility are also encouraging (Eakin et al. 2004). In Finland, no studies or programs utilizing self-monitoring in physical activity promotion have been published.

3.3.4 Telephone, e-mail and Internet-based approaches

Telephone contacts in physical activity promotion have been utilized more frequently during the past two decades (Castro and King 2002). Using telephone is more accessible and less burdensome regarding time constraints for the health care personnel and participants and can be considered a relevant alternative to or supplement for face-to-face communication.

In most of the studies telephone contacts have been used for reinforcement and follow-up purposes after the initial face-to-face session (Castro and King 2002). According to the review by Castro and King (2002) such telephone assisted approaches can increase the physical activity of the participants, at least in short-term. This finding has later been confirmed by Green et al. (2002) but studies with no short-term increases in physical activity have also recently been

reported (Jacobs et al. 2004). Regarding the effectiveness of print supported telephone contacts and fully automated telephone counseling systems the results seem less encouraging (Marshall et al. 2004). However, in the study by Pinto et al. (2002) the proportion of participants meeting PA recommendations at three months was higher in the computer-based telephone counseling group compared to the reference group, which received telephone counseling on healthy eating.

Castro et al. (2001) showed that the less intensive approach - mailed printed material - was more effective than telephone and the mailed material together in maintaining the physical activity changes adopted after telephone counseling. Consistently, Lombard et al. (1995) found, although not investigated in primary health care, that the frequent phoning was equally effective as structured contacts in committing the participants to walking. In a study by Humpel et al. (2005), where the printed program was compared with printed plus telephone program, the latter focused participants' attention on the printed materials but was not more effective than the printed program alone in increasing walking in a community setting. In the most recent study conducted in primary health care a Tele-Walk program consisting of eight telephone counseling sessions proved effective in increasing moderate-intensity physical activity among low-active older people (Kolt et al. 2007).

The information on the feasibility of telephone-based interventions is limited. In the Tele-Walk intervention the participants' (N=186) views regarding a telephone-based approach were positive (Kolt et al. 2006).

E-mail has also been used to promote physical activity but a recent study indicates that it is not yet widely used in patient communication (Brooks and Menachemi 2006). However, according to Ferney and Marshall (2006) the option to use e-mail for receiving expert advice on physical activity seems appealing among free living population. The findings about its use in promoting physical activity in workplace settings have also been encouraging (Plotnikoff et al. 2005).

As a result of rapid technology development and increased availability of computers the role of *Internet* has increased in health promotion (Evers 2006). The low cost and resource demands have also facilitated delivering health care interventions over the internet (Griffiths et al. 2006). Furthermore, in recent years, the population's interest in sites on nutrition and exercise has increased (Evers 2006). However, many health-related websites lack the basics of behavior change and participation in web-based health behavior programs is low (Evers et al. 2005). Studies on the effectiveness of Internet-based physical activity promotion conducted in health care show that it can be beneficial if supported with personal feedback (Calfas et al. 2002, Kypri et al. 2005, Norman et al. 2007). This has been confirmed in a workplace setting (Marshall et al. 2003) and among general population (Spittaels et al. 2007). However, there are also studies showing that a website intervention supplemented with general e-mail tips can be effective in a workplace setting (Napolitano et al. 2003).

Many studies indicate that the Internet-based approaches can be feasibly integrated into primary health care (Anhøj and Jensen 2004, Calfas et al. 2002,

Hageman et al. 2005) although examples of less successful implementation have also been reported (Sciamanna et al. 2004). The main problem in general has been poor participant adherence and engagement with the programs (Leslie et al. 2005). Initial face-to-face contact has, in a university hospital setting, been found essential in facilitating participants to visit the physical activity website (Spittaels and de Bourdeaudhuij 2006).

3.4 Dissemination of personal approaches to health care

Evaluations on programs aiming to disseminate physical activity approaches to primary health care have seldom been reported (Eakin et al. 2005, Estabrooks and Glasgow 2006, Estabrooks and Gyurcsik 2003, Glasgow et al. 2002). This applies to health promotion in general (Lewando-Hundt and Al Zaroo 2004, p.164, Oldenburg et al. 1999, Rychetnik et al. 1997) as well as to the feasibility and effectiveness of different dissemination strategies (King et al. 1998a, Grimshaw et al. 2004, Moulding et al. 1999, Oldenburg et al. 1999). Even the interventions with physician-based approaches have been poorly evaluated outside research protocols (Estabrooks and Glasgow 2006, Marcus and Forsyth 1999). One likely reason is that dissemination research is poorly resourced (Bodenheimer et al. 2005, Lewando-Hundt and Al Zaroo 2004, Rabin et al. 2006, Shediak-Rizkallah and Bone 1998).

Most frequently dissemination has been studied in regard to clinical guidelines (Green and Johnson 1996). Based on the findings, it seems that simply presenting research evidence or passing information to clinicians is often insufficient (Bero et al. 1998, Glanville et al. 1998) and multifaceted interventions targeting different barriers to implementation are more likely to be effective than single interventions (Cohen et al. 2005, Grimshaw et al. 2004, Moulding et al. 1999, Tones and Tilford 2001, p.187). Education and reminders have been claimed to be generally effective whereas the results on the use of audit, feedback and local opinion leaders are more contradictory (Grimshaw et al. 2004). Understanding the context in which the dissemination occurs is one of the key elements of success (Cohen et al. 2005, Oldenburg and Parcel 2002, p. 319, Tones and Tilford 2001, p. 186). The combination of national dissemination strategy and local support mechanisms is emphasized in increasing the uptake of changes (Glanville et al. 1998).

Only few studies have been reported on the dissemination of personal physical activity promotion approaches in a health care setting. In the study by Sims et al. (2004) the program evaluated was the Active Script Program implemented in Australia in parallel with Active Practice (Smith et al. 2000), where written prescriptions by physicians were used to promote physical activity. The evaluation was based on the RE-AIM framework (Glasgow et al. 1999) although the focus was mainly on cost-effectiveness. According to the findings the program reach was modest and the effectiveness was high but the adoption, implementation and maintenance of the program seemed less

successful. The authors report that it was difficult to engage physicians in the counseling practice. They suggest that to maintain the new practice continuing education and reminders are needed. Also, multifaceted strategies are suggested to engage physicians and other health professionals in the program. Furthermore, intersectoral collaboration and referrals to community organizations were recommended to improve patients' adherence to physical activity changes.

The findings are in line with more recent reports, which indicate that the best way to change clinical practices related to health promotion is to integrate clinical and community services (Cifuentes et al. 2005, Woolf et al. 2005). This has also been advocated in physical activity promotion by the U.S. Preventive Task Force (2002) and Tulloch et al. (2006).

3.5 Implications for clinical practice and current recommendations

Marcus and Forsyth (1999) have roughly estimated that behavioral change interventions can produce 10–25% increase in physical activity frequency compared to no intervention. However, there is insufficient evidence to determine that any approach is superior to another in achieving these positive effects (Marcus et al. 2006, U.S. Preventive Services Task Force 2002). This is mostly due to the methodological deficiencies of the studies: lack of randomization, poor follow-up rates, variability in categorizing active or inactive participants, inconsistent primary outcomes, limited subgroup analysis and minimal long-term analysis (Jacobson et al. 2005). Also, only limited information is available on the feasibility of various physical activity approaches (Eden et al. 2002, Whitlock et al. 2002). In fact, it has been argued that most of the studies include approaches that can be implemented in supervised conditions but are not directly applicable to the usual health care practices (Dzewaltowski et al. 2004). Presumably, the most time consuming and skill demanding approaches are the least feasible in primary health care since it has been discovered that the main barriers to promoting physical activity in clinical practice are time constraints and lack of skills (Abramson et al. 2000, Ainsworth and Youmans 2002, Petrella and Wight 2000).

Some consensus, however, has been reached about the core principles, which contribute to feasible and effective physical activity promotion in primary health care. Marcus et al. (1996) claim that the critical components are 1) enhancing the perceived benefits of physical activity, 2) enhancing self-efficacy, 3) increasing intentions to exercise, 4) increasing enjoyment of physical activity, 5) enhancing social support and 6) including moderate-intensity activity. According to the more recent report (Jacobson 2005) the most successful interventions focus on physical activity only, use multi-professional teamwork, include tailored written prescriptions, provide professionals with interactive

training and integrate a systematic support system. A similar, although more general conclusion, is drawn by Cavill et al. (2006), who suggest single factor brief advice focusing on moderate-intensity physical activity supported by written materials for short-term effects and referral to community exercise specialist for long-term effects in health care settings. Single factor promotion is also emphasized by Taylor et al. (2004), who discovered that the readiness to change behavior and the relationship between readiness and interest in discussing health behaviors with health care providers is different for physical activity and nutrition.

Estabrooks and Glasgow (2006) conclude that for physical activity promotion to be effective in health care clinics it should be recognized that 1) most primary health care physicians do not have time for even 3 minutes of intervention, 2) the load of interventional activities should be shared by clinical and community staff, 3) tailored interventions are more effective than generic advice, 4) brief advice alone does not lead to sustainable changes and 5) to improve the maintenance of the intervention effects physical activity should be supported with community opportunities. The latter has also been advocated by the U.S. Preventive Services Task Force (2002). Tulloch et al. (2006) propose an allied health professional model in which the physicians use their credibility to recommend physical activity behavior change and then refer the patients to an allied health professional for more specialized instructions.

To incorporate the core principles into real health care situations some practical illustrations have been developed. The model by Laitakari and Asikainen (1998) is one example of such illustrations (Figure 5). It follows the procedure of general health care contact: assessment, defining the target, planning, implementation and evaluation (Nupponen 1998). The principles of stages of change (see p. 22) and the determinants of physical activity adopted from Green et al. (1980) have also been integrated into the model.

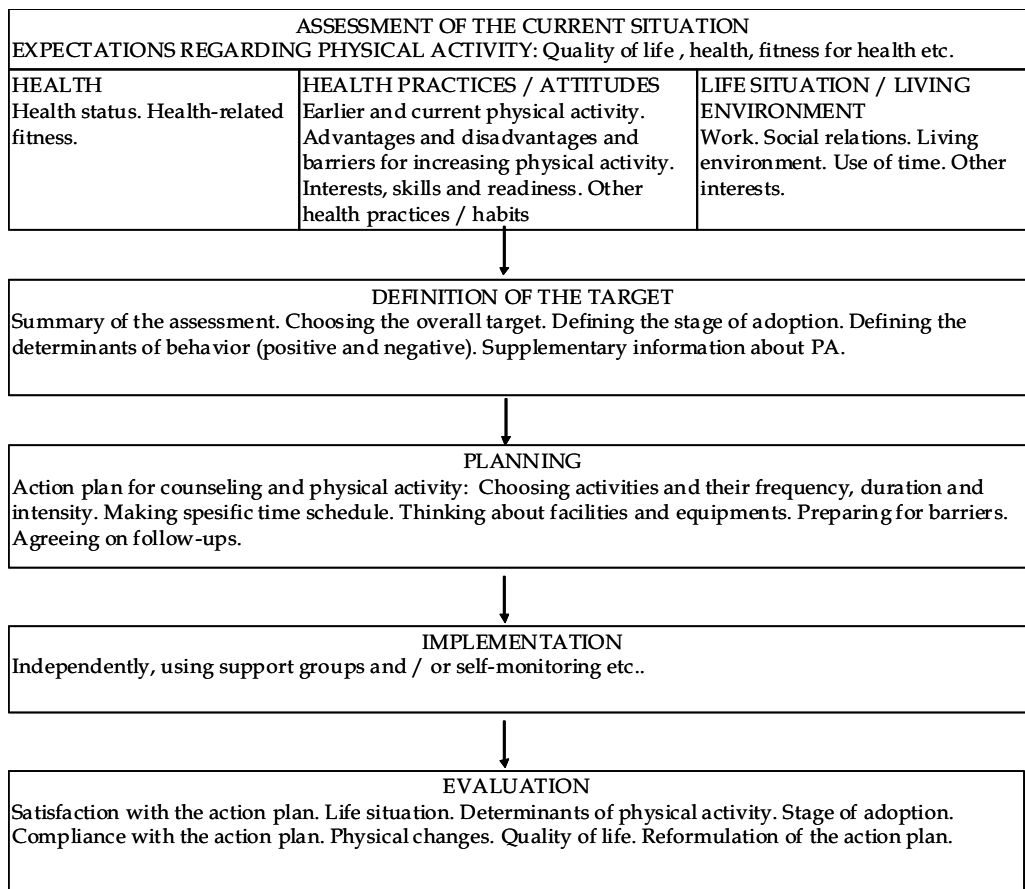


FIGURE 5 The process of physical activity counseling. Remodeled from Laitakari and Asikainen (1998)

Another illustration of physical activity promotion in a health care setting is the framework of the “5As” (Ainsworth and Youmans 2002, Estabrooks et al. 2003, Estabrooks and Glasgow 2006, Goldstein 2004, Pinto et al. 1998). This was introduced as a guideline for enhancing smoking cessation (The Tobacco Use and Dependence Clinical Practice Guideline Panel, Staff, and Consortium Representatives 2000) but has also been modified and extended for physical activity promotion purposes by, for example, Goldstein et al. (2004), Pinto (1998) and Whitlock et al. (2002) (Table 4). The five steps in the framework – **Assess, Advice, Agree, Assist, Arrange** – represent the minimum criteria needed for promoting behavior change (Evers et al. 2005). According to Glasgow et al. (2006) the last two As are especially important for sustainable behavior changes but are also applied least often (Glasgow et al. 2001) mostly due to time constraints (Estabrooks and Glasgow 2006).

TABLE 4 Framework of 5As. Modified from Pinto et al. (1998) and Whitlock et al. (2002).

Assess	Current behavior, risk factors, readiness, preferences, skills, knowledge, beliefs
Advise	Health benefits and harms, physical activity dose and modes
Agree	Goal-setting and action plan
Assist	Recognizing barriers and strategies to overcome them, need for social support
Arrange	Scheduling follow-up, evaluating need for referrals

PACE (Long et al. 1996), computer-mediated PACE+ (Prochaska et al. 2000) and Helping People Change (Mason et al. 1994) are also examples of structured approaches integrating the core principles into physical activity promotion. They rely primarily on the model of Stages of Change, which means that the approaches are strongly linked to stage matching. A framework for maximizing the effectiveness of PACE-based physical activity counseling has also been introduced (Blackburn 2002).

In the recent literature, the need for more thorough evaluation of dissemination regarding physical activity programs or interventions has been clearly articulated (Eakin et al. 2005, Marcus et al. 2006, Owen et al. 2006, Rabin et al. 2006). Dzewaltowski et al. (2004) argue that the efficacy of physical activity interventions when delivered in controlled conditions may not be generalizable or sustainable under the real world conditions where several factors may interact or moderate the reach, adoption, delivery, impact, or sustainability of an intervention. Thus, effectiveness, which merely represents the internal validity of the program should be evaluated against the indicators of external validity such as reach, adoption, implementation and maintenance rates (Valente 2006). For more systematic balancing of internal and external validity the use of the framework of RE-AIM introduced by Glasgow et al. (1999) has been recommended (Bull et al. 2003, Eakin et al. 2005, Estabrooks and Gyurcsik 2003, Owen et al. 2006, Valente 2006). In the framework five dimensions are indicated as the key components of evaluation: reach, efficacy / effectiveness, adoption, implementation and maintenance (Glasgow et al. 1999, Glasgow 2002, Glasgow et al. 2002, Glasgow et al. 2004, see also www.re-aim.org) (Table 5).

TABLE 5 RE-AIM dimensions and their evaluation questions (Glasgow 2002).

RE-AIM dimension	Questions
Reach (Individual level)	What percentage of potentially eligible participants will take part and how representative are they?
Efficacy or effectiveness (Individual level)	What impact did the intervention have on all participants who began the program, on process intermediate and primary outcomes, and on both positive and negative outcomes including quality of life?
Adoption (Setting level)	What percentage of settings and intervention agents will participate and how representative are they?
Implementation (Setting or agent level)	To what extent are the various intervention components delivered as intended, especially when conducted by regular staff in applied setting?
Maintenance (Both individual and setting level)	What are the long-term effects? To what extent are different intervention components continued or institutionalized?

3.6 Summary

According to recent research some core principles have been identified to be beneficial in promoting physical activity in the health care setting. Based on these findings some illustrations for clinical work have also been introduced. However, no consensus has been reached about the best practices in physical activity promotion in primary care. As stated by Harrison et al. (2005), it is unlikely that “one size fits all” referring to the fact that multiple approaches are needed to promote physical activity among various categories of populations. Thus, more studies on the effectiveness of various approaches are still needed.

However, effectiveness alone does not guarantee that the approach is worth adopting in clinical practice. To justify the dissemination, the feasibility of the approaches should also be examined. So far, the information on the feasibility of various approaches has been limited. Furthermore, even if the approach is found feasible and effective, dissemination is seldom evaluated or reported partly due to lack of funding. Yet, for evidence-based approaches to have a broad and lasting impact on the population prevalence of physical activity, effective interventions must be widely used (Owen et al. 2006).

Finally, as effectiveness, feasibility and dissemination of the approaches are heavily context-dependent, the results are seldom directly generalizable in countries or arenas different from the original ones. Thus, the approaches need to be tested in their actual contexts as well. In Finland, no studies on the effectiveness, feasibility or dissemination of different personal approaches to promote physical activity in primary health care context have yet been conducted.

4 SUBJECTS AND METHODS

The primary aim of the study was to produce more scientific evidence about the feasibility and effectiveness of selected personal approaches to promote physical activity of working aged adults in Finnish primary health care. For the particular purpose three separate interventions were conducted in settings in which a substantial number of individuals at risk could be reached, where physical activity promotion was already part of everyday routine or where it needed to be more frequently integrated. The approaches examined in the interventions were selected by acknowledging the current practices and resources for physical activity promotion in each setting and the scientific base of different approaches.

The subjects and methods of the interventions are described under the subheading "Interventions on feasibility and effectiveness". The similar information on the separate interventions has been combined and often presented in the same table to better illustrate the similarities and differences in the contexts, recruitment methods, subjects, designs and approaches of the interventions. More specific details on each separate intervention can be found in the original articles referred to in the text and tables by their Roman number (I-IV).

The secondary aim of the study was to produce information on the dissemination of new approaches to promoting physical activity in the Finnish primary health care. For this purpose, a national program to disseminate one of the approaches examined in the interventions was evaluated. The subjects and methods related to the evaluation are presented under the subheading "Dissemination" but they are described in more detail in the original article (V).

4.1 Interventions on feasibility and effectiveness (I-IV)

The interventions were integrated into real health care practices and the participating personnel in each setting were trained for the arrangements and approaches. Intervention 1 took place in occupational health care (OHC) and the approaches evaluated were individual face-to-face counseling alone and supported by fitness testing. Intervention 2 was carried out in municipal health centers and OHC and the approaches examined were Physical Activity Prescription by physicians and patient self-monitoring with pedometer and LTPA logbook followed by a written feedback. Intervention 3 was conducted in municipal maternity and child health care and the approach investigated was individual face-to-face counseling supported by supervised group exercise.

4.1.1 Subjects

Health care units and practitioners

In interventions 1 and 2 the recruitment of the health care units was based on telephone calls to the management of possible organizations, in intervention 3 earlier contacts to administration were utilized (Table 6). The telephone calls were made in intervention 1 to all the OHC units in Tampere region with at least one full-time nurse (N=18) and in intervention 2 to all the health centers and OHC units with at least four physicians and within two hour traveling time from the research institute (N=34).

As a result of recruitment altogether 37 health care units from Southern Finland collaborated in the interventions (Table 7). The management personnel of the units recruited health care practitioners (HCP) for the interventions. As a result, altogether 8 occupational nurses, 67 physicians and 24 public health nurses volunteered for the interventions. In addition, one physiotherapist in intervention 1 was involved in conducting the fitness testing and 54 receptionists in intervention 2 in recruiting the patients.

Training sessions were arranged for the participating HCPs before the interventions. This included four sessions (11 hours) in intervention 1, one session (2 hours for physicians and 1 hour for receptionists) in intervention 2 and three sessions (9 hours) in intervention 3. HCPs were also supported during the interventions by additional meetings and researcher visits to the units.

TABLE 6 Strategies in recruiting health care units, practitioners and participants for the interventions.

Health care units	Recruitment strategy			Participants
	Health care practitioners	Other collaborators		
Intervention 1: Individual face-to-face counseling with and without fitness testing in occupational health care (I-II)				
Telephone contact to the chief physician of the occupational health care units	Management person recruited voluntary occupational nurses	Voluntary occupational nurses recruited one of their client companies		A screening questionnaire was mailed to all the employees of the participating companies
Intervention 2: Physical Activity Prescription by physicians and patient self-monitoring in health centers and occupational health care (III)				
Telephone contacts to the chief physicians of the health care units	Chief physician or head nurse recruited voluntary receptionists and physicians	-		A screening questionnaire was filled out before the physician appointment
Intervention 3: Individual face-to-face counseling supported by supervised group exercise in maternity and child health care (IV)				
Earlier contacts to the administrative personnel	Administrative personnel recruited voluntary public health nurses	-		A preliminary request was made on the telephone when the time for the first appointment was set. A screening questionnaire was mailed to the participants.

TABLE 7 Number of health care units and providers recruited, participating and completing the interventions.

	Health care units			Health care practitioners		
	Recruited	Participated N (%)	Completed N (%)	Recruited	Participated N	Completed N (%)
Intervention 1: Individual face-to-face counseling with and without fitness testing in occupational health care (I-II)	18	7 (39)	7 (100)	Not obtained	8	8 (100)
Intervention 2: Physical Activity Prescription by physicians and patient self-monitoring in health centers and occupational health care (III)	34 (Health centers)	24 (Health center units)	23 (96)	Not obtained	67	45 (67)
Intervention 3: Individual face-to-face counseling supported by supervised group exercise in maternity and child health care (IV)	6	6 (100)	6 (100)	Not obtained	24	24 (100)
Total	58	37	36	-	93	77 (83)

Participants

Altogether 644 eligible participants took part in the interventions (Table 8). In interventions 1 and 2 they were working aged men and women who according to the current physical activity recommendations were insufficiently physically active and ready to increase their LTPA. In intervention 3, the participants were healthy pregnant and postpartum women without earlier deliveries. The detailed description of the inclusion and exclusion criteria can be found from the original articles (I, III, IV).

A questionnaire was used for screening the eligibility and for obtaining written informed consent in interventions 1 and 2. In intervention 1 the questionnaire was mailed to all the employees of the participating companies and returned to the OHC unit. In intervention 2 the questionnaire was completed before the medical consultation and returned to the receptionist who checked the eligibility. In intervention 3 the nurses interviewed all the women with no earlier deliveries, in most cases by telephone, when setting the appointment time for the first visit. Eligibility was confirmed and written informed consent obtained at the first visit.

4.1.2 Intervention designs and personal approaches

The design of the interventions and the selection of the approaches were based on the understanding of the current practices in each of the settings. For example, it was acknowledged from practical experience and earlier research findings (Laitakari et al. 1989) that in occupational, maternity and child health care settings more intensive approaches with multiple visits could be implemented whereas during physicians' consultation visits in health centers, due to time constraints, brief advice supplemented by support from other health care professionals would be the most appropriate approach. A description of the approaches in each intervention is provided in Table 9. Due to voluntary enrolment, the participants were presumed to be at the stages beyond pre-contemplation. As proposed by Laitakari and Miilunpalo (1998), the promotional focus was therefore on enabling and reinforcing factors.

Intervention 1 (I-II)

One hundred and sixty-nine employees who responded fulfilled the inclusion criteria and were accepted for the study. In one company screening resulted in too many participants for the occupational nurse (not enough time) leading to the random exclusion of 14 participants. Thus, 155 employees (women 56%, men 44%) participated in the intervention. They were randomized separately in each company into three groups: 1) individual face-to-face counseling (N=52), 2) individual face-to-face counseling + fitness testing (N=51) and 3) data collection only (control group, N=52) (Figure 6).

TABLE 8 Number of subjects recruited, responding, eligible, participating and completing in each intervention.

	Subjects recruited	Subjects responding	Subjects eligible	Participants	Completers
	N	N (%)	N (%)	N (%)	N (%)
Intervention 1: Individual face-to-face counseling with and without fitness testing in occupational health care (I-II)	1349	784 (58)	169 (22)	155 (92)	152 (98)
Intervention 2: Physical Activity Prescription by physicians and patient self-monitoring in health centers and occupational health care (III)	992	-	535 (54)	265 (50)	203 (77)
Intervention 3: Individual face-to-face counseling supported by supervised group exercise in maternity and child health care (IV)					
Maternity clinics	196	-	176 (90)	132 (75)	105 (80)
Child health clinics	127	-	114 (90)	92 (81)	88 (96)
Total	2664	-	994 (37)	644 (65)	551 (86)

TABLE 9 Description of the personal approaches used in the interventions.

Personal approach	Allocated time for the primary visit	Timing of the follow-up visits	Allocated time for the follow-up visits
Intervention 1: Individual face-to-face counseling with and without fitness testing in occupational health care (I-II)			
Face-to-face counseling	60 minutes	8 weeks 6 months 12 months	30–60 minutes
Face-to-face counseling	60 minutes	8 weeks (counseling only)	30–60 minutes
Fitness testing and feedback	90 minutes	6 months (counseling + retesting) 12 months (counseling + retesting)	60 minutes 60 minutes
Intervention 2: Physical Activity Prescription by physicians and patient self-monitoring in health centers and occupational health care (III)			
Physical Activity Prescription by physician	5–10 minutes	Not scheduled in advance, physician-dependent	Not scheduled in advance, physician-dependent
Patient self-monitoring with a pedometer and a physical activity log + feedback	Self-records from 5 consequent days	Mailed feedback on the recordings 2 weeks after the monitoring devices had been returned	No follow-up visits
Intervention 3: Individual face-to-face counseling supported by supervised group exercise in maternity and child health care (IV)			
Face-to-face counseling + supervised group exercise	20–30 minutes	16–18 weeks gestation / 3 months after delivery 22–24 weeks gestation / 5 months after delivery	10–15 minutes
	60 minutes	32–34 weeks gestation / 6 months after delivery 36–37 weeks gestation / 10 months after delivery	

The model of Laitakari and Asikainen (1998) described in Figure 5 was used in formulating the structure and topics of the counseling sessions. The counseling was grounded on discussions and agreements between the nurse and the participant. The topics of the primary session and three booster sessions were guided by the counseling card, which was filled in for each participant at each session. First, the participant's current LTPA and her need and opportunities for LTPA were assessed. Then the benefits and restrictions of LTPA were discussed with the help of a take-home leaflet developed earlier by the UKK Institute. Finally, the participant, together with the nurse, set him or herself a specific LTPA goal and made a written action plan for weekly LTPA.

The supplementary fitness testing in group 2 was conducted by a physiotherapist after the counseling session. The tests were selected from the Health-related Fitness Test Battery developed for middle-aged adults by the UKK Institute for Health Promotion Research in Finland (Suni 2000). After testing, the results were discussed with each participant and the action plan made earlier with the occupational nurse at the counseling session, was modified according to the needs arising in the fitness testing.

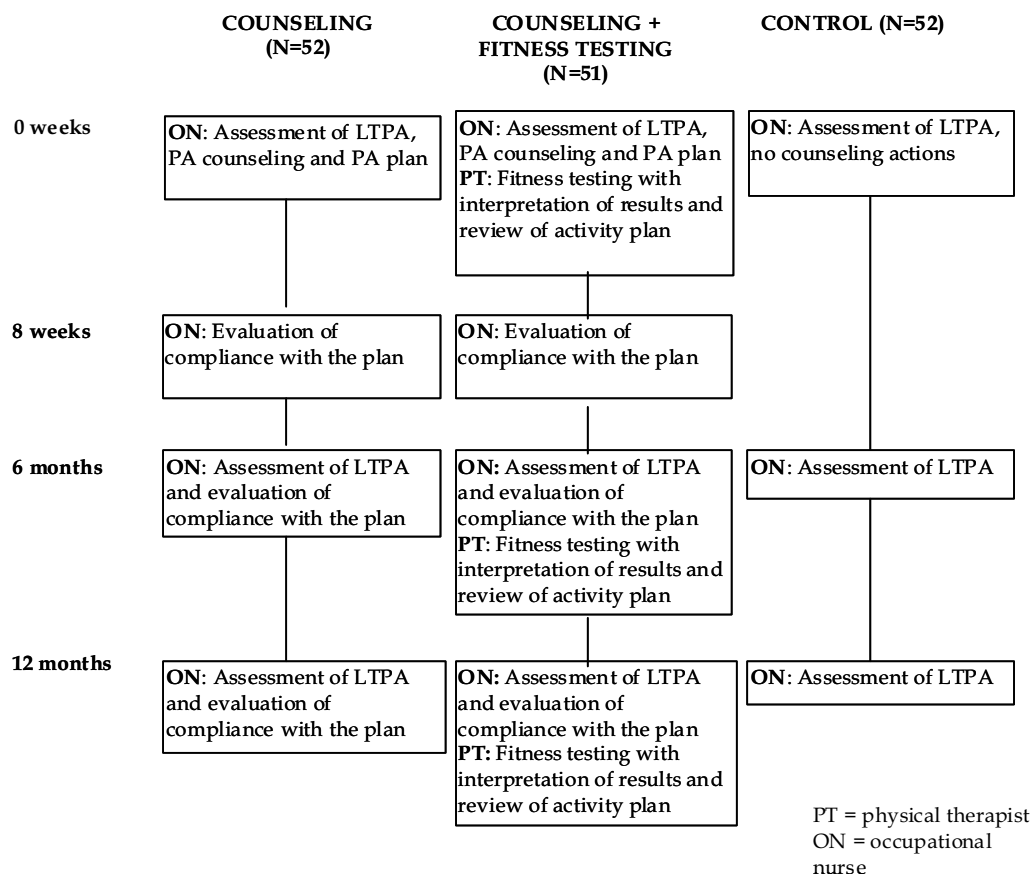


FIGURE 6 Design of intervention 1.

Intervention 2 (III)

The voluntary physicians (N=67) were randomized in each health care unit into the prescription or non-prescription group (Figure 7). Two hundred and sixty five of their patients fulfilled the inclusion criteria and participated in the intervention. The patient of a prescription physician went to the appointment with the screening questionnaire, a copy of the consent form and a prescription form, which was a sign for the physician to include Physical Activity Prescription in the usual care (PREX). If the prescription was not included, the physician was instructed to file the blank prescription in the patient's records. Patients of non-prescription physicians received only the usual care at the appointment. However, every other one of them was asked to see the receptionist after the appointment and was instructed to use a pedometer and a physical activity diary for five consecutive days (MON). The patients of non-prescription physicians who did not participate in self-monitoring served as controls (CON).

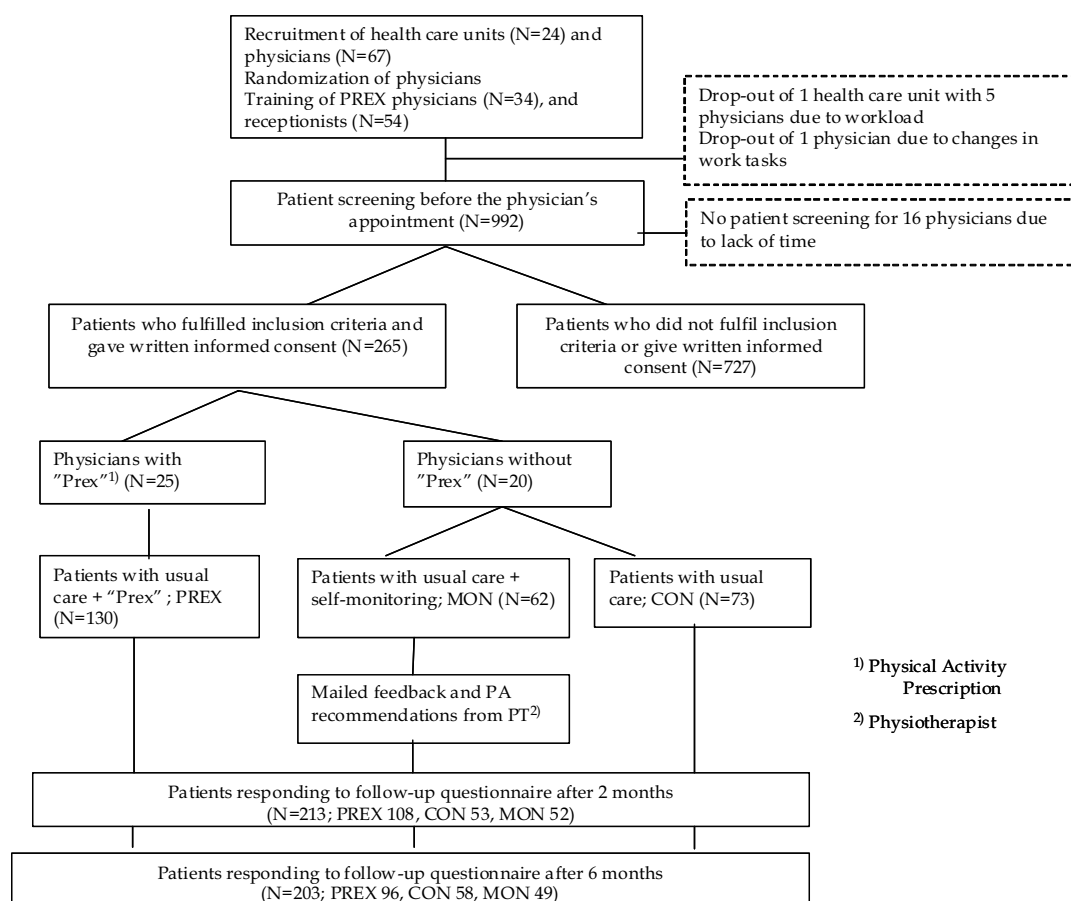


FIGURE 7 Design of intervention 2.

Physical Activity Prescription, "Prex", was developed in a nationwide Physical Activity Prescription Programme (PAPP) in 2001 (Figure 8). The prescription was to guide physicians to the principles of "good counseling practices", derived from earlier literature on health behavior change (Green et al. 1980, Prochaska and Velicer 1997), implementation of physical activity counseling (Laitakari and Asikainen 1998, Laitakari and Miilunpalo 1998) and effectiveness of physical activity counseling in health care or related setting (Dishman and Buckworth 1996, Dunn et al. 1998, Eaton and Menard 1998, Pinto et al. 1998, Simons-Morton et al. 1998). The counseling principles included in the prescription can also be applied to the 5 A's construct (see Table 4) .

In PREX, the participant's prevailing LTPA habits were assessed. Then the physicians commented on the sufficiency of the LTPA with regard to health and explained potential benefits of LTPA to the participant. The participants' opportunities and willingness to increase LTPA as well as the preferred and most suitable LTPA modes were also discussed. A personal goal was set and an action plan for weekly LTPA was written on the prescription form. Finally, a follow-up plan was drawn up. For those patients assumed to benefit from self-monitoring a LTPA log was provided.

In MON, the participants kept a record of their daily number of steps and LTPA for five consecutive days with a pedometer and a diary. Approximately two weeks after they had returned them to the health care unit they received feedback on their recordings by mail from a physiotherapist, individualized LTPA recommendations and LTPA action plan sheet. Usual care was delivered in CON.

PHYSICAL ACTIVITY PRESCRIPTION

Name: _____ Identity code: _____

Current regular physical activity of at least 30 minutes per day:

- Hardly any
- Light-intensity physical activity _____ days a week
- Moderate-intensity physical activity _____ days a week
- Vigorous-intensity physical activity _____ days a week
- From a health point of view Adequate Inadequate

Health basis or goal of physical activity: _____

INSTRUCTIONS:

Form of physical activity and/or sport	Days per week	Duration per day	Intensity	
E.g. walking to place of work or hobby, mowing the lawn, shoveling snow, cycling to work, walking for fitness, home gymnastics, exercise classes, ball games, dancing, gym training		minutes	light - hardly out of breath moderate - somewhat out of breath hard - very out of breath	heart rate range

Additional advice:

- Leaflet _____
- Appointment with _____ Tel. _____
- Other _____

Assessment and monitoring:

- At next appointment _____
- After _____ months at _____ Tel. _____
- Other _____

Date: _____ Physician's signature _____

Finnish Rheumatism Association • Fit for Life Programme • Finnish Medical Association • Finnish Heart Association • Research Centre for Health Promotion/University of Jyväskylä • UKK Institute for Health Promotion Research

Assess

- Current LTPA
- Readiness to increase LTPA

Advice

- PA recommendations
- Benefits of increasing LTPA

Agree

- Individual LTPA goal
- Weekly LTPA plan

Assist and Arrange

- Co-operation
- Systematic support

FIGURE 8 Physical Activity Prescription by physicians, "Prex".

Intervention 3 (IV)

From the convenience sample of six municipal maternity and child health clinics three volunteered for the experimental group (EXP) and the rest were assigned to the control group (CON) (Figure 9). 132 pregnant and 92 postpartum women were deemed eligible and participated in the study. In EXP individual face-to-face physical activity counseling was integrated into five of the routine visits to the clinics. The primary session was implemented in maternity clinics during the first visit at 8–9 weeks' gestation and in child health clinics when the child was two months old. Four booster sessions were implemented during the subsequent visits. In CON former practices, including those related to physical activity, were continued. A detailed description of the intervention is provided in the original article (IV).

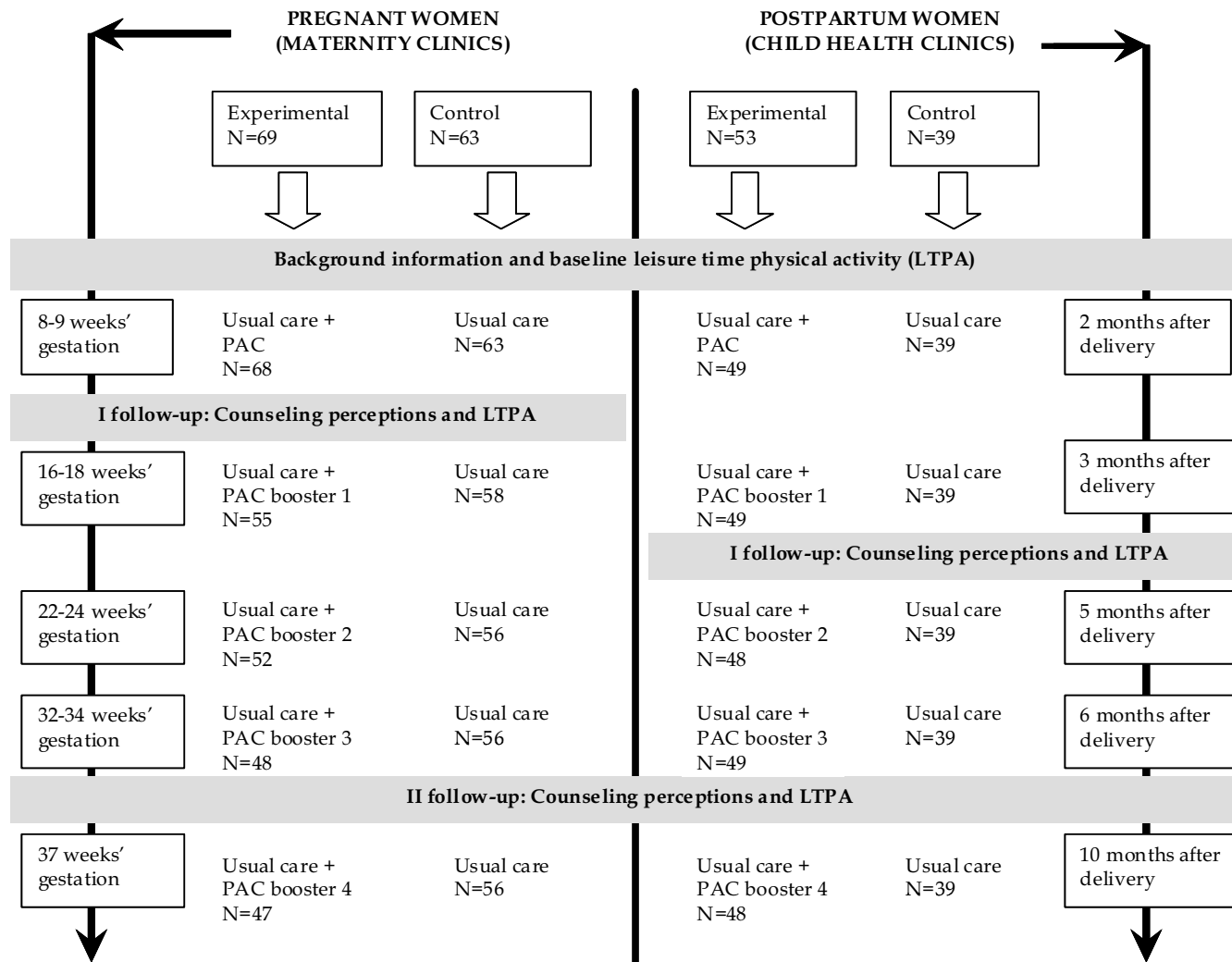


FIGURE 9 Design of intervention 3.

In the counseling a procedure similar to that in intervention 1 was followed (see Figure 5). Borg's (1982) visual scale of perceived exertion (RPE) including ratings 6–20 was used in intensity assessment and the counseling focused on promoting LTPA with RPE ratings 12–14 (somewhat hard) as suggested in the current guidelines on exercise during pregnancy and postpartum (ACOG 2002, Artal and O'Toole 2003, Davies et al. 2003).

The information leaflet used in counseling was especially designed for pregnant and postpartum women, as was also the form where the women wrote down and monitored their action plans for weekly LTPA. To support counseling, the participants were offered an option for supervised group exercise (60') once a week arranged close to their maternity or child health care clinic. The content of the exercise classes was designed especially for the study and consisted of three types of training: walking, low impact aerobic and circuit training. In the postpartum group, the mothers were encouraged to take their babies to the exercise sessions.

4.1.3 Measures

Feasibility

In this study, four components were included in the feasibility analysis: integrity, participant responsiveness, applicability to routine health care practices and safety. The indicators and measures of the components in each intervention are described in Table 10. More specific information on the measures is provided in the original articles (I–V).

Effectiveness

The change in LTPA was selected as the primary outcome because the participants were at the stages beyond pre-contemplation and thus ready to make some changes in their physical activity behavior. Changes in health or quality of life were not assessed because the time periods were short and adherence to additional measurements may have had an impact on LTPA in the control groups, too. Moreover, within the limits of these intervention designs, it would have been difficult to evaluate whether the possible changes in health or quality of life were due to changes in physical activity behavior. The indicators of LTPA vary across the interventions and are described intervention by intervention in Table 11. Comparison was made with usual care or data collection only.

TABLE 10 Components, indicators and measures of feasibility in the interventions.

Component and indicator	Measure		
	Intervention 1	Intervention 2	Intervention 3
Integrity			
Target group reach	Screening questionnaire before the intervention	Screening questionnaire before the intervention	Nurses' recruitment notes
Number of drop-outs	Nurses' reports	No response to the follow-up questionnaires	Nurses' notes and reports
Timing of the sessions	Counseling card	Not relevant	Counseling card
Duration of the sessions	Questionnaire to the nurses after the intervention	Telephone interview of 15 randomly selected physicians in the prescription group after the intervention	Counseling card
Number of sessions implemented	Counseling card	Number of empty prescriptions returned	Counseling card
Accordance of counseling to training	Counseling card	Analysis of 30 randomly selected prescriptions after the intervention	Counseling card
Adherence to fitness testing	Participation lists	Not relevant	Not relevant
Adherence to group exercise	Not relevant	Not relevant	Participation lists
Participant responsiveness			
Acceptability of the counseling approach	Not obtained	Telephone interview of 15 randomly selected participants in the prescription group after the intervention	Not obtained
Perceived effects of counseling on LTPA	Follow-up questionnaires	Telephone interview of 15 randomly selected participants in the prescription group after the intervention	A questionnaire to all the participants before the last follow-up visit
Satisfaction with counseling	Not obtained	Not obtained	A questionnaire before the last follow-up
Applicability			
Acceptability and suitability of the approach to routine practices	Questionnaire to the nurses after the intervention	Telephone interview of 15 randomly selected physicians in the prescription group after the intervention	Questionnaire to the nurses after the completion of at least one primary session
Safety			
Incidence of adverse events	Last follow-up questionnaire	Follow-up questionnaires	Elicited from the participants at booster visits by the nurses
Child's birth weight	Not relevant	Not relevant	Maternity health cards of pregnant completers
Weeks' gestation at delivery	Not relevant	Not relevant	Maternity health cards of pregnant completers

TABLE 11 Indicators and measures of effectiveness in the interventions.

Indicator	Measure		
	Intervention 1	Intervention 2	Intervention 3
Change in overall LTPA			
• number of weekly sessions	Questionnaire	Questionnaire	-
• weekly duration (minutes)	7-day logbook	Questionnaire	-
• number of daily steps	pedometer	-	-
• weekly amount of kcals spent on LTPA	7-day logbook	-	-
Change in at least moderate-intensity LTPA			
• number of weekly sessions	7-day logbook	Questionnaire	Questionnaire
• duration of weekly LTPA (minutes)	7-day logbook	Questionnaire	Questionnaire
Change in light-intensity LTPA			
• number of weekly sessions	-	-	Questionnaire
• duration of weekly LTPA (minutes)	-	-	Questionnaire
Fulfillment of HEPA recommendations ¹⁾	7-day logbook	-	-
Fulfillment of FPA recommendations ²⁾	7-day logbook	-	-
Minutes spent sitting during a working day	Questionnaire	-	-
Minutes spent sitting during a non-working day	Questionnaire	-	-

¹⁾ Moderate (some breathlessness) LTPA 30 minutes or more on at least 4 days of the week.

²⁾ Vigorous (strong breathlessness) LTPA 30 minutes or more per session on at least 2 times per week.

LTPA was defined as “All habitual physical activity during leisure time including e.g. commuting activity to work or errands, house caring activities, building or renovating, gardening, physically demanding household work, berry picking, mushroom gathering, hunting, fishing and hiking as well as actual sports and physical activity for fitness”. Physical activity during working hours was excluded, because it is not always voluntary and may also have other than positive effects on health.

A questionnaire, a pedometer and a 7-day LTPA logbook were used as measures depending on the intervention. At the time of the interventions no validity or reliability tested physical activity questionnaires were available in Finland. The questionnaire was therefore modified from the short usual week self-administered International Physical Activity Questionnaire, IPAQ (www.ipaq.ki.se), which was undergoing evaluation at the time of the interventions. In the 12-country reliability and validity study on IPAQ, subsequently reported by Craig et al. (2003), the Spearman correlation coefficients of the short usual week format against accelerometer data varied from -0.12 to 0.32. However, no information was provided on the Finnish sample. The test-retest coefficients varied from 0.64 to 0.84 the lowest value being in Finland.

In this study, contrary to original IPAQ, the intensities were expressed as amount of breathlessness (strong, some, none) because there were indications that for some subgroups, the meaning of intensity may be difficult to understand (Tudor-Locke et al. 2003). The question regarding walking was also

replaced with light-intensity LTPA to better respond to the challenges related to the assessment of unstructured physical activity. It has been estimated, for example, that in women a large part of physical activity may remain unrecorded or underreported in the current questionnaires, which traditionally focus on structured activities (Ainsworth et al. 2000a).

The 7-day logbook was formulated by utilizing information from earlier publications (e.g. Ainsworth et al. 1994, Montoye et al. 1996). To assess total physical activity, log keeping for several days, reflecting the typical week with working and nonworking days, is recommended (Melanson et al. 1996) and in earlier studies seven consecutive days are usually used (Baranowski et al. 1984). In this study, physical activity modes, their durations and intensities were recorded from five working and two non-working days at the end of each self-monitoring day. A similar procedure with comparable logbooks has shown Spearman correlation coefficients of 0.34 and 0.22 for moderate and vigorous intensity physical activity against accelerometer recordings (Ainsworth et al. 2000b).

The number of steps was assessed with Yamax DW 700-pedometer, which is easy to use and has shown an accuracy of one percent in moderate-intensity walking (Bassett et al. 1996, Crouter et al. 2003). Activities involving other than vertical movement cannot be detected by the pedometer. However, number of steps has been shown to correlate with daily physical activity estimated by accelerometers (Leenders et al. 2000), which, due to their ability to capture data on intensity and duration, are generally considered more accurate than pedometers. To predict weekly physical activity in adults the collection of pedometer recording from at least three days is recommended (Tudor-Locke et al. 2005). In this study, the pedometer was worn for the same seven days as the logbook was kept and the recordings were made in the logbook at the end of each day.

The time-scale was selected for short-, mid- and long-term effects. Effects at 2 months were considered short-term, whereas changes sustained for six months (mid-term) or more (long-term) were considered more permanent. This was based on earlier studies which show that most drop-outs from physical activity interventions occur before six months (Dishman and Sallis 1994, Laitakari et al. 1996, Oldridge 1984, p.467).

4.1.4 Statistics

In all the interventions the descriptive information is given as means, standard deviations (SD) and percentages.

Feasibility

Chi-square test of independence or Fisher's exact test was used to analyze the group differences in self-reported changes and perceived effects of counseling in intervention 1, in the possible adverse effects and physicians' follow-up

practices in intervention 2 and in the perceived effects of counseling and incidence of selected adverse events in intervention 3.

In intervention 2, the feasibility aspects related to patient and physician interviews were described in proportions. In intervention 3, analysis of covariance with selected confounding factors was used to compare the means in counseling satisfaction, birth weight and weeks' gestation at delivery between the experimental and the control group.

Effectiveness

In all the interventions the group differences in LTPA changes were tested by analysis of covariance with baseline values and selected confounding factors as covariates. In interventions 1 and 3 the relative between-group differences (%) were calculated using anti-logs of mean differences of log-transformed variables and were given with 95% confidence intervals. In intervention 2, before the analysis, the missing values in the data were replaced by a multiple imputation method (Schafer's NORM program, version 2.03 for Windows 95/98/NT) because the drop-out rate was greater in the control group than in the two other groups, especially at 2-month follow-up. Square root transformations were used to normalize the distributions. The number of imputed data sets was six.

In intervention 1, the changes in the categorical variables, accomplishing of health enhancing physical activity (HEPA) and fitness physical activity (FPA) recommendations (yes/no), were analyzed with generalized estimated equations (GEE) model (Oswald Software Library ver 3.2 in S-Plus program ver 4.0) regarding the whole study group and the differences between the groups.

In intervention 1 the analyses were performed with two contrasts: the combination of the counseling groups compared with the control group, and the counseling groups compared with each other. In intervention 2 each approach, prescription and self-monitoring was compared separately with the control group. In intervention 3, the contrast was experimental group versus control group in both maternity and child health clinics.

4.2 Dissemination program

4.2.1 Overview of the program

In 2001 the collaborative Physical Activity Prescription Program (PAPP) was initiated in Finland to increase physical activity counseling among physicians, especially in primary care. All the organizations (N=6) invited by the initiator, the Finnish Rheumatism Association, agreed to participate. From each organization 1-2 members joined the steering group. A full-time program coordinator was employed — other members used their regular working hours for the program. The work of the steering group was supported by a management group, which included one management person from each

organization. PAPP was planned to last for three years (2001–2003) due to the funding practices of the major financier, the Ministry of Social Affairs and Health Finland.

Five actions were implemented to reach the program goal: 1) developing a counseling approach for physicians, 2) providing easy and open access to counseling material, 3) facilitating physicians' uptake and adoption of the counseling approach, 4) disseminating information about the counseling approach to physicians, health and exercise professionals and decision-makers and 5) raising financial resources to cover program expenses.

4.2.2 Actions for reaching the program goal (Implementation)

Developing a counseling approach for physicians

A prescription form was chosen as the counseling approach due to time limits in physicians' consultations, differences in physicians' skills in providing counseling (Abramson et al. 2000, Ainsworth and Youmans 2002) and encouraging results from the effectiveness studies mentioned earlier.

The prescription was to guide physicians to "good counseling principles" as described earlier on page 39. In the autumn of 2001 two prescription forms, a user's guide and a training protocol were produced and tested in a pilot study involving three municipal health centers and two occupational health care units with 58 physicians. The final version of a form, "Prex" (Figure 8), was launched in February 2002 at a national medical congress.

The counseling principles of "Prex" can be applied to the 5 A's construct recommended for counseling in a health care setting (Estabrooks et al. 2003, Goldstein et al. 2004). In "Prex" the assessment of current physical activity habits and the statement on the sufficiency of physical activity represent "assess" and "advise", goal setting and instructions "agree", and additional advice and monitoring "assist" and "arrange". Cooperation with municipal exercise services was emphasized, as recently proposed (Hillsdon et al. 2005). A 10-page booklet, "User's Guide", was prepared to enhance the adoption of the principles in clinical practice.

Providing easy and open access to counseling material

The web pages for PAPP (www.liikkumisresepti.net) were opened in February 2002. Requests for printed material provided free of charge were dealt with by one person in the Finnish Medical Association. One "User's Guide" was attached to the block of 20 prescriptions. At the request of physicians, a physical activity log for follow-up purposes was developed and printed.

The need for an electronic "Prex" soon became evident, especially in OHC, where the majority of patient data is in electronic form. Negotiations with two companies producing and maintaining the two leading electronic patient record systems in Finland were initiated in 2002. In the meantime, a pdf form was

attached to the PAPP website. Demo-software was also produced for personal computers to speed up the negotiations and to make the installation of “Prex” possible for health care units maintaining their own electronic records.

Facilitating uptake and adoption of the counseling approach

Training, recruitment of an opinion leader and producing evidence on the effectiveness of “Prex” were seen as primary approaches to lower the threshold for physicians’ uptake of “Prex”. The training protocol included two modes: 1) peer training (4 hours) for physicians who were interested in introducing “Prex” to their colleagues and 2) user training (45 or 90 min), which the peer trainers then arranged for their colleagues and local health care and exercise professionals. At both modes the physicians practised completing “Prex”. Two members from the steering group provided the peer training. The target was to recruit 15 to 30 peers from all parts of the country, mainly by advertisements in medical journals. The peer trainers were provided with transparencies and PowerPoint presentations and also with an overview of physical activity in various diseases, which was replaced in 2004 with an evidence-based web review (Kukkonen-Harjula and Vuori 2004). Peer trainers’ contact information was attached to PAPP websites.

Disseminating information about the counseling approach to physicians, health and exercise professionals and decision-makers

The role of the PAPP members and their networks was to introduce “Prex” in national and local health promotion meetings and events and in professional journals for health care and exercise specialists. Events arranged for physicians were given top priority but inter-professional meetings at the community and municipal level were also prioritized for the facilitation of local “Prex” projects. The members of PAPP involved in national health policy decision-making were to advocate “Prex” in health promotion meetings. Also, collaborators were searched for to disseminate information to medical students.

Raising financial resources to cover PAPP expenses

The Finnish Rheumatism Association, as coordinator, was responsible for applying for funding for the program, allocating it according to the needs (e.g. materials, peer training, salary of the program coordinator) and making the annual action plans and reports to the financial supporters.

4.2.3 Principles of evaluation

The evaluation was based on the RE-AIM framework (see Table 5) introduced by Glasgow et al. (1999) and modified for the purposes of the program (Figure 10). A more detailed description of the indicators and measures can be found in the original article (V).

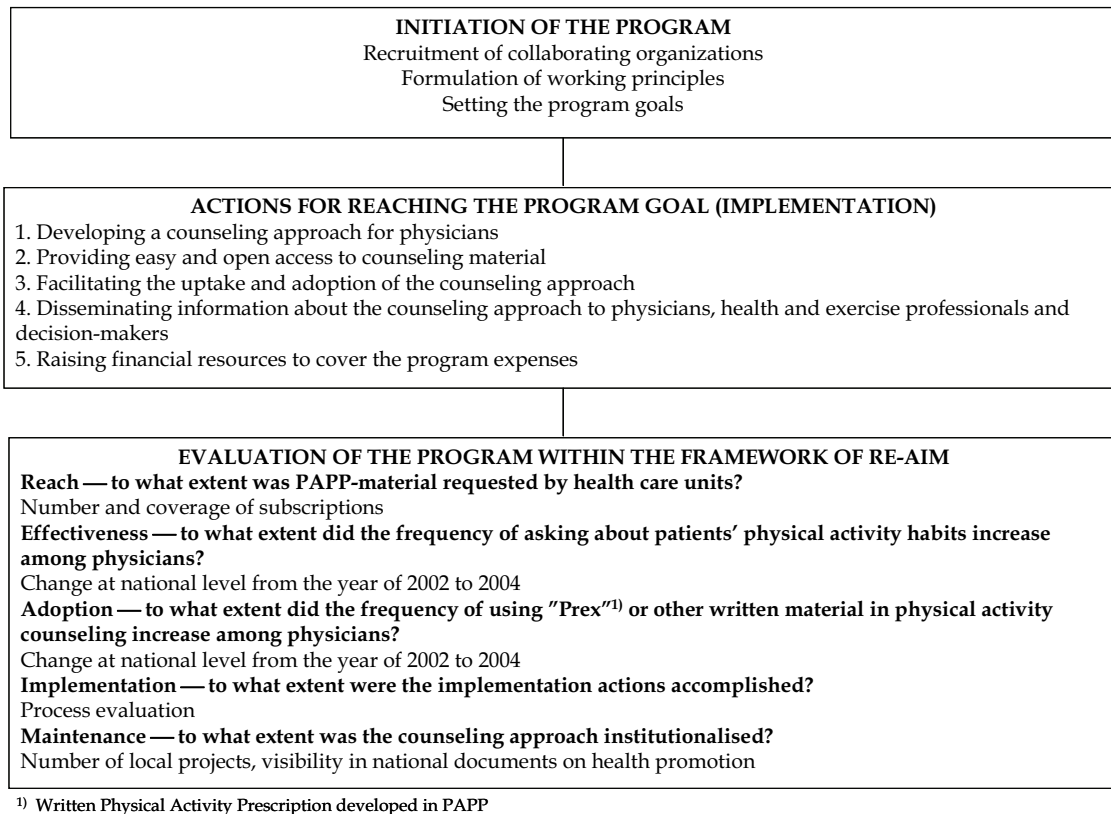


FIGURE 10 Overview of the Physical Activity Prescription Program (PAPP).

4.2.4 Statistics

Changes in percentage units and their confidence intervals from 2002 to 2004 were evaluated regarding effectiveness (frequency of asking about patients' physical activity habits) and adoption (frequency of using prescription or other written material in physical activity counseling). The results regarding the other RE-AIM dimensions are based on process evaluation and are mostly presented in proportions.

5 RESULTS

The results from the three separate interventions on the feasibility and effectiveness of the selected approaches to promote physical activity in Finnish primary health care are presented first under the subheading “Feasibility and effectiveness”. As in the subjects and methods chapter, the similar results on the subjects are combined and presented in the same table to better illustrate the similarities and differences between the interventions. More detailed information on the subjects of each separate intervention can be found in the original articles (I–IV). The results on the feasibility and effectiveness of the selected approaches are reported intervention by intervention because the findings are highly setting-specific.

The results on dissemination are presented under the subheading “Dissemination”. The structure of the text follows the RE-AIM framework used in evaluating the national program for the dissemination of Physical Activity Prescription. The results are reported as in the original article (V).

5.1 Feasibility and effectiveness (I–IV)

5.1.1 Subjects

Baseline data collected varied across the interventions. The least background information was collected in intervention 2 to obtain the highest possible participation rate. The baseline data collected from all the participants was age, gender, weekly sessions and duration of at least moderate-intensity LTPA. This information is presented in Table 12. The more detailed baseline information

related to each particular intervention can be found in Article I (Intervention 1), Article III (Intervention 2) and Article IV (Intervention 3).

TABLE 12 Baseline data collected on the participants in all the interventions.

Variable	Intervention 1	Intervention 2	Intervention 3	
			Pregnant women	Postpartum women
Age, mean (SD)	44 (9)	47 (11)	28 (5)	28 (4)
Gender (%)				
female	56	76	100	100
male	44	24	-	-
At least moderate-intensity weekly LTPA, mean (SD)				
• number of days (sessions)	4.1 (3.5)	2.5 (1.8)	4.4 (2.3)	4.9 (2.6)
• duration (minutes)	185 (162)	76 (55)	253 (186)	298 (227)

5.1.2 Intervention 1: Individual face-to-face counseling with and without fitness testing in occupational health care (I, II)

Integrity

From a total of 1349 employees 784 (58%) responded. Half of the respondents (N=380) belonged to the target group of being both physically inactive and intending to increase physical activity. Of these, 201 were willing to participate, representing 53% of the eligible respondents. No information could be obtained from the non-respondents. Two participants withdrew from the study at 6-month follow-up. One hundred and fifty-two participants (98% of the 155 participants) completed the 6 and 12-month follow-up questionnaires.

All the participants completed the primary visit; among completers no follow-up visits were missed. According to the questionnaire to the occupational nurses, the duration of the counseling visits was as allocated: the primary counseling visit usually lasted 60–90 minutes and each of the follow-up visits 30–45 minutes. Notes on the counseling cards returned after the intervention indicated that the counseling topics had been raised as intended.

Participant responsiveness

Information was collected only from participants in the counseling groups because no actions other than data collection were implemented in the control group. One third (33%) of the employees in the two counseling groups felt that the counseling had clearly improved their ability to develop LTPA habits on their own. No statistically significant differences were discovered between the counseling groups ($p=0.23$). The majority of the participants (82%) reported that

counseling had influenced the quantity or quality of their LTPA at least a little. The rest perceived no affects. Again, no differences between the two counseling groups were detected ($p=0.60$).

Applicability to routine practices

All the nurses were satisfied with the training and with the counseling material, and felt that the study had improved their counseling skills. They were pleased with the systematic but still holistic approach of the counseling model, which they felt was suitable for their routine health care practice regardless of the time-restrains. Some of the nurses had also started to apply similar protocol to other health counseling. The only negative experience reported by the nurses was the time-consuming process of setting up the appointments required by the study protocol.

Safety

Adverse events caused by LTPA were elicited in the last follow-up questionnaire. The number of participants with adverse events was 5 in the counseling group, 12 in the fitness testing group and 6 in the control group (unreported data). The differences between the groups were not statistically significant (Chi Square Test, $p=0.1$).

Effectiveness

There were no statistically significant differences between the groups in any of the physical activity measures (Table 13). However, the fitness group seemed to spend less time sitting during a non-working day at 12-month follow-up than did the other two groups. In the whole study group, including the control group, there seemed to be a slight increasing trend in LTPA energy expenditure at 12-month follow-up ($p=0.011$). A similar trend was seen in the fulfillment of the physical activity recommendation for fitness at both follow-ups ($p=0.034$ and $p=0.0003$) and in the fulfillment of physical activity recommendation for health at 12-month follow-up ($p=0.049$). In addition, the mean sedentary time during a working day seemed to have decreased at 12-month follow-up ($p=0.023$).

TABLE 13 Intervention 1: Difference of changes between the intervention groups ^{1),2),3)} in the amount of leisure-time physical activity (LTPA) from baseline to 6 and 12 months' follow-up visits.

Variable / group+	Change in the amount of overall LTPA					
	6 months			12 months		
	Difference*) (%)	95% CI	p	Difference*) (%)	95% CI	p
Number of LTPA sessions per week						
Groups 1&2 vs. control	-9.9	-25.4 to 8.9	0.28	-10.3	-25.0 to 7.2	0.23
Group 1 vs. group 2	1.5	-18.5 to 26.5	0.89	7.5	-12.4 to 31.8	0.49
Minutes of LTPA per week						
Groups 1&2 vs. control	10.4	-28.4 to 70.2	0.65	-15.9	-39.2 to 16.5	0.30
Group 1 vs. group 2	-4.1	-42.1 to 58.5	0.87	9.5	-24.7 to 59.2	0.63
Number of steps per day						
Groups 1&2 vs. control	4.9	-4.8 to 15.7	0.33	0.2	-8.2 to 9.3	0.97
Group 1 vs. group 2	-1.0	-11.6 to 11.0	0.87	-1.0	-10.4 to 9.5	0.85
Kcals per week						
Groups 1&2 vs. control	14.0	-33.6 to 95.9	0.63	-17.9	-44.4 to 21.3	0.32
Group 1 vs. group 2	-11.2	-52.6 to 66.3	0.71	8.9	-30.3 to 70.2	0.71
Number of at least moderate-intensity LTPA sessions per week						
Groups 1&2 vs. control	-6.2	-26.2 to 19.4	0.60	-6.4	-25.0 to 17.0	0.56
Group 1 vs. group 2	-2.6	-26.4 to 28.8	0.85	6.3	-17.7 to 37.1	0.64
Minutes of at least moderate-intensity LTPA per week						
Groups 1&2 vs. control	67.1	-14.7 to 227.3	0.13	-3.6	-44.0 to 66.0	0.89
Group 1 vs. group 2	2.1	-53.2 to 123.4	0.96	-4.0	-48.5 to 78.6	0.90
Minutes spent sitting during a working day						
Groups 1&2 vs. control	-	-	-	-0.3	-14.8 to 16.8	0.97
Group 1 vs. group 2	-	-	-	3.7	-13.4 to 24.2	0.69
Minutes spent sitting during a non-working day						
Groups 1&2 vs. control	-	-	-	-7.1	-20.4 to 8.5	0.35
Group 1 vs. group 2	-	-	-	28.5	7.5 to 43.9	0.006

¹⁾ Group 1; Individual face-to-face counseling by occupational nurse

²⁾ Group 2; Individual face-to-face counseling by occupational nurse + fitness testing and feedback by physiotherapist

³⁾ Group 3; Data collection only; control group

*) Group differences adjusted for baseline; sex, education, perceived health and fitness compared to age-mates (analysis of covariance).

5.1.3 Intervention 2: Physical Activity Prescription and patient self monitoring in health centers and occupational health care (III)

Integrity

Patients were screened for 45 (74%) participating physicians. The questionnaire was completed by 992 patients and 535 (54%) of them were eligible for the study. 265 of the eligible patients gave written informed consent representing 50 percent of eligible patients. After two reminders, 213 patients (80%) returned the 2-month and 203 (77%) the 6-month follow-up questionnaire.

Counseling with "Prex" took 5–10 minutes on average, but 8 of the 15 physicians interviewed would have preferred 15 minutes. The average number of "Prex" per physician was 5: two physicians made only 1 and eleven physicians 5–10 prescriptions. No blank "Prex" forms were returned, suggesting that "Prex" had been delivered to all the patients intended. The content analysis of 30 "Prex" copies showed that LTPA habits had been assessed (100%), an LTPA goal had been set (78%) and a control visit had been agreed (87%). Most of the goals were health-oriented (70%) and the average number of weekly LTPA sessions recommended (7.6) was quite high compared to patients' prevailing sessions in "Prex" (3.7). Fifty three percent of the LTPA plans included only structured exercise and none of them were exclusively based on lifestyle activities. A control visit was in most cases (82%) the next visit to the physician but a preset date had been written down in only every other "Prex". Three physicians had used "Prex" as a referral to other health care personnel or exercise specialists.

Participant responsiveness

The majority (N=13) of the patients interviewed (N=15) reported that the prescription ("Prex") served as a trigger to initiate LTPA. Nine patients felt that they would not have changed their LTPA habits without "Prex". The most common reasons for not carrying out "Prex" as intended were lack of time and willpower. Factors disposing to "Prex" included company, good feeling after physical activity, baby-sitter, good weather. All patients felt that "Prex" had been within their capabilities to carry out and all except one considered "Prex" a worthwhile way of promoting physical activity in health care.

Applicability to routine practices

Most of the physicians interviewed (N=13) reported that "Prex" was an acceptable counseling tool, being most applicable to health checkup and control visits. Ten physicians believed they would use "Prex" in the future. Lack of time and difficulty of linking other health care workers to the counseling were the most frequently mentioned obstacles to adoption.

Safety

In the 2-month follow-up questionnaire, 24% of all respondents reported some adverse effects caused by physical activity, mostly musculoskeletal pains, but no statistically significant differences were found between the prescription, self-monitoring and control group.

Effectiveness

At 2-month follow-up the weekly number of overall LTPA sessions was on average 1.0 (95% CI 0.0 to 2.0) session and the weekly number of at least moderate-intensity LTPA 0.8 (95% CI 0.1 to 1.5) sessions greater in PREX than in CON (Table 14). At 6-month follow-up the mean difference between PREX and CON in at least moderate-intensity LTPA was 0.9 weekly sessions (95% CI 0.2 to 1.5) for the favor of PREX. In MON the mean increase of weekly duration of overall LTPA at 2-month follow-up was 217 minutes (95% CI 23 to 411) more than in CON.

5.1.4 Intervention 3: Individual face-to-face counseling supported by supervised group exercise in maternity and child health care (IV)

Integrity

In maternity clinics 197 pregnant women with no earlier deliveries were recruited for the study. Of these 176 (89%) were eligible for the study according to the inclusion and exclusion criteria and 132 gave their informed consent to participate, representing 75% of the eligible women. In child health clinics 127 postpartum women were recruited, 114 (90%) of these were eligible and 92 of the eligible women were willing to participate, representing 81 percent of the eligible women. During the intervention 27 pregnant (20 in EXP and 7 in CON) and 4 postpartum women (4 in EXP and 0 in CON) withdrew from the study.

The timing of the counseling sessions was as intended in both maternity and child health clinics. During maternity visits, the mean length was 25.6 (SD 8.1) minutes for the primary session and 12.1 (5.6) minutes for the boosters. During child health visits, the corresponding means were 28.3 (11.1) and 11.9 (5.6) minutes. Five boosters were missed in both maternity and child health clinics. Adherence to group exercise was 28% among pregnant and 47% among postpartum participants.

Participant responsiveness

Among the pregnant participants at the last follow-up the score for counseling satisfaction (1–5) was on average 3.7 (SD 0.8) in EXP and 2.9 (1.0) in CON. Among postpartum participants the mean score was 3.3 (0.9) in EXP and 2.8

TABLE 14 Intervention 2: Group differences in leisure-time physical activity (LTPA) changes from baseline to the 2- and 6- month follow-up compared to CON. Means, confidence intervals (95% CI) and statistical significance (p) between the groups.

LTPA	2 months			Change in LTPA*)		
	Group diff. of changes	95% CI	p	Group diff. of changes	95 % CI	p
Number of overall weekly LTPA sessions						
PREX ¹⁾ vs. CON ³⁾	1.0	0.0 to 2.0	0.05	1.1	-0.1 to 2.2	0.07
MON ²⁾ vs. CON	0.9	-0.3 to 2.2	0.07	0.5	-0.7 to 1.7	0.43
Number of at least moderate-intensity weekly LTPA sessions						
PREX vs. CON	0.8	0.1 to 1.5	0.024	0.9	0.2 to 1.5	0.023
MON vs. CON	0.3	-0.5 to 1.0	0.51	0.4	-0.4 to 1.1	0.33
Duration of overall weekly LTPA (minutes)						
PREX vs. CON	118	-50 to 286	0.17	79	-28 to 186	0.15
MON vs. CON	217	23 to 411	0.029	79	-46 to 205	0.22
Duration of at least moderate-intensity weekly PA (minutes)						
PREX vs. CON	21	-2 to 43	0.07	16	-6 to 37	0.15
MON vs. CON	24	-2 to 50	0.07	6	-20 to 31	0.67

¹⁾ Usual care + Physical Activity Prescription by (“Prex”) by physicians

²⁾ Usual care + self-monitoring of LTPA with a pedometer and a logbook for 5 consequent days followed by mailed feedback and recommendations

³⁾ Usual care; appointments to physicians carried out as usual; control group

*) Group differences adjusted for baseline; gender, age and chronic illness-related physician appointment as covariates in the analysis of covariance; missing values replaced by multiple imputation, yielding N=265.

(0.7) in CON. Compared to CON, the mean between-group difference was 0.7 (95% CI 0.3 to 1.1) in maternity clinics and 0.5 (95% CI 0.1 to 0.9) in child health clinics which is statistically significant. Pregnant participants in EXP reported more often than their peers in CON that counseling had encouraged them to initiate or maintain LTPA (81% vs. 43%, $p < 0.001$). A similar finding was made among postpartum participants (70% vs. 30%, $p = 0.012$).

Applicability to routine practices

All the nurses in EXP (N=14) returned the questionnaire concerning the primary counseling session. The mean score (1-5) for the applicability of the primary session was 3.9 (SD 0.6) in maternity and 3.8 (0.4) in child health clinics. Thirteen of the nurses were interviewed after the intervention about the applicability of booster sessions. The one nurse not interviewed changed jobs during the intervention. According to the responses, the mean score (1-5) for the applicability was 3.5 (0.5) in maternity and 3.6 (0.7) in child health clinics.

Safety

No statistically significant differences were discovered between EXP and CON groups in the incidence (%) of selected adverse events among pregnant and postpartum participants. Among pregnant participants, of the two miscarriages in EXP, one was due to blighted ovum and one due to unknown causes before the first booster session. Among pregnant completers the mean birth weight of children was 3401g (SD 341) in EXP and 3440g (490) in CON and the adjusted mean between-group difference -44g (95% CI -241 to 153). The mean weeks' gestation at delivery was 39.9 in both EXP (SD 1.45) and CON (SD 1.28) and the adjusted mean between-group difference 0.2 weeks (95% CI -0.4 to 0.8).

Effectiveness

Among pregnant participants at the first follow-up there were no differences in LTPA between EXP and CON (Table 15). At the second follow-up the weekly number of at least moderate-intensity LTPA days was 43% (95% CI 9 to 87) higher and the weekly duration of at least moderate-intensity LTPA 154% (95% CI 16 to 455) higher in EXP compared to CON. Conversely, the weekly number of light-intensity LTPA days was 24% (95% CI 41 to 3) lower in EXP than in CON. Among postpartum participants no group differences in LTPA were observed at either of the follow-ups.

According to the analyses of covariance with the same confounding factors as used in the effectiveness analysis, adherence to supervised group-exercise (attending $\geq 50\%$ of the available sessions) was not related to the changes in the weekly number of days or minutes of at least moderate-intensity LTPA in either maternity (mean difference 0.5 days, 95% CI -0.9 to 2.0 and 39 minutes, 95% CI -39 to 118) or child health clinics (mean difference 0.9 days, 95% CI -0.5 to 2.3 and

TABLE 15 Intervention 3: Adjusted group differences (%) at the end of follow-ups for weekly leisure time physical activity (LTPA). Experimental group (EXP) compared with the control group (CON).

Participants / LTPA variables	Change in the weekly LTPA ^{*)}					
	I follow-up			II follow-up		
	Group diff. (%) EXP ¹⁾ vs. CON ²⁾	95% CI	<i>p</i>	Group diff. (%) EXP vs. CON	95 % CI	<i>p</i>
Pregnant participants	16-18 weeks' gestation, N=94-96			37 weeks' gestation, N=85-89		
Number of days with at least moderate-intensity LTPA	-2	-12 to 19	0.78	43	9 to 87	0.010
Minutes of at least moderate-intensity LTPA	12	-26 to 71	0.58	154	16 to 455	0.020
Number of days with light LTPA	-10	-28 to 11	0.32	-24	-41 to -3	0.030
Minutes of light LTPA	-7	-46 to 60	0.80	-36	-65 to 20	0.16
Postpartum participants	5 months from delivery, N=86-87			10 months from delivery, N=78-81		
Number of days with at least moderate-intensity LTPA	9	-8 to 29	0.32	2	-17 to 24	0.87
Minutes of at least moderate-intensity LTPA	19	-17 to 71	0.33	21	-18 to 78	0.33
Number of days with light LTPA	-12	-31 to 13	0.32	-11	-33 to 17	0.38
Minutes of light LTPA	-19	-57 to 50	0.50	-14	-57 to 73	0.67

¹⁾ Individual face-to-face counseling by public health nurses; one primary and four booster counseling sessions + an option for supervised group exercise once a week

²⁾ Usual care; counseling according to routine practices, no supervised group exercise arranged

^{*)} Group differences at the end of follow-ups adjusted for baseline; LTPA, age, BMI, smoking status and education as confounding factors in the analysis of covariance.

-21 minutes, 95% CI -103 to 62). It seems therefore that other LTPA was mostly accountable for the changes (unreported data).

5.2 Dissemination (V)

5.2.1 Reach

A total of 3048 blocks of prescriptions had been delivered by the end of 2004, 50% of them to municipal health centers (MHC), 15% to occupational health care (OHC), 24% to local projects and 11% to hospitals, private clinics and rehabilitation centers. The number of MHCs requesting material was 96, representing approximately 34% of all centers, the southern and western parts of Finland being the most actively interested. Regarding OHC the coverage was approximately 7%.

5.2.2 Effectiveness

A question "How many of your patients do you ask about their physical activity habits?" adopted from Laitakari et al. (1989) was added to the annual surveys of The Finnish Medical Association to all the registered physicians (address known, not retired) in 2002 (N=16692) at the time of launching "Prex" and in 2004 (N=17170), when it had been available for approximately two years. The response alternatives were 1) nearly all, 2) two out of three, 3) every second, 4) one out of three, 5) fewer or none. Only physicians receiving patients at clinical appointments were asked to respond. The response rate was 85% (N=14155) in 2002 and 82% (N=14011) in 2004.

In examining the change between the years, answer categories 1-4 were combined and only those (N=9435) responding in both survey rounds were included. In examining the change between the years, answer categories 1-4 were combined and only those (N=9435) responding in both survey rounds were included. The proportion of physicians asking at least one out of three of their patients about physical activity habits was 64.9% in 2002 and 66.8% in 2004. Due to the large sample size this change of 1.9% units (95% CI 1.1 to 2.8) is statistically significant. Similar changes were found in all subgroups except for the youngest age group and those working in private clinics and OHC (Table 16). However, the clinical relevance of the fairly modest changes can be questioned.

TABLE 16 Proportions of physicians (%) asking about physical activity habits from at least one out of three patients according to the surveys¹⁾ in 2002 and 2004 and the change in the proportions from 2002 to 2004.

	Respondents %	Proportion of respondents asking about PA habits from at least one out of three patients			
		2002	2004	Change in proportions % units 95% CI ²⁾	
Gender (N=9435)					
Male	44.9	61.8	64.3	2.5	1.2 to 3.8
Female	55.1	67.4	68.9	1.5	0.3 to 2.7
Age in 2002 (N=9435)					
< 35	18.7	58.8	58.8	-0.1	-2.4 to 2.3
35-44	31.8	65.2	68.1	2.9	1.4 to 4.4
45-54	34.6	68.4	70.3	1.9	0.5 to 3.3
≥55	14.9	63.7	66.1	2.4	0.2 to 4.6
Primary working place in 2002 (N=8827)					
Hospital, rehabilitation center, hospice	47.0	60.1	62.1	2.1	0.7 to 3.3
Municipal health center	28.4	73.3	76.0	2.7	0.9 to 4.5
Private clinic	11.2	57.2	57.5	0.3	-2.1 to 2.7
Occupational health care	7.3	84.8	85.1	0.3	-2.3 to 2.9
Administration, research, teaching, other	6.1	60.5	64.7	4.3	0.4 to 8.1

¹⁾ Annual survey of the Finnish Medical Association mailed to all practising physicians in 2002 (N=16692) and in 2004 (N=17170). Only physicians receiving patients at clinical appointments were asked to respond and only those responding to this question at both surveys were included (N=9435).

²⁾ 95% confidence interval

5.2.3 Adoption

Another question “To how many patients do you give “Prex” or other written material to support verbal advice on physical activity?” was added to the Finnish Medical Association surveys in 2002 and 2004. The response alternatives, re-categorising of the responses and the inclusion of the respondents (N=8629) were the same as for the effectiveness question. The proportion of physicians using “Prex” or other written material in physical activity counseling with at least one out of three patients was 12.2% in 2002 and 11.0% in 2004 (Table 17), indicating a statistically significant decline of 1.3% units (95% CI -2.0 to -0.5). The decrease can be seen in both genders and in the youngest and oldest age groups as well as in physicians working in MHCs. Again, the declines seem quite modest from the clinical point of view.

5.2.4 Implementation

Developing a counseling approach for physicians

The counseling approach developed seemed credible and acceptable: It was plausible due to its resemblance to drug prescriptions, was developed in conjunction with physicians in a pilot study, was based on the prevailing evidence on health enhancing physical activity and physical activity counseling, and compliance with counseling principles was enhanced with a “User’s Guide”. In the further development of “Prex”, however, PAPP was not as successful: Negotiations with the electronic patient record system producers were prolonged and finally abandoned due, according to the producers, to insufficient customer demand.

Providing easy and open access to the counseling material

For “Prex” requests, PAPP was able to use the FMA, which was considered a well-established, well-known and reliable channel among physicians. The unexpectedly large number of requests illustrates that the material was easy to find and accessible.

Facilitating uptake and adoption of the counseling approach

By the end of 2004, 76 peer-trainers from the most densely populated areas of Finland had participated in one of the 4 peer training sessions. The user training was therefore within easy reach of the majority of health care units. Based on peer trainers’ self-reports, 898 physicians had participated in the user training. Of these, 629 worked in MHCs, representing approximately 19% of all MHC physicians, and 129 worked in OHC, representing approximately 16% of all OHC physicians. One of the peer trainers took the role of an opinion leader. A

TABLE 17 Proportions of physicians (%) using Physical Activity Prescription or other written material in physical activity (PA) counseling with at least one out of three patients according to the surveys¹⁾ in 2002 and 2004 and the change in the proportions from 2002 to 2004.

	Respondents %	Proportion of respondents using written material in PA counseling with at least one out of three patients			
		2002	2004	Change in proportions % units	95% CI ²⁾
Gender (N=8629)					
Male	44.5	13.1	11.9	-1.3	-2.4 to -0.2
Female	55.5	11.5	10.3	-1.2	-2.2 to -0.2
Age (N=8629)					
< 35	19.4	7.6	6.0	-1.6	-3.0 to -0.1
35-44	32.1	11.0	10.2	-0.8	-2.2 to 0.5
45-54	34.2	14.3	13.6	-0.7	-2.1 to 0.6
≥55	14.3	16.3	13.3	-3.0	-5.0 to -1.0
Primary working place in 2002 (N=8074)					
Hospital, rehabilitation center, hospice	46.9	11.3	10.5	-0.8	-1.9 to 0.3
Municipal health center	29.2	11.2	9.0	-2.2	-3.6 to -0.8
Private clinic	10.9	13.9	13.4	-0.6	-2.8 to 1.7
Occupational health care	7.1	20.7	20.1	-0.5	-4.1 to 3.0
Administration, research, teaching, other	5.9	12.6	11.4	-1.3	-4.6 to 2.0

¹⁾ Annual survey of the Finnish Medical Association mailed to all practising physicians in 2002 (N=16692) and in 2004 (N=17170). Only physicians receiving patients at clinical appointments were asked to respond and only those responding to this question at both surveys were included (N=8629).

²⁾ 95% Confidence Interval

randomized, controlled study on the effectiveness of “Prex” was started in 2002 on other funding.

Disseminating information about the counseling approach to physicians, health and exercise professionals and decision-makers

By the end of 2003, “Prex” had been introduced at 49 events involving altogether 3555 participants and in 8 articles published in professional journals. References to it were made in 69 newspaper articles, 33 articles in health and exercise magazines, 8 articles in other magazines, and 7 TV and 5 radio programs. Collaboration was started with the six Finnish Centers of Exercise Medicine, which together with the universities provide training for medical students. Furthermore, altogether 1480 information leaflets were mailed to physicians in hospitals, private clinics and rehabilitation centers.

Raising financial resources to cover PAPP expenses

Funding for 2001–2003 was applied for annually by the Finnish Rheumatism Association from the Ministry of Social Affairs and Health Finland. Various other resources were needed for additional support and in 2003 funding for another year was deemed essential for institutionalization. During the period 2001–2004 a total of 8 financial decisions were needed to cover the program costs of 266,000 Euros, which included 117,600 Euros of the collaborative organizations’ own funding (working hours of the steering group).

5.2.5 Maintenance

By the end of 2004, at least 14 local projects had been initiated based on the use of “Prex”. Seven of the projects represented southern Finland, 4 central and 3 eastern Finland. In most of them the purpose was to harmonize physical activity counseling practices in health care and to improve inter-sectoral co-operation. “Prex” was introduced as a recommended tool for physical activity counseling in two nationally important public health documents: Recommendations for promoting health enhancing physical activity (Ministry of Social Affairs and Health 2001) and the Program for the Prevention of Type 2 Diabetes (Finnish Diabetes Association, 2003). The latter program was implemented in five of the 20 Finnish hospital districts during the period 2003–2007.

6 DISCUSSION

Physical activity is one of the key factors for health (Kesäniemi et al. 2001). Its importance in health promotion has also been acknowledged in primary health care, which can reach a substantial number of individuals who are insufficiently physically active and thus exposed to many health risks.

The personal approaches used in promoting physical activity seem diverse in Finland as well and also in other countries where the topic has been examined. This is partly because there are no conclusive data on how to promote physical activity effectively in primary health care (Smith 2004, U.S. Preventive Services Task Force 2002). Furthermore, only limited information is available on the feasibility of various approaches, which is a precondition for disseminating the study results in practice (Eden et al. 2002, Whitlock et al. 2002). Dissemination, on the other hand, has been studied little because the majority of studies have focused on establishing effectiveness and very little funding has been expended on dissemination (Bodenheimer et al. 2005, Lewando-Hundt and Al Zaroo 2004, Rabin et al. 2006). Thus, more research is needed on the feasibility, effectiveness and dissemination of approaches to promote physical activity in primary health care.

The primary aim of this study was to produce more scientific evidence about the feasibility and effectiveness of selected personal approaches to promote physical activity in Finnish primary health care. For this purpose, a set of three interventions was conducted in settings which on the basis of the earlier literature were most appropriate and had unused potential for physical activity promotion. The first intervention was carried out in OHC, where face-to-face counseling alone and face-to-face counseling supported by fitness testing were compared with data collection only. The second intervention was conducted in health centers and in OHC, where Physical Activity Prescription by physicians

and self-monitoring with a pedometer and LTPA logbook followed by written feedback were compared with usual care. The third intervention was implemented in maternity and child health care where face-to-face counseling supported by optional supervised group exercise was compared to usual care. The selection of approaches examined in the interventions was based on the earlier literature and experiences of the current practices related to physical activity promotion in each setting.

The secondary aim of the study was to produce information on the dissemination of new approaches in Finnish primary health care. For this purpose, the program for nationwide dissemination of one of the approaches, Physical Activity Prescription, was evaluated. The evaluation was based on the RE-AIM framework, which included five dimensions: **R**each, **E**ffectiveness, **A**doption, **I**mplementation and **M**aintenance.

According to the findings the integrity and participant responsiveness of the approaches were high and they proved safe and applicable to routine health care. Physical Activity Prescription by physicians showed both short- and mid-term benefits in health centers and OHC compared with current practices. The results on self-monitoring with pedometer and LTPA logbook were also encouraging but only in the short-term. In maternity health care, individual face-to-face counseling supported by optional group exercise proved also effective in maternity health care compared with usual care but no similar changes in child health care were observed. Individual face-to-face counseling alone or supported by fitness testing were not beneficial in OHC compared to data collection only. However, compared with baseline, LTPA increased in all the groups, suggesting that data collection itself with a pedometer, LTPA logbook and a questionnaire may have affected to participants' LTPA. The national program for the dissemination of Physical Activity Prescription succeeded on all dimensions except effectiveness and adoption.

In the following, the findings and their relations to earlier studies are discussed in more detail beginning from the components of feasibility, continuing with effectiveness and dissemination and ending with methodological considerations affecting the generalization and the application of the study results. Although the findings on feasibility and effectiveness are based on separate interventions conducted in different settings, the results have been discussed in combination to create a more comprehensive picture of the study.

6.1 Feasibility

Integrity

Reaching the target group has been addressed as one of the main problems in health promotion research due to the risk of selection bias (Grosch et al. 1998, Kwak et al. 2005, Lerman and Shemer 1996). In interventions 2 and 3, at least 50

percent of the eligible persons participated. The reach can be considered reasonable considering that the practitioners were responsible for recruiting the participants during their busy working hours and most likely had no chance to put extra effort into recruitment. However, in intervention 2, where the baseline information was collected from all approached, some differences were observed between participants and non-participants: the non-participants seemed more likely to be men, without chronic illnesses and more physically active (Article III: Table 1).

In intervention 1, where the recruitment was based on a questionnaire, the participation rate was also 50 percent. However, the rate was based on respondents, not the whole group of employees approached. Therefore, the participation rate was likely to have been much lower because according to earlier studies (King et al. 1990) there seems to be much target group potential among the group of non-respondents. In this respect, a questionnaire proved much more limited than personal contacts in reaching the potential target group.

In all the interventions the duration of the counseling sessions was as allocated. The timing of the sessions and number of sessions implemented corresponded well with the instructions given to the practitioners. This refers to the high commitment of the practitioners to the interventions. Pregnant women's poor adherence to the optional supervised group exercise in intervention 3 compared to that of postpartum women may indicate that they experience less need for peer support. Work-related time constraints and other practical barriers as well as no perceived need for special group exercise at the beginning of pregnancy may have been other reasons for less interest.

In all the interventions the training seemed to succeed in transmitting the core principles of individual counseling to the practitioners. However, in intervention 2 with Physical Activity Prescription, a more patient-centered orientation with patient-initiated goals, LTPA plans with more lifestyle activity and a precise schedule for control visits seemed lacking. Also, as reported by other studies (Pinto et al. 1998, Sims et al. 2004), physicians who had received training did not refer their patients to other health care workers more than those who had not had such training, nor did they seem to fix control visits with their patients more than their counterparts. However, in the primary visit, using the prescription as a referral and setting up control visits would probably have saved time, which many of the physicians would have preferred. It seems and has also been found in earlier studies (Sims et al. 2004) that a more comprehensive approach than a single training session would have been needed for physicians to achieve patient-centeredness, co-operation and accurate control visit practices.

It can be concluded that, with the exception of target group reach in intervention 1, the integrity was high. This suggests that the findings on effectiveness were mainly gained due to the approaches implemented and not to other possible factors.

Participant responsiveness

In intervention 2, Physical Activity Prescription by physicians was widely accepted among the participants. This is consistent with the findings from earlier studies in Finland (Ståhl et al. 2004) and elsewhere (Jimmy and Martin 2005, Sims et al. 2004). In all the interventions, the findings concerning the participants' self-perceived effects were also positive: the participants reported that they had benefited from the approaches. Furthermore, in intervention 3 the pregnant and postpartum participants in experimental groups rated their satisfaction with counseling higher than the participants in the control groups. The study results indicate that discussions with health care providers on physical activity are appreciated by the patients. This corroborates earlier studies (Krans et al. 2005, Richmond et al. 1996, Sims et al. 2004) and may reflect the need for more intensive physical activity promotion in primary health care.

Applicability

The approaches proved applicable in all the interventions. In intervention 1 the most difficult task was to incorporate the intended sessions into the timetable of both the occupational nurse and the participant. In many cases this may have resulted from the fact that in some of the companies, OHC services were not provided in the exact location of each employee's workplace and the visits to the OHC were therefore time-consuming. Another reason in some companies may have been that the work of the employees required much traveling, making their time schedules irregular.

In intervention 2, lack of time was reported among the most common barriers for the application of Physical Activity Prescription, as also found in other studies (Abramson et al. 2000, Ainsworth and Youmans 2002, Eakin et al. 2005, Lawlor et al. 1999, McKenna et al. 1998, Walsh et al. 1999). This may have been overcome by using the prescription as a referral to other health care practitioners or to community-based physical activity services for more detailed instructions. Sharing the responsibility could have enhanced the continuity of counseling process, which may be important for long-term effects (Eden et al. 2002).

In intervention 3, the applicability rating by the nurses was high considering the increased time demands for physical activity discussions compared with their previous practices. This may reflect their autonomy to regulate their time schedules and the content of the visits. The applicability of supervised group exercise as a supportive action for counseling was not assessed.

Safety

Individual face-to-face counseling alone and supported by fitness testing appeared safe in the OHC setting since the number of participants reporting LTPA-related adverse events did not statistically differ between the groups.

However, from the clinical point of view it seems that the number of participants with adverse events was somewhat higher in the fitness testing group than in the other two groups. Even so, the small number of drop-outs (N=2) indicates that most likely only minor events were experienced. In the study by Suni et al. (1998), where the safety of the same fitness tests was examined in working aged adults, 60 percent of men and 78 percent of women experienced some degree of delayed-onset muscle soreness after testing but only few had severe symptoms.

Individual face-to-face counseling proved safe also in maternity and child health care, even though it was supplemented with an option for supervised group exercise and the target group can be considered more susceptible to various adverse events. This is in accordance with the physical activity recommendation, which states that moderate-intensity physical activity does not increase the risk of adverse events in uncomplicated pregnancies (Artal and O'Toole 2003).

Physical Activity Prescription and self-monitoring were found to be safe in health centers and OHC on the basis that no more adverse effects were found in the experimental groups compared to usual care. The results are similar to those from the EXERT study, where the total number of visits to general practitioners (GP) was compared between three study groups: GP referral for leisure center-based exercise, for community-based walking and for advice only (Isaacs et al. 2007). The number of GP visits due to cardiovascular and musculoskeletal symptoms did not increase in any of the groups compared to the situation before and during the trial.

It can be concluded that the approaches examined in this study were safe regarding their original setting, design and participants. The main reason for the high safety may be that the agreements on increasing LTPA were based on the needs, readiness and opportunities of each individual. The participants themselves were also fully responsible for carrying out their physical activity; the health care practitioners only provided support for initiation and continuation. Practical tools, such as amount of breathlessness and RPE for intensity assessment were also offered.

Furthermore, the primary focus in all interventions was to promote moderate-intensity physical activity and lifestyle activities rather than structured exercise. It has been shown that the risks of both musculoskeletal and cardiac events increase as the intensity and amount of physical activity increases (Haskell et al. 2007). For walking, for example, an injury rate of 1.4% within the previous 30 days has been reported (Powell et al. 1998).

The scientific information on the safety of personal approaches aiming to promote physical activity in primary health care is limited. Safety should, however, be considered among the most important issues when implementing approaches to promote physical activity in health care settings: There is no point in using approaches which are successful in increasing physical activity in the short-term but at the same time cause adverse events that prevent participants

from long-term adherence. This counteracts the positive effects that physical activity has on health and furthermore to health costs.

6.2 Effectiveness

In intervention 1, individual face-to-face counseling was not successful in increasing LTPA in OHC compared to the control group, which was predisposed to data collection with a pedometer and with a LTPA logbook. In a study by Proper et al. (2003b) face-to-face counseling based on the PACE protocol had a positive influence on employees' sports activity. However, as in this study, no effects were reported on meeting the physical activity recommendation of moderate-intensity activity or on LTPA other than sports.

The effectiveness of counseling was not improved by fitness testing. This is also consistent with earlier studies (Loughlan and Mutrie 1997, Proper et al. 2003a) but in intervention 1 it was hypothesized that the use of more comprehensive fitness testing would lead to better results. One reason why it did not appear to do so could be that due to the inclusion criteria the employees were already well aware of their physical activity needs. Thus, fitness testing was not able to raise their awareness or to assist them in making changes.

Nevertheless, compared with baseline, the participants in all groups increased their LTPA, including the controls. One possible explanation is that self-monitoring alone enhanced participants' LTPA within the limits of their personal possibilities and no additional benefits could be obtained from the use of more intensive approaches.

The latter assumption is supported by the findings of intervention 2, which show that short-term increase in LTPA can be achieved in health centers and OHC by simply using a pedometer and a LTPA logbook and providing mailed feedback and recommendations based on the facts recorded. Similar findings have also been discovered in the most recent systematic review of the effectiveness of pedometer-based interventions, where the overall increase in physical activity in pedometer users was 27 percent over baseline (Bravata et al. 2007). According to the same review an important factor for the increase was having a specific step goal. This was not present in either intervention 1 or intervention 2. However, in both of them a logbook was used for making the daily LTPA entries, which has also been shown to be associated with pedometer-based increase in physical activity (Bravata et al. 2007).

In the same setting the Physical Activity Prescription by physicians seemed beneficial in both short- and mid-term. In the most recent reviews only short-term results have been reported (Cavill et al. 2006, Hillsdon et al. 2005, Marcus et al. 2006, Sørensen et al. 2006). One reason for the inconsistency may be that the prescription forms and practices are different: The Finnish prescription follows the principles of the 5 A's and requires interaction between the patient and the physician, while most of the referral practices reviewed in the earlier literature are more simple. Also, in the Finnish approach the emphasis is on

physical activity, which is easily adapted to everyday routine and a logbook for self-monitoring is provided.

In maternity care, individual face-to-face counseling supported by an option for supervised group exercise seemed effective: it encouraged first time pregnant women to continue with at least moderate-intensity LTPA almost to the end of pregnancy. The results are encouraging from the health promotion point of view, because it has been shown that women who integrate exercise into their routine during pregnancy are more likely to continue exercising after delivery than their counterparts (Clapp 2000, Devine et al. 2000).

No comparable references can be found concerning face-to-face counseling supported by group exercise in maternity care. In the study by Polley et al. (2002) education and behavioral strategies were used in order to achieve the recommended rates of pregnancy weight gain. As a result, no changes in energy expenditure were discovered in the intervention group compared to the standard care group. However, individual counseling sessions were only provided for women who exceeded the normal weight gain pattern and the number of individual counseling sessions varied from 1 to 11. Therefore, no direct comparison to the results of this study can be made.

Among postpartum women no increase in physical activity was discovered. The most reasonable explanation may be that, as the baseline LTPA was already high, the participants' capacity to increase it may have been limited, especially due to new child care responsibilities. Thus, counseling was not able to overcome these barriers. This is supported by earlier studies showing that lack of time due to family duties is the major barrier for physical activity after delivery (Devine et al. 2000, Symons Downs and Hausenblas 2004). However, no comparable feasibility and effectiveness reports are available. In a study by Watson et al. (2005), which aimed at increasing postpartum women's physical activity by community-based pram walking groups, the attendance at walks was poor and pram walking was not able to increase the physical activity of the participants. O'Toole et al. (2003) found that an educational intervention was effective in increasing postpartum women's energy expenditure over a period of one year but the high drop-out rate of 43 % impairs the value of the results.

6.3 Dissemination

The Physical Activity Prescription Program (PAPP) was successful in reaching the health care units (Reach), in accomplishing most of the implementation actions (Implementation) and in facilitating the initiation of local projects (Maintenance). However, at the national level among physicians, no increase from 2002 to 2004 could be observed in the frequency of asking about patients' physical activity habits (Effectiveness) or in the frequency of using "Prex" or other written material in physical activity counseling (Adoption). As stated by Glasgow et al. (Glasgow et al. 2002), differences in the outcomes of different

dimensions are typical and from the public health point of view, it may sometimes be more essential, for example, to select a program with high reach and low effectiveness rather than one with low reach and high effectiveness (Estabrooks and Gyurcsik 2003, Eakin et al. 2005).

In PAPP, taking into account the short duration of the active phase (2 years) as well as the modest human and financial resources, reaching 34% of MHC can be considered successful. In implementation the strengths were the pilot study, the opportunity to use well-known and respected channels for disseminating the counseling material and the large network of peer-trainers. The primary drawback was the failure to negotiate electronic "Prex" for patient record systems. From the maintenance point of view, the number of local inter-sectoral projects based on "Prex" was encouraging because coordination is needed to achieve more permanent changes in clinical practices (Haines and Donald 1998).

6.4 Methodological considerations

6.4.1 Interventions

The most important strength of the study was that the approaches were integrated into authentic health care situations and carried out by health care personnel normally working in the settings, not by separate staff provided for the study. This enhances the transferability of the study results to practice. Also, in two of the interventions, randomization was used in assigning the eligible individuals or participating health care practitioners to the experimental or control group. This improves the internal validity of the results diminishing the possibility that some other factors than the interventions could have contributed to the effects. In addition, the health care practitioners were carefully trained in the approaches, which were semi-structured and guided with written material. This enhanced the implementation of the approaches as intended as well as the likelihood that the findings resulted from the specific approaches. Finally, in all the interventions multiple components were included in the feasibility evaluation. They describe the external validity of the study results and help to interpret them in terms of generalization.

There are, however, some issues that need to be considered when applying the results to similar populations or settings. First of all, the findings are limited by self-reported LTPA data, which may be susceptible to over- or underreporting. Earlier studies indicate that people in general tend to underestimate time spent in light-intensity physical activity and overestimate time spent in more intensive physical activity (e.g. Klesges et al. 1990). The participant's activity level may also have affected the LTPA responses: physically active people may underestimate and physically inactive people overestimate their physical activity (Leenders et al. 2001). However, these problems should not have affected group comparisons in any of the

interventions because the possibility to over- or underreporting was similar in all groups.

The wide variation in the distributions of especially light-intensity LTPA collected with questionnaires may indicate to validity problems. In the study published after the interventions, the validity of the original IPAQ against the accelerometer recordings appeared quite low, from -0.12 to 0.32 (Craig et al. 2003). No information on the modified versions used in this study is available. This is a common problem in physical activity studies in general: the questionnaires are used widely before appropriate reliability and validity testing (Shephard 2003).

Seasonal reasons may also have been responsible for the wide variation (Pivarnik et al. 2003). This applies particularly to interventions 2 and 3, where the season during the follow-ups among some participants may have differed from baseline. Due to the wide variation the sensitivity of the questionnaires to reveal small between-group differences may have been impaired.

Attention paid to the participants alone in terms of taking part in the study and taking measurements may have temporarily facilitated participants' physical activity by raising their physical activity awareness (van Sluijs et al. 2006). This so-called Hawthorne effect may also have diminished the differences between the groups and the ability of the selected measures to detect the differences. To ensure that the difference compared with the minimal intervention can be revealed, elements based on best evidence should be integrated into the approaches. Also, assessment measures with high sensitivity should be used.

The recruitment strategies or drop-outs may have caused some selection bias impairing the representativeness of the samples and thus the generalizability of the findings. This is a common problem concerning randomized controlled trials in general (Sanson-Fisher et al. 2007). In intervention 1, the major concern was the recruitment strategy, which limited participation to those responding to the screening questionnaire. As no information was collected from the non-respondents, it was not possible to assess the representativeness of the sample. In intervention 2, the possible selection bias may have been related to the fact that the receptionists were not able to approach all the patients intended due to time constraints. Therefore, unintended selection may have occurred in the recruitment situation and may have impaired the representativeness of the sample. In intervention 3, selection bias may have occurred due to non-randomized design and the number of drop-outs in the experimental groups, especially since there were indications that some differences existed between the completers and non-completers. However, at baseline, the overall sample can be considered quite representative as 75 percent of the eligible pregnant women and 81 percent of the eligible postpartum women participated in the study.

In intervention 1, contamination at subject level may have been possible because there were employees from all the study groups in the same company thus increasing the possibility that the employees exposed to physical activity

promotion would be in contact with those in the control group. This may have diminished the differences between the groups. In other interventions the possibility of contamination was minimal because providers or units were randomized instead of subjects. Furthermore, due to the setting it was unlikely that many of the participants had repeated contacts with each other during the interventions.

Possibly due to selectivity, the baseline LTPA of the participants was relatively high, especially in interventions 1 and 3. This may have impaired the experimental participants' ability to increase their physical activity. As a result, the changes may have been too small to be revealed by the measures used. Also, regarding all the interventions, the health care units participating may have been more compliant with health promotion than those not participating. Due to differences in outcome indicators, measures, target groups and settings, no further comparisons of the feasibility and effectiveness of the different approaches in their original setting can be made. Neither is it possible to say whether any of them would be feasible and effective in a setting other than the original one. This weakens the systematic interpretation of the results and warrants additional research. It is also difficult to estimate to what extent the findings are culture-dependent.

6.4.2 Dissemination program

The modest outcomes in effectiveness and adoption may indicate at least three problems in evaluation. First, the time perspective may have been too short. Studies on clinical guidelines indicate that the adoption process is slow (Haynes and Haines 1998) because numerous aspects influence health care providers' practices (Davis and Taylor-Vaisey 1997). Similar modest changes in physicians' physical activity counseling have been discovered earlier (Eakin et al. 2004). Thus, the possibility to add PAPP questions to the Finnish Medical Association survey in the near future should be explored. Second, the survey data were based on physicians' self-reports, which may reflect what they should do rather than what they actually do (Brotons et al. 2005) impairing the ability of self-reports to detect clinically relevant changes. However, in the study by Laitakari et al. (1989) the question proved quite conclusive in assessing health care professionals' counseling practices.

Third, the ultimate question is whether the implementation actions were selected appropriately for effectiveness and adoption. For effectiveness, more action may have been needed, especially at the beginning, to strengthen physicians' confidence in physical activity counseling and their knowledge of its effectiveness. The gaps in these are, after all, among the main barriers to physicians' counseling (Abramson et al. 2000, Lawlor et al. 1999). Information about the above-mentioned issues could have been disseminated through channels capable of reaching the majority of physicians (e.g. professional journals), although it is conceded that information alone is not powerful in changing practices (Baro et al. 1998, Melin et al. 2005). To be convincing,

evidence on “Prex” should have been available (Wang et al. 2006). In this respect, the results of the effectiveness intervention (III) came late.

In adoption, focusing on training seemed an appropriate approach, especially since physicians’ peer-training seems effective (Davis and Taylor-Vaisey 1997). However, single training sessions were not enough to put “Prex” into practice and to facilitate inter-sectoral co-operation at local level, as also confirmed in recent studies (Sims et al. 2004). Introducing ways of collaboration in the user training and supporting the participants to tailor their own strategy may have yielded better results (Cifuentes et al. 2005, Woolf et al. 2005). Furthermore, the administrators at the unit and district level should have been committed to “Prex” and cooperation supported by literature on clinical guidelines (Haines and Donald 1998). Local cooperation may also have created more pressure for electronic “Prex”.

6.5 Summary

All the approaches examined were feasible in their original settings regardless of the enlarged time demands compared with the usual practices, caused by some of the approaches. This refers to the good ability of the compliant health care practitioners to integrate physical activity promotion into their everyday routines. Knowledge of the real world conditions might also have helped in generating approaches that were feasible in the specified settings.

Some of the selected personal approaches in their particular settings also seemed effective (Table 18). Those shown effective compared with usual care were 1) Physical Activity Prescription in health centers and OHC, 2) self-monitoring with pedometer and LTPA logbook followed by a mailed feedback in health centers and OHC and 3) face-to-face counseling supported by supervised group exercise in maternity care. The results on face-to-face counseling with or without fitness testing in OHC and face-to-face counseling supported by supervised group exercise in child health care were not as positive.

TABLE 18 Summary of the effectiveness of personal approaches evaluated in the study.

Personal approach	Effectiveness
<p>Intervention 1 in occupational health care Individual face-to-face counseling Individual face-to-face counseling supported by fitness testing Self-monitoring of physical activity with a pedometer and LTPA log (control group)</p>	<ul style="list-style-type: none"> • Neither of the counseling approaches were effective in mid (6 months) or long-term (12 months) compared with data collection only. • All of the approaches, including data collection with self-monitoring in the control group, produced some long-term (12 months) changes in LTPA compared with baseline.
<p>Intervention 2 in health centers and occupational health care Physical Activity Prescription by physicians Self-monitoring with a pedometer and LTPA log followed by individualized feedback and LTPA recommendations by mail</p>	<ul style="list-style-type: none"> • Prescription was effective in short (2 months) and mid-term (6 months) compared with usual care. • Self-monitoring was effective in short term (2 months) compared with usual care.
<p>Intervention 3 in maternity and child health care Individual face-to-face counseling supported with an option for supervised group exercise in maternity care Individual face-to-face counseling supported with optional supervised group exercise in child health care</p>	<ul style="list-style-type: none"> • Counseling was effective in long term (7–8 months) compared with usual care • Counseling was not effective in short (3 months) or long term (8 months) compared with usual care.

Thus, in one setting encouraging improvements in physical activity were achieved even by the simplest approaches but in some other settings no benefits were gained even with a very intensive approach. This inconsistency may partly relate to methodological issues, such as outcome measures. For example, particularly in intervention 1, the use of a pedometer and an LTPA log as outcome measures may markedly have diminished the between-group differences and thus impaired the possibility to discover the impact of face-to-face counseling with or without fitness testing. However, the differences in the settings and target groups may also be responsible for the inconclusiveness. For example, during the postpartum period the primary attention is paid to the baby's wellbeing and the mothers may perceive issues related to their own lifestyle less crucial than during pregnancy. Together with time constraints due to new family responsibilities, interfering with physical activity behavior in child health care may not be most opportune.

No strong conclusions on the generalizability of the results, even in their original settings, can be drawn because no comparable studies have been reported in Finland. Nevertheless, the findings concerning Physical Activity Prescription by physicians are in line with the most recent reviews on similar studies in other countries (e.g. Cavill et al. 2006, Hillsdon et al. 2005, Marcus et al. 2006, Morgan 2005, Sørensen et al. 2006). This is also the case with self-

monitoring with a pedometer and an LTPA log (Bravata et al. 2007). Within the limitations related to the differences in the studies in regard to culture, setting, provider and target group, Physical Activity Prescription by physicians and self-monitoring with a pedometer and an LTPA logbook may cautiously be recommended for application in health centers and OHC.

The findings on face-to-face counseling supported by group exercise in maternity care are not as clear because no similar studies have been reported in Finland or in other countries. The study by Polley et al. (2002) is not comparable because it aimed at preventing excessive weight gain and provided dietary and physical activity counseling only to those with abnormal weight gain pattern. In light of the current study it can therefore only be concluded that the results on face-to-face counseling supported by group exercise in maternity care seem promising in first-time pregnant women. The reasons why it did not work in postpartum women can only be conjectured. They may relate to time constraints due to new family duties, to giving preference to the baby's well-being instead of the mother's or to other factors which need further research. Nevertheless, due to lack of comparable studies, no direct conclusions on ineffectiveness can be drawn, either. More studies are needed to build evidence on physical activity counseling in postnatal care.

Face-to-face counseling in OHC was not able to bring about positive changes in the physical activity of the employees. This may partly result from methodological issues, such as using outcome measures, which themselves can promote physical activity and from the fact that the employees were physically quite active at baseline. Nevertheless, the findings are consistent with the study by Proper et al. (2003b) in terms of increasing moderate-intensity physical activity. Fitness testing seemed not to bring any additional benefits to face-to-face counseling. The results concur with studies reported earlier in Finland (Miilunpalo et al. 1989) and in other countries (Loughlan and Mutrie 1997, Proper et al. 2003a), although a different approach and set of tests were used in them, making the comparison of the results difficult. It seems, however, that alternative or supplementary actions to face-to-face counseling with or without fitness testing may be needed to promote physical activity in OHC. In the review by Marshall (2004) a shift from individual to more comprehensive approaches incorporating individual, mediated and social approaches is suggested.

On the basis of this study it cannot be estimated to what extent the findings regarding each approach could be applied beyond their original setting. In maternity care, for example, where the target group is generally most susceptible to behavioral modifications (Artal and O'Toole 2003, Paisley et al. 2003), it may be that similar positive effects to those resulting from repeated face-to-face contacts and group exercise in intervention 3 could be achieved by less intensive Physical Activity Prescription or self-monitoring. This would diminish the workload of the health care practitioners, reduce the time needed for the visits and ultimately save health care costs. In a study by Isaacs et al. (2007) GP's referral to advice only produced increases in physical activity

similar to the more intensive approaches but was the most cost-effective. Similar findings on the cost-effectiveness of physician-based Physical Activity Prescription have been obtained by Elley et al. (2004).

Further studies are needed to produce evidence on the relative feasibility and effectiveness of various approaches in each of the settings. For comparability, similar indicators and validity-tested measures should then be used. Also, costs should be evaluated to justify the uptake and dissemination of particular approaches.

A three-year program implemented at national level was not sufficient to disseminate new physical activity promotion practices to primary health care. To improve uptake and adoption the duration of the program should have been more than three years, which is the common basis for public funding. Also, more emphasis should have been put on tailoring alternative strategies and models for uptake at local level and on supporting their implementation, which is suggested also by earlier reports (Glanville et al. 1998).

7 CONCLUSIONS AND SUGGESTIONS

This study was one of the first to examine the feasibility, effectiveness and dissemination of approaches aiming to promote the physical activity of working aged adults in Finnish primary health care. On the basis of this study the following conclusions can be made:

- 1) All the approaches examined were feasible in their original settings in terms of integrity, participant responsiveness, applicability and safety.
- 2) Physical Activity Prescription by physicians in health centers and OHC appeared effective in producing short and mid-term positive physical activity changes compared with usual care.
- 3) Self-monitoring with a pedometer and an LTPA log followed by mailed feedback in health centers and OHC brought about short-term positive physical activity changes compared with usual care.
- 4) Individual face-to-face counseling supported by supervised group exercise in maternity care helped the first-time pregnant women to maintain their moderate-intensity physical activity to the end of their pregnancies better than usual counseling practices.
- 5) Individual face-to-face counseling supported by supervised group exercise in child health care had no effects on postpartum women's physical activity.
- 6) Individual face-to-face counseling with or without fitness testing in OHC did not have favorable effects on employees' physical activity compared with data collection only.
- 7) A national level program with three-year public funding was successful in reaching the target group, implementing the actions for the program goal and creating local projects for maintenance. However, it did not facilitate

the uptake and adoption of the new physical activity promotion approach, Physical Activity Prescription. Extending the duration of the program and investing more effort at local level may have improved the results.

However, this study is not enough to make the conclusions plausible. The strength of the conclusions varies depending on the level of scientific evidence reported by earlier studies. The strongest support is for conclusions 2) and 3) with regard to short-term effects: They are consistent with several reviews of similar studies conducted in various countries other than Finland. This may be considered sufficient to recommend Physical Activity Prescription by physicians and self-monitoring with a pedometer and an LTPA log followed by mailed feedback for practical implementation in their original settings. However, retesting is still needed to confirm the findings in the Finnish context.

Very little or inconsistent literature is available to support the other conclusions. Although some of them seem favorable, such as conclusion 4) on face-to-face counseling and group exercise in maternity care, they are limited to the interventions of this study until determined by further research.

On the basis of this study it remains unknown whether the effects of the approaches examined would be beneficial in other settings and among other target groups. Therefore, to select the most effective approach, further research is needed to compare the feasibility and effectiveness of various approaches in each setting. For comparability, similar indicators and validity-tested measures should then be used. Attention should also be paid to the cost-effectiveness for justification of the approaches.

YHTEENVETO

Väitöskirjan ensisijaisena tavoitteena oli kehittää perusterveydenhuoltoon erilaisia systemaattisia liikunnan edistämisen työtapoja ja selvittää niiden toteuttamiskelpoisuutta ja vaikuttavuutta. Tätä tarkoitusta varten toteutettiin kolme osatutkimusta, joista kaksi ensimmäistä olivat satunnaistettuja ja kontrolloituja tutkimuksia ja kolmas kontrolloitu pilottitutkimus. Yhteistyökumppaneina oli yhteensä 35 terveysasemaa Etelä-Suomen alueelta.

Ensimmäinen osatutkimus toteutettiin työterveyshuollossa (N=7). Yhdeksän yrityksen työntekijät (N=155) satunnaistettiin kontrolliryhmään ja kahteen koeryhmään. Ensimmäisen koeryhmän työntekijät osallistuivat oman työpaikansa työterveyshoitajan (N=8) liikuntaneuvontaan, toisessa koeryhmässä samanlaista neuvontaa täydennettiin fysioterapeutin ohjaamalla kuntotestauksella ja siitä saatavalla palautteella. Kontrolliryhmään kuuluville työntekijöiltä kerättiin vain liikunta-aktiivisuutta koskevat tiedot. Osatutkimus kesti 12 kuukautta ja sinä aikana koeryhmäläisille järjestettiin työterveyshuollossa yhteensä neljä liikuntaneuvontatuokiota.

Toinen osatutkimus toteutui terveyskeskuksissa ja työterveyshuollossa (N=24). Tutkimukseen osallistui 67 lääkäriä, jotka satunnaistettiin koe- ja kontrolliryhmään. Vastaanotolle tulevien potilaiden (N=265) tutkimusryhmä määräytyi lääkäreiden mukaan. Koeryhmän lääkärit sisällyttivät Liikkumisreseptin mukaisen liikuntaneuvonnan potilaan vastaanottokäyntiin, kontrolliryhmän lääkäreiden vastaanotolla ei käytetty Liikkumisreseptiä. Vastaanoton jälkeen joka toinen kontrollilääkärin potilas sai vastaanottosihteeriltä askelmittarin ja liikuntapäiväkirjan, joiden avulla hänen tuli pitää kirjaa liikunta-aktiivisuudestaan seitsemän päivän ajan. Postitettuaan mittarin ja merkinnät takaisin tutkimuslaitokseen potilas sai vastineeksi fysioterapeutin kirjallisen liikuntapalautteen ja -suosituksen.

Kolmas osatutkimus toteutettiin kuudessa äitiys- ja lastenneuvolassa, jotka jaettiin koe- ja kontrolliryhmään. Raskaana olevien (N=132) ja synnyttäneiden (N=92) naisten tutkimusryhmä määräytyi neuvolan mukaan. Koeneuvoloissa terveydenhoitajat (N=14) toteuttivat tehostetun liikuntaneuvonnan viidellä rutiinikäynnillä. Lisäksi asiakkailla oli mahdollisuus osallistua ohjattuun liikuntaryhmään kerran viikossa. Kontrollineuvoloissa terveydenhoitajat (N=10) keskustelivat liikunnasta kuten ennenkin.

Työtapojen vaikuttavuutta arvioitiin ryhmien välisillä eroilla vapaa-ajan liikunta-aktiivisuudessa lyhyellä (2 kuukautta), keskipitkällä (6 kuukautta) tai pitkällä (> 6 kuukautta) aikavälillä. Mittareina käytettiin kyselylomakkeita, askelmittareita tai liikuntapäiväkirjoja tutkimuksesta riippuen. Toteuttamiskelpoisuutta arvioitiin sillä, miten hyvin liikunnan edistämisen työtavat toteutuivat suunnitellulla tavalla, asiakkaiden kokemuksilla työtavoista, terveydenhuollon ammattilaisten näkemyksillä työtavan käyttökelpoisuudesta sekä työtapojen turvallisuudella. Arviointi perustui kyselyihin ja tutkimuksen aikana kerättyyn muuhun aineistoon.

Osatutkimusten tulokset osoittivat, että kaikki työtävät olivat toteuttamiskelpoisia omista toimintaympäristöissään. Liikkumisresepti lisäsi vapaa-ajan liikuntaa perusterveydenhuollossa sekä lyhyellä että keskipitkällä aikavälillä. Myös itsetarkkailu askelmittarin ja liikuntapäiväkirjan avulla sekä siitä saatu palaute lisäsivät liikuntaa tavanomaiseen vastaanottokäyntiin verrattuna lyhyellä aikavälillä. Äitiysneuvolassa toteutettu tehostettu liikuntaneuvonta auttoi raskaana olevia naisia pitämään yllä kohtuukuormitteisen liikunnan määrän raskauden loppuun saakka tavanomaiseen neuvontakäytäntöön verrattuna. Lastenneuvolassa liikunta-aktiivisuudessa ei ollut eroa tehostettuun ja tavanomaiseen neuvontaan osallistuneiden välillä. Työterveyshuollossa toteutettu liikuntaneuvonta ilman kuntotestausta tai kuntotestauksen kanssa ei lisännyt osallistujien liikuntaa kontrolliryhmään verrattuna.

Väitöskirjan toisena tavoitteena oli arvioida valtakunnallista Liikkumisresepti-hanketta sen pyrkimyksissä lisätä perusterveydenhuollon lääkärin liikuntaneuvontaa levittämällä lääkärin käyttöön Liikkumisresepti ja siihen liittyvää tukimateriaalia. Hankkeen arviointi liitettiin RE-AIM-viitekehykseen (www.reaim.org), johon kuuluu viisi eri osiota: 1) tavoitavuus (Reach), 2) vaikuttavuus (Effectiveness), 3) käyttöönotto (Adoption), 4) toteuttaminen (Implementation) ja 5) pysyvyys (Maintenance). Tavoitavuutta arvioitiin tilattujen reseptilomakkeiden määrällä ja levikillä valtakunnallisesti. Vaikuttavuuden ja käyttöönoton arviointi perustui vuoden 2002 (N= 16692) ja 2004 (N=17170) Suomen Lääkäriliiton Lääkärikyselyihin, joissa tiedusteltiin lääkärin toteuttaman liikuntaneuvonnan määrää ja kirjallisen ohjeen käyttöä neuvonnan tukena. Toteutumisessa arvioitiin hankkeen viiden keskeisen toimenpiteen onnistumista suhteessa suunnitelmiin (prosessiarviointi). Ne liittyivät työkalun ja tukimateriaalin kehittämiseen, materiaalin avoimeen ja helppoon saatavuuteen, koulutukseen ja tieteellisen näytön tuottamiseen, tiedonlevitykseen ja rahoitukseen. Pysyvyyttä kuvasi se, missä määrin Liikkumisresepti jäi elämään paikallisissa hankkeissa ja miten se näkyi valtakunnallisissa terveyden edistämisen dokumenteissa. Nelivuotinen hanke onnistui hyvin tavoitavuudessa, toteuttamisessa ja pysyvyydessä. Se ei kuitenkaan lisännyt liikuntaneuvontaa (vaikuttavuus) eikä kirjallisten liikkumisohjeiden, kuten Liikkumisreseptin, käyttöä perusterveydenhuollon lääkäreiden liikuntaneuvonnassa (käyttöönotto).

Yhteenvedona osatutkimuksista voidaan todeta, että niihin kehitetyt liikunnan edistämisen työtävät olivat tässä väitöskirjassa käytettyjen arviointiperusteiden mukaan toteuttamiskelpoisia omista toimintaympäristöissään. Vaikuttavuustulokset olivat selvästi epäyhtenäisempiä. Tämän väitöskirjan osatutkimusten ja aikaisempien ulkomaisten tutkimusten perusteella selkeintä näyttöä on lääkärin reseptiin perustuvasta liikuntaneuvonnasta (Liikkumisresepti) sekä liikkumisen itsetarkkailusta askelmittarin ja päiväkirjan avulla. Muiden tässä väitöskirjassa tarkasteltujen työtapojen vaikuttavuudesta on vain vähän, ristiriitaista tai ei lainkaan aikaisempaa tutkimustietoa. Siksi niiden vaikuttavuudesta ei tämän väitöskirjan perusteella voi tehdä varmoja johtopäätöksiä, vaan tulosten tueksi tarvitaan lisää vertailukelpoista tutkimustietoa.

Valtakunnallisen Liikkumisresepti-hankkeen arviointi osoitti, että hanke onnistui keskeisten toimenpiteiden toteuttamisessa, mutta ei saanut aikaan muutoksia lääkäreiden liikuntaneuvonnassa. Suurimpana syynä voi olla hankkeen lyhyt kesto – tiedetään, että muutokset tapahtuvat hitaasti ja asteittain. Toisaalta syynä voi myös olla se, että toimenpiteitä ei ollut valittu tavoitteen kannalta oikein. Saattaa olla, että lääkäreiden luottamusta omiin neuvontataitoihin ja tietoa neuvonnan vaikuttavuudesta olisi pitänyt vahvistaa enemmän, näyttöä Liikkumisreseptin vaikuttavuudesta olisi pitänyt olla jo hanketta käynnistettäessä ja käyttöönottoa olisi pitänyt edistää konkreettisemmin paikallisella tasolla.

Tämä väitöskirjatutkimus oli ensimmäinen, jossa tarkasteltiin erilaisten liikuntaa edistävien työtapojen käyttökelpoisuutta, vaikuttavuutta ja käyttöönoton levittämistä suomalaisessa perusterveydenhuollon toimintaympäristössä. Tutkimus vahvisti ulkomailla tehtyjen tutkimusten myönteisiä tuloksia lääkärin reseptiin perustuvasta liikuntaneuvonnasta (Liikkumisresepti) sekä liikunnan itsetarkkailusta askelmittarin ja liikuntapäiväkirjan avulla. Muiden työtapojen vaikuttavuuden tueksi tarvitaan lisää tutkimustietoa niiden alkuperäisissä toimintaympäristöissä. Jatkotutkimuksissa on tarpeen selvittää myös sitä, miten käyttökelpoisia ja kustannusvaikuttavia työtavat ovat toistensa suhteen.

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