STUDIES IN SPORT, PHYSICAL EDUCATION AND HEALTH
263

Karoliina Kaasalainen

Awaking the Motivation for Change

Relationships Between Physical Fitness, Physical Activity and Psychosocial Factors Among Men in the Adventures of Joe Finn Campaign

JYVÄSKYLÄN YLIOPISTO

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ABSTRACT

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This thesis examined how physical fitness is associated with self-reported physical activity (PA), eating habits and psychosocial factors among Finnish men who engaged in the Adventures of Joe Finn Campaign. The thesis comprises four original publications and supplementary results. The research framework utilizes the Health Action Process Approach (HAPA) and principles of social marketing. HAPA guides the explanation of health behaviors at the individual level within the wider framework of social marketing, which links the individual-level effects with the campaign.

Data were collected during the Adventures of Joe Finn Campaign tour in 2011 and by a post-campaign e-mail survey in 2014. Physical fitness was estimated with a body fitness index (BFI) based on the Inbody 720, Polar OwnIndex test and a hand grip test. Self-reported PA, phase of PA change (intention/action) and psychosocial factors were elicited by questionnaire. Of the 900 baseline participants (M_{age}=43.9, SD=12.7), 19 % had low and 42 % moderate BFI. For further analyses, 361 of these men were assigned to a "need-for-change" group on the basis of a low or moderate BFI, body mass index (BMI)>25 kg/m^2) and indications of abdominal obesity. In 2014, 102 of these men completed a follow-up questionnaire and 41 men in the "need-for change" group underwent a second BFI test.

When compared against their BFI, 63% of the low-fit participants overestimated their fitness. Low self-efficacy, self-regulatory skills, lack of goals and lower social support differentiated this group from their high-fit counterparts. Based on the fitness test, 40 % of the men needed to change their health behaviors. The post-campaign study revealed that, in this group, while the proportion of the least active men decreased, the median activity level did not change. Men who reported positive changes in PA had higher PA goals at baseline and they expressed stronger autonomous promoters for PA than those who remained at the low PA level.

The results suggest that low-fit men need stronger self-efficacy and support for skill development. Individual counseling after a fitness test, easy access to PA groups or regular self-monitoring and feedback may be appropriate additional interventions for this group.

Keywords: Physical fitness, campaign, social marketing, men, self-efficacy, self-regulation

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Jyväskylä, 02.11.2017
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FIGURES

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LIST OF ORIGINAL PUBLICATIONS

This thesis is based on four original publications and supplementary results. Published results are referred to in the text by the following numerals.

I Kaasalainen Karoliina, Kasila Kirsti, Villberg Jari, Komulainen Jyrki & Poskiparta Marita. A cross-sectional study of low physical fitness, self-rated fitness and psychosocial factors in a sample of Finnish 18- to 64-year-old men. BMC Public Health 2013; 13 (1), 1113. doi:10.1186/1471-2458-13-1113

II Kaasalainen Karoliina, Kasila Kirsti, Komulainen Jyrki, Malvela Miia & Poskiparta Marita. Psychometric Properties of a Short Measure for Psychosocial Factors and Associations With Phase of Physical Activity Change Among Finnish Working-Aged Men. American Journal of Men's Health 2015; doi:10.1177/1557988315614615.

III Kaasalainen Karoliina, Kasila Kirsti, Komulainen Jyrki, Malvela Miia & Poskiparta Marita. Readiness for health behavior changes among low fitness men in a Finnish health promotion campaign. Health Promotion International 2015; doi:10.1093/heapro/dav068

IV Kaasalainen Karoliina, Kasila Kirsti, Komulainen Jyrki, Malvela Miia & Poskiparta Marita. Changes in psychosocial factors and physical activity among Finnish working-aged men in the Adventures of Joe Finn Campaign (submitted).

ABBREVIATIONS

ACSM=American College of Sports Medicine
ACT=Acceptance and commitment therapy
BCT=Behavioral change technique
BFI =Body fitness index
BIA =Bioimpedance
BMI =Body mass index
CFI=Comparative fit index
CI=Confidence interval
DF=Degree of freedom
EB = Eating behavior
F&V =Fruits and vegetables
F=Frequency
HAPA=Health Action Process Approach
IT=Information technology
MI=Motivational interviewing
NSMC=National Social Marketing Center
OR=Odds ratio
PA= Physical activity
PF = Physical fitness
RMSEA= Root mean square error approximation
SMM= Skeletal muscle mass
T1=2011
T2=2014
TLI= Tucker-Lewis index
TPB= Theory of planned behavior
TTM=Transtheoretical model
VFA =Visceral fat area
WRMR= Weighted root mean square residual

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APPENDICES

APPENDIX 1 Explorative factor analysis for scores on psychosocial factors.

APPENDIX 2 Bivariate correlations of study variables of follow-up participants.

APPENDIX 3 Confirmatory factor analysis and model fit for motivational (mot) and volitional (vol) factors.

APPENDIX 4 Health behavior Questionnaire (selected study variables).

1 INTRODUCTION

Regular physical activity (PA) has several health benefits. It improves physical fitness, reduces risk for overweight and non-communicable diseases, and is associated with psychological well-being (Lee et al. 2012, Pedersen & Saltin 2015). Healthy eating is another factor associated with normal body weight, good fitness and health (Fogelholm et al. 2012). Awareness of the positive health effects of these lifestyles has reached the great majority of people in western countries. Notwithstanding, inactivity and overweight are public health issues of increasing concern (Lee et al. 2012). Men, in particular, have been targeted as they have had higher mortality from chronic diseases and less healthy lifestyles than women (Gavarkovs, Burke & Petrella 2015). Moreover, health differences between socioeconomic groups of men have been wide (Kaikkonen et al. 2015, Koskinen & Martelin 2013).

Masculine norms have been raised in the debate on the reasons why men have not followed as healthy a lifestyle as women (Courtenay 2000). Environmental and social circumstances can promote or hinder health-promoting behaviors. However, PA and healthy eating have largely been explained by psychosocial factors, such as individuals' knowledge, intentions, self-efficacy, self-regulatory skills and autonomous motivation (Bauman et al. 2012, Teixeira et al. 2012, Teixeira et al. 2015). These factors reflect the perceived benefits and importance of the desired behavior and confidence that one can successfully attain those behaviors. Researchers also emphasize that people need special skills to control their behavior and navigate different social systems (Schwarzer, Lippke & Luszczynska 2011). The Health Action Process Approach (HAPA) is one theoretical model that demonstrates the dynamics between psychosocial factors during efforts at health behavior change (Schwarzer, Lippke & Luszczynska 2011). Previous research has proposed that self-efficacy and self-regulatory skills are the best predictors of the target behavior. These factors can distinguish people who intend to be physically active, but have not realized their intentions, and those who end up engaging in the behavior. Although research evidence has accumulated on the theoretical mechanisms of health behavior change, finding effective ways to influence these factors remains a major challenge.

Health promoters have attempted to improve men's health behaviors by various informational and behavioral interventions (George et al. 2012, Taylor et al. 2013, Bottorff et al. 2015). Men's engagement in and attitudes to PA and healthy eating programs has varied, and a preference has been shown for PA-oriented interventions. The acceptability and effectiveness of such programs can be improved by designing gender-sensitive interventions. Social marketing is one health campaign planning approach to targeting health messages to specific groups who might be reluctant to respond to general health interventions. Social marketing refers to the use of marketing principles and techniques to promote voluntary changes in behavior (Kotler et al. 2002, NSMC 2011).

Despite the fact that appropriate marketing strategies can increase the recognition, adoption and acceptance of health messages, solid facts and persuasive communication alone are not effective in promoting actual change in health behaviors. PA campaigns have typically relied on this type of health communication. However, information is not meaningful if people do not perceive the importance of health outcomes or have the confidence and skills to change their behavior in the desired direction (Bauman et al. 2012, Biddle et al. 2012, Michie & West 2013). Therefore, the effectiveness of campaigns can be improved by including interactive elements in interventions. Personal experiences can promote confidence that one can modify one's behaviors in everyday social reality.

Understanding on effective methods of supporting healthy lifestyles among men has increased (George et al. 2012, Taylor et al. 2013, Bottorff et al. 2015). However, only a few campaigns have been targeted to men. Furthermore, evaluation of the effectiveness of multicomponent campaigns is difficult. A general limitation of the studies evaluating changes in knowledge, attitudes and intentions to change health behaviors has been a focus on change in the short term (Heath et al. 2012, Anker et al. 2016).

This doctoral research examined the relationship between psychosocial factors and physical fitness among participants in a health campaign under the title "The Adventures of Joe Finn". Specifically, the purpose was to investigate the long-term associations between changes in psychosocial factors and PA. "The Adventures of Joe Finn" is a Finnish health campaign offering free fitness tests, feedback, and public events for men in a good-humored way. Public fitness testing is a unique approach to activating working-aged men. The results of this study further increase understanding on men's health behaviors. This knowledge has value for health professionals designing future interventions and campaigns.

2 LITERATURE REVIEW

2.1 Physical fitness, physical activity and eating habits among Finnish men

2.1.1 Physical fitness and physical activity

In Finland, men have been found to show a higher prevalence of cardiovascular diseases, engage more in unhealthy behaviors (e.g. unhealthy diet, alcohol consumption and smoking) and have a life-expectancy six years lower than women (Prättälä, Karisto & Berg 1994, Koskinen & Martelin 2013, Helldán & Helakorpi 2015, Kaikkonen et al. 2015, Borodulin et al. 2016). About one-third of 55- to 64-year-old men have hypertension (35 %) or elevated blood cholesterol (30 %) compared to one-tenth of women at the same age (Helldán & Helakorpi 2015). Moreover, thirteen per cent of men aged 55-64 have diagnosed diabetes and over 60 per cent are overweight or obese (body mass index (BMI) >25 kg/m2) (Helldán & Helakorpi 2015, Kaikkonen et al. 2015). Although about a half of 35- to 50-year-old men do not have chronic diseases, almost 40 per cent of this age group have musculoskeletal problems, such as low-back pain (Helldán & Helakorpi 2015) (Table 1).

Good physical fitness is associated with lower mortality rates, lower likelihood of developing several non-communicable diseases and improved capacity to cope with physiological and psychological stress in everyday life (Lee et al. 2011, Shuval 2014, Pedersen & Saltin 2015). Good fitness can also attenuate the detrimental effects of overweight. A recent meta-analysis found that regardless of BMI, mortality risk was twice as high in unfit than fit individuals (Barry et al. 2014). The so called "obesity paradox", meaning that unfit normal weight people had higher risk for mortality than overweight unfit individuals, was also observed. This paradox has been explained by the potential protective influence of overweight from a decrease in functional ability at older ages (Barry et al. 2014).

Physical fitness includes health-related and skill-related domains (Caspersen, Powell & Christenson 1985). Health-related fitness comprises aerobic capacity (aerobic/cardiorespiratory fitness), skeletal muscle strength, flexibility and body composition (Caspersen, Powell & Christenson 1985). Skill-related components include agility, balance, coordination, speed, power and reaction time. While aerobic and muscular fitness capacity have been emphasized as factors protecting against metabolic diseases, motor skills and strength also have importance for functional ability, safety and enjoyment of physical activities (Lee et al. 2005, Whaley 2006).

A sufficient amount of physical activity (PA) and a healthy diet are the most important modifiable factors affecting physical fitness (Vuori 2001, Lee et al. 2012). PA has been defined as "*any bodily movement produced by skeletal muscles that results in energy expenditure*" (Caspersen, Powell & Christenson 1985). PA can be further divided into different types, which have various goals and motives. For example, physical activity may be related to occupational tasks or to leisure-time activities, or both. Sport and exercise are specific types of PA. Exercise refers to planned, structured and repetitive PA aimed at improving or maintaining physical fitness (Caspersen, Powell & Christenson 1985).

Although physical fitness may have an even greater role in reducing risk for mortality than the level of PA itself (Lee et al. 2005), there is accumulating evidence on the beneficial effects of PA in decreasing all-cause mortality, risk for coronary heart diseases, type 2 diabetes, high blood pressure, stroke, metabolic syndrome, some cancers and depression (Vuori 2001, Whaley 2006, Lee et al. 2012). Regular PA and good fitness in middle age have been associated with fewer sickness absences at work as well as lower morbidity and mortality in later life (Savela et al. 2010, Shuval 2014). Aerobic PA (e.g. walking, running, cycling and swimming) is effective in reducing fat from abdominal tissues and decreasing risk for metabolic diseases (Lakka & Laaksonen 2007). Furthermore, strength training is essential for good functional ability while it has also positive effects on metabolism by increasing energy consumption and improving insulin sensitivity (Johannsen et al. 2016). To improve and maintain good physical fitness, PA guidelines recommend both aerobic and strength activities. For example it is recommended that adults engage in moderate intensity aerobic PA at least 150 min/week or vigorous PA 75 min/week and to perform strength and mobility enhancing exercises at least twice a week (Haskell et al. 2007, UKK-institute 2009). However, only 15 per cent of Finnish adult men meet these recommendations (Husu et al. 2014b, Kaikkonen et al. 2015). More than one-third (35 %) engage in either aerobic or strength exercises but not both (Kaikkonen et al. 2015).

Population PA levels are declining in western countries (Hallal et al. 2012, World Health Organisation 2014). Everyday life does not require engagement in vigorous activities and most occupations involve only light activity. Current research emphasizes that, regardless of leisure-time PA, an additional risk factor for metabolic diseases and poor physical fitness is prolonged sedentary time (Patel et al. 2010). Levels of PA objectively assessed by accelerometers indicated that adults spent only five per cent of their waking-hours on moderate-to-

vigorous PA and 20 per cent on light activities (Husu et al. 2014b). In Finland, a half of working-aged men report physically strenuous work and one-fourth report spending at least 15 minutes daily in active commuting to work (Helldán & Helakorpi 2015). However, one-fifth of 20- to 54-year-old men evaluate that they are unable to run 500 meters or longer and one-fourth believe that they will not be able to remain at work until retirement (Kaikkonen et al. 2015).

TABLE 1 Health and health behaviors in Finnish 15- to 64-year-old men.

	Age			
	15-34	**35-54**	**55-64**	**Total**
	%	%	%	%
Physical activity[1]				
Commuting activity daily>15min	27	19	19	23
LTPA>2x/wk	65	64	68	67
Physically vigorous work	50	53	47	50
Level of PA[2]				
Low (<1h/wk)	30	32	30	31
Moderate (1-3h/wk)	32	40	51	41
High (>3h/wk)	29	25	18	24
Hompetitive sport	8	3	1	4
Self-reported physical fitness[3]				
poor	3	12	15	11
moderate	30	38	37	36
good	67	50	46	53
Unable to run >500m	10	15	34	13
Eating habits[1]				
Use vegetable fats in cooking	55	55	53	53
Do not eat rye bread	19	10	9	12
Eat fish at least once/wk	66	74	85	75
Eat fresh vegetables daily	25	37	41	34
Do not eat breakfast	20	17	16	18
Drink soft drinks at least 3x/wk				
All	20	10	7	12
Unemployed	40	13	13	22
Substance use[1]				
Alcohol risk use (>16 portions/wk)	-	-	-	40
Daily smoking	-	-	-	16
Health counseling[1]				
Advised to change eating habits	23	38	35	33
Advised to increase physical activity	30	35	29	32
Increased physical activity	30	25	19	23
Changed eating habits	30	36	40	35
Changed health behaviors for health reasons	58	67	61	63
Tried to lose weight	19	25	25	23
Reduced weight	20	21	16	19
General health[1]				
No chronic diseases	67	54	36	53
No sickness absences during past year	30	35	53	38

Sources: 1=Helakorpi, Prättälä & Uutela 2011, 2=Helldan & Helakorpi 2015, 3=Kaikkonen et al. 2015

A population-based study indicated that 60 per cent of men aged 18-64 perceive their physical fitness as good or fairly good (Helldán & Helakorpi 2015). Self-reported evaluations of fitness include a risk for overestimation; however, only a few studies objectively measured fitness in adult populations by field tests. A Swedish cohort study of 1 317 713 men, who conscripted between the years 1969-1996, indicated that low aerobic fitness in young adulthood increased the risk for early death during the 29-year follow-up (Högström, Nordström & Nordström 2016). Aerobic fitness also reduced all-cause mortality risk in normal weight and overweight but not obese individuals. A study of Finnish conscripts indicated that aerobic capacity decreased by over ten per cent between the years 1979-2004, when measured by the 12-minute running test (Santtila et al. 2006). A similar trend was found among working-aged male reservists. One-tenth of these reservists had poor physical fitness and only a half had sufficient aerobic fitness to perform tasks required of reservists (Vaara & Kyröläinen 2016). Surprisingly, muscular strength had improved over the results for previous years (Vaara et al. 2009, Vaara & Kyröläinen 2016). Despite the relatively representative samples of the studies using conscripts and reservists, the results cannot be generalized to all Finnish men. The participants in these studies tended to be healthy men selected for relative fitness, and thus overall proportion of men with low fitness in the general population may be greater. Selection phenomena has been noticed also in population-based study that measured physical fitness among Finnish men and women with several functional tests (Koskinen, Lundqvist & Ristiluoma 2012). The results indicated, that while the functional ability has improved among the older age groups between years 2000-2011, the men aged 30-44 tended to have increasing number of functional problems (Suni et al. 2012).

Some studies exist on PA patterns among Finnish adult men. The results show that most men engage in PA alone (81 %). Peer groups (56 %) form the next most common context for practicing physical activity. To a much lesser extent PA takes place in fitness centers (15 %), workplaces (11 %) or sport clubs (14 %) (Suomen Kuntourheiluliitto 2010). The most commonly reported types of leisure-time PA are walking, cycling, gym training, skiing and jogging. Preferred PA environments include pedestrian paths, streets, skiing and hiking tracks, wilderness and gyms. In general, 80 per cent of working-aged men perceive the availability of PA services as sufficient (Kaikkonen et al. 2015). Most popular activities are relatively inexpensive, although socioeconomic factors and a poor PA environment may decrease possibilities for engagement in PA.

2.1.2 Eating habits

Apart from PA, eating behavior is another influential factor that is related to health and risks for metabolic diseases (Laaksonen et al. 2008, Boeing et al. 2012, Fogelholm et al. 2012). According to official Finnish nutrition recommendations (2014), a health promoting diet is based on vegetables, berries, fruits, wholegrain cereals, vegetable fats and protein sources, such as legumes, low-fat dairy products, fish and poultry (The National Nutrition Council 2014). It is

recommended that at least half a kilo of vegetables and other food plants is eaten daily. Foods with added sugar and salt, and processed meat should occupy a marginal role in the diet. A concrete guideline for constructing a healthy meal is "the food plate model" (The National Nutrition Council 2014). It recommends that half of every meal should be vegetables, fruits or berries, one-quarter grains, cereals, potatoes, rice or other sources of carbohydrates and one-quarter from protein-rich foods (e.g. fish, meat, poultry, lentils, beans etc.). Having regular meal times supports healthy dietary choices and may help maintenance of normal body weight (BMI= 18-25 kg/m2) (Fogelholm et al. 2012).

When compared against the nutrition recommendations referred to above, the diet of approximately one-fifth of Finnish men has a shortfall (e.g. low intake of fruit and vegetables, regular intake of sugar-sweetened soft drinks, irregular meal times) (Helldán & Helakorpi 2015, Kaikkonen et al. 2015, Ovaskainen et al. 2015). A sufficient intake of vegetables could improve diet quality and help to maintain the energy balance required for normal body weight (Boeing et al. 2012, Fogelholm et al. 2012). Only one-third of working-aged Finnish men reported daily intake of vegetables and fruit (F&V) (Table 1). The proportion is lower than that of Finnish women and less than that of other men in Europe (OECD 2013). During the past 20 years, the development of many eating habits of Finnish men has been positive but the latest report indicates also contradictory results (Raulio et al. 2013). For example, consumpton of saturated fats has begun to rise again. Essential dietary targets for Finnish men would be to increase intake of F&V, reduce salt consumption, improve quality of fats and increase fiber-rich carbohydrates (The National Nutrition Council 2014). Other relevant dietary goals in young and working-aged men are reduced intake of alcohol and sugar-sweetened drinks (Helldán & Helakorpi 2015, Borodulin, Jallinoja & Koivusalo 2016).

2.1.3 Differences in sociodemographic groups

Men's health behaviors have been often described negatively. Generally, men have been less active than women in seeking health information and using health services (OECD 2015, Ek 2015). At the population level, one-third of 18- to 64-year-old Finnish men reported that they had been advised to increase PA, a half (33 %) had received dietary advice and slightly more than a fourth (28 %) had tried to lose weight during the past year (Table 1). Underestimation of perceived health risks has been suggested to be one reason for non-participation in health-promoting behaviors (Brug et al. 2006, Salmela et al. 2012, Vähäsarja et al. 2012). For example, Näslindh-Ylispangar (2008) studied men at risk for cardiovascular diseases. The results revealed that only a few of the 341 men studied had received health counseling from professionals and that the men tended to underestimate their health risks. Furthermore, study dropouts perceived that they had no need to change their habits despite the risk factors. Men's unrealistic optimism and masculine norms may constrain help-seeking for symptoms. In this connection, Salmela et al. (2012) found that, overall, 36 %

of men with type 2 diabetes perceived a need for lifestyle counseling, but more than one-third of these men declined to attend the counseling intervention.

Rather than treating men's health behaviors as a single entity it is relevant to evaluate unhealthy behaviors across sociodemographic groups (Koskinen & Martelin 2013, Kaikkonen et al. 2015, Borodulin et al. 2016). Sociodemographic factors, in this study, refer to age, educational level, marital status and employment status. Studies on different age-groups have concluded that while Finnish men are generally health conscious, among the most vulnerable groups this knowledge is applied to their behavior in only small measure (Näslindh-Ylispangar 2008, Pietilä 2008, Hirvonen et al. 2015). The MOPO study among young men indicated that PA information, transmitted by traditional health communication channels, did not reach inactive young men (Ahola et al. 2013, Hirvonen et al. 2015). Poor health knowledge and information processing abilities (Health information literacy) have been related to avoidance of health-related information (Hirvonen 2015).

A population-based study found that psychosocial factors (e.g. self-efficacy, self-control and social support) predicted individuals' low PA more than environmental factors (Borodulin, Jallinoja & Koivusalo 2016). Low-active men had lower self-efficacy and self-control and received less social support to engage in PA than highly active men. However, the associations were not similar across all sociodemographic groups. In the unemployed group, low self-efficacy, lack of social support and younger age, predicted insufficient PA, whereas among the employed group only low self-control was related to low PA (Kinnunen et al. 2012, Borodulin et al. 2016, Borodulin, Jallinoja & Koivusalo 2016). High self-control has also predicted better aerobic fitness and higher PA among young Finnish men (Kinnunen et al. 2012).

In cross-sectional research, low education was related not only to insufficient activity but also to a decrease in PA in the long term (Loman 2016). A study of 2 584 Finnish working-aged adults found that the lower-educated showed the greatest likelihood to decrease PA during the 11-year follow-up (Haapala et al. 2016). Higher-educated adults tended not only exercise more but also use more preventive health services, engage more in weight management programs and perceive participation as more beneficial than lower-educated counterparts (Husu et al. 2014a). Similarly, only a half of unemployed men engaged in PA at least twice a week as compared to 80% of upper-white collar workers (Helldán & Helakorpi 2015).

It has been reported that despite the greater prevalence of many unhealthy behaviors among men in general, men receive more social support for PA from close people than women in the same situation (Hankonen et al. 2010). However, the amount of social support and types of social norms have varied across sub groups of men. Low social support for PA decreases the likelihood of sufficient PA (Borodulin, Jallinoja & Koivusalo 2016). Typically, social norms have played a greater role among young than middle-aged and older men. The ethnographic study by Kauravaara (2013) found that PA and health were distant values for young men in vocational school. Similarly, the VARU study indicat-

ed that young men considered healthy living habits stressful and as requiring too much self-control (Jallinoja, Sahi & Uutela 2008). Enjoyment, social relations and living without stress seemed to be more valued objectives (Jallinoja, Sahi & Uutela 2008, Kauravaara 2013, Hirvonen 2015). In turn, a study on middle-aged working-class men suggested that participants had taken heed of the central health messages and discourses of health promotion (Pietilä 2008). Among these men too, while "healthism" was disapproved of, attempts had been made to strike a balance between healthy and unhealthy practices.

Eating habits have displayed many similar relationships between socio-demographic groups and similar associations with psychosocial factors as PA, although different patterns have also been observed (Guillaumie, Godin & Vezina-Im 2010, Borodulin, Jallinoja & Koivusalo 2016). As with PA, an unhealthy diet has been related to low self-control, younger age, low education and having lunch outside home (Borodulin, Jallinoja & Koivusalo 2016). A half of upper-white collar workers reported eating fresh vegetables daily, while only one-fifth of unemployed and blue collar workers used F&V in daily meals (Table 1) (Helldán & Helakorpi 2015). In addition, regular intake of soft drinks was most common among unemployed young men (Helldán & Helakorpi 2015) and 40 per cent of low educated men consumed alcohol in excess of the risk consumption recommendation (> 16 portions/wk) (Kaikkonen et al. 2015). Although differences in eating habits across sociodemographic groups of men are marked, gender has additional influence on the dynamics between social status and health behaviors. For instance, employed men tended to have a slightly greater likelihood of following an unhealthy diet than employed women (Kaikkonen et al. 2015).

Marital status has shown an impact on PA and eating habits among men. Whereas differences in PA between cohabiting and single-living men were small, marital status was more influential on eating habits (Helldán & Helakorpi 2015). Forty per cent of married/cohabiting men ate fresh vegetables daily but compared to almost half this proportion (24 %) among single-living men. A study on men with cardiovascular risk factors indicated that married men were more interested in health-promoting behaviors than single men (Näslindh-Ylispangar 2008). On the other hand, married men perceived less need for lifestyle counseling than single-living men, which may reflect the greater degree of available social support from spouses and other close people (Salmela et al. 2012).

In sum, PA and eating habits are dependent on individual, social and environmental factors. Individualized health promotion interventions, such as personal and group counseling, have been shown to be effective in promoting health behavior change (Bock, Jarczok & Litaker 2014). However, the reach of these programs is limited to small groups in the population (Biddle et al. 2012, Heath et al. 2012). Therefore, better understanding of methods that can successfully be used among larger publics is needed. Developing such methods requires knowledge of the most easily modifiable determinants of the behavior of the target group.

2.2 Psychosocial factors mediating physical activity change

As discussed in the previous section, health behavior is influenced by various psychosocial factors, including cognitive, affective and normative factors (Tones & Green 2004, 111-154). Health knowledge and beliefs are cognitive factors whereas attitudes are affective. Normative factors refer to social networks and pressures that may either promote or restrict health actions (Tones & Green 2004). ***Health knowledge*** means awareness of the benefits of healthy lifestyles, such as what constitutes a sufficient amount of health-promoting PA or a balanced diet (Williams et al. 2008, Marcus & Forsyth 2009). ***Beliefs*** refer to subjective probabilities, such as risk perceptions, while ***attitudes*** represent positive or negative judgments on the target behavior, such as positive ***outcome expectations*** (i.e. gaining benefits by changing health behaviors) (Tones & Green 2004, Schwarzer & Luszczynska 2008). Health knowledge creates the basis for ***perceived need,*** which reflects the belief that health behavior change will have personal benefits (Schwarzer, Lippke & Luszczynska 2011). Perceived need is distinct from general knowledge, and is thus a more important determinant for adopting a new health behavior (Bauman et al. 2012, Rhodes & Quinlan 2015). Knowledge, beliefs and attitudes combine to affect an individual's motivation and readiness for health behavior change.

2.2.1 Readiness for change

Readiness for change includes the perceived personal value of the behavior, awareness of susceptibility to health risks, an intention to change and the use of different cognitive and behavioral strategies to implement the target behaviors (Prochaska & DiClemente 1983, Marcus & Forsyth 2009, Prochaska et al. 2010). ***Intention*** is a goal-directed attitude to the behavior (Ajzen 2006, Fishbein & Ajzen 2011, Schwarzer, Lippke & Luszczynska 2011). Intention is essential but not an absolute predictor of actual change. Many people have the intention to be physically active but less than a half successfully change their behavior (Rhodes & de Bruijn 2013). The use of cognitive and behavioral strategies reflects one's perceived capability to perform a behavior, self-regulatory skills and opportunities to implement behavioral intentions (Prochaska & DiClemente 1983, Tones & Green 2004, Marcus & Forsyth 2009). Cognitive strategies include seeking new information and feedback on the behavior and reflecting on one's own behavior. Cognitions are related to awareness of the emotional aspects of the behavior, caring about the consequences to others, comprehending the benefits of the behavior and recognizing alternative behavioral models (Prochaska & DiClemente 1983, Marshall & Biddle 2001, Marcus & Forsyth 2009).

Behavioral strategies comprise the substitution of alternative behaviors for the problem behavior, enlisting social support, reinforcing the behavior, committing oneself (e.g. goal setting, planning, self-monitoring, rewarding) and controlling the stimulus to engage in the problem behavior (Prochaska & Di-

Clemente 1983, Marcus & Forsyth 2009, Prochaska et al. 2010). Researchers have described differences in the use of cognitive and behavioral strategies between individuals who intend to change and those who have implemented change. Usually, persons who are physically active tend to make more use of behavioral strategies while intenders mainly consider cognitive strategies (Marshall & Biddle 2001). Given that intention is an essential but insufficient factor to drive behavioral change, there is a need to identify other factors that promote the adoption and maintenance of positive health behaviors (Schwarzer, Lippke & Luszczynska 2011, Bauman et al. 2012, Rhodes & de Bruijn 2013).

2.2.2 Motivation

Motivation has been used as an umbrella term for goal-oriented cognitions that direct a person's actions (Ryan & Connell 1989, Ryan et al. 1997). Readiness for change, including intentions, reflects the degree of motivation but says little about its quality (Ryan & Deci 2002, Teixeira et al. 2012). Strength of intention indicates how much effort one is ready to put into goal achievement (e.g. increasing PA). However, it does not answer the question "why" the intention has been formed. Motivation has its antecedents in personal needs and values, outcome expectancies and perceived capabilities (Ryan & Deci 2002).

Evidence has accumulated showing that long-term PA is related to ***autonomous motivation*** which is reflecting in personal volition and willingness to participate in the target behavior (Teixeira et al. 2012). Autonomously motivated individuals tend to have positive outcome expectations and attitudes to the desired behavior. Motivation, which stems from enjoyment, fun, competence, self-selected goals and values, is autonomous. In contrast, feelings of external pressure and obligation to be physically active are examples of ***controlled motivation,*** which is usually short-term motivation to engage in the desired behavior.(Ryan & Deci 2002).

Health and fitness-related motives have been among the most commonly reported reasons for increasing PA in adult populations (Aaltonen et al. 2012, Teixeira et al. 2012, Aaltonen et al. 2014). These motives are autonomously controlled, but extrinsic rather than intrinsic. This means that a person engages in PA because he values the consequences of the behavior but does not necessarily enjoy the activity itself (Ryan & Deci 2002). Empirical studies have found a positive relationship between fitness motives and short-term increase in PA, whereas the long-term associations have been mixed (Teixeira et al. 2012).

The inconsistencies in results have been explained by the various meanings that good fitness has for different people. Some may pursue good fitness to gain social approval or higher status while others seek to enhance personal well-being. Intrinsically motivated people perceive cognitive rewards during PA spontaneously, while in cases of extrinsic motivation, rewards are separable from the behavior itself (Ryan et al. 1997). However, extrinsic motives can become more intrinsic over time. If a person maintains the activity, he can begin to experience it as meaningful and rewarding. The adoption of a desired behavior can be understood as a learning process in which a person finds effective new

ways to initiate action towards goal achievement (Carver & Scheier 1998, 1-47). Intrinsic and external feedback contribute this process. Feedback can promote perceived confidence in one's abilities, reinforce action and indicate the appropriateness of selected behavioral strategies (Carver & Scheier 1998, 10-18).

2.2.3 Self-efficacy

People are thought to be more likely to engage in behaviors if they believe in their personal capacity to perform a behavior successfully (Bandura 1997). This self-efficacy belief has been shown to have great importance in health behavior change and maintenance (Ashford, Edmunds & French 2010, Rhodes & Nigg 2011, Samson & Solomon 2011, Bauman et al. 2012). According to Albert Bandura (1997), the motivation to take action towards a desired goal is not dependent solely on one's knowledge or skills but also on a sense of efficacy, i.e., how well one can use one's cognitive and behavioral resources. Furthermore, self-efficacy contributes to persistence in working with challenging tasks and goals. Higher self-efficacy increased commitment to goal achievement (Bandura 1997). Therefore, self-efficacy is important for health behavior change when a person needs to learn new ways of action and maintain those practices over time.

Self-efficacy is highly context- and behavior-specific and is assumed to be represented in different ways during behavior change (Schwarzer, Lippke & Luszczynska 2011). Action self-efficacy (i.e. confidence in one's ability to begin a new task) has been differentiated from maintenance self-efficacy (i.e., the ability to maintain a behavior and cope with barriers) and recovery self-efficacy (i.e., the ability to recover after setbacks) (Schwarzer, Lippke & Luszczynska 2011). Self-efficacy is likely to be related to physiological and mental states, such as perceived fitness, strength, pain, exhaustion and stress. Lack of PA skills, poor health, fitness or overweight can decrease perceived competence to engage in PA (Samson & Solomon 2011, Teixeira et al. 2012, Olander et al. 2013). In contrast, high self-efficacy can influence interpretations of one's internal states and help to sustain discomfort and susceptibility to temptations. Learning to interpret one's own physiological and psychological states could result stronger self-efficacy (Samson & Solomon 2011, Schwarzer, Lippke & Luszczynska 2011).

For the purpose of health promotion, the interesting question is how self-efficacy can be strengthened. Self-efficacy beliefs are constructed as a result of cognitive processes and reflection (Bandura 1997, Bandura 1998, Samson & Solomon 2011, Warner et al. 2014). Theoretically, major sources of self-efficacy are past performance (mastery experiences), psychological states, vicarious experiences (e.g. learning from other's successful experiences) and verbal persuasion (encouragement, health counseling). Past performance, i.e., previous mastery experiences influences individuals' perceptions of the success or failure of the target behavior. Contextual factors, such as social environment, can either increase or reduce self-efficacy. For example, verbal persuasion includes social support, feedback, and encouragement, goal-setting and self-talk. Vicarious experiences and modeling include observing other's or one's own successful per-

formances, social comparison and role models. These experiences may strengthen self-efficacy while, for example, the nature of the feedback received (negative/positive) and similarities with the role model (e.g. age, gender, fitness status) can also influence changes in efficacy beliefs (Bandura 1998, Williams & French 2011, Olander et al. 2013, French et al. 2014).

Self-efficacy promotes behavioral change when the individual also has positive outcome expectations and sufficient self-regulatory skills (Bandura 1998). However, the associations may be different in different subgroups. A systematic review indicated that other mechanisms than self-efficacy may be more important for PA change in overweight/obese adults than non-obese adults (Olander et al. 2013, Parschau et al. 2013a, Parschau 2014). The researchers suggested that while interventions may increase participant's self-efficacy for PA, if they do not believe that PA will contribute positively to weight loss, meaningful PA change will not be implemented. This indicates the importance of identifying the individual's goals and how these interact with self-efficacy. A recent review also suggested that affective responses (e.g. enjoyment, fun) can influence people's perceived self-efficacy and motivation to engage in PA in the future (Teixeira et al. 2012, Rhodes & Quinlan 2015).

2.2.4 Self-regulatory skills

Self-regulation has received much attention in health behavior research over the past decade (Carver & Scheier 1998, 10-28, Baumeister & Vohs 2004, 1-12, Schwarzer, Lippke & Luszczynska 2011). Self-regulation refers to the cognitive processing and integration of information about one's own inner states and the physical and social environment. The aim of this type of conscious processing is to control acquisition of the desired behavior (Baumeister & Vohs 2004, 1-12). Self-regulation begins with the relatively simple and direct processes of seeking to control attention, thoughts, emotions, impulses and actions, but it is also involved in more complex processes of managing one's life (Gollwitzer & Bargh 1996). Goals, feedback and self-reflection construct the core of the self-regulatory process (Carver & Scheier 1998, 10-28). Baumeister & Vohs (2004, 1-12) proposed that self-regulation cannot be successful unless it is successful both at monitoring the state in relation to the goal and at making the desired behavioral changes and adjustments.

Self-regulatory skills are the individual strategies that people use when seeking to control goal-directed behavior (Carver & Scheier 1998). These strategies may include information seeking, barrier identification, goal setting, action planning and self-monitoring (Baumeister & Vohs 2004, Kok et al. 2016). Health programs can promote individuals' skill development by providing informational, practical and social support (Tones & Green 2004, 107-141). Behavior change techniques (BCT) are specific strategies to promote individuals self-regulatory processes (Michie et al. 2011). Self-regulation occurs in interaction with the physical and social environment. Thus, social skills are also important for self-regulation. Social skills can facilitate the acquisition of target behavior-related knowledge, feedback, encouragement and help in organizing the behav-

ior (see also 2.2.5) (Tones & Green 2004, 111-154). Self-regulation has been seen as a cyclical process that guides the adoption and maintenance of the desired behavior (Carver & Scheier 1998, Tones & Green 2004, Baumeister & Vohs 2004).

Goals are defined as inherently valued outcomes that are derived from dissatisfaction with the current situation (Horowitz & Townsend 2004, Latham & Locke 2007, Shilts, Pearson 2012). Goals direct human action. However, only some goals can be effectively pursued at any one time. Limited resources and the personal importance and proximity of goals lead people to put effort into the realization of selected goals (Baumeister & Vohs 2004). The ***goal setting*** process consists of recognizing a need for change, establishing the relevant goal, planning the action, implementing the plan, collecting feedback and self-monitoring one's behavior (Shilts, Horowitz & Townsend 2004). Goal setting theory assumes that the difficulty, specificity and proximity of the goal may either promote or hinder goal achievement (Latham & Locke 2007).

Research recommends that setting both short- and long-term goals and encouraging people to set goals individually may enhance commitment to behavioral change (Shilts, Horowitz & Townsend 2004, McEwan et al. 2016). However, goal specificity has not predicted the effectiveness of interventions, which have been equally effective whether the goals were set individually or participatively (McEwan et al. 2016). There is some evidence that the most effective PA interventions have advised goal setting in relation to daily or daily and weekly PA routines, but not weekly PA alone (McEwan et al. 2016).

With respect to task difficulty, interventions where participants have been encouraged to set moderate intensity PA goals have been more effective than those encouraging vigorous PA goals (McEwan et al. 2016). Goal setting has been shown to promote PA change in various groups (Shilts, Horowitz & Townsend 2004, Pearson 2012, McEwan et al. 2016). However, it may not help if the individual has set irrelevant goals or lacks self-efficacy (Luszczynska et al. 2011, Koring et al. 2012a). It has been suggested that self-efficacy and goal setting have a reciprocal relationship (Koring et al. 2012a, Koring et al. 2012b, Parschau et al. 2013a, McEwan et al. 2016). The successful attainment of short-term goals can build mastery experiences, which further strengthen perceived self-efficacy and help the individual to put more effort into attaining further behavioral goals. Goal achievement can be promoted by using BCTs, such as action planning, self-monitoring, feedback and rewards (Michie et al. 2011, Kok et al. 2016, McEwan et al. 2016). Interventions may be more effective if several BCTs have been used and the synergistic effects of these task-specific strategies support goal setting (McEwan et al. 2016).

Action planning is a self-regulation strategy which refers to the setting of sub-goals for the overall goal and appropriate cues for action (Carver & Scheier 1998, Schwarzer, Lippke & Luszczynska 2011). A concrete planning strategy is to first identify when, where and how one is aiming to engage in PA in the near future. Action planning starts by defining the goal, reviewing previous behavior and identifying potential barriers. Planning targeted at maintenance of the behavior is termed ***coping planning*** (Michie et al. 2011, Schwarzer, Lippke &

Luszczynska 2011). Coping plans have been made to find solutions to risk situations ("if then-plan") (Schwarzer, Lippke & Luszczynska 2011). Planning helps people to organize their behavior and overcome barriers despite situational constraints (Hankonen et al 2014, Lippke et al. 2014, Parschau et al. 2014).

Barrier identification assists people to differentiate true barriers from excuses (Marcus & Forsyth 2009). However, barrier identification may not promote PA change in the early stages of change, or in cases where self-efficacy is low (Williams & French 2011, Koring et al. 2012b, Parschau et al. 2013a). Therefore, interventions that target the enhancement of self-efficacy (e.g. prompting engagement in PA trials, encouragement), are recommended before detailed action planning (Williams & French 2011, Koring et al. 2012b, Parschau et al. 2013a). Rather than the number of perceived barriers, the ability to meet challenges and find the motivation for change may be more influential in the beginning of adopting a new behavior.

Common barriers to PA have been lack of interest, insufficient social support, poor perceived health and fitness, and environmental and time constraints (Korkiakangas, Alahuhta & Laitinen 2009, Cerin et al. 2010, Van Dyck et al. 2014, Borodulin et al. 2016). Nigg et al. (2008) suggest that contextual factors (e.g. stress, daily hassles and environment) may facilitate or impede physical activity maintenance directly and indirectly via individual psychosocial variables (Nigg et al. 2008). Sorensen & Gill (2008) proposed that high active men tend to report priority barriers (e.g. lack of time and energy) less than low active men while high active women reported cognitive and affective barriers (e.g. disinterest, does not perceive self as a "physically active" person) less than low active women (Sorensen & Gill 2008). Despite the fact that motivational factors are the greatest barriers to PA, from an ecological perspective it would be important to reduce environmental and social barriers to ensure similar possibilities for PA across all population groups (Bauman et al. 2012, Biddle et al. 2012, Bukman et al. 2014).

Self-monitoring is a strategy that refers to the regular recording of a certain behavior (e.g. physical activity, diet) with the aim of achieving a specific goal (e.g. weight loss or improvement in physical fitness) (Michie et al. 2011). Pedometers, accelerometers, heart-rate belts and PA diaries are typical ways to track PA behavior. Systematic reviews have concluded that while self-monitoring is related to successful behavioral change, it does not necessarily promote maintenance of the desired behavior (Fjeldsoe et al. 2011, Greaves et al. 2011, Ramage et al. 2013). Other behavioral techniques are also needed. If the self-regulatory process is viewed as a larger entity, self-monitoring without regular feedback and guidance in goal setting and action planning is not likely to be successful (Carver & Scheier 1998, Baumaister & Vohs 2004, 1-12). Different devices and IT-based applications may generate feedback on behavior but do not necessarily promote one's ability to interpret such data or promote self-regulation (Karapanos et al. 2016).

The importance of reflection on one's own monitoring data, interaction with others and some degree of accountability have been assumed to promote

the effectiveness of self-monitoring (Jakicic et al. 2016, Karapanos et al. 2016, Harkin et al. 2016). Hunt et al. (2013) found that while pedometers were highly accepted among men, their long-term effects were mixed (Hunt et al. 2013). Karapanos et al. (2016) suggested that some people use accelerometers for experimental purposes rather than purposively to improve fitness (Karapanos et al. 2016). Experimental users, in particular may benefit from social networks and interpretative feedback. For example, step-count and activity level may be sufficient feedback for purposeful users but not make sense to experimental users. The latter would be motivated more by relatedness, social comparison and challenges (Karapanos et al. 2016).

Self-monitoring, with pedometers, accelerometers or a heart belt seems to be less effective if the program does not include group supervision or feedback (Bottorff et al. 2015). One problem has been that self-monitoring devices provide one-directional feedback that focuses only on the health benefits (Karapanos et al. 2016). Emotional aspects and personal values have often been ignored. An integral skill for PA maintenance may be the ability to modify self-monitoring practices simultaneously with goal-setting. There is evidence to support the efficiency of self-monitoring in PA change, but less is known about its appropriateness during the maintenance of change (Fjeldsoe et al. 2011, Harkin et al. 2016, Jakicic et al. 2016)

2.2.5 Social support and norms

Social support derives from a positively perceived relationship with others (Tones & Green 2004, Williams et al. 2008, Marcus & Forsyth 2009). Social support can enhance one's resources to cope with barriers and to achieve individually or collaboratively set goals (Tones & Green 2004, Glanz et al. 2008). Support can be emotional (e.g. empathy, love, trust), instrumental (tangible aid and services), informational (advice, suggestion, information) or appraisal-related (i.e., information that is useful for self-evaluation, e.g. feedback) (Glanz et al. 2008). In health behavior change, social support has been assumed to operate as a mediator of PA change (Baruth et al. 2010, Schwarzer, Lippke & Luszczynska 2011). The reasons for a change may be related to improved problem-solving abilities, access to new contacts and information, and to increased perceived control (Bandura 1998, Glanz et al. 2008). However, the effects of support are dependent on its quality and quantity and the provider's characteristics (e.g. close people vs. health professionals) (Tones & Green 2004, Williams et al. 2008, Marcus & Forsyth 2009). Personal beliefs and readiness for change may also influence the perceived usefulness of provided social support.

Community, peers and close people can help individuals to modify their behaviors. The individual's social environment supplies the normative codes for behavior. Social norms influence individuals' beliefs about whether significant others will value the behavior (Fishbein & Ajzen 2011, Sheeran et al. 2016). Research on how social norms predict changes in PA, or whether social norms have similar effect on behavior across different population groups and behaviors has not yielded consistent results (Hagger & Chatzisarantis 2002,

McEachan et al. 2016, Sheeran et al. 2016). However, a recent meta-analysis found that interventions designed to change norms are effective in changing intentions and behavior (Sheeran et al. 2016). In general, close people are assumed to affect people's behavior more than national or community norms (Tones & Green 2004, Kwasnicka et al. 2016). Health behavior change tends to diffuse in population groups if the community members themselves recognizes the benefits of the change and can identify ways of implementing the behavior. Externally defined needs and practices are less effective at inducing behavioral change (Tones & Green 2004, 115).

Social support has enhanced men's commitment to PA programs and promoted successful health behavior changes (Archibald et al. 2015, Bottorff et al. 2015). Hankonen et al. (2010), who examined gender differences in cognitive determinants of PA, found that men tended to report more social support for PA than women. Nevertheless, PA or sport are not necessarily related to health-promoting behaviors among men (De Visser, Smith & McDonnell 2009). Sport and exercise have been associated with muscularity, competitiveness and power, rather than health-promoting goals. Hegemonic masculinity represents an idealized form of masculinity (Courtenay 2000). According to the stereotypical thinking, men are expected to be independent, strong and ready for sport-related challenges (Courtenay 2000). Therefore, the inability to meet these normative expectations, may cause feelings of shame, guilt and other negative feelings about the self (Castonguay 2014).

Despite the "real men" myths, no single hegemonic masculinity exists; instead, there are several ideals, depending on context and "social field" (De Visser, Smith & McDonnell 2009). The majority of working-aged men perceive health and fitness as positive resources which help them to participate in valued life areas (Caperchione et al. 2012). Active engagement in working life and being a rational, health-conscious and responsible, citizen are more recent masculine ideals that guide men's health choices (Pietilä 2008). Good fitness enhances well-being and the capacity to cope with work, which in turn provide the rationale and incentives to engage in PA (Kolu, Vasankari & Luoto 2014, Föhr et al. 2016). However, the normative requirement to be physically fit may cause further stress and feelings of incompetence (Näslindh-Ylispangar 2008). An atmosphere of encouragement, but not one that labels people, is the most favorable for promoting PA among unfit groups (Verdonk, Seesing & de Rijk 2010, Caperchione et al. 2012).

2.2.6 Theories explaining physical activity change

Various theories aim to explain how individuals modify their behavior and the processes that are included in behavior change (Prestwich et al. 2014b, Gourlan et al. 2016). Of these, health psychology theories present connections between single psychosocial factors with the aim of forming a meaningful entity from these constructs. Traditionally, PA and eating behavior change has been described as either a continuum or as a distinctive series of stages (Schwarzer, Lippke & Luszczynska 2011, Hagger & Chatzisarantis 2014). For example, the

Transtheoretical Model (TTM) is a well-known stage model, which focuses on explaining different motivational stages and predicting individuals' engagement in PA behavior (Prochaska & DiClemente 1983). The ***Theory of Planned Behavior*** (TPB) in turn is concerned more with explaining the associations between mediating variables and the outcome as a continuum (Ajzen 1991, Ajzen 2011). Critiques of the aforementioned theories have prompted interest in theory development and integration (Nigg et al. 2008, Schwarzer & Luszczynska 2008, Hagger & Chatzisarantis 2014). For example, the ***Health Action Process Approach*** (HAPA) is a dual phase model that combines the stage and continuum approaches. It can both explain processes in PA change and distinguish between motivational phases (Schwarzer, Lippke & Luszczynska 2011). This section offers a short review of the models widely-applied to PA change and focuses the framework of the present study.

The TTM has two key dimensions: ***stages of change*** and ***processes of change*** (Prochaska & DiClemente 1983, Marcus et al. 1992). The stages describe readiness for change and how attitudes, intentions and behaviors vary at different points during the desired health behavior change. Processes of change (see also 2.2.1) addresses strategies and techniques that people use to modify their behavior. The first stage in the TTM is precontemplation, a state in which the individual has not yet recognized the need for change or at least has no intention to change in the next six months. The second stage is contemplation, in which people are aware of their need to increase PA and have seriously started thinking about making changes in the next six months. The third stage is preparation, and refers to the planning of PA change along with the intention to implement changes during the next few months, and may also include attempts to incorporate planned changes into their behavior. In the action stage, individuals put greater effort into modifying their behavior, experiences, or environment in order to overcome their problems and implement the change plan. To be in the action stage, requires that the target PA has been a regular behavior usually less than six months. The fifth stage is maintenance, meaning participation in the recommended amount of PA for at least six months. (Prochaska & DiClemente 1983, Marcus et al. 1992).

Stage transitions have been seen as a cyclical rather than linear process. The motivation and resources for self-regulation can vary temporally. An individual may progress and regress through different stages several times before being ready to engage in the target PA as a regular habit (Marshall & Biddle 2001, Nigg et al. 2011). In addition to stages, the TTM describes the possibility of relapses, i.e., regression to earlier habits during any stage of change (Prochaska & DiClemente 1983, Marcus et al. 1992). The TTM has been criticized for differentiating motivational readiness into five distinctive stages and for ambiguity in the time frame of stages of change (Nigg et al. 2011). Some studies have divided the change into just two stages: intention and action. Empirical studies have indicated that especially the first three stages in the TTM do not differentiate motivational changes very effectively; rather the stages resembles different points along a continuum (Marshall & Biddle 2001, Nigg et al. 2011).

The TPB is a continuum model which assumes that people who are ready to increase PA tend to form conscious plans for PA (Ajzen 1991, Armitage & Conner 2001, Hagger & Chatzisarantis 2002). The basic hypothesis of the TPB is that intention is the most proximal predictor of PA behavior and intention mediates the effects of attitudes, subjective norms and perceived behavioral control (Ajzen 1991, Armitage & Conner 2001, Hagger & Chatzisarantis 2002). However, the TPB has been criticized for its inability to explain the inconsistency between intention and actual behavior ("intention-behavior gap") (Rhodes & Nigg 2011, Hagger & Chatzisarantis 2014). Recent research found that only 48 % of individuals who intend to become physically active will successfully implement their intentions (Rhodes & de Bruijn 2013, Rhodes 2014). Accumulating evidence suggests that PA behavior and maintenance are better explained if the model includes constructs describing translation into action as well as intention formation (Greaves et al. 2011, Schwarzer, Lippke & Luszczynska 2011, Hagger & Chatzisarantis 2014, Rhodes 2014). These constructs comprise self-regulatory skills (e.g. action planning, self-monitoring) and different presentations of self-efficacy.

An increasing number of studies have turned their attention to theories, such as the Health Action Process Approach (HAPA), which include self-regulatory processes in health behavior change and comprises both motivational and volitional processes (Figure 1). Motivational processes refer to risk perception, outcome expectations and action self-efficacy (Schwarzer, Lippke & Luszczynska 2011). Intention formation is assumed to take place in the motivational phase. Volitional processes include action planning, action control and coping planning, which are influenced by maintenance and recovery self-efficacies (i.e., perceived ability to maintain PA despite barriers and temptations). Another HAPA principle is that volitional processes lead to behavior change. Individuals in the volitional phase may be in either the intention or action stage, depending on whether they have already adopted change or are just intending to change their behavior. The HAPA also emphasizes the dynamic nature of planning and self-efficacy (Schwarzer, Lippke & Luszczynska 2011). Planning is divided into action planning and coping planning. According to the model, PA adoption and maintenance also require phase-specific self-efficacy.

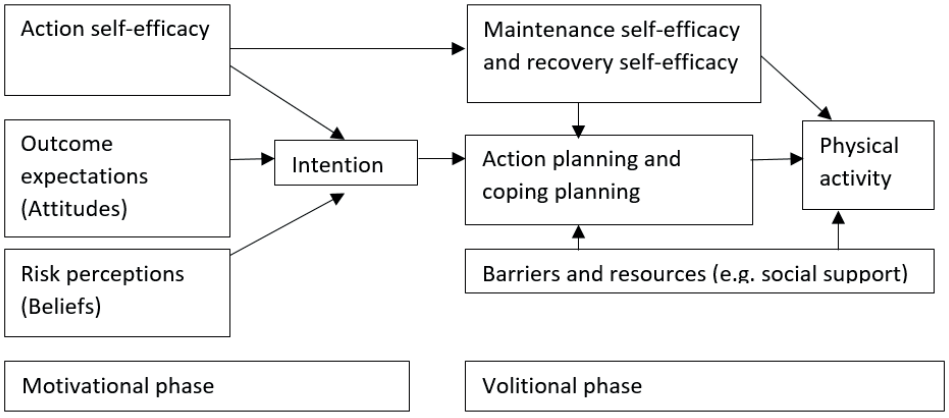

FIGURE 1 Health Action Process Approach modified from Schwarzer, Lippke & Luszczynska 2011.

Social support and perceived barriers are further constructs in the HAPA, and these factors constitute potential resources or obstacles to PA change (Schwarzer, Lippke & Luszczynska 2011). Although there is some evidence for phase-specific self-efficacy, the overlapping nature of these constructs pose challenges for empirical research (Parschau et al. 2013b, Lippke & Plotnikoff 2014). The role of action planning as a mediator of PA changes also requires more investigation. Past performance and positive experiences may have a direct effect on behavior and facilitate spontaneous PA without behavioral intentions (Parschau et al. 2013a, Hattar, Pal & Hagger 2016). More research is needed on the motivational and behavioral antecedents of PA.

Debate is ongoing on what theoretical frameworks would be most applicable for explaining PA behavior and guiding intervention planning. Many theories and models contain similar constructs that highlight the importance of personal motivation, self-efficacy, self-regulatory skills, and social and environmental factors (Michie et al. 2014, Kok et al. 2016). Prestwich et al. (2014) concluded that theory-based may not outperform non-theory-based interventions, while a recent analysis reported an association between theory-based interventions and improved outcomes (Prestwich et al. 2014b, Gourlan et al. 2016). The problem in implementing highly controlled interventions is finding participants who are not self-selected for motivation. Otherwise, the role of the different components in theories may become indistinguishable, causing the results to have poor generalizability to real-life settings (Prestwich et al. 2014b, Gourlan et al. 2016). To summarize, no clearly superior health behavior theory currently exists, while for any theory its applicability will depend on the intervention type and setting. It is worth considering the use of a well-defined BCTs (e.g. self-monitoring, goal setting, providing feedback) and tailoring interventions to fit the needs of the target group (Michie et al. 2011). In this study, the HAPA was used as a guiding theory for classifying phases of PA change and exploring the associations of motivational and volitional factors with PA.

2.3 Social marketing in physical activity campaigns

The previous section introduced the current theories that purport to explain PA behavior at the individual level. However, when the aim is to plan interventions, campaigns and programs for population groups, theories need to be integrated into wider health promotion frameworks (Tones & Green 2004, Glanz et al. 2008, NSMC 2011). A health program is an umbrella term for activities that include different kinds of interventions at the individual, community, organizational and national level (Tones & Green 2004). Health campaigns in turn refers to communication-based interventions that typically aim to influence the health behaviors of a relatively large number of individuals within a limited period of time (Noar 2006). Effective campaigns have been theory-based, multicomponent, multisector and multisite (Heath et al. 2012). A commonly used framework for planning health promotion campaigns has been social marketing (Kotler et al. 2002, Snyder 2007, NSMC 2011).

2.3.1 Social marketing

The National Social Marketing Center (NSMC) defines social marketing as *"an approach used to develop activities aimed at changing or maintaining people's behavior for the benefit of individuals and society as a whole"* (NSMC 2011). Social marketing has similarities with commercial marketing, but its goal is not to generate profits for marketers; instead the aim is to promote recognition of the need for change, and to motivate people to adopt and maintain voluntary changes in behavior (Kotler et al. 2002). The social marketing process consists of six phases: 1) formative research, 2) scoping and segmentation, 3) planning and development, 4) implementation, 5) evaluation, and 6) follow-up. Social marketing also has eight benchmark criteria interacting with the whole process (Kotler et al. 2002).

The first benchmark criterion is behavior change. Social marketing should influence behavior, not merely change knowledge, attitudes and beliefs. This requires understanding of the motivation, habits, emotional effects and information gaps for engaging in a particular behavior by members of the target population. The second criterion is having a customer orientation. This entails that the audience and different stakeholders are involved in the process. The third criterion emphasizes the use of theory. Different theories can help in segmentation of the target population, increase understanding of the behavioral determinants and guide the planning phases. The fourth criterion underlines the importance of gaining a deep insight into the factors that inspires and motivates the target group. Insight forms the basis for the selection of effective intervention methods. The fifth criterion is an exchange value, which means that the social marketers should recognize the benefits and costs of adopting and maintaining the new behavior.

The sixth criterion supplements the fifth, and concerns competition. There are many factors in everyday life that compete with the adoption of a promoted

behavior for the time, attention and motivation of an audience. The seventh criteria concerns segmentation (i.e., the identification of sub-groups that have similarities in their behavioral determinants, such as demographic, psychosocial factors, readiness for change). Cost-effective segmentation takes into account the size of the audience, the proportion of people at risk, how easily they are persuaded, how this population segment can be reached, whether they have the resources for change, and whether a need exists to target disadvantaged segments.

The last criterion concerns the mix of methods to be used. A typical feature of social marketing is the marketing mix. The mix comprises the following components: product, price, place and promotion. Product means that the promoted behavior is presented in an attractive package for the target audience. Price refers to the minimal costs of behavior change. Placement aims to make adoption of the behavior convenient and easy. Promotion ensures that the behavior change intervention utilizes effective methods and channels to reach the target group (Andreasen 2002). Relevant intervention strategies are selected according to the nature of the behavior and characteristics of the target group. To be effective, implementation must consider contextual factors, the nature of the social system (social norms, values), existing change agents, appropriate communication channels (mass vs. interpersonal communication), potential collaborators and stakeholders (People) and the probable time needed for the target group to adopt the desired behavior (Process) (NSMC 2011).

Social marketing is a multicomponent planning framework, which has both strategic and operational purposes (NSMC 2011). Social marketing can inform policy and the strategies to be used. Thus, campaign planners should understand both individual factors and environmental influences in the community. Although social marketing is not a theory, the inclusion of specific health behavior theories broaden the perspective and may improve the effectiveness of an intervention (Truong 2014). However, the evaluation of campaign effectiveness is difficult, which may be the reason why it is often a neglected part of the process (Truong 2014, Anker et al. 2016). Other problems are that evaluations have only concerned changes in awareness and attitudes (Helmig & Thaler 2010), the use of theories has been imperfectly reported, and evaluations have been limited to immediate changes, not long-term effects (Truong 2014, Anker et al. 2016).

Failure to evaluate campaigns may lead to the use of ineffective intervention strategies or even cause undesirable behavioral or emotional responses (e.g. fear-arousal messages) (Helmig & Thaler 2010). To avoid potential pitfalls, careful formative research is valuable as it provides an insight into the key factors that direct desired outcomes. For example, given that self-efficacy and self-regulatory skills are strong predictors of PA change and maintenance, these factors merit consideration in designing and evaluating social marketing campaigns (Heath et al. 2012, Truong 2014, Anker et al. 2016). Several theories (e.g. TTM, TPB or HAPA) provide a rationale for PA campaigns to target their actions to proximal behavioral determinants (e.g. self-efficacy) rather than aware-

ness (Biddle et al. 2012, Luca & Suggs 2013, Anker et al. 2016). While permanent changes in behavior are the primary goal, the short-term effects of an intervention can be revealed by an evaluation of the relevant psychosocial factors. Despite this, relatively few studies have reported on the influence of campaigns on self-regulatory skills or self-efficacy (Latimer, Brawley & Bassett 2010, Anker et al. 2016).

Traditional mass media campaigns have focused on information sharing and persuasive communication (Noar 2006), but social marketing does not rely on these strategies alone. Research recommends that to promote long-term PA, mass media communication should be supplemented by interactive interventions, such as mobilization, community events and interpersonal communication (Latimer, Brawley & Bassett 2010, Anker et al. 2016). For example, community events providing health screening, fitness tests and counseling services can facilitate campaign effectiveness (NSMC 2011).

An example of a successful self-efficacy-enhancing mass media campaign is the Canadian ParticipACTION campaign (Craig et al. 2015). The campaign presented regular people's PA stories in mass media. The messages emphasized that everyone has the potential to initiate change (Craig et al. 2015). This campaign was successful in inducing short-term changes in self-efficacy and prompting trial PA change behavior. Another innovative approach to community mobilization was used in the VERB campaign (Heitzler, Asbury & Kusner 2008). The campaign activated young people by applying experiential marketing, meaning "a live event or experience that gives the target audience the opportunity to see a product and experience it for themselves" (Heitzler, Asbury & Kusner 2008). An evaluation study revealed that VERB participants had better self-efficacy and were engaging in higher activity two years later than non-participants (Berkowitz et al. 2008). Both the ParticipACTION and VERB campaigns showed promising results in self-efficacy development and inducing PA change. The next challenge is to target campaigns that attract hard-to-reach men.

2.3.2 Physical activity programs for men

In Finland, men's increased risk for non-communicable diseases was recognized over 40 years ago. The North Karelia Project was subsequently launched in the 1972, particularly to reduce high mortality among men from cardiovascular diseases (Puska et al. 2009). The North Karelia Project was a comprehensive community-based health promotion program, involving health services, mass media, local health organizations, lay leaders and other community practitioners (Puska et al. 2009). At that time, general knowledge among the general population on the health risks of smoking, high intake of salt and saturated fat was poor The North Karelia Project thus took a pioneering role in disseminating educational health information via several channels. The project was successful in increasing awareness and changing risk behaviors for non-communicable diseases (Puska et al. 2009). Long-term survey results in Finland show that between the years 1972-2007 smoking and consumption of saturated fats fell significantly, and that mortality from coronary diseases fell by

80 per cent (Vartiainen et al. 2010). However, gender differences in receptiveness to health messages were observed during the North Karelia Project. Honkasalo (2013) found that women were more active in adopting and applying health information, although men were the primary target group. Men responded to professional health messages with suspicion and linked the causes of diseases to general political and societal factors rather than personal behaviors (Honkasalo 2013).

Health programs have consistently found the majority of participants to be women (Young et al. 2012, Robertson et al. 2014, Archibald et al. 2015, Bottorff et al. 2015). It has been assumed that health programs do not coincide with men's interests and preferences. For example, men have perceived weight loss groups as feminine and withdrawn from programs that include strict limitations on diet or alcohol intake (Young et al. 2012, Robertson et al. 2014, Archibald et al. 2015, Bottorff et al. 2015). In general, health messages have been less likely to reach men than women (Biddle et al. 2012, King et al. 2013, Leavy et al. 2014). Although awareness of health has increased across the population, men continue to be more reluctant than women to enroll in health programs. However, recent research suggests that once men have decided to participate in a health program, they are less likely to drop out than women (Robertson et al. 2014). The challenge health services face is attracting men's attention and getting them interested in the issue. There is also need for innovative strategies, individual-level interventions and careful tailoring of health messages (Biddle et al. 2012).

Men's readiness for participation in health programs have been related to personal motives, such as better health and well-being, willingness to lose weight and a desire to regain good fitness for valued activities. Further motives have been wishes to be a healthier role model for the family and perform better at work (Caperchione et al. 2012, Hunt et al. 2014b, Short et al. 2014, Gavarkovs, Burke & Petrella 2015). Intervention studies have increased understanding of effective methods for recruiting men and promoting health behavior change (Bottorff et al. 2015, Gavarkovs, Burke & Petrella 2015). The first issue is to use effective channels and the right tone when delivering messages and implementing recruitment (Hunt et al. 2014b, Bottorff et al. 2015). Men were reached well on the internet, in commonly valued venues (e.g. pubs, sport clubs) and by word-of-mouth. Messages that highlight fun, enjoyment and the social advantages of PA have promoted men's interest in health information (Robertson et al. 2013, Hunt et al. 2014b). Humor and the opportunity to strike a balance between masculinity and healthiness have been important components in the implementation of health programs (Pietilä 2008, Verdonk, Seesing & de Rijk 2010, Archibald et al. 2015).

Paradoxically, both the likelihood of paying attention to health messages and the ability to realize change are related to motivation, positive outcome expectations, self-efficacy and self-regulatory skills (Larsen & Prizmic 2004, Rothman, Baldwin & Herte 2004). Psychosocial factors like these direct attention to health messages, increase receptiveness to recruitment and facilitate ac-

tual change. People with unhealthy habits are also less likely to possess these characteristics (Baumeister 1996, 36; Rothman, Baldwin & Herte 2004). Therefore, the pull factors for participation should be related to other motives, not just to health benefits. An appealing setting has been one facilitating element. Examples of situated interventions are the "Football Fans in Training" (FFIT) program (Gray et al. 2013, Hunt et al. 2014a) and "The Premier League Health programme" (PLH) (Robertson et al. 2013, Pringle et al. 2014). Football clubs are a traditional male environment. Being granted access to highly-valued sport clubs provided a feeling of being "privileged". Other settings for successful program delivery have been workplaces, barbershops and the internet (Hunt et al. 2014a, Bottorff et al. 2015).

In their message framing and content, PA and sport issues have been better accepted than dietary interventions. Men have been also interested in collecting self-monitoring data and participating in friendly competitions and challenges (George et al. 2012, Bottorff et al. 2015). However, not all men perceive sport or competition as inspiring. Therefore, program materials should portray normal men rather than young and fit models (Vandelanotte et al. 2013, Castonguay et al. 2014, Archibald et al. 2015). Competitions can be perceived as stressful and arouse feelings of ineptitude among low-fit and overweight persons (Verdonk, Seesing & de Rijk 2010, Bottorff et al. 2015). Personal health information and feedback have more potential to motivate physically less active men than public competitions (George et al. 2012). Successful person-centered and group-based interventions have been flexible and focused on promoting self-efficacy and self-regulatory skills (Bottorff et al. 2015, Gavarkovs, Burke & Petrella 2015). Such interventions have included some type of individual contact (face-to-face, email, mobile phone) (Bottorff et al. 2015) and the use of BCTs, like self-monitoring, skill development, goal setting, feedback and social support (Gray et al. 2013, Hunt et al. 2014a, Robertson et al. 2014, Young et al. 2015).

Robertson et al. (2013) see trust between participants and program organizers as essential for long-term commitment. Men tend to prefer participation in programs where they can feel accepted and receive peer support (George et al. 2012, Robertson et al. 2013, Hunt et al. 2014b). Flexibility in participation, allowing drop-in and drop-out, can strengthen men's willingness to stay in the program (Robertson et al. 2013). Men have reported preferring to engage in groups on their own terms, without being judged or having to abide by strict regulations (Robertson et al. 2013). Robertson and colleagues (2013) found that engagement in their projects generated behavior change almost by default, because the participants had a positive motivation to adopt a healthier lifestyle. The researchers also suggested that changes in men's health behaviors may have wider positive effects, such as promoting a healthy lifestyle in their families and elsewhere (George et al. 2012, Robertson et al. 2013, Hunt et al. 2014b).

Thus far, gender-sensitized interventions for small groups and individuals have been successful in many ways. However, evaluating the effectiveness of campaigns at the community level is more complex. An example of a community-wide health program is the Australian ManUp project (Caperchione et al.

2016), which delivered information in mass media and web-pages and organized community events and training courses for men. The community events reached 75 000 people altogether, both men and women. The aim was to improve men's PA, dietary behaviors and health literacy. The project was guided by self-regulatory theories and targeted both individuals and organizations (e.g. workplaces). Evaluation showed that while community activities and web-based tools were well accepted among men, participation in the intervention remained low (Caperchione et al. 2016). The intervention was web-based and succeeded in committing a limited group of men (N=124). It also promoted health literacy, PA and dietary habits in the short term (Duncan et al. 2014). However, the evaluation of the ManUp-project does not reveal how men in the community benefitted from the project in the long term (Caperchione et al. 2016).

Another example of a community-based PA-project is the Irish "Men on the Move Activity Program" (Canavan 2013). This program, too, included information events, free health checks, a poster campaign, and referral from community groups, as well as collaboration with community welfare staff and other agencies. Actions included advertising on the radio and in print media, and the mobilization of local sport groups. The campaign emphasized fun and an enjoyable atmosphere across all the program activities. Participants (N=137) received face-to-face contacts, counseling and peer support. The "Men on the Move" program is a promising project, as the results indicated positive changes in fitness and physical activity. However, the period evaluated was relatively short. The author recommended to the use of novel strategies and the provision of maintenance programs at the community level (Canavan 2013).

A combination of web-based or mobile phone applications and face-to-face counseling may be effective in supporting long term PA changes among men. Web-based services can be flexible and cost-effective. However, the implementation of IT-based programs should be well-designed (Bottorff et al. 2015, Crane et al. 2015, Young et al. 2015). Quick and easy-to-use applications are preferred. Vandelanotte et al. (2013), in a pilot study, noticed that men (n=13) were interested in using web-based self-monitoring tools but showed low commitment to online tasks. The possibility for social networking, however, was not used by many participants. Another example of an intervention applying web-based methods is the Australian SHED-IT program ("Self-Help, Exercise, and Diet using Information Technology") (Morgan et al. 2014, Young et al. 2015). Participants were 159 overweight or obese men, who received information packages, web-based or printed self-monitoring tools, pedometers and regular feedback on progress. The men were encouraged to self-monitor their weekly steps and set personal goals. The results showed that participant's self-efficacy, self-regulation skills and perceived social support had increased after three months (Morgan et al. 2014, Young et al. 2015). All three programs (ManUp-, Men on the move- and SHED-IT) succeeded in reaching men and promoting their behavior change through interventions. However, maintenance of change in communities needs further investigation (Caperchione et al. 2016).

2.3.3 Fitness tests interventions and motivation for PA change

Previous studies have reported that PA elements and self-monitoring have been well-accepted among men (Bottorff et al. 2015). However, men may still have a tendency to overestimate their PA and fitness (Näslindh-Ylispangar 2008, Vandelanotte et al. 2011, Salmela et al. 2012, Vähäsarja et al. 2012). Feedback on physical fitness could guide relevant goal setting and enhance the motivation for change (Pearson 2012, McEwan et al. 2016). Some studies have examined the motivational effects of fitness testing and feedback as a component of group-based PA counseling. However, differences between men and women have not been reported, and the results have been conflicting (Proper et al. 2003, Aittasalo, Miilunpalo & Suni 2004, Biddle et al. 2012, Reijonsaari et al. 2012).

Reijonsaari et al. (2012) found that a 12-week workplace intervention including fitness tests, accelerometer monitoring, goal setting, online service, counseling and web messages was not effective in increasing PA among participants. The control group engaged only in the fitness test and received an information leaflet. The study did not evaluate whether a single point-of-decision fitness test can promote motivation to implement PA changes. Similarly, Proper et al. (2003) found that fitness tests and feedback did not increase PA in an intervention where the control group received fitness tests only. Again, a study by Aittasalo and colleagues (2004) indicated that fitness tests did not contribute to the desired behavior change if individuals were already aware of their current physical fitness, or had low self-efficacy. Aittasalo et al. (2004) suggested that these sub-groups may not receive additional motivation for PA change from fitness tests.

To summarize, fitness tests may be most beneficial to those who do not recognize their poor fitness, or who are already active, and want to track their progress towards their PA goals (Aittasalo, Miilunpalo & Suni 2004). The problem regarding unfit people is that they may not participate in PA interventions, including fitness tests. Furthermore, regular self-monitoring and feedback on daily PA should be ensured between fitness testing occasions. The evidence on point-of-decision testing is not strong (Biddle et al. 2012, McEwan et al. 2016). There is also little previous research on the effectiveness of fitness tests and feedback on PA in community-based programs (Noar 2006, Snyder 2007, Biddle et al. 2012, Heath et al. 2012). Campaigns rarely provide access to self-monitoring tools, opportunities for personal communication or long-term support for behavioral change.

2.4 The Adventures of Joe Finn Campaign and the present study

Understanding on individualized and group-based health promotion programs for men has substantially increased over recent years (George et al. 2012, Taylor et al. 2013, Bottorff et al. 2015, Caperchione et al. 2016). However, less is known about the effectiveness of public health campaigns targeted to men. One

innovative effort to fill this gap was the "Adventures of Joe Finn" campaign (Väisänen & Komulainen 2008). This multilevel interactive campaign was launched in 2007 as a part of the Finnish national Fit for Life Program. The goal was to inspire middle-aged men to look after their health by using a gender-sensitized approach (Fit for Life Program 2015). The campaign was designed according to social marketing principles, but no specific theories were integrated into the marketing framework. The social marketing framework, as understood in this study, is illustrated in figure 2. Examples of benchmark criteria are also presented.

The campaign messages emphasized good humor, flexibility, the benefits of healthy choices, autonomy and personal responsibility. Intervention strategies included mass communication, community events, peer groups for men, networking at the local level and education for health professionals. Web-pages (www.suomimies.fi) offered information and tips for PA and healthy eating. Web-pages also included blogs (to share positive peer experiences), professional articles and down-loadable leaflets. The campaign messages were disseminated in national media (newspapers, radio, internet, TV), local billboards, shops, market places, workplaces and health centers. To educate and support the skill development of the target population and stakeholders, the campaign organized local events, exercise and cooking courses and lectures for health professionals.

A road tour and community events were the publicly visible and interactive parts of the whole campaign. Easy fitness tests for men were provided in marketplaces and filling stations. The idea was to offer men a low-threshold for taking the test in these places. The mobile test lab was installed in an articulated lorry, which in itself represented a masculine artefact. The fitness test was a concrete product for the audience, and performing it did not require high effort. The fitness tests (Inbody 720, Polar OwnIndex Test and hand grip-test) were all conducted at rest, without sweating (Heiskanen et al. 2012, Kaasalainen et al. 2013). After completing the tests, each participant received a personal test-feedback sheet demonstrating his current fitness status. Interpretation was promoted by "traffic light" illustrations, indicating the level of fitness, and a Body Fitness Index score. Participants had also a possibility to engage in a professional-led feedback session in groups. Furthermore, health associations and sport clubs in the event area offered tips for PA possibilities, PA trials and challenges or health checks (e.g. blood sugar test) (Väisänen & Komulainen 2008).

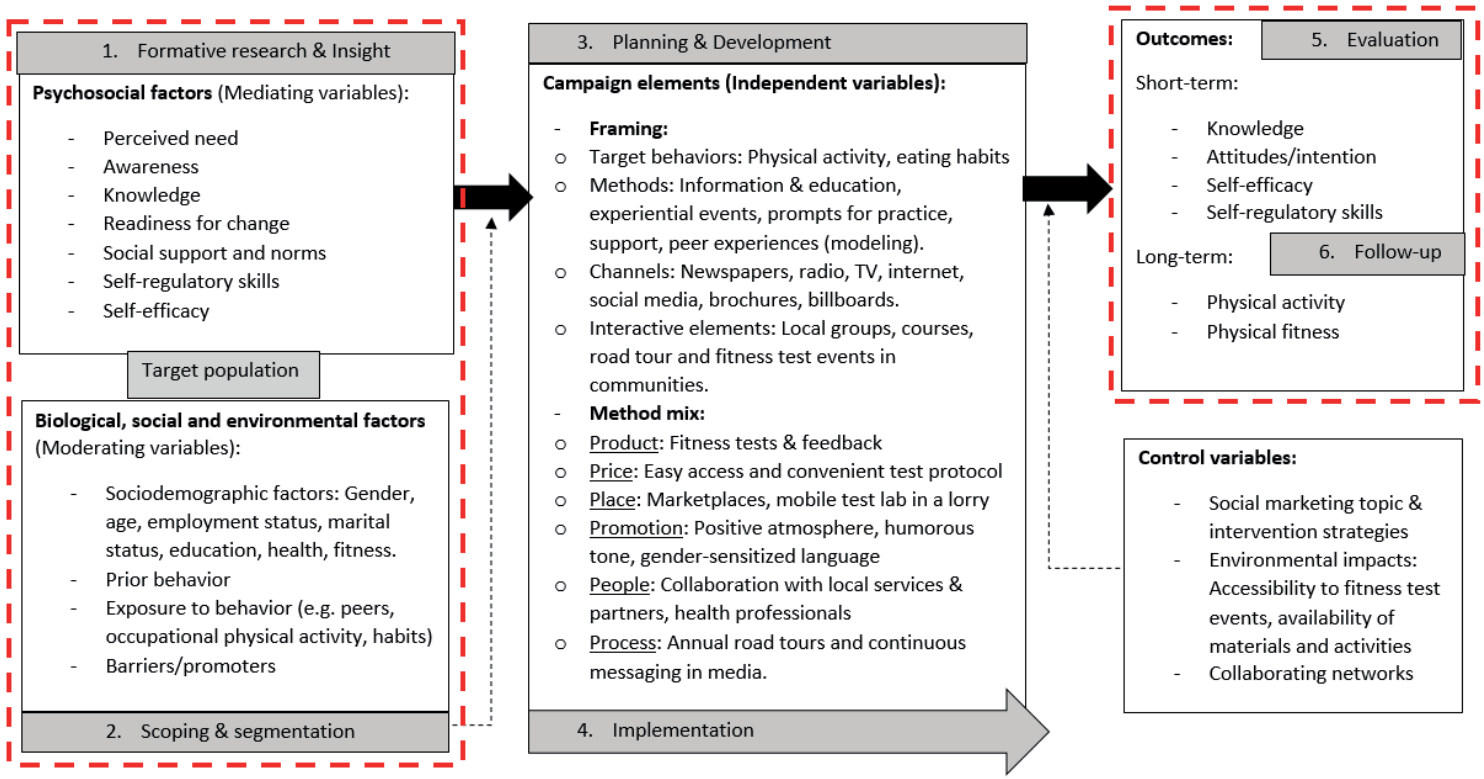

FIGURE 2 Social marketing framework for fitness campaign and relationships with behavior change.

To date, the Adventures of Joe Finn road tour has been organized four times (2007, 2011, 2013, 2014). Fitness test events have been organized in 80 different communities around Finland, and each road tour has reached over 10 000 Finnish men. The campaign evaluation has mostly concerned the informational aspects of the campaign interventions. The focus has been on the feasibility of communication strategies, experiences of the fitness test events, satisfaction with health message content and participants' perceived abilities to apply health information in their own behavior (Mäkilä 2010, Kaasalainen et al. 2011, Fit for Life Program 2015).

The Adventures of Joe Finn Campaign has received relatively high attention. Awareness of the campaign (42 %) is comparable with that of the Australian ManUp-program where 47 per cent of the study population reported noticing the campaign (Fit for Life Program 2015, Caperchione et al. 2016). Nationally, seven per cent of 25-64-year old Finnish men recognized the Adventures of Joe Finn Campaign in the year 2011 (Helakorpi, Prättälä & Uutela 2011). However, awareness of the campaign was much greater in those areas where the road tour took place. The Fit for Life Program organized a telephone survey that indicated that awareness of the campaign in the road tour communities increased from 33 to 42 per cent over two years (2011-2013) (Fit for Life Program & TNS-Gallup 2013). A half of the interviewed men (N=1409) perceived the campaign as important for themselves. However, only one-fifth of men were definitely willing to participate in the fitness tests. Overweight reduced interest in participation. Later, process evaluation surveys have shown that most of the men were recruited to the fitness tests through newspapers (37 %), family and friends (16 %), workplaces (11 %) and the internet (11 %) (Fit for Life Program 2015).

In her master's thesis, Mäkilä (2010) examined participants' self-reported changes in PA and eating habits one year after the fitness test. The results showed that 37 per cent of the respondents (N=278, 83 % men) reported increased PA following the fitness test. Moreover, a half perceived their eating habits as healthier than before the test (Mäkilä 2010). Participants also regarded the campaign messages as understandable, helpful and targeted to them. Campaign events were experienced as positive.

For health promoters, campaign events are an opportunity to create personal contact with the audience and to provide individually tailored information. For participants, informal communication among them can reinforce intentions to change and promote self-efficacy. Participation can also raise the campaign profile and hence the likelihood that attention will be paid to the campaign's messages in the future (Figure 2). Despite the potential contributory effects of campaign to psychosocial factors, and further on health behaviors, previous studies have not investigated these relationships among campaign participants (Mäkilä 2010, Kaasalainen et al. 2011, Malvela et al. 2011, Heiskanen et al. 2012).

Hence the aim of this research was to examine how psychosocial factors are associated with PA and eating behaviors among participants in the Adven-

tures of Joe Finn Campaign. The Adventures of Joe Finn is a multicomponent campaign, but the special focus of this study was on the individual (psychosocial) factors that are thought to mediate PA change. Figure 2 depicted with dash line-boxes the focus of the study in relation to the social marketing framework. The interest does not include the evaluation of mass media communication, awareness, material content, group activities or other elements of the campaign. The research focuses on PA. Some results on eating behaviors are also presented, because, along with PA, healthy eating was a leading theme in The Adventures of Joe Finn Campaign. It is important to bear this research frame in mind throughout this research summary.

3 THE AIMS OF THE STUDY

The research questions were:

1. How were psychosocial factors, readiness for change in physical activity and eating behaviors related to fitness level among working-aged men in the Adventures of Joe Finn Campaign? (Studies I & II + unpublished results)

2. How was readiness to change related to physical activity and health knowledge in participants who had a need for change their health behaviors? (Study III + unpublished results)

3. How did self-reported physical activity change over three years among those who needed to change their health behaviors and how well did psychosocial factors explain these changes? (Study IV)

4. How did the Body Fitness Index change between baseline and follow-up among the "need-for-change" group of participants who completed the fitness tests on two occasions? (Study V, unpublished results)

4 MATERIALS AND METHODS

4.1 Data collection and study participants

The initial data were collected from the "Adventures of Joe Finn" campaign in September 2011. The participants were recruited at road tour events where they participated in the Joe Finn fitness test. The tests were conducted in a mobile test lab by trained personnel. Completion of all tests took about 15 minutes per participant. In September 2011, 5 165 men participated in the road tour fitness tests in 15 different municipalities around Finland (Heiskanen et al. 2012). For this study, data were collected from 12 towns. Research questionnaires were delivered randomly to men while they were in the queue for the test lab. About 1 100 questionnaires were delivered and 900 were acceptably completed (Figure 3). The inclusion criteria were gender (male), age (18–64) and completion of both the fitness tests and the health behavior questionnaire. Mean participant age was 43.9 (SD = 12.7). The majority of the study participants were employed (69%) and married or cohabiting (66 %).

Second data wave was implemented in 2014, in connection with another Joe Finn road tour. The data were required for a follow-up survey, and fitness tests, with a selected sub-group of the baseline participants. The criteria for being identified as having a "need for change" were male gender, age (18-64), participation in the fitness tests, returning the health behavior questionnaire (Appendix 4), having either low BFI or moderate BFI, and being overweight (body mass index (BMI)>25 kg/m^2) and at risk for abdominal obesity (Visceral fat (VFA)>100 cm^2). In this phase, 361 meet these criteria. The purpose was to detect changes in physical fitness, health behaviors (PA and eating habits) and psychosocial factors between the years 2011 and 2014. Participation was voluntary and all participants gave their written consent in 2011. The study was approved by the University of Jyväskylä Ethical Committee.

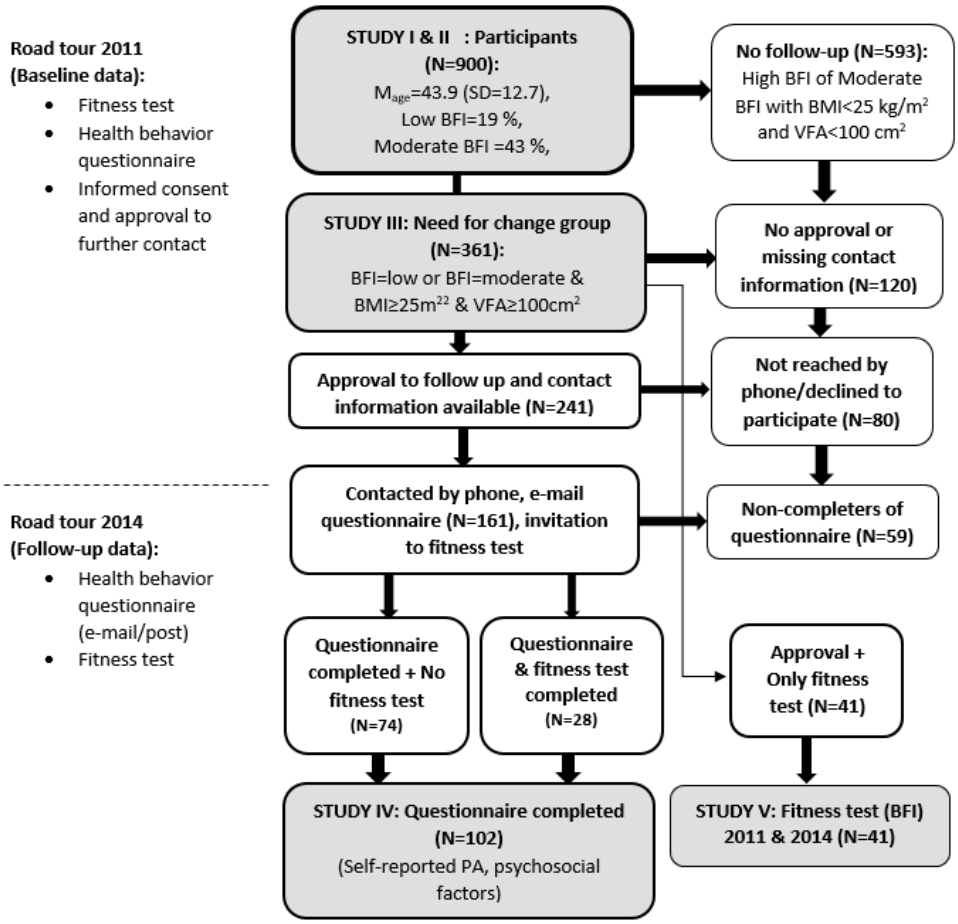

FIGURE 3 Data collection and participants.

4.2 Measures

4.2.1 Body fitness index

The fitness tests included hand grip strength (Saehan dynamometer), the Polar Own Index Test (Polar Electro, Kempele, Finland) and a body composition analysis (InBody 720 analyser). Previous studies indicate that hand grip-strength, the Polar Own Index Test and body composition analysis by bioelectrical impedance (BIA) are feasible tests in population-based research, and the results have correlated strongly with other methods of assessment (Kinnunen et al. 2000, Borodulin et al. 2004, Duz, Kocak & Korkusuz 2009,

Rantanen et al. 2012). These three tests were chosen, as they were expected to encourage participation by sedentary men and help them to become aware of their physical fitness (Heiskanen et al. 2012). Physically demanding tests were not deemed suitable for health counselling purposes or for mass implementation. The test protocol in campaign context had to be easy, quick, safe and informative for participants. The construction of the Body Fitness Index measurement has been described in detail in the first original article, and includes the following information below (Kaasalainen et al. 2013).

Hand grip strength was measured with a Saehan dynamometer and the results were compared with age- and gender-specific reference values. The reference values were based on fitness test data on working-aged Finnish men collected by the LIKES Research Center for Sport and Health Sciences between the years 2007-2011 (Heiskanen et al. 2012). Hand grip strength describes the general fitness of the skeletal muscles, and also predicts functional ability and risk for chronic diseases in the last years of life (Rantanen et al. 2012).

Aerobic fitness was measured with the Polar OwnIndex Test, which predicts a person's aerobic capacity (VO_2max) (Borodulin 2006). Estimation is based on resting heart rate, heart rate variability, gender, age, height, body weight and self-reported level of long-term physical activity. The resulting value was compared to international reference standards for aerobic capacity by gender and age, and the individual assigned to one of 7 fitness categories (Shvartz & Reibold 1990). The Polar OwnIndex Test has been shown to be a reliable test of aerobic fitness in population-based studies (Borodulin et al. 2004).

Body composition was measured with an InBody 720 analyser. The body composition analysis estimates body weight, percentage of total body fat (fat %), visceral fat area (VFA) (cm^2) and skeletal muscle mass (SMM) (kg/m). VFA describes abdominal obesity, which has been associated with increased risk for mortality and metabolic diseases (Lee et al. 2005). Obese individuals with good physical fitness have had less internal fat than obese and unfit individuals, and also lower risk for metabolic diseases independently of visceral adiposity (Lee et al. 2005, O'Donovan et al. 2012, Silva et al. 2013, Kim et al. 2014). SSM describes fat-free mass, which has positive associations with functional ability and energy metabolism (Pedersen & Saltin 2015). In comparison to the other body composition assessment methods (e.g. DEXA and MRI), BIA has reasonable validity (Duz, Kocak & Korkusuz 2009).

The final score, the Body Fitness Index (BFI) (Heiskanen et al. 2012), described health-related fitness on a numeric scale. The BFI was computed from the results of the following fitness test variables: estimated aerobic capacity (VO2max), hang grip strength (kg/kg), percentage of total body fat (fat %), SSM (kg/m) and VFA (cm^2). All the test results were converted to standardized points and then weighted with the following equations:

Aerobic fitness (VO_2max): points = 0,5 x [10 x (ml/kg/min - (−0,2835 x age + 50,307))/ 30]
Body fat (%): points = 0,1 x [− (10 x fat% - (0,143 x age + 15,264))/ 24]
VFA (cm^2): points = 0,15 x [− (10 x (cm2 - (1,326 x age + 56,031))) / 140]

Hand grip strength (kg/kg): points = 0,15 x [10 x (kg/kg – (−0,036 x age + 22,33))/10]
SSM (kg/m): points = 0,1 x [10 x (kg/m - (−0,0037 x age + 0,83)) / 0,5].

The final BFI ranges from ′ -5, +5′ , where < −3 = very poor, < −1 = poor, < +1 = acceptable, < +3 = good and > +3 = very good physical fitness. For the statistical analyses, the BFI was recoded into low physical fitness (BFI ⩽ −1), moderate physical fitness (BFI <1) and high BFI (BFI ⩾ 1) classes (Kaasalainen et al. 2013).

4.2.2 Health Behavior Questionnaire

4.2.2.1 Self-reported physical fitness

Self-rated physical fitness was elicited with the question "What do you think about your current level of physical fitness?" (Appendix 4, Question 4). The response alternatives were given on a 5-point scale (1 = very good…5 = very poor). For the statistical analyses, self-rated physical fitness was recoded into three classes (good, moderate and poor). Furthermore, perceived sufficiency of PA was elicited with the statement "I am sufficiently physically active". The response alternatives were given on a 5-point scale (1 = totally agree…4 = totally disagree, 5 = don't know). The responses were assigned to one of three classes (1 = agree, 2 = disagree and 0 = don't know). The categories were dichotomized for the statistical analyses into two classes (1 = agree, 2 = disagree or don't know) (Kaasalainen et al. 2013).

4.2.2.2 Self-reported physical activity

Participants self-evaluated their level of general PA as one of 4 categories (1= over 5 h/week (wk), 2 =3-5 h/wk, 3=1-3 h/wk and 4= 1 or 0 h/wk). The classification was based on the answers given on the Polar OwnIndex Test background form (Polar Electro, 2015). The PA assessment included descriptions of the frequency, duration and intensity of PA, including both conditioning and non-conditioning PA. These four categories were used in the statistical analyses in the other study publications but not in the first analyses in Study I, where three categories were used: 1=PA less than 1h/week, 2= PA 1-3 h/week and 3= PA more than 3h/week.

In Study I, a single categorical variable was computed from the three PA questions (Appendix 4, Questions 1-3 & Polar test background form). Total PA included commuting PA (0 or 1 points), gym training (0 or 1 points) and overall activity (1-3 points). Total scores ranged from 0 to 5, and were subsequently grouped to form three PA categories: 1= low PA (0-2 points), 2=moderate PA (3 points) and high PA (4-5 points). High PA was an indicator of meeting the PA recommendations (PA at least 3h/week and gym training at least 2 times/week) (Haskell et al. 2007). The PA assessment included descriptions of the frequency, duration and intensity of PA, including both conditioning and non-conditioning PA.

PA change was evaluated in the post-campaign survey (Study IV). For statistical analyses, those who reported being in a higher group post-campaign than at baseline were assigned to category 1 (Positive PA behavior=1). Those who had reduced their activity to or maintained their activity at under 3h/wk were as assigned to category 0 (Negative PA behavior=0). All participants who maintained high activity (PA>3h/wk) over time were assigned to category 1.

4.2.2.3 Eating habits

In this study, the terms "eating behavior" and "eating habits" will be used as synonyms. However, in the results section, eating behavior refers to one's food choices and intentions to modify own diet (i.e. change eating habits) while eating habits refers to particular eating patterns (e.g. intake of F&V). Eating habits were assessed in the health behavior questionnaire with twelve items: use of vegetable fats, eating low-fat dairy, cheese and cold cuts, eating fish (at least twice a week), daily whole grain use, daily consumption of vegetables, regular eating patterns, snacking habits, use of salty foods and eating fast food (Appendix 4, Question 9). The questions were based on previous research (Kuninkaanniemi et al. 2011). Each item was scored 0 or 1 depending on the health aspect of the habit (e.g. 'I eat fish at least 2 times/week', yes = 1 or 'I have a frequent habit of snacking', no = 1). In Study III, the final eating habit score was calculated as the sum of healthy choices. The score varied between 0 and 12, higher scores indicating a higher number of healthy eating choices. For statistical analysis, the score was divided into three tertiles indicating dietary quality of diet: 1 = low (0–6 points), 2 = intermediate (7–8 points) and 3 = high (9–12 points) (Kaasalainen et al. 2015). The criteria for a healthy diet in the supplementary analyses in this dissertation were: daily use of F&V, whole grain products, fish at least 2/wk and regular meal times. The diet was considered healthy if the score exceeded 3 points (score 0-4 points). These items were selected on the basis of dietary features that are related to normal body weight (Fogelholm et al. 2012).

4.2.2.4 Readiness for change and phase of change

Readiness for PA change was assessed with the question "Have you changed your physical activity habits during the past year?" (1 = No, and I have no intention to change; 2= No, but I intend to change in the near future; 3 = I have tried to change; 4 = I have made major changes; and 5=I have been doing PA on regular basis") (Saaristo et al. 2007) (Appendix 4, Question 5). Participants were assigned to one of three moderate-to-vigorous PA (MVPA) categories based on their self-reported PA (Polar Electro 2015). In the further analysis, a new variable was computed using self-reported PA and readiness for change. Participants were categorized into intention and action phases, with intention comprising readiness categories 1-3 and action categories 4-5. PA was used to record physically active intenders (PA>3h/wk) into the action category. Henceforth these variables distinguished inactive intenders from participants

who had already reached the PA recommendations and reported no intention to increase their PA. To summarize, in the results and discussion, "readiness for change" refers to participants' original self-reported change in or intention to change their PA behavior. In turn, "phase of change" is a recoded variable, computed on the basis of "readiness for change" and "self-reported level of PA". Phase of change assigns participants into one of two categories (intention/action).

Readiness for change in eating behavior (EB) was elicited with the question "Have you changed your eating habits during the past year?" (1 = No, and I have no intention to change, 2= No, but I intend to change in the near future, 3 = I have tried to change, 4 = I have made some changes, and 5=I have made considerable changes") (Appendix 4, Question 10). In the further analyses, the responses were classified into three stage-of-change categories: 1 = contemplation (stages 1-2), 2 =preparation (stage 3) and 3 = action (stages 4-5). The eating habits score was used to recode "healthy eating" intenders (eating habit score>9 points) into the action category. Participants were categorized further into intention and action phases, with intention comprising readiness categories 1-3 and action categories 4-5. The original alternatives did not include a question on the maintenance of a healthy diet, so the reclassification into phases of change was able to distinguish healthy eating participants not aiming to change from those who have a poor diet and are in the same category. Use of terms "readiness for EB changes" and "phase of EB change" followed the same logic as described for PA.

4.2.2.5 Psychosocial factors

The health behavior questionnaire contained 22 statements (Cronbach's alfa 0.91) pertaining to psychosocial factors (Appendix 4, Question 8) (Kaasalainen et al. 2013). The items were modified on the basis of theoretical constructs used in previous studies. The theoretical dimensions comprised knowledge, attitudes and processes of change, action planning, social norms/social support and self-efficacy (Marcus et al. 1992, Ajzen 2006, Ishikawa, Takeuchi & Yano 2008, Marcus & Forsyth 2009, Hankonen 2011). Participants were asked to assess how well the statements matched their situation. The original response alternatives were given on a 5-point scale (1 = totally agree, 2 = somewhat agree, 3 = somewhat disagree, 4 = totally disagree 5 = I don't know) (Kaasalainen et al. 2013).

In the further analysis, the psychosocial items were divided into five subdimensions (knowledge, skills, goal setting, social support and self-efficacy). Explorative factor analysis (EFA) with Varimax-rotation suggested 4-factor model and exclusion of 3 items due to low loadings (<0.40) or similar loadings on multiple factors (Appendix 1). Thus, 19 items (Cronbach's alpha 0.90) were used in the first study (Kaasalainen et al. 2013). Internal consistency of subdimensions was further examined by confirmatory factor analysis (CFA). Three items were excluded and Studies II &III used these shorter scores. The excluded items were not located in the same factor due to low internal consistency

(Cronbach's alpha= 0.55). Finally, a two-factor model was constructed for motivational and volitional aspects of psychosocial factors. Knowledge and social support were assumed to reflect motivational factors (Cronbach's α = 0.79). Volitional factors (Cronbach's α = 0.85) were represented by sub-scores for self-efficacy, skills and goal-setting (see also 4.3.1).

The responses to the psychosocial items were classified in two different ways. For the logistic regression analyses (Studies I & III), the responses were assigned to two classes (1 = agree, 2 = disagree or don't know I do not know). Those who agreed with all the score-related items formed the high-score group (Kaasalainen et al. 2013, Kaasalainen et al. 2015). Another classification was done for the mean comparisons. The items were recoded in reverse order, so that the category 5 = don't know was assigned the value 0 and category 1 was recoded as 4. The new values were used to compute a sum score. The final score was the mean of the items for each dimension (e.g. self-efficacy), which varied between 0 and 4.

4.2.2.6 Barriers and promoters

The scale measuring barriers to PA (Cronbach's α = 0.67) comprised 10 items (e.g. tiredness, lack of motivation, time or social support) (Appendix 4, Question 7). Respondents were asked to estimate on a 5-point Likert-scale to what extent certain factors hinder their engagement in physical activity (Kaasalainen et al. 2011). Alternatives were 1=very much, 2 =moderately 3=fairly little, 4=a little or not at all and 5=don't know. Factors promoting PA (Cronbach's α = 0.66) were elicited with 8 items (e.g. good sport facilities, health promotion and weight management) (Kaasalainen et al. 2011). For statistical analyses, sum scores were computed for the promoting and hindering variables. Promoters were recoded in reverse order, greater values indicating a higher score, while for barriers a higher score indicates that the barriers have less impact on the respondent's PA (Appendix 4, Question 6). In study IV, promoters were subsequently divided into two sub-scores: external promoters (pleasant environment, good facilities, social factors) (Cronbach's α = 0.74) and personal promoters (health, fitness, refreshment, weight loss) (Cronbach's α = 0.80). Barriers to PA were similarly divided into external (e.g. busy at work, time, lack of social support, lack of PA facilities) (Cronbach's α = 0.71) and personal barriers (tiredness, lack of motivation, health problems) (Cronbach's α = 0.69)

4.2.2.7 Health knowledge

Health knowledge was assessed in the second publication (Kaasalainen et al. 2015) by asking respondents to rate their knowledge of the current physical activity recommendations and the food plate model (Appendix 4: Questions 13 & 14). Response alternatives were 1=Good knowledge, 2= some knowledge about it, 3= "Have heard about it, but don't remember and 4 = No knowledge. The questions were constructed for this study in order to objectively evaluate participants' health knowledge and health literacy in relation to PA guidelines and

healthy eating (Kaasalainen et al. 2011). For statistical analyses, alternatives 1 and 2 were categorized as having knowledge and 3 as not having knowledge of the health issue. PA guidelines for Finnish adults recommend at least 150 min moderate intensity or 75 min high intensity PA per week. Also recommended are strength and mobility enhancing exercises twice weekly (UKK-institute 2009). The food plate model is recommended for constructing a healthy meal. The model suggests that half of the food on the plate should consist of vegetables, fruits or berries, one quarter grains, potatoes or rice and one quarter fish, meat, poultry or other protein-rich food (Aro 2005).

4.3 Data analyses

4.3.1 Statistical analyses

Data were analyzed with IBM SPSS statistics 20.0 and Mplus 7.31 (Muthén & Muthén 2006). Descriptive statistics, differences between participants and dropouts, and changes in study variables over time were examined with cross tabulations, student's t-test for independent samples, One Way Analysis of Variance (ANOVA) and nonparametric tests (Kruskal-Wallis, Mann-Whitney, Wilcoxon's test). Significances were reported with alpha level of $p<0.05$. Participants were stratified according to their BFI, age and phase of PA change (intention/action) (Studies I & II). The whole data analysis process and the methods used in each part of the study are described in Table 2.

The composition of the sub-scores of the psychosocial factors were explored by factor analysis before computing the sum scores (Appendix 1). Associations between psychosocial factors and health behaviors were examined with logistic regression analyses in Studies I and III (Table 2). ANOVA and post-hoc tests (Bonferroni) were used in Study II to test for differences in psychosocial factors across the BFI groups and phases of change. Means (M), standard deviations (SD), and F- values with degrees of freedom (df) and significances (p-value) were reported for ANOVAs.

Internal consistency of each of the psychosocial dub-dimensions was evaluated with Cronbach's alpha. Reliability of sum scores was also examined using confirmatory factor analysis (CFA) when studying the two motivational subgroups of participants (intention/action). Factor loadings, χ2-value with degree of freedom (df) and fit indices (Comparative fit index (CFI), Tucker-Lewis index (TLI) and RMSEA (Root Mean Square Error Approximation)) were all reported. Cut-off values for acceptable fit were CFI/TLI>0.90 and RMSEA<0.06 (Hu 1999). All models were estimated with maximum likelihood estimation with robust standard errors (MLR).

The HAPA results on the constructs of motivational and volitional factors were first tested with CFA (Appendix 3). After confirming appropriate fit to the data, associations between the motivational (x1) and volitional factors (x2), self-reported PA (y1) and BFI (y2) were examined with structural equation model-

ing (SEM) (Figure 4). Parameter estimates, χ^2-values with degree of freedom (df), fit indices (Comparative fit index (CFI), Tucker-Lewis index (TLI), RMSEA (Root Mean Square Error Approximation)) and WRMS (Weighted Root Mean Square Residual) were reported for the regression models. WRMR is suitable for models where the sample statistics exhibit wide variances, and when the sample statistics are on different scales, as in models with mean and/or threshold structures (Hsu 2009). A smaller WRMR value (e.g., below .90) indicates good model fit. Model analysis was executed with theta parameterization for categorical variables. Paths between psychosocial covariates (motivational and volitional factors) were estimated with linear regression and paths between mediator (self-reported PA) and categorical dependent (BFI) variable with multinomial logistic regression analysis (Muthén & Muthén 2006).

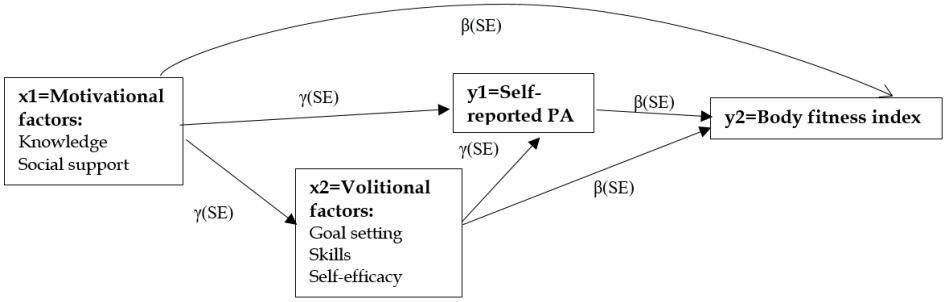

FIGURE 4 Hypothesized associations between motivational and volitional factors, self-reported PA and BFI.

TABLE 2 Research questions and data analysis.

Research question	Subjects and Measures	Study variables	Methods	Original paper
Study I & II				
How were psychosocial factors, readiness for change in physical activity and eating behaviors related to fitness level among working-aged men in the Adventures of Joe - Finn campaign?	Baseline fitness tests & questionnaire (N=900)	BFI, psychosocial factors, age, self-reported fitness	Logistic regression analyses, cross-tabulations (χ^2-test)	Kaasalainen et al. (2013) A cross-sectional study of low physical fitness, self-rated fitness and psychosocial factors in a sample of Finnish 18- to 64-year-old men. BMC Public Health, doi:10.1186/1471-2458-13-1113.
		BFI, psychosocial factors, phase of PA change	Confirmatory factor analysis, t-test, one-way ANOVA	Kaasalainen et al. (2015b) Psychometric Properties of a Short Measure for Psychosocial Factors and Associations With Phase of Physical Activity Change Among Finnish Working-Aged Men. American Journal of Men's Health, doi:10.1177/1557988315614615.
		BFI, psychosocial factors, self-reported PA, barriers, promoters, eating habits	Structural equation models, cross-tabulations (χ^2-test), t-test, one-way ANOVA	unpublished
Study III				
How was readiness to change related to physical activity and health knowledge in participants who had a need for change their health behaviors?	Baseline fitness tests & questionnaire (N=361)	Readiness for PA &EB change, psychosocial factors, barriers, promoters, health knowledge, eating habits	Logistic regression analyses, non-parametric tests	Kaasalainen et al. (2015a). Readiness for health behavior changes among low fitness men in a Finnish health promotion campaign. Health promotion international, doi:10.1093/heapro/dav068.
	Baseline fitness tests, questionnaire (N=361)	Psychosocial factors, self-reported PA, eating habits	one-way ANOVA	unpublished
Study IV				
How did self-reported physical activity change over three years among those who needed to change their health behaviors and how well do psychosocial factors explain these changes?	Baseline and follow-up questionnaire (N=102)	Self-reported PA, psychosocial factors, phase of PA change, barriers, promoters	t-test, non-parametric tests	Kaasalainen et al. (submitted) Changes in psychosocial factors and physical activity among Finnish working-aged men in the Adventures of Joe Finn Campaign.
Study V				
How did the Body Fitness Index changed between baseline and follow-up among the "need-for-change"- group of participants who completed the fitness tests on two occasions.	Baseline and follow up fitness tests (n=41)	BFI (hand grip-strength, aerobic fitness, body composition)	non-parametric tests	unpublished

4.3.2 Missing data

At baseline, less than 5 % of questionnaire responses to the sociodemographic items (employment status, education, marital status), 2 % of responses to the psychosocial items and 7 % of the responses to the eating habits items were missing. In Study I missing responses in single psychosocial items were recoded in the same category as "Don't know" answers. All missing responses scored zero.

In study III, missing responses for PA change (n=1) and EB change (n=17) were imputed with IBM SPSS statistics for Windows 20.0 multiple imputation. Education was not reported by 17 participants. These missing cases were coded as zero for the statistical analysis. In Study II, the original number of participants was reduced by 6.5 % (n=900 to n=841) when missing cases and outliers were excluded from the data used in CFA. In the follow-up study (Study IV), less than 2 % of the baseline data in variables studied were missing. Complete responses were available for all participants (N=102) in the post-campaign questionnaires. In study V, only the fitness test data were complete.

4.3.3 Dropout

The post-campaign questionnaire in 2014 (T2) was completed by 102 (28 %) of the 361 participants who in 2011 (T1) aimed to participate in the follow-up. At T2, the majority of participants were age 50 (M_{age} 49.7 SD 11.1, range 23-68 years), employed (77 %), living with a partner (75 %) and did not have tertiary level education (65 %). Baseline PA or self-reported physical fitness did not differ between dropouts and follow-up participants. Seventy-two per cent of dropouts and 75 % of follow-up participants had been inactive or moderately active in their everyday lives (PA<3h/wk). Follow-up participants were older (M 45.7 vs. 49.7, $p<0.05$), scored higher on PA skills (M=2.92 (0.90) vs. 3.12 (0.74, $p<0.05$) and reported more social support for PA at baseline than dropouts (M=2.93 (0.91) vs. 3.21 (0.70), $p<0.05$). In both groups a similar proportion of participants (65 %) reported an intention to increase their PA during the next year.

5 RESULTS

5.1 How is BFI related to PA health behaviors and psychosocial factors?

5.1.1 Physical activity

This chapter describes the key findings of the original studies, along with some previously unpublished results. In the original studies (Study I & II), detailed results are reported and the differences in psychosocial factors, health behavior and readiness for change across the BFI groups discussed. One-fifth (19 %) of the study participants (N=900) had a low body fitness index (BFI), 42 % were in the moderate BFI group and remaining 38 per cent were in the high-fit group. The high-fit men reported the most regular PA and the majority (66%) of them reached the recommended amount of weekly PA (PA>3h/wk). Almost all (95 %) of the low-fit men reported intending or trying to increase their PA, but less than one-fifth of them exercised regularly (PA>3h/wk) (Study I). Sixty-three per cent of the low-fit men and 80 % of the low-fit men aged 18-34 overestimated their fitness when self-rated fitness was compared to their BFI. Furthermore, 40 per cent of young low-fit men perceived that they exercised sufficiently (Study I).

Supplementary analyses in Study I indicated differences across age groups in phase of PA change and PA level (Table 3). The youngest men reported more overall PA activity, engaged more in gym training and had the least non-intentions to increase their PA. In turn, the men aged 55-64 reported successful changes in PA the least and more participants had non-intentions to increase PA. A similar proportion of the men at all age groups (14 %) reported regular engagement in PA.

TABLE 3 Differences in physical activity between age groups (N=900).

	Age			
	18-34 (N=257)	**35-54 (N=325)**	**55-64 (N=318)**	
	f(%)	**f(%)**	**f(%)**	**χ^2(df), p$**
Overall Physical Activity				
<1 h/week (wk)	25 (10)	56 (17)	59 (19)	19.25 (4), p<0.001
1-3 h/wk	107 (42)	148 (46)	410 (46)	
>3 h/wk	125 (48)	121 (37)	350 (39)	
Frequency of strength training				
less than once a wk	56 (22)	118 (36)	91 (30)	20.29 (4) p<0.001
1-2 times/wk	95 (37)	102 (32)	127 (41)	
at least 3 times/wk	104 (41)	102 (32)	90 (29)	
Commuting to work by walking or cycling/ week				
≤ 1 h /wk	167 (65)	236 (73)	216 (68)	4.06 (2), p=0.131
> 1 h/wk	90 (35)	89 (27)	102 (32)	
Readiness for change				
No intention to increase PA	23 (9)	33 (10)	52 (17)	24.2 (8), p=0.002
Intention to increase PA	48 (19)	75 (23)	67 (21)	
Tried to increase PA	88 (34)	107 (33)	117 (38)	
Increased PA during the past year	61 (24)	66 (20)	35 (11)	
PA on regular basis	37 (14)	44 (14)	43 (14)	

$=Significances tested by cross tabulations with Chi-square test, f=frequency, %=percentage. df=degree of freedom.

5.1.2 Barriers and promoters to physical activity

Supplementary results on promoters and barriers to PA showed that lack of energy, lack of motivation and busy at work were the most reported barriers to PA in all the BFI groups (Figure 5). In general, the low- and moderately-fit men reported stronger internal barriers than the high-fit men (lack of motivation/energy). Busy at work and family reasons were almost similar barriers to all BFI groups, but lack of motivation, lack of energy and lack of exercise friend or group were stronger barriers to low- and moderately- than high-fit men. The only barrier which was more marked in the high-fit than other BFI groups was lack of exercise facilities, but the difference was not statistically significant.

The low-fit men perceived weight management and a pleasant environment as PA promoters more often than the men in the other BFI groups (Figure 6). In the moderately-fit group, friends, exercise groups and improvements in physical fitness and health were reported as important PA motivators. Appearance and good exercise facilities were more commonly promoters for the high-fit men than those in the other BFI-groups.

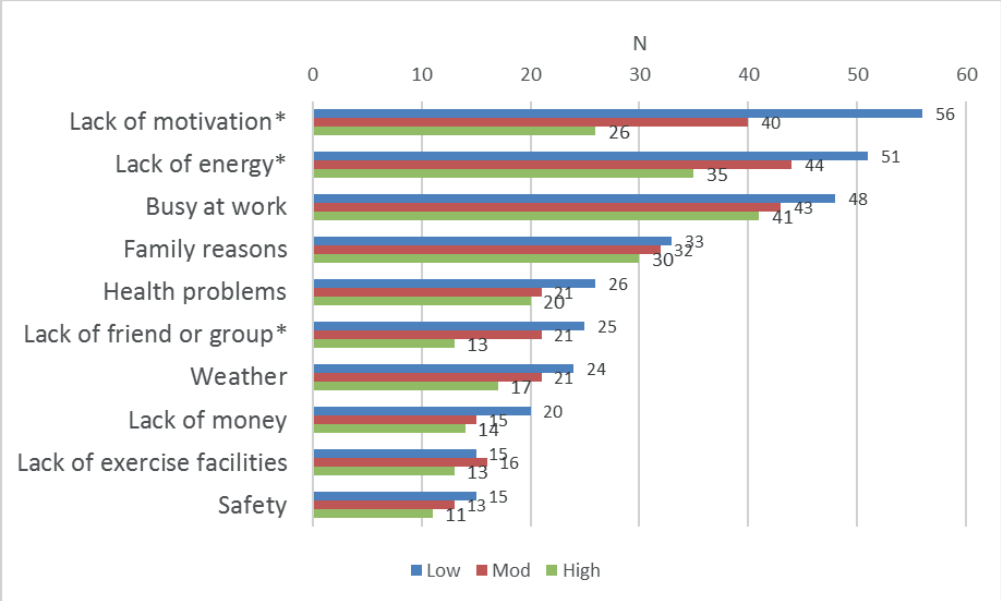

FIGURE 5 Barriers to PA across BFI groups. *Statistically significant difference in cross tabulations with Chi- square test, p<0.05 (N=900).

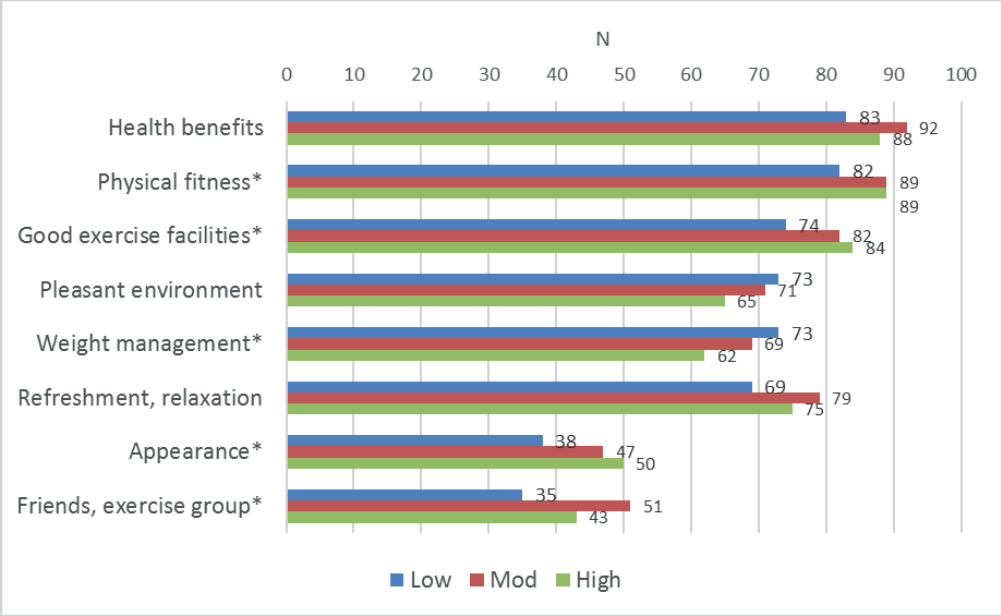

FIGURE 6 Promoters of PA across BFI groups. *Statistically significant difference in cross tabulations with Chi-square test, p<0.05, (N=900).

5.1.3 Eating habits

The following results on eating habits were not included in the published studies (Study I & II) (Figure 7). The high-fit participants reported more healthy eating habits than either the moderately- or low-fit men. More than 85 per cent of the high-fit men ate whole grains and F&V daily. The high-fit men more often had regular meal times, less often a habit of snacking and only a few of them (6 %) consumed sugar-sweetened drinks with meals. Some of the sociodemographic factors were related to healthy eating habits, although not to readiness for change. Men who lived with a partner more often met at least three of the criteria of a healthy diet (use of fish, vegetables and whole grains and regular meal times) than those living singly (24 % vs. 15 %, p=0.006). A higher level of education was related to having healthy eating habits compared to elementary school education only (10, 42, 48 %, p=0.046) Two- thirds (66 %) of all the men who did not meet the healthy diet criteria, reported intending to change their eating habits during the next year. The majority (58 %) of the low-fit men intended or had tried to change their eating habits and only nine per cent reported no intention to change.

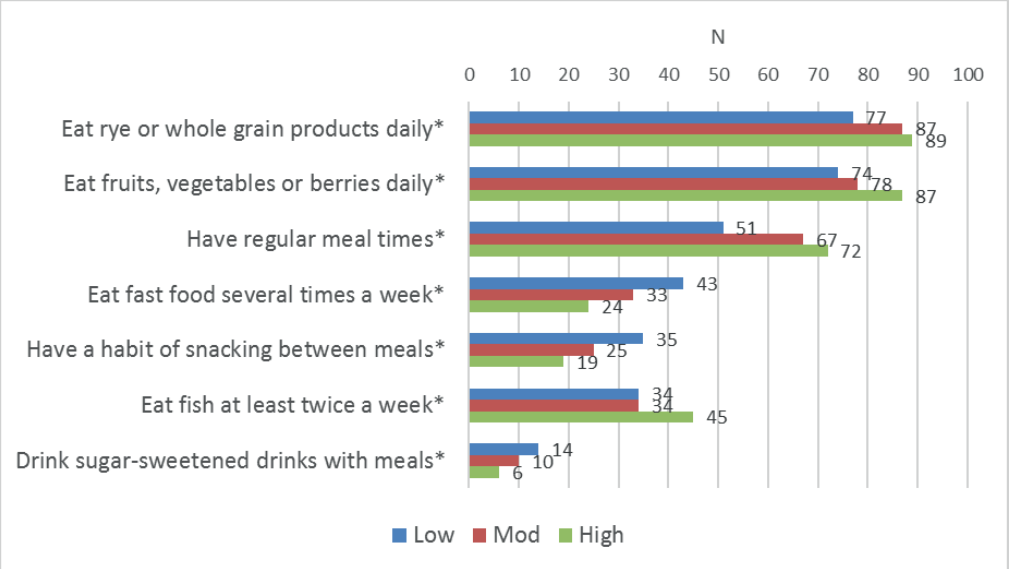

FIGURE 7 Differences in eating habits across BFI groups. *p<0.05, significances tested by cross-tabulations with Chi-square test (N=900).

Age was related to eating habits in the BFI groups. Fish eating was seldom reported in the low-fit 18- to 34-year-olds (low-fit: 10 %, moderately-fit: 27 % and high-fit: 29 %, X^2=6.59, p=0.037). Differences were also found among those aged 35-54 (20, 34 and 46 %, X^2=8.7, p=0.013), but not in the oldest age-group (55-64). Almost a half (49 %) of the oldest men ate fish at least 2 times per week, regardless of BFI status. BFI differentiated younger from older men only in the

use of whole grain products. The proportions of men who reported intake of whole grain daily differed across the BFI groups among the younger men (16, 42, and 42 %, for the low-, moderately- and high-BFI respectively, X^2=8.9, p=0.011). The younger men ate F&V less often than the older men. The moderately-fit young men ate F&V the least (73, 66, 84 %, X^2=7.9, p=0.020). The oldest men also differed in F&V across the BFI groups, but in general the percentages were higher for the older than younger men in all the BFI groups (74, 79, 87 %, X^2=9.8, p=0.013).

The most irregular meal times were found among the oldest men with low fitness (percentages of regular meal times: 43, 72, 66 %, X^2=14.4, p=0.001). The corresponding percentages for the middle-aged men were 50, 64, 74 %, X^2=10.3, p=0.001. For snacking, 29, 44 and 27 per cent of the low-, moderately- and high-fit middle-aged men had a habit of snacking between meals (X^2=7.1, p=0.029). The oldest men showed largely similar differences across the BFI groups (28, 46 and 25 %, X^2=10.0, p=0.006). The middle-aged low-fit men ate fast food the most (49, 34, 23 %, X^2=12.8, p=0.02). The younger low- and moderately-fit men tended to use the most sugar-sweetened drinks with meals (15, 17, 6 %, X^2=6.1, p=0.046).

There were also differences in readiness for EB change across the age and fitness groups (Table 4). The oldest men (aged 55-64) less often reported intention to change their EB and less often reported implementing changes in their behavior than the youngest men. This age-related analysis did not take BFI or healthiness of eating behavior into account; however, when BFI was controlled for, no age differences were observed in readiness for change. About 16 per cent of the low-fit men did not intend to change their EB while one-third reported having attempted to change their EB. Almost 40 per cent of the low-fit men had changed their EB during the past year. The high-fit men differed across the age groups (χ^2 (df) =16.5(8), p=0.036): the youngest and middle-aged men reported changes in EB more often than the older men (40, 37 vs. 26 %, respectively) and non-intentions to change less often (38, 33, 52 %, respectively).

TABLE 4 Readiness for change in eating behavior across age groups and BFI categories (N=857).

	Age				
	18-34	35-54	55-64	All	
	249	310	298	857	
Readiness for change#	f (%)	f (%)	f (%)	f (%)	χ^2(df), p$
No intention to change EB	81 (33)	93 (30)	118 (40)	298 (34)	18.7 (8)
Intention to change EB	22 (9)	35 (11)	41 (14)	98 (11)	p=0.017
Tried to change EB	45 (18)	66 (21)	61 (21)	172 (20)	
Small changes in EB during the past year	74 (33)	87 (28)	63 (21)	224 (26)	
Notable changes in EB during the past year	27 (11)	29 (9)	15 (5)	71 (8)	
	BFI				
	Low	Mod	High	All	
	162	371	323	857	
	f (%)	f (%)	f (%)	f (%)	χ^2(df), p$
No intention to change EB	26 (16)	133 (36)	133 (41)	292 (34)	51.23 (8)
Intention to change EB	29 (17)	44 (12)	25 (8)	98 (11)	p<0.001
Tried to change EB	48 (30)	78 (21)	46 (14)	172 (20)	
Small changes in EB during the past year	38 (24)	92 (25)	94 (29)	224 (26)	
Notable changes in EB during the past year	22 (14)	24 (7)	25 (8)	71 (8)	

$=Significances tested by cross tabulations with Chi-square test #=Missing responses N=43 (4.8 %), EB=eating behavior, BFI=Body fitness index, f=frequency, %=percentage, df=degree of freedom

5.1.4 Psychosocial factors

The relationship between BFI and psychosocial factors was the main focus of this study. The key finding was that the high-fit men scored higher on all the psychosocial factors (knowledge, goal setting, self-efficacy, skills and social support) than the low-fit men (Study I). The most evident differences across the BFI groups were in self-efficacy, skills and goal setting. These factors are labeled volitional factors as in the HAPA model. A noticeable characteristics among the low-fit men were that only a half of them had sought PA information and that 40 per cent did not know where to obtain social support. Half of the low-fit men reported that they had set exercise goals, although 60 per cent believed that they could achieve PA goals. The low-fit men were less confident than the moderately- and high-fit men that they would be able to be physically active in challenging life situations (busy, tired) (Study I).

When the psychosocial factors were compared across the BFI categories by age group, the skills and self-efficacy scores were lower among the low-fit young men than their high-fit peers. However, among these men aged 18-34, the low and moderately-fit groups did not show differences in skills and self-efficacy. Higher social support differentiated the young moderately-fit from their low-fit peers. In turn, among the men aged 35 or older, the lower the BFI, the more likely the participants were to report low skills and self-efficacy, although lack of social support not did not separate the BFI-groups among the middle-aged and oldest men (Study I).

The further analysis was conducted to examine the associations of the motivational (knowledge & social support) and volitional factors (self-efficacy, goal-setting, skills) with self-reported physical activity and BFI (Table 5). The results indicated that the motivational factors had a statistically significant effect on the volitional factors but neither had an effect on self-reported PA or BFI. Volitional factors, in turn, had a direct effect on BFI and an indirect effect on BFI via self-reported PA. The motivational factors (knowledge & social support) seemed to have a positive impact on volition (self-efficacy, goal-setting, skills) but not on behavior itself.

TABLE 5 Associations between psychosocial factors, self-reported physical activity and Body Fitness Index (N=855).

	Estimate			**p-value**
Overall model fit				
χ2(df)	0.003 (1)			0.959
CFI/TLI	1.00/1.05			
RMSEA/WRMR	0.00/0.011			
		95 % CI	**R^2**	
Direct effects				
Volitional factors (y1)			0.36	<0.001
Motivational factors (x1)	0.598 (0.018)	0.553-0.627		<0.001
Self-reported PA (y2)			0.25	<0.001
Motivational factors (x1)	0.046 (0.037)	-0.05-0.110		0.229
Volitional factors (x2)	0.466 (0.038)	0.371-0.527		<0.001
Body fitness index (y3)			0.36	<0.001
Volitional factors (x2)	0.130 (0.038)	0.033-0.192		<0.001
Self-reported PA (y2)	0.526 (0.038)	0.427-0.588		<0.001
Indirect effects to BFI				
Motivational factors				
PA	0.024 (0.02)	-0.028-0.077		0.230
Volitional factors	0.147 (0.03)	0.103-0.191		0.001
Volitional factors				
PA	0.245 (0.04)	0.174-0.031		<0.001

df=degree of freedom, CFI=comparative fit index, TLI= Tucker-Lewis index, RMSEA= Root Mean Square Error Approximation, WRMR=Weighted root mean residual,

SE=standard error, CI=Confidence interval. Missing responses and outliers excluded from analysis, N=45 (5 %).

5.1.5 Phase of PA change

The goal setting score, in particular, differentiated the intention and action phases of PA change. Those who were physically active (PA>3h/wk) or had increased their PA to a moderate level (1-3h/wk) during the past year, reported higher goals than intenders, despite BFI (Study II). Table 6 presents the results on differences between the two phases of change for psychosocial factors, sociodemographic factors and eating behaviors. Those who were not yet physically active (intenders) had a significantly lower BFI, higher VFA and BMI than men in the action phase. Intenders scored lower on all the psychosocial factors, reported more barriers to PA and fewer promoters of PA. Intenders were also older, mostly employed and married or cohabiting. The action phase of PA change was related to healthier eating habits and changes in eating (Table 6).

TABLE 6 Summary of physical fitness, health behaviors and psychosocial factors by phase of PA change among study sub-groups.

	Baseline data (n=900)			**"need-for-change" group (N=361)**			**Follow-up (n=102)**		
	Intention (n=430-446) M(SD)	Action (n=430-450) M(SD)	p$	Intention (n=240) M (SD)	Action (n=121) M (SD)	p$	Intention (n=66) M (SD)	Action (n=35) M (SD)	p$
Body fitness index (BFI)	-0.19 (1.4)	1.19 (1.6)	<0.001	-1.09 (1.11)	-0.81 (1.11)	0.022	-1.17 (1.10)	-0.56 (0.99)	0.008
Visceral fat (VFA)	116.9 (50.1)	99.4 (52.8)	<0.001	147.2 (47.5)	169 (56.5)	0.022	150 (39.0)	155 (48.8)	ns
Body mass index (BMI)	26.74 (4.3)	26.1 (4.1)	0.015	29.3 (4.0)	30.4 (4.6)	0.013	29.6 (4.14)	30.1 (3.75)	ns
Age	44.5 (11.5)	41.5 (12.5)	<0.001	44.5 (11.1)	43 (12.5)	ns	48 (10.4)	44 (12.3)	ns
Psychosocial factors									
PA barriers	1.87 (0.38)	1.66 (0.39)	<0.001	1.79 (0.49)	1.67 (0.49)	0.037	1.80 (0.38)	1.61 (0.38)	0.002
PA promoters	2.86 (0.47)	2.97 (0.46)	0.001	2.67 (0.70)	2.88 (0.61)	0.005	2.77 (0.47)	3.01 (0.35)	0.009
Knowledge	3.16 (0.54)	3.37 (0.47)	<0.001	3.00 (0.71)	3.20 (0.60)	0.011	3.19 (0.52)	3.19 (0.50)	ns
Skills	3.05 (0.66)	3.47 (0.57)	<0.001	2.87 (0.79)	3.21 (0.86)	<0.001	3.03 (0.70)	3.37 (0.57)	0.015
Goal setting	2.62 (0.79)	3.21 (0.71)	<0.001	2.49 (0.87)	3.01 (0.84)	<0.001	2.61 (0.85)	3.06 (0.71)	0.009
Social support	3.10 (0.71)	3.35 (0.69)	<0.001	2.97 (0.83)	3.12 (0.87)	ns	3.20 (0.64)	3.33 (0.59)	ns
Self-efficacy	2.79 (0.57)	3.16 (0.56)	<0.001	2.63 (0.68)	2.95 (0.71)	<0.001	2.69 (0.51)	3.07 (0.54)	0.001
Demographics (f, %)	**(f, %)**	**(f, %)**		**(f, %)**	**(f, %)**		**(f, %)**	**(f, %)**	
Employed	354 (83)	312 (73)	<0.001	185 (83)	78 (66)	<0.001	51 (79)	25 (74)	ns
Married/cohabiting	328 (77)	294 (69)	0.011	172 (77)	86 (72)	ns	51 (79)	26 (77)	ns
Chronic diseases (at least one)	84 (19)	80 (18)	ns	53 (23)	26 (21)	ns	82 (80)	20 (20)	ns
Education									
Low	48 (11)	32 (8)	ns	19 (9)	12 (10)	ns	5 (8)	1 (3)	ns
Intermediate	219 (52)	213 (49)		123 (55)	65 (55)		33 (51)	18 (53)	
High	158 (37)	184 (43)		81 (36)	42 (35)		27 (42)	15 (44)	
Health behaviors									
Eating habits (high score>3 p)	77 (19)	106 (25)	0.022	34 (16)	24 (19)	ns	9 (15)	6 (17)	ns
EB change (action#)	142 (32)	192 (43)	0.001	72 (31)	61 (48)	0.002	25 (38)	19 (54)	ns
PA level (>3h/wk)	0	350 (78 %)	<0.001	0	89 (70)	<0.001	0	26 (74)	<0.001

$=difference calculated with student's t-test, cross-tabulations with Chi-square test and Mann Whitney's U-test, ns=no significant difference, Stages of change (intention=no changes in health behavior, #=changed health behavior during past year or maintenance of change, f=frequency, %=percentage, df=degree of freedom, M=mean, SD=standard deviation, There were missing responses in demographical factors, N=39-43 (<5 %).

5.2 How is need for change related to phase of change and psychosocial factors?

The second part of the study examined the participants who had the greatest need for health behavior change. The results of the original study (Study III) indicated that one-third (29 %) of these men reported an intention to increase PA, 41 had tried to increase their activity level and 34 per cent were in the action phase of change. Participants in the action phase reported twice more often than intenders that they exercised because they experienced it as refreshing and relaxing (OR=1.99, 95 % CI=1.07–3.72 p = 0.031). They were also more likely to report that lack of motivation was not a barrier to PA (3.39, 1.71–6.66, p<0.001) (Study III).

While the majority of these men realistically evaluated themselves as overweight, 36 per cent of the obese participants perceived themselves as overweight rather than obese. Overall, 85 per cent of the men were willing to lose weight, with the older men more often willing than the younger to lose weight. The youngest men (aged 18-34), who reported the best knowledge about the food plate model, also reported the least healthy eating habits. The majority (87 %) of the participants reported that they were knowledgeable about the PA recommendations and 80 per cent that they were knowledgeable about the food plate model (Study III).

Differences in psychosocial factors among participants in the "need-for-change" group were not comprehensively explored in the original study (Study III). Supplementary analyses revealed that the participants in the action phase of PA change had higher scores for knowledge, self-efficacy, skills and goal setting than intenders (Table 6).

Social support did not differentiate intenders from the action group. In this sub-sample, the participants who scored high on the volitional and motivational factors were more active, and had healthier eating habits (Table 7). The motivational factors also differentiated men in the different education and marital status categories. High education and being married or cohabiting were related to a higher score on the motivational factors.

TABLE 7 Differences in motivational and volitional factors among sociodemographic groups, physical activity level and phase of change.

		Motivational factors		Volitional factors	
Variables	**f(%)**	**M(SD)**	**p$**	**M(SD)**	**p$**
Sociodemographic factors[2]					
Education					
Low	208 (64)	3.15 (0.48)	<0.001	2.87 (0.55)	ns
High	121 (36)	3.35 (0.46)		2.94 (0.56)	
Marital status					
Married/ Cohabiting	247 (75)	3.27 (0.48)	0.003	2.91 (0.53)	ns
Single	83 (25)	3.09 (0.48)		2.86 (0.63)	
Employment status					
Employed	254 (77)	3.20 (0.50)	ns	2.87 (0.63)	ns
Unemployed	74 (23)	3.26 (0.46)		2.94 (0.54)	
Age					
18-34	96 (27)	3.26 (0.49)	ns	3.00 (0.61)	ns
35-55	124 (37)	3.14 (0.53)		2.85 (0.53)	
54-64	121 (36)	3.26 (0.45)		2.83 (0.55)	
Health status					
No chronic diseases	267 (78)	3.20 (0.50)	ns	2.86 (0.59)	ns
At least one disease	75 (22)	3.29 (0.46)		2.94 (0.46)	
Health behaviors					
Self-reported PA					
Low (<1h/wk)	90 (26)	3.01 (0.51)	<0.001[a]	2.62 (0.55)	<0.001[b]
Moderate (1-3h/wk)	166 (49)	3.27 (0.46)		2.91 (0.50)	
High (>3h/wk)	85 (25)	3.34 (0.45)		3.14 (0.60)	
Eating habits					
Low sore (less healthy)	269 (83)	3.20 (0.50)	0.026	2.86 (0.58)	0.030
High score (healthy)	54 (17)	3.36 (0.49)		3.04 (0.54)	
Phase of PA change					
Intention	223 (66)	3.17 (0.49)	0.014	2.75 (0.53)	<0.001
Action	119 (34)	3.31 (0.48)		3.14 (0.55)	

$Significances tested by Student's t-test and one-way ANOVA, Post hoc-tests (Bonferroni) for self-reported PA a=Low<Mod & Low<High, b=Low<Mod<High, M=mean, SD= Standard deviation, f=frequency, %=percentage, ns=no significant, PA=physical activity, [2]=Missing responses in sociodemographic factors (N=29-33 <10 %), health behaviors (N=20, 5.5 %) and outliers of motivational and volitional factors excluded from analysis.

5.3 Changes in psychosocial factors and physical activity

Less than one-third of the 361 men in the "need for change" group were reached and recruited to answer the follow-up post-campaign survey. The final sample comprised 102 men. The main finding of the post-campaign survey was that 64 per cent of the 26 men who were inactive at baseline reported having increased their PA from baseline (Figure 8). In contrast, 5 men (8 %) in the moderate and 10 (38 %) in the high PA group reported a reduction in their PA. The median activity level of the participants did not change (Study IV). At baseline, 25 per cent of men were inactive (PA<1h/wk) whereas post-campaign this proportion had fallen to 15 per cent. At T2, those in the low activity group reported more chronic diseases than those in the moderate and highly active groups (44, 10 and 19 %, respectively $\chi 2=9.74(2)$, $p=0.008$). A retrospective analysis showed that 34 per cent of the men were in the action phase of PA change at baseline (2011) (Table 6). At baseline, these men reported fewer barriers to PA than intenders and scored higher on PA promoters, goal setting, self-efficacy and skills (volitional factors). There were no differences in social support or knowledge.

Correlations between the psychosocial factors and PA were low or moderate (Appendix 2). The strongest correlations with PA at T2 were found for self-efficacy ($r=0.43$, $p<0.001$) and goal setting (0.43, $p<0.001$). Of the different psychosocial factors measured at T2, social support and skills ($r=0.67$, $p<0.001$), and self-efficacy and goal setting ($r=0.64$, $p<0.001$) showed the highest correlations with PA. Knowledge ($r=0.62$, $p<0.001$) and self-efficacy ($r=0.51$, $p<0.001$) showed the strongest correlations over time (T1-T2). Changes in psychosocial factors were found for self-efficacy and social support. Increased self-efficacy scores were found among those in the highly active group post campaign and social support among those who were highly active at baseline. Examination of the associations between psychosocial factors and changes in PA showed that high goals at baseline were related to increased PA or maintenance of high PA post-campaign. This group also showed better skills and self-efficacy post-campaign, and they perceived higher personal promoters for PA (refreshment, health, fitness, weight management) than those who had maintained their PA at a low or moderate level.

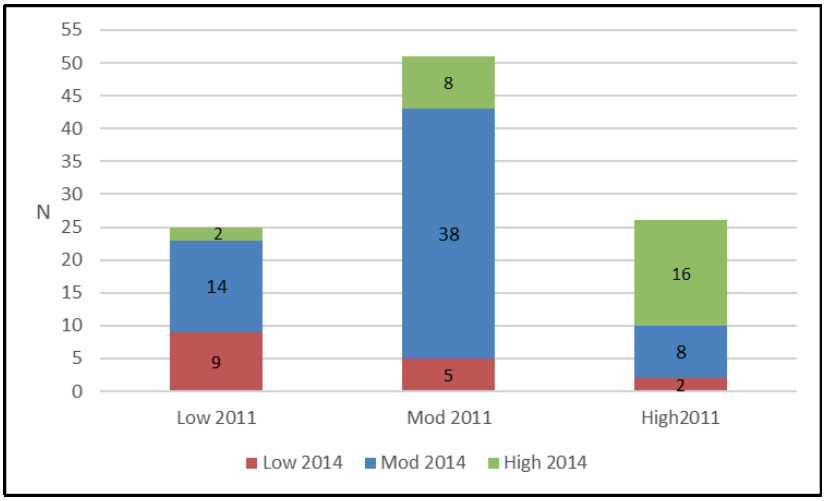

FIGURE 8 Changes in self-reported physical activity in baseline activity groups (N=102). Low: physical activity (PA) <1h/wk; Moderate: PA=1-3h/wk; High: PA>3h/wk.

The proportion of men who reported lack of motivation (40 vs. 40 %), lack of energy (45 vs. 38 %) or being busy at work (33 vs. 37 %) as barriers to PA did not show statistically significant changes over time. However, post-campaign, a greater proportion of the participants at reported feeling confident about exercising even when in a bad mood, and even if their close people did not have a high regard for PA and even if they had to restart exercising after a break. Other positive changes in psychosocial items was the higher proportion of participants who perceived that they exercised sufficiently (35 vs 51 %), had good exercise skills (78 vs. 86 %) and received support for PA from their close people (82 vs. 94 %) (Study IV).

5.4 Changes in Body Fitness Index

The last part of the study (study V) examined changes in BFI between 2011 and 2014. However, participation in the fitness tests was low, despite personal phone calls and letters of invitation. In total, 41 men in the baseline (2011) "need-for-change" group, participated in the Joe Finn fitness tests during the second wave of the campaign in 2014. The sociodemographic characteristics of the fitness test participants corresponded to those of the other men in the "need for change" group who did not enroll in the fitness tests. Two-thirds (73 %) of the fitness test participants were employed, 72 per cent married or cohabiting and 45 per cent had high education. One-fifth (22 %) were aged 18-34, 36 per cent in the middle-age group (aged 35-54) and 42 per cent were 55-64 years-old. One fifth (22 %) were inactive at baseline and 37 per cent exercised at least 3h/week. The fitness test results indicated that while no change had occurred in

overall BFI, fat percentage had decreased (Table 8). The median level of aerobic fitness had increased but hand grip-strength had decreased.

TABLE 8 Changes in Fitness test results among follow-up participants (N=41)

	2011 M(SD)	**2014 M(SD)**	**p-value$**
Body Fitness Index	-0.60 (0.97)	-0.23 (1.27)	0.172
Body mass index (kg/m2)	29.2 (4.73)	28.6 (2.89)	0.079
Visceral fat area (cm2)	141.4 (35.3)	120.6 (29.3)	<0.001
Fat percentage	26.4 (4.72)	25.5 (4.98)	0.036
	median (IQR)	**median (IQR)**	
Hand grip-class#	3 (4)	3 (4)	0.030[a]
Polar fitness class£	4 (5)	4 (7)	0.002 [b]

$=Statistical analyses conducted by Wilcoxon's mean rank test for paired samples. #= age-adjusted classification of hand grip force (kg), £=age-adjusted classification of aerobic fitness (VO2max), a=2011>2014, b=2011<2014, M=mean, SD=standard deviation, IQR=inter quartile range.

6 DISCUSSION

This research examined objectively evaluated physical fitness in relation to health behaviors (PA and eating habits), personal knowledge, social support, self-efficacy and self-regulatory skills in Finnish men. Perceived barriers and promoters of PA were also investigated. The results indicated that 40 per cent of the participating men had need for change in their health behaviors. Readiness for change in this group was strong but only one-fifth were in the action phase of PA change and 35 per cent reported dietary changes. Moreover, 63 percent of the low-fit participants overestimated their fitness level. Volitional factors, including self-efficacy and self-regulatory skills, were stronger correlates of good fitness and sufficient PA than knowledge and social support. The follow-up study revealed that the proportion of the least active men had decreased, although median activity had not increased. Men who reported positive changes in PA had higher PA goals at baseline and more autonomous promoters of PA than those whose PA remained at a low level. Changes in BFI were evaluated in a small sample. These results showed that while aerobic fitness had increased and visceral fat decreased, overall BFI had not changed.

6.1 Summary of the results and practical implications

6.1.1 Physical activity and eating behavior - Is there a need for change?

One-fifth of the study participants had a low level of fitness (Study I). This proportion of unfit men was higher than has been reported in national health surveys (19 % vs 10 %) (Koskinen, Lundqvist & Ristiluoma 2012, Helldán & Helakorpi 2015). From this point of view, unfit men were well represented in the study. However, when the proportion of men with self-reported low fitness in the present study was compared to the proportion in a population-based study, it was somewhat smaller in this study (8 vs. 10 %). Over 60 per cent of the low-fit men overestimated their fitness, which showed that the campaign's goal "to awaken men to the importance of a healthy lifestyle" was highly rele-

vant. Young men, especially, produced unrealistic assessments of their own physical condition. Overestimation of PA and fitness in self-reports has also been noted in other studies (Watkinson et al. 2010, Dyrstad et al. 2014).

There may be several reasons for such misperceptions. Overestimation of fitness has been found to be more common among inactive and unfit than fit and active persons (Mikkelsson et al. 2005, Shook et al. 2016). It is plausible that fit persons, if they regularly engage in PA, will evaluate their physical condition more realistically than unfit people whose PA level is low. Highly active men may also use self-monitoring tools to maintain awareness of the effects of their daily PA and possible changes in physical fitness. Low-fit people, in turn, have less experiences of PA, which may blur their perception of their own fitness. Another problem observed among the participating men was abdominal obesity and the risk for metabolic diseases. These conditions are not necessarily noticed in the absence of objective assessment. Among young men, poor fitness may not markedly restrict their everyday life. This may induce a feeling that one is invulnerable and lead to delay in modifying one's health behaviors (Castonguay et al. 2014, Gavarkovs, Burke & Petrella 2015, Gavarkovs et al. 2016). However, metabolic risks begin to accumulate at early ages, and therefore the prevention of obesity-related health conditions later in life is important (Laaksonen et al. 2008, Barry et al. 2014, Högström, Nordström & Nordström 2016). Nevertheless, the motivation for change seems to be awoken by the sense that one is in poor physical condition (Robertson et al. 2014, Archibald et al. 2015). Thus, objective feedback on fitness is valuable for unfit people at all ages, and can foster motivation for change.

Estimation of need for change in Study III, revealed that 40 per cent of the participating men had a fitness profile that required attention. Poor fitness, overweight and high visceral fat were the criteria for assigning a participant to the "need for change" group. Depending on fitness characteristics, primary targets for further lifestyle modifications can be increased PA, change in eating habits or both. While exercise is obviously needed to improve aerobic and muscular fitness, previous research suggests that anthropometric changes and long-term weight management are more likely to be achieved through a combination of PA and dietary change (Young et al. 2012, Ramage et al. 2013, Schwingshackl, Dias & Hoffmann 2014, Robertson et al. 2014). Greater likelihood of long-term maintenance of weight loss is also among the advantages of increased PA (Young et al. 2012, Ramage et al. 2013). Although the present study focused more on examining the determinants of PA, eating habits were also investigated as these are deemed important in promoting health outcomes and well-being.

While the fitness evaluation showed a need for health behavior change, the present participants tended to report healthy lifestyles. Average PA and eating habits were closer to national recommendations than among men in the general population (Helldán & Helakorpi 2015). Irrespective of age or fitness level, at least 70 per cent of the men reported eating F&V daily, whereas at the population level, only one-third have reported eating fresh vegetables, fruits or berries daily (Helldán & Helakorpi 2015). Sixteen per cent of all the participants

engaged in less than an hour of PA per week, as compared to one-third in a national survey (Kaikkonen et al. 2015). Notwithstanding, there were differences in health behaviors across the fitness groups. Low-fit men were less likely to eat F&V, fish and whole grain than high-fit men. In the need-for-change group, the youngest men (aged 18-34) consumed sugar-sweetened drinks the most, while the older age groups had less regular mealtimes and ate more fast food than the youngest. Less favorable mealtimes among the 35- to 64-year-olds was a somewhat unexpected result. Irregular eating and fast food consumption may be related to work commitments and life situation.

In sum, the study participants represented health conscious men, who exhibited risk factors but also a strong readiness for change. Among the low-fit men, only 5 per cent reported no intention to increase their level of PA. This implies that the determinants of poor fitness and phase of change are complex. Unhealthy behaviors provided an explanation for poor fitness, but the antecedents of lifestyle differences remained unexplained. The following section discuss the role of psychosocial factors as determinants of PA and physical fitness in relation to theoretical assumptions about self-regulatory processes. Examination of psychosocial factors furthers understanding of individual differences in motivation and behavioral patterns.

6.1.2 Theory – The role of psychosocial factors in behavior change

The value of the HAPA model for this study was that it helped to understand the relative importance of selected psychosocial factors. In particular, phase-specific self-efficacy (Schwarzer, Lippke & Luszczynska 2011) provided a reasonable explanation for the PA differences observed across the fitness groups. The HAPA model suggests that motivational factors (risk perception, knowledge, intention) provide a basis for volitional behavioral processes (goal setting, planning) and action (Schwarzer, Lippke & Luszczynska 2011). Theoretically, almost all the participants of this study were in the volitional phase of change, i.e., in either the intention or action phase (Study II).

The high-fit men were clearly in the action phase of PA change, as they reported the strongest goals, self-efficacy and highest degree of self-regulatory processes (e.g. seeking information and PA alternatives) (Studies I&II). The Moderately-fit men, who formed the largest group in the study population, were approaching the action phase of PA change. However, the variation in levels of self-efficacy and skills was the widest in this group. The values for motivational factors in this group were nearer to those of the high-fit than low-fit men, but their use of self-regulatory skills and degree of self-efficacy differentiated them from both groups. The low-fit men formed the smallest sub-group of participants, and had the lowest average scores in all the psychosocial factors. The majority of them were insufficiently active and reported intending to increase their PA.

In the "need-for-change" group those in the intention and those in the action phases were not differentiated by social support, but by knowledge (Study III). A previous empirical study reported that motivational factors did not differen-

tiate active and inactive people (Parschau et al. 2013b). However, in this study, practical knowledge seemed to be better among the more active men, and related to volitional factors. One-third of the low-fit men did not know what the relevant intensity of exercise should be, or where to receive social support. Again, one-third had not found an enjoyable way to exercise. The results supported the choice of paying special attention to intervention methods that promote practical knowledge and the ability to use it in modifying one's own behavior. Previous research has suggested that men are willing to receive factual information that helps them to make concrete changes (Taylor et al. 2013, Robertson et al. 2014, Bottorff et al. 2015). This type of personal information can promote action self-efficacy and facilitate engagement in PA trials.

The post-campaign survey indicated that self-efficacy increased among those participants who were highly active at follow-up but not in the other PA groups (Study IV). Furthermore, those who had adopted a more active lifestyle or maintained their high PA had higher goals at baseline. This group also regarded PA as motivating because it is refreshing and promotes health and fitness. This result is in line with previous findings. Strong intentions and autonomous motivation have been better related to successful PA changes than weak intentions and external motives (de Bruijn & Rhodes 2011, Teixeira et al. 2012, Rhodes & de Bruijn 2013).

The present findings assume that many of the men in the "need-for-change" group would benefit from having better self-regulatory skills and self-efficacy for maintaining change (Studies III & IV). While better self-efficacy and self-regulatory skills can help in both the intention and action phases, they are not identical to the skills needed for the maintenance of change. Therefore, the methods for promoting these skills should be different in the different phases of change and, the dynamics between social support, self-regulatory skills and self-efficacy would merit consideration (Luszczynska et al. 2011, Lippke & Plotnikoff 2014). Researchers have proposed that for intenders, social support and promotion of outcome expectations are needed, while for individuals in the action phase the focus should be more on action planning (Luszczynska et al. 2011, Williams & French 2011, Lippke & Plotnikoff 2014, Parschau et al. 2014). Self-regulatory skills received special emphasis during the habit formation phase (Kwasnicka et al. 2016). In particular, identification of barriers may have more impact after the person has acquired some experience of PA (Luszczynska et al. 2011, Williams & French 2011, Lippke & Plotnikoff 2014, Parschau et al. 2014). The HAPA model suggests that the intention and action phases of behavior change are moderated by resources and barriers, such as social support and the environment (Schwarzer, Lippke & Luszczynska 2011).

6.1.3 Competing interests– Barriers and promoters of behavior change

The desire for better health and fitness were the most dominant promoters of PA, regardless of fitness group (Study I, II, III). The main promoters were similar to those detected in other studies on men (Pietilä 2008, Caperchione et al. 2012, Hunt et al. 2014b). Health-related goals have been reported, particularly

by middle-aged and older men, while younger men have given improved appearance and physical performance as their reasons for engaging in PA and taking up a healthy diet (Robertson et al. 2014, Ashton et al. 2015). The present low-fit men perceived weight management and a pleasant environment more often than other BFI groups as promoters of PA. Appearance, fitness and good exercise facilities were less important promoters for the low-fit men than for those in the higher fitness groups.

Evidence on association between type of motivation and the likelihood of regular exercise is mixed (Teixeira et al. 2012, Lindwall et al. 2017). Health and fitness are autonomously regulated motives, and in most cases, positively correlated with PA (Teixeira et al. 2012). Body-related motives (e.g. weight, appearance), in turn, are typically extrinsic motives, but those can appear simultaneously with other personally important motives (e.g. feeling refreshed, skill development) (Teixeira et al. 2012). As concluded in a recent study, motivation is a multidimensional construct that varies not only between but also within individuals (Lindwall et al. 2017). A fruitful approach to the promotion of PA would be to consider multiple individual motives, and the interaction between environmental and social factors on the one hand and personal emotional responses and intrinsic motivation on the other.

For the low-fit men, a pleasant environment was as important a promoter of PA as weight management. Although the PA environment is an external promoter, it can also be a pull factor for PA and contribute to the development of intrinsic motivation. From this perspective, the present findings supported the previous suggestions that environmental interventions and an attractive setting can promote PA among low-fit and inactive groups (see also 6.1.4) (Gladwell et al. 2013, Hunt et al. 2013, Robertson et al. 2013). It is not exercise-specific facilities that are primarily needed but more opportunities to be active in everyday life. A pleasant environment can also refer to opportunities for positive social interaction, and not just to the esthetics of the physical environment. Social factors should not be neglected, as they can either promote or erode behavioral intention and action (Schwarzer, Lippke & Luszczynska 2011).

In this study, the importance of social support as a promoter of or barrier to PA varied across the fitness sub-groups. Therefore, interpretation of the results was not straightforward. A clear finding was that the low-fit men reported less social support for PA than the high-fit men. In turn, the associations between social support and phase of change in the need-for-change group were mixed. Lack of exercise friends was perceived as a barrier to PA among a quarter of the low-fit and a fifth of the moderately-fit men. However, half of the moderately-fit men reported friends as a promoter of PA, a higher proportion than that found among the low- or high-fit men. This result can mean one or both of two things: the low-fit men regarded the social aspects of PA as less motivating than did the moderately-fit men or they could not imagine what it would be like to experience social support and encouragement. While the moderately-fit men reported receiving social support, it was not necessarily sufficiently available to all. As suggested in the previous section, low-fit men would need a different

form of social support than the moderately-fit. Social support for moderately-fit men can be less individualized and personal advice focus more on action planning, self-monitoring strategies and coping planning.

Perceived social support was related not only to fitness but also to age, education and marital status. Unfit young men reported less social support than their older counterparts in the other fitness groups (Study I). In contrast, while the middle-aged and oldest BFI groups were not differentiated by social support, self-regulatory skills were significantly lower in the low- than moderately-fit group (Study I). Marital status and education were additional factors that were related to the degree of social support. Married and highly educated men reported more social support for PA than those living without a partner or with low education. Furthermore, the married and highly educated men in the need-for-change-group scored higher on motivational factors than the others. This may indicate better personal skills in utilizing information but also improved access to relevant information sources through their social environment. A positive effect of marital status on health behaviors has also been found on the population level (Borodulin et al. 2016, Borodulin, Jallinoja & Koivusalo 2016).

In this study, being busy at work was one of the major barriers to PA, ranking immediately after lack of motivation and tiredness. A notable finding was that among the post-campaign participants, the perceived barriers remained almost constant over time (Study IV). To determine the antecedents of these barriers would need further research. Lack of motivation and tiredness are likely to derive from imbalance between individual resources and external pressures. A recent study found that poor fitness and overweight delayed recovery from daily workload (Föhr et al. 2016). Therefore, intentions to increase PA or change eating habits can be difficult to realize if other stress factors in life do not change. The self-regulation theory suggests that when the management of daily tasks (e.g. work, studies, personal relationships) require much attention, cognitive resources are overloaded and not sufficiently available for learning new habits (Baumeister 1996, Rothman, Baldwin & Herte 2004).

Family, friends, peer group or health professionals can enhance the individual's resources for PA changes and maintenance. A key factor is that this support comes from a trusted source (Archibald et al. 2015, Young et al. 2015, Kwasnicka et al. 2016). Conversely, the social environment can impair efforts at PA change through mockery or discouraging comments, or diverting the intender away from change to the resumption of old habits. Among men, so called "social sabotage" has been more likely to occur in the context of dietary change than PA (Robertson et al. 2015). Age may influence a person's predisposition to social impacts. It has been found that young men tend to perceive more pressures to act in accordance with social norms than older men (Kauravaara 2013, Ashton et al. 2015, Hirvonen 2015). Despite positive or neutral attitudes to PA, the benefits of a healthy lifestyle do not outweigh the short-term gains of some unhealthy habits. For example, time spent on PA may compete with the time spent with friends. For middle-aged men the regular PA faces competition from such factors as work and family, which are often major priorities in life

(Caperchione et al. 2012, Robertson et al. 2014, Bottorff et al. 2015). High individual variation in the life situation and the quality and quantity of relevant social support may explain why research evidence on the effectiveness of social support is inconsistent (Scarapicchia et al. 2017).

Interventions targeting social norms are most influential where self-efficacy and behavioral skills are sufficient but social practices hinder behavioral action (Kok et al. 2016, Sheeran et al. 2016). In these cases, social norms can be effective in changing behavior, also in the absence of changes in attitudes or self-efficacy (Sheeran et al. 2016). In sum, the social norms related to PA were mostly positive in the present study population. Therefore, the primary need would be for concrete social support, in the form of personal advice, feedback or access to exercise groups. Multiple interventions, co-operation and flexible protocols would help in establishing support networks for promoting behavior change.

6.1.4 Practical implications – How can fitness testing promote behavior change?

Figure 9 demonstrates the role of psychosocial factors and factors competing with behavioral change in the context of present study. The results suggest that campaigns offering fitness tests can promote behavior change in multiple ways, depending on the phase of change and psychosocial factors. Engagement in the campaign is the first step. Thereafter, behavior is influenced by overall experience, interpretation of the feedback and former outcome expectations. Participants who are in the action phase of PA change may purposefully seek tips on how to achieve specific PA goals while for intenders the future planning of PA is less clear. In both situations, fitness testing can promote personal behavioral change through self-regulatory processes (Figure 9). Supplementary interventions moderate behavior change and maintenance of change.

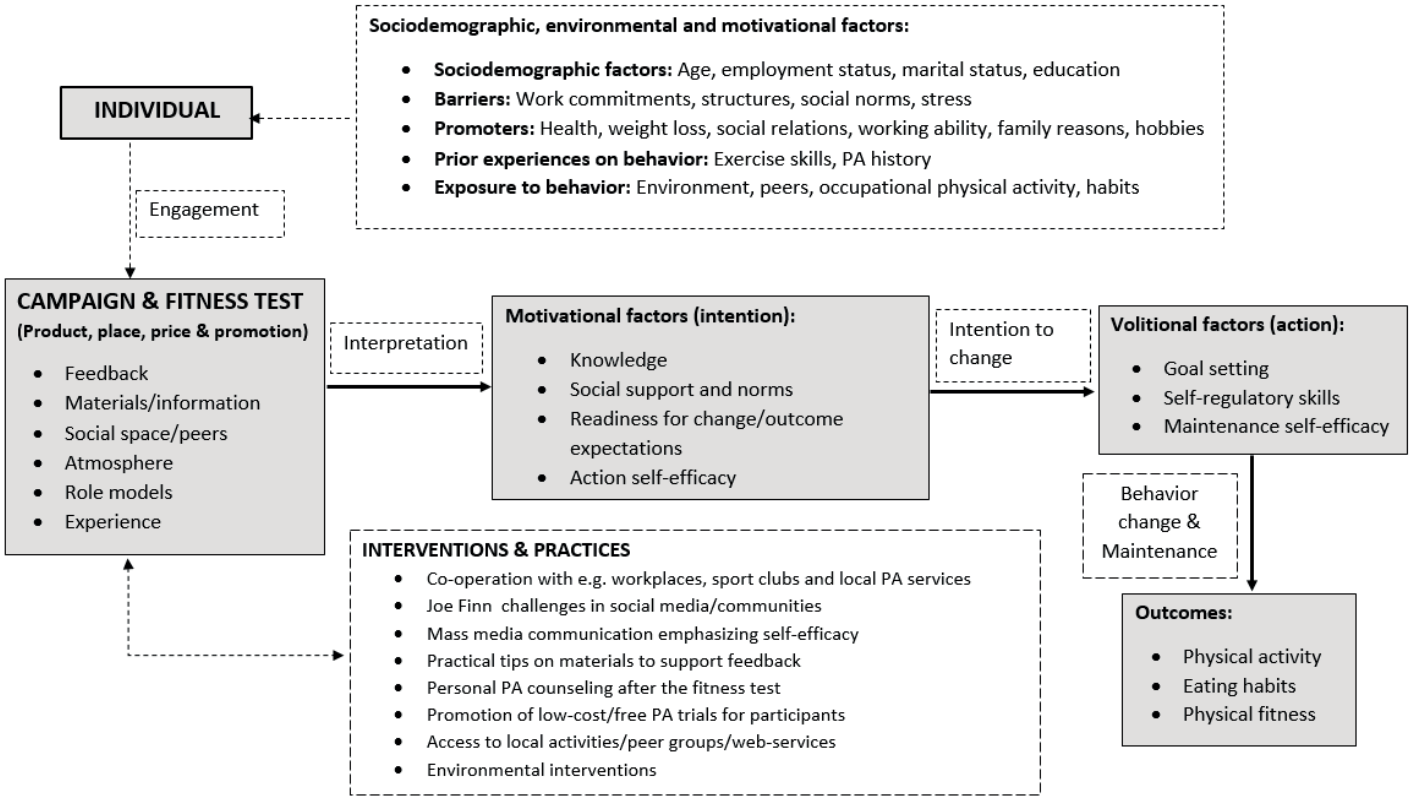

FIGURE 9 Social marketing process and physical activity change in the Adventures of Joe Finn Campaign.

Positive **personal experience** has importance for positive outcome expectations and a lower threshold for later behavior. From this perspective, the concept of the fitness test campaign has many strengths. The attractiveness of the campaign product (fitness test), placement (mobile laboratory in the marketplace) and atmosphere can all contribute a positive experience. Moreover, the Joe Finn road tours brought a large number of men with relatively similar interests to the same place. This provides an opportunity for social comparison and role modeling for enhancing action self-efficacy. The fitness test is easily performed by all men without risk for health complications or feelings of shame or incompetence. The tone of the campaign messages and personal feedback were designed to accommodate to the audience's needs. Personal test results, with numerical data and illustrations, are a form of factual information that men have been reported to prefer (Robertson et al. 2014). According to previous research, a humorous and tone framed by the expectation of gain has been recommended when presenting health information (Latimer, Brawley & Bassett 2010, Hunt et al. 2014a, Archibald et al. 2015). Humor can ease confronting unexpected results, particularly where fitness perceptions overestimate reality. The self-regulation theory suggests that the rejection of health messages can be reads as a sign of attempts to protect one's identity from shame or failure (Baumeister 1996). For example, Hirvonen (2015) found that, despite its accessibility, young inactive men avoided PA information. The Joe Finn Campaign aimed at disseminating information in a positive, easy-going and encouraging manner.

A challenge when delivering fitness feedback is sufficient individualization. A situation where results are provided without tools for their meaningful interpretation is not likely to be effective. In theory, feedback is part of the self-regulation process, as it offers information for goal setting, self-reflection and self-monitoring (Carver & Scheier 1998). The personal feedback sheet for the Joe Finn test was thoroughly pre-scrutinized in group sessions with a professional, who also gave tips for further changes. However, a fitness test result demonstrates only the behavioral outcome, not the outcome of the whole process (Michie et al. 2011, McEwan et al. 2016). People in the adoption phase of a new behavior benefit from self-monitoring, which is linked to daily practices and goals (McEwan et al. 2016). Inactive people may not have a clear concept of possible further steps and goal setting. Therefore, while group sessions work well as a standard method for giving feedback, personal communication may be necessary for some participants. A practical issue is how to evaluate whether the men having need for change are willing to avail themselves of an opportunity to receive personal advice, either during the road tour event or later.

Men may have increased readiness, not only to receive health information, but also to enroll in PA groups soon after test feedback. This situated type of motivation merits consideration. For, example, an opportunity to sign up for local PA groups or to book a consultation time for PA counselor in the campaign area could be integrated with the fitness test. Moderately-fit men, especially, may be ready to engage in groups and recall prompts for practice. Practi-

cal PA trials are important for low-fit men as a motivator of skill development and the acquisition of agreeable PA experiences. The providers of PA counseling and services may include several stakeholders, such as sport clubs, local associations, personal trainers, peer groups and workplaces.

Workplaces offer a promising setting for recruiting men and supporting their efforts at PA change in the long-term. Workplace health interventions have received increased attention in recent years, although the evidence on their effectiveness is inconsistent (Rongen et al. 2013, Kwak et al. 2014, Malik, Blake & Suggs 2014). Oliffe et al (2015) emphasize that acceptable workplace interventions to promote men's healthy lifestyles should consider masculine norms (Oliffe et al. 2015). Traditionally, in northern rural areas, food has been seen as "quick filling fuel" for work, and fewer thoughts have been paid to the health aspects (Oliffe et al. 2015). Similarly, leisure time PA has not been perceived as necessity if the work includes physical activity (Oliffe et al. 2015). Masculine norms are renewing, also in male-dominated work communities (e.g. truck-drivers and blue-collar workers) (Pietilä 2008, Puhkala et al. 2015). Gender-sensitized approach is still needed to increase men's enrollment in the health programs (Verdonk, Seesing & de Rijk 2010, Puhkala et al. 2015).

Familiarity with the Adventures of Joe Finn brand may induce men to enroll in a workplace health program. Prerequisites for successful co-operation with the campaign are that the men themselves are involved in the worksite-program planning and that their employers have a positive attitude to fitness interventions (Wong et al. 2012). Commitment by whole organization would be the most effective strategy. A limitation of workplace co-operation is that it only reaches selected groups of men. Unemployed men and those with short-term contracts should be reached by other channels.

Sport clubs can be another effective setting in which to recruit inactive men, irrespective of their employment status. However, the approach should be selected carefully (Robertson et al. 2013, Hunt et al. 2014b). Programs for low-fit people would need appealing elements other than sports alone. For example, English and Scottish PA programs for men have been situated in football clubs, rugby stadiums and hockey stadiums (Archibald et al. 2015, Gill et al. 2016). These sports typically have a strong fan culture, which in turn has inspired men to initiate their own activity. In Finland, applications may be fitness programs linked to ice hockey teams or providing fitness tests at motor sport events. These sports have traditionally been popular among Finnish men. One route via sport clubs to reach men is to design PA courses or programs for whole families (Lubans et al. 2012). Whole family participation could accord with men's desire to be a good role model for their children (Caperchione et al. 2012, Lubans et al. 2012). It could also reduce conflicts with busy timetables. Cross-cultural differences and possibilities to involve non-athletes in sport clubs should be considered. Sport clubs would also need sufficient resources as well as the ambition to provide services to diverse groups, and not only to competitive athletes.

Web- and mobile phone interventions could provide an alternative to face-to-face and group interventions and support changes after road tour events. Co-

workers and local partners are an important resource that could help enable personal counseling during hectic campaign events. Collaboration would facilitate construction of a service pathway after fitness tests. It should be noted that not all men either want to join PA groups or have the time to commit to fixed programs. While people who prefer using web-based tools may have a desire for personally relevant information, self-monitoring tools and feedback, they do not necessarily have high regard for peer support (Vandelanotte et al. 2013, Harries et al. 2016). Web-based tools have been well accepted among men, and can provide a resource for self-directed change (Vandelanotte et al. 2013, Duncan et al. 2014, Young et al. 2017). Interactive web-services could be provided by some of the campaign partners (e.g. health association, PA counseling service in a municipality, occupational health service). Sharing responsibilities and resources at the organizational level could make Campaign administration more cost-effective and the dissemination of interventions more sustainable.

A campaign event is also a promising setting to facilitate change in eating behaviors. Whereas nutritional advice might be rejected in a traditional context, the present study showed that the intention to adopt healthy eating habits along and PA change are likely to occur simultaneously. Although the mechanisms of PA and eating behavior change are not the same, self-efficacy and self-regulation for PA can easily be generalized to other related behaviors (Schwarzer, Lippke & Luszczynska 2011, Ochsner, Scholz & Hornung 2013, Prestwich et al. 2014a, Williams & French 2011). The key is to adopt a gender-sensitized, individualized approach in dispensing dietary advice. For example, researchers do not recommend tight restrictions on unhealthy beverages (e.g. alcohol, snacks) (Robertson et al. 2014, Archibald et al. 2015). Autonomous choices are more likely to be accepted and maintained (Ryan & Deci 2000, Teixeira et al. 2012, Rhodes & Quinlan 2015, Teixeira et al. 2015). Therefore, men's tendency to disregard expert-led lifestyle programs may be seen less as a disadvantage and more of an opportunity to support self-determined choices. However, some dietary behaviors are hard to change. Regulation of portion sizes and fast food consumption have been accepted among men, but a more challenging goal has been to increase vegetable consumption (Taylor et al. 2013, Young et al. 2015). Dietary advice that is consistent with men's identity and values would better promote the maintenance of healthy eating habits (Taylor et al. 2013). The messages disseminated during the Adventures of Joe Finn Campaign were based on these principles.

Despite the various elements and additional interventions comprising a male health campaign, many men do not take note of campaign messages or engage in the campaign events. The promotion of PA targeted to people who do not enjoy PA, or value its outcomes, is challenging. Promising approaches to arouse motivation include person-centered methods, related to motivational interviewing (MI) (Hardcastle & Hagger 2011, Hardcastle et al. 2013) and acceptance and commitment therapy (ACT)–based behavioral interventions (Lappalainen et al. 2014, Kangasniemi et al. 2015). The idea behind these approaches is to find meaningful ways to be physically active through reflection on one's

personal values and sources of well-being. The ACT-based approach may be helpful in developing self-regulatory skills and conditions for sustainable behavior change. Interventions also have potential to be applied to web-based and mobile services, which can improve the reach and acceptance of the tools provided. However, evidence on the effectiveness and feasibility of ACT- and MI-based mobile-interventions among different target groups (e.g. men vs. women) is scarce (Lappalainen et al. 2013, Mattila et al. 2016, Friederichs et al. 2016).

Given that the great majority of inactive people cannot be reached individually, social and environmental factors merit consideration. PA promoters can seek non-typical alternatives to implement interventions outside the health and sport sectors. Potential venues for PA promotion could be places where other hobbies or cultural activities are held. Competition between PA and other life priorities can be minimized by integrating activity cues and opportunities in different settings. The natural environment has increased enjoyment of PA among some people (Gladwell et al. 2013). A pleasing physical or social environment may increase everyday activity, enjoyment of PA and diminish negative emotional responses (Gladwell et al. 2013, Robertson et al. 2013, Hunt et al. 2013).

Previous research suggests that those who are unlikely to participate in health promotion programs can benefit most from environmental interventions (Van Dyck et al. 2014). Thus, an infrastructure that encourages adoption of an active lifestyle or reduces sedentary time could reach these individuals better than investment in special sport facilities or PA services (Van Dyck et al. 2014, Vasankari 2014). Alternatively, public services and policies may be effective in promoting PA and healthy eating via non-conscious routes to behavior control (Bauman et al. 2012, Borodulin et al. 2016). Self-regulation skills are integral to volitional changes and planned behavior, whereas non-intentional action is explained by other emotional and habitual processes (Kwasnicka et al. 2016, Rebar et al. 2016).

To conclude, the original concept of the Joe Finn fitness tests comprised several components that are likely to have positive effect on psychosocial factors and mediate health behavior changes. The campaign-related practices since implemented are in line with suggestions that arose from the present results. The Fit for Life Program has gradually developed the campaign further since the data for this study were collected. For example, more activities and materials have been targeted to young men, collaboration between workplaces has been strengthened and access to fitness tests is provided at local events, not only during the national road tour (Fit for Life Program 2015). Some suggestions for further development can still be made. From the participants' perspective, the greatest challenge is to turn intentions into practice after the test event. At the organizational level, the challenge is to construct a network that facilitates continuous support and services for groups and individuals. The final, and maybe the hardest, goal is to recruit more men from the least active groups and motivate them to initiate health behavior change. Multiple interventions and co-

operation between different stakeholders can help integrate supplementary interventions into the fitness test.

The present findings assume that sustainable changes in behavior can be promoted by practices such as those listed below. Some of these suggestions have already been included in the campaign, and hence the next step is to evaluate the success of their dissemination.

Interventions to promote participation, PA change and maintenance of change (Figure 9):

- Co-operation with e.g. workplaces, sport clubs and local PA services
- Joe Finn challenges in social media/communities
- Mass media communication emphasizing self-efficacy
- Practical tips on materials to support feedback
- Personal PA counseling after the fitness test
- Promotion of low-cost/free PA trials for participants
- Access to local activities/peer groups/web-services
- Environmental interventions

6.2 Validity, reliability and ethical issues

6.2.1 Data collection and generalizability of results

The study participants self-reported more PA than respondents in population-based studies. The present data included fewer men who reported engaging in PA for less than one hour a week than found in a national survey (Kaikkonen et al. 2015). Thus, the data were selected and the study reached only a small proportion of the 10 100 men who had participated in the mobile campaign during September 2011 (Heiskanen et al. 2012, Kaasalainen et al. 2013). Despite this, the distribution of physical fitness across the participants is likely to be nearer to the actual fitness levels in the population than that in self-reported surveys. Approximately one-fifth of the present participants had low fitness and 40 per cent had a clear need to make changes in their health behavior. To compare the present results with other objectively measured data on physical fitness in Finnish men, one in ten reservists (men aged 25-45) showed poor fitness (Vaara & Kyröläinen 2016).

The proportions of men in the different age groups were relatively equal. Mean participant age at baseline was 43. The post-campaign survey respondents were selected, favoring older men with a mean age of almost 50. The youngest men were slightly underrepresented (29 % vs. 36% (aged 35-54) and 35% (aged 55-64)). Since 2007, the Fit for Life program has considered age differences in lifestyles and put more effort into designing materials and actions targeted to different age-groups (Mäkilä 2010, Fit for Life Program 2015). Two

other ongoing research programs for young Finnish men (aged 15-25) exist (Ahola et al. 2013, Hankonen et al. 2016) but, unlike the Adventures of Joe Finn, these are not population-wide campaigns, providing services to men at all-ages and across the whole country.

The campaign context enabled recruitment of men who may not be involved in fitness-related research in other settings. For example, a previous study proposed that the workplace environment is not a best choice of setting for recruiting inactive persons (Aittasalo & Miilunpalo 2006). While the majority of the present participants were employed, recruitment of unemployed men was also possible. While selection was likely to be present when compared to a general population study, it did not favor any particular subgroup of fitness campaign participants. During recruitment, the research questionnaires were randomly delivered to as many fitness test participants as possible, without knowing their age or level of fitness. Not all the randomly selected men answered the questionnaire. Moreover, the participants may have represented community members who are open to new experiences, interested in meeting other people at public events and prepared to adopt new ideas (Tones & Green 2004). Therefore, a similar level of motivation and readiness for health behavior change cannot be assumed between the campaign participants and the general population. However, this type of selection may not necessarily impair a campaign's effectiveness as the participants may function as change agents in their peer groups.

The main limitations in this study were the small group sizes and the dropout rate in the post-campaign study. The BFI was not used as an outcome variable as originally intended because only a few men participated in the second fitness test. Instead, self-reported PA, which increases the risk for misclassification and measurement error, was used. Small group sizes can increase the likelihood for type II error, i.e., failure to reject the null hypothesis (Borg & Gall 1989). The small group sizes also restricted the use of more robust statistical tests in the post-campaign study, such as path analyses and regression models. However, the fact that several different analyses demonstrated same associations between BFI, PA and psychosocial factors increases the reliability and validity of the results.

The present study was conducted in a real-life setting, and no intervention was targeted to participants after the first fitness test. Thus, changes in psychosocial factors and PA over time can be mediated by several potential confounders. It is not possible to identify the factors affecting changes or potential fluctuation in health behaviors. On the other hand, the long interval between the first fitness test and the post-campaign survey is a strength of this study. Campaign studies have generally had short-term follow-up times which do not permit detection of true changes in behavior (Anker et al. 2016). Reviews have emphasized the need for long-term studies that evaluate the effectiveness of social marketing when researching behavioral outcomes (Heath et al. 2012, Anker et al. 2016). This study produced great deal of information on the target group of value in further research and practice. Unfortunately, the insufficient sample

size and choice of measures did not provide a basis for a trustworthy evaluation of simultaneous changes in BFI and psychosocial factors. Better planning of the data collection and measures would be needed in future studies.

6.2.2 Body Fitness Index

The objective assessment of BFI was a strength of this study, as objective assessment is free from subjective overestimation bias. Self-evaluation methods, in turn, enable more people to be reached at reasonable cost (Hallal et al. 2012, Dyrstad et al. 2014, Pedisic & Bauman 2015). Self-reports have shown relatively good validity in population-wide studies; however, previous research indicates that the most inactive groups tend to overestimate their physical fitness (Borodulin et al. 2004, Mikkelsson et al. 2005, Prince et al. 2008, Shook et al. 2016). This study found a contradiction between BFI and self-reported fitness, thereby underlining the importance of objective methods. The youngest men (aged 18-34) overestimated their fitness more often than the older men; this may reflect incorrect estimation of latent health-risk factors (e.g. VFA).

The accuracy of the BFI can be limited. First, the Polar OwnIndex Test estimated individuals' aerobic capacity (VO_{2max}) on the basis of resting heart rate, heart rate variability, age, gender, height, weight, and self-reported level of physical activity (Kinnunen et al. 2000). The Polar Own Index test has been shown to be a valid measure of fitness in big samples and related to self-reported fitness and leisure-time PA; however, the test result has not been related to non-conditioning PA (Borodulin et al. 2004). Measurement error in the Polar Own Index-test may have had an impact on the fitness classification, as aerobic capacity had the greatest weight in the BFI computation. In these cases, aerobic fitness was estimated with a non-exercise questionnaire (Jackson et al. 1990). Aerobic fitness has a clear association with reduced risk for non-communicable diseases, such as cardiovascular diseases and type 2 diabetes (Whaley 2006, Haskell et al. 2007, Juraschek et al. 2014), which justifies the high weighting of aerobic fitness in the BFI.

Turning to the other fitness measures, general body strength was measured by the hand grip-test, which is easy to perform and correlates with functional ability in later life (Rantanen et al. 2012). However, motivation or practice may have some influence on the results. This effect has reduced by allowing two trials with each hand. The BFI also takes account of muscle mass, fat percentage and VFA obtained from body composition analyses. A potential source of bias when using Inbody analysis concern the conditions of measurement. The present tests were conducted in a free-living setting where participants' pre-test nutrition, hydration or physical exercise cannot be controlled for. These factors may have an impact on body composition or resting heart rate variability (McArdle, Katch & Katch 2010).

Despite its limitations, the BFI is a reliable and valid method of estimating health-related fitness for non-clinical purposes. A strength of the BFI is its multidimensionality. Current PA recommendations emphasize aerobic, musculoskeletal and motor activities (Haskell et al. 2007, UKK-institute 2009). Aerobic

capacity has been the most often evaluated fitness component in adult populations (Rinne et al. 2010). Muscular strength and especially motor abilities have received less attention in PA promotion and disease prevention among working-age populations, although these components have a central role in predicting functional ability and risk for metabolic diseases (Lindström et al. 2010, Rinne et al. 2010, O'Donovan et al. 2012, Shuval 2014). BFI results are also easy to interpret, safe and quick to perform. Low-fit people may be unable to participate in strenuous fitness tests, such as cycle ergometer, running and walking tests. BFI is likely to yield a more reliable estimation of fitness than self-reports, without requiring complex testing protocols or vigorous PA. The cut-points for the present BFI categories were drawn from age-specific regressions of 25 800 Finnish men (Heiskanen et al. 2012). Thus, the standards for low, moderate and high BFI are suited to the Finnish male population, although not necessarily to other population groups.

6.2.3 Self-reported physical activity

Self-reported PA was estimated by the Polar Own Index- Test questionnaire, which uses four categories of overall PA (Polar Electro 2015). The measure was not very accurate. This PA question was supplemented by separate questions on commuting activity and gym training. However, these types of PA were found to poorly differentiate the participants and cumulate with overall PA. Only a few men reported an amount of commuting activity that would have brought their total PA up to the recommended level. The greatest limitation in the PA estimation method was that PA categories were not equivalent to the PA recommendations. It was not possible, therefore, to evaluate the actual proportion of participants who reached PA recommendations. The category of moderate PA was 1-3h/wk irrespective of intensity. In future, PA should be evaluated with greater accuracy. Questions should include details on frequency (times/wk), duration (min/bout) and intensity (light/moderate/vigorous) of PA. This would enable better interpretation of PA and comparison with PA guidelines.

Furthermore, objective information on PA would be valuable. A general problem with self-reported PA is that people tend to overestimate their level of PA. Motivated and physically active persons may also have a tendency to answer in socially desirable ways (Dyrstad et al. 2014). It is also possible that people do not always recognize their true daily activity or inactivity. Therefore, objective assessment methods are needed to provide such crucial information on PA levels in the study population (Husu et al. 2014b, Pedisic & Bauman 2015). Objective methods (pedometers, accelerometers), however, also includes potential sources of bias. Accelerometers do not necessarily record all types of PA (e.g. cycling, swimming, strength training), estimation of PA is affected by the cut-points selected for intensity, and awareness of accelerometer-monitoring may influence one's PA and sedentary time (Dyrstad et al. 2014, Pedisic & Bauman 2015). Therefore, PA self-reports continue to have some validity and strengths. Research suggests that accelerometers are useful in inter-

vention studies, thereby supporting self-monitoring in PA counseling (Dyrstad et al. 2014, Pedisic & Bauman 2015). Self-reports are better applied in bigger samples and campaign contexts.

6.2.4 Psychosocial factors

The limitations of the psychosocial factors were related to the validity of items and deficiencies in the study design which in turn affected the evaluation of reliability. In the present study, the associations between psychosocial factors and behavior were examined on the basis of theoretical assumptions drawn from HAPA, TTM and TPB, but the items were not validated for any specific theory as an entity. This new set of questions was constructed because the form had to be short and feasible for using in the field-conditions but also able to evaluate important themes for planning the campaign in future. Rhodes & Nigg (2011) proposed that simply picking and choosing constructs from theories and models without making a full attempt to validate a theory may lead to problems in furthering PA research. However, the fact that the measures used had been piloted in a previous study with the same target population strengthens the reliability of the results (Kaasalainen et al. 2011).

The internal consistency of items and stability of the measures used are indicators of reliability (Borg & Gall 1989). In this study, internal consistency was acceptable (Cronbach's $\alpha>0.70$) for the self-efficacy and knowledge scores, but more problematic for social support and self-regulatory skills (e.g. goal setting, planning skills) (Tavakol & Dennick 2011). The sub-scores showed heterogeneous content that limited interpretation of the results. The test-retest reliability for these sub-scores has not been examined. The correlations between the T1 and T2 psychosocial factors were moderate, a result that is likely to be related to the modifiability of these factors over time rather than instability of the measure.

The results demonstrated the importance of choosing a sufficient number of items for each measured construct. For example, self-regulatory skills should have been better operationalized. The items on self-regulation comprised goal setting and action planning (e.g. searching PA alternatives and information) but did not include self-monitoring. It has been assumed that goal setting promotes PA change (Pearson 2012, McEwan et al. 2016), and this was supported by the present study. However, goal setting was measured at very general level without specifying e.g. how much, what, when, where and with whom one aims to exercise. This hindered evaluation of the relevance of baseline goals for fitness level and existing resources.

Immediate post-test evaluation of self-efficacy and goal setting would have been informative about short-term effects, and revealed whether a contradiction between self-evaluated fitness and objective feedback either reduces self-efficacy or generates more intentions for change. One limitation in the self-efficacy items was a focus on the maintenance rather than adoption of PA. This means that inactive people may perceive the questions as irrelevant to them.

The social support items also had validity issues. The measure could be improved by clarifying the terms used (e.g. "close people", "important other").

A high proportion of the respondents perceived their close people as supporting their PA. However, in each BFI group, a gap of ten percentage points was observed between perceived social support and knowledge about where to obtain social support. Some distributions of the psychosocial sub-scores, particularly those of the knowledge and social support items, were, owing to the ceiling effect, skewed towards high values. This is a sign that the study population was selected in favor of health-conscious men.

Despite their methodological limitations, the psychosocial factors showed hypothesized cross-sectional associations with self-reported PA and fitness. Psychometric properties were evaluated in Study II, and results indicated that the scores differentiated participants by fitness group and motivational phase. Motivational and volitional factors had clear differentiating effect across the fitness groups. The correlations between PA and the volitional factors were greater than those between PA and the motivational factors. Notwithstanding, the volitional factors explained a relatively small proportion of the variation in PA. This indicates incompleteness of the models and the complexity of the studied phenomena (Bauman et al., 2012, Rhodes & Horne, 2013, Hagger & Chatzisarantis, 2014). Long-term PA is explained by several factors, including self-regulatory skills, self-efficacy, type of motivation, unconscious factors (habits, affects) and contextual factors (environment, culture, health) (Olander et al. 2013, Hagger & Chatzisarantis 2014, Teixeira et al. 2015, Kwasnicka et al. 2016). Psychosocial factors, barriers and promoters accounted for most of the modifiable factors of behavior change. Non-conscious processes of behavior regulation cannot be examined in this type of study, although automatic control is likely to contribute to health behavior (Hollands, Marteau & Fletcher 2016, Rebar et al. 2016).

6.2.5 Readiness for change

The analyses revealed that classifying the phase of PA change was problematic: the original categorization failed to distinguish individuals who were active and had no need to increase their PA from inactive intenders. Therefore, a new variable was computed on the basis on self-reported PA and readiness for PA change. With this, we were able to separate different activity levels in the pre-action and action phases. Nevertheless, readiness for PA change and current PA level should have been assessed more accurately in the questionnaire. Overall, the usefulness of evaluating the motivational phase of PA change is dependent on the characteristics of the target population. Rhodes & de Bruijn (2013) proposed that stage of change assessment is worthwhile only for groups who aim to reach public physical activity guidelines. From a public health perspective, the intention to increase PA of those who are already sufficiently active is of no interest (Rhodes & de Bruijn 2013).

6.2.6 Ethical issues

According to the ethical principles of health-related research (ETENE 2011), health promotion interventions should especially be targeted at groups who have fewer possibilities to maintain good health. However, people with poor health also tend to be the most hard-to-reach group. In Finland, health and health behaviors are polarized across different socio-economical groups (Koskinen & Martelin 2013, Kaikkonen et al. 2015). A campaign has the potential to reduce these differences by providing support for healthy lifestyles for all, regardless of age, income or fitness level.

Principles of integrity, meticulousness and accuracy are key elements in the responsible conduct of research (Resnik 1998). The participants in this study were informed about the study in a written leaflet and they gave their consent to participate in the study. Participants' privacy was ensured at all phases of the study, including the data collection and reporting of results. Autonomy and personal volition with regard to participation were respected. Dropout was high but should be accepted and considered when reporting the results.

An ethical issue related to the publication process concerns the terminology used to describe the study population and the different fitness groups. The aim was to use neutral terms to avoid labeling participants on the basis of their gender, fitness level, weight or socio-economic status. However, inclusion of participants in discrete categories (e.g. "low-fit", "a need-for-change group") may oversimplify the phenomena of interest. The categories were based on normal weight ranges (BMI) and risk factors (e.g. high VFA). In order to take into consideration sensitivity of personal health behavior, the campaign used a gender-sensitized approach, emphasized fun and positivity and the materials portrayed normal men. The messages aimed to increase self-efficacy and highlight the active role of individuals as promoters of their own health. This approach contrasts with the traditional negative discourse on men's health (Courtenay 2000, De Visser, Smith & McDonnell 2009). Although gender-sensitized communication presents a risk for strengthening stereotypes, the research knowledge obtained can help in the identification of different sub-groups and improve the relevance of the campaign in the future.

Physical activity and healthy eating are desirable behaviors in present-day society. Good fitness is highly valued, whereas being overweight may even raise fears of disapproval or limited access to the labor market. Although physical fitness correlates strongly with PA, it should be noted that the reasons for low fitness may be other than just a lack of sufficient PA. For example, chronic diseases or genetic dispositions may affect the level of physical fitness (Williams 2001, Rankinen & Bouchard 2008, Bauman et al. 2012). Therefore, health behaviors should not regarded as internal goals but rather as a means to well-being. While this study focused on behavioral determinants among lower fitness groups, community events have great value for both fit and unfit persons. All participants, whatever their motivational influences, can benefit from fitness test events.

6.3 Suggestions for further research

- There is a need for better designed long-term studies on simultaneous changes in psychosocial factors and BFI among campaign participants. Further research should use more representative samples and also investigate the stability of PA among all fitness groups, including high-fit men.

- Psychosocial factors were measured by a novel scale. This should be improved and validated in other studies. Factorial invariance should be examined over time and in different population groups.

- Eating habits, and related psychosocial factors, need to be studied more carefully among this population. It is likely that not all the mechanisms and determinants of eating behavior change are the same as those for PA change.

- In future research, PA should be evaluated objectively and with a more accurate questionnaire. The questions should include details on frequency (times/wk), duration (min/bout) and intensity (light/moderate/vigorous) of PA. Objective evaluation with accelerometers or pedometers would give reliable information on actual PA.

- This study followed a quantitative approach. It would be useful to study the process of behavior change using a qualitative approach. This could increase understanding of the values and meanings that men attribute to PA. A qualitative follow-up study could also be informative in detecting fluctuation between inactive and active periods and identifying differences in -promoting action and maintenance of change.

- Several ideas for research and practice concern the BFI test battery. Although the BFI covers some other dimensions of physical fitness, motor skills and coordination are not included. The test battery could be supplemented by validated tests for skill-related physical fitness and functional ability (Suni et al. 1996). This could motivate certain individuals and inform their selection of appropriate exercise types that also match their personal preferences and physical resources.

- Fitness tests can be useful in contexts where clinical testing is not needed. Potential settings include fitness centers, occupational health services, and different events and campaigns. Additional measures for stress and recovery could also supplement PA counseling after fitness testing. This entails that the test participant has the possibility to receive regular feedback (e.g. by occupational health services etc.).

- The effectiveness of the fitness campaign as a motivator for health behavior change could be examined with an intervention trial. For example, participants could be randomized into three groups: 1) fitness test & feedback + PA counseling program, 2) fitness test & feedback only, 3) control (no fitness test/counseling). This would increase understanding on the relative importance of personal support after this type of fitness test, and what supplementary interventions might be needed. Central questions concern the most effective and acceptable setting for fitness testing (e.g. workplace, community, sport club, peer group), type of other support (web-based, face-to-face) and duration of the intervention. Designing the intervention would require proper use of health behavior theories and behavior change techniques.

- From a wider perspective, the effectiveness of the Joe Finn Campaign could be evaluated by comparing PA levels between campaign communities and non-campaign communities. This would provide information on whether the social marketing intervention has influenced behaviors across the whole community.

6.4 Conclusions

- The majority (63 %) of the low-fit men, especially those men aged 18-34, overestimated their fitness. The low-fit men recognized the benefits of PA on the general level but lacked information to serve their own purposes. Low-fit men need individual advice and feedback. A campaign like the Joe Finn can provide them relevant information through the right channels (e.g. what is a suitable goal, where to find social support and how to find a feasible way to be physically active).

- Self-efficacy and self-regulatory skills were the most influential factors for high PA and good fitness. The association was similar among the need-for-change group and across the phases of PA change. Encouragement and prompts can promote action self-efficacy among inactive men.

- Low social support was related to poor fitness among the youngest men but not in the other age-groups. The low-fit men over age 35 perceived lower self-efficacy and skills than their moderately- and high-fit peers. The relative importance of different psychosocial factors, promoters and barriers to PA across age groups should thus be considered.

- Goal setting at baseline was associated with greater post campaign PA behavior. Tiredness, work commitments and lack of motivation were

constant barriers over time. Multilevel methods are needed to improve men's ability to achieve their goals and overcome barriers.

- Co-operation with workplaces, sport clubs, health associations and self-help groups can contribute to the establishment of a continuous service pathway and dissemination of PA services in communities.

YHTEENVETO (FINNISH SUMMARY)

SuomiMies seikkailee-kampanja muutosmotivaatiota herättelemässä – Fyysisen kunnon, liikunta-aktiivisuuden ja psykososiaalisten tekijöiden väliset yhteydet kampanjaan osallistuneilla miehillä

Tämän väitöskirjatutkimuksen tarkoituksena oli selvittää, miten fyysinen kunto on yhteydessä itsearvioituun liikunta-aktiivisuuteen, ruokailutottumuksiin ja psykososiaalisiin tekijöihin suomalaisilla työikäisillä miehillä, jotka osallistuivat Suomi mies seikkailee -kampanjaan. Teoreettisena taustana käytettiin Health Action Process Aproach (HAPA) -mallia ja sosiaalisen markkinoinnin viitekehystä. HAPA -malli selittää terveyskäyttäytymistä yksilötasolla, kun taas sosiaalinen markkinointi liittää yksilötason vaikutukset kampanjan toimintaympäristöön. Väitöskirja koostuu neljästä alkuperäisjulkaisusta sekä aikaisemmin julkaisemattomista tuloksista.

Aineistot kerättiin Suomi mies seikkailee -kampanjan rekkakiertueelta vuonna 2011 ja seurantakyselyllä vuonna 2014. Osa miehistä kutsuttiin kuntotesteihin myös vuonna 2014. Kuntoa arvioitiin kehon kuntoindeksillä (BFI), perustuen kehon koostumusanalyysiin (Inbody 720), kestävyyskunnon arvioon (Polar OwnIndex) ja käden puristusvoimamittaukseen. Liikunta-aktiivisuutta, ruokailutottumuksia, terveystottumusten muutosvaihetta sekä psykososiaalisia tekijöitä (tiedot, taidot, pystyvyys, tavoitteen asettaminen, sosiaalinen tuki) arvioitiin kyselylomakkeella. Tutkimusaineistot analysoitiin keskiarvo- ja mediaanitesteillä sekä monimuuttujamenetelmillä. Tutkimukseen osallistui 900 miestä (keski-ikä=43.9, SD= 12.7), joista 19 % oli huonokuntoisia, 43 % keskitasoisessa kunnossa ja 38 % hyväkuntoisia. Kaikkiaan 40 prosentilla (N=361) oli kuntotason ja kehon koostumuksen mittausarvojen perusteella selkeä tarve terveystottumusten muutoksille. Vuoden 2014 aikana näistä miehistä 102 vastasi seurantakyselyyn ja 41 osallistui kuntotesteihin.

Tulokset osoittivat, että 63 prosenttia huonokuntoisista miehistä itsearvioi kuntonsa vähintään keskitasoiseksi. Heikko pystyvyys sekä tavoitteiden, taitojen ja sosiaalisen tuen puute erottivat huonokuntoiset hyväkuntoisista. Lähes kaikki (95%) huonokuntoiset miehet aikoivat lisätä liikunnan harrastamista. Seurantakysely osoitti, että alle tunnin viikossa liikkuvien osuus väheni neljäsosasta 16 prosenttiin, mutta yli kolme tuntia viikossa liikkuvien määrä ei kasvanut. Myönteisiä liikuntamuutoksia raportoineet miehet olivat asettaneet vahvempia liikuntatavoitteita ja heillä liikuntaa edistävät tekijät liittyivät useammin hyvinvointiin ja rentoutumiseen kuin niillä miehillä, joilla alkutilanteen liikunta-aktiivisuustaso säilyi tai väheni. Kuntotesteihin osallistuneiden 41 miehen keskimääräinen kuntoindeksi ei kohonnut, mutta yksittäisillä terveyskunnon osa-alueilla havaittiin myönteisiä muutoksia.

Seuranta-aineiston pienen koon ja useiden sekoittavien tekijöiden vuoksi tulokset eivät kerro liikuntamuutoksiin vaikuttavien tekijöiden välisistä kausaa-

lisuhteista. Tulosten yleistettävyyttä rajoittaa osallistujien valikoituminen terveystietoisiin miehiin.

Tutkimuksen keskeiset tulokset osoittivat, että Suomi mies seikkailee-kampanjan tavoittamat miehet tietävät yleisellä tasolla liikuntasuositukset, terveellisen ruokavalion periaatteet ja ovat kiinnostuneita muuttamaan elintapojaan. Vähän liikkuvilla ja huonokuntoisilla miehillä taidot ja pystyvyys omien elintapamuutosten edistämiseen ovat kuitenkin puutteellisia.

Jatkossa kampanjoiden viestinnässä ja miehille suunnattavissa interventioissa tulisi vahvistaa osallistujien liikuntapystyvyyttä sekä tarjota monipuolisia mahdollisuuksia liikuntaan liittyvien taitojen kehittämiselle. Näihin tekijöihin vaikuttavia, ja kuntotestejä täydentäviä, toimia voivat olla esimerkiksi yksilöllinen liikuntaneuvonta, matalan kynnyksen ryhmät ja säännöllinen palaute elintapamuutosten suunnasta. Yhteistyö paikallistason toimijoiden, työyhteisöjen ja liikuntajärjestöjen kanssa voi juurruttaa kuntotestit osaksi liikunnan palveluketjua.

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APPENDIX 1

TABLE 1A Explorative factor analysis for scores on psychosocial factors.

Items in the original scale	EFA loadings				CFA loadings in 5 factor model[$]				
	Knowledge	Self-efficacy	Goal set-ting&Skills	Social support	Knowledge	Goal set-ting	Skills	Social support	Self-efficacy
I know the health benefits of PA	**0.486**	0.130	0.121	0.226	0.500				
I know how often I should exercise	**0.812**	0.133	0.152	0.075	0.819				
I know how many hours a week I should exercise	**0.843**	0.127	0.172	0.073	0.854				
I know the intensity at which I should exercise	**0.604**	0.185	0.223	0.118	0.647				
I know where I can get social support for exercise	**0.376**	0.136	0.286	0.231	0.445				
I have a high regard for PA[#]	0.338	0.276	0.246	0.332					
I have good exercise skills[£]	0.268	0.310	**0.410**	0.193					
I exercise sufficiently[#]	0.177	0.417	**0.505**	0.165					
I have good possibilities to exercise[#]	0.242	0.238	0.315	0.325					
I have set goals for exercise	0.155	0.158	**0.785**	0.128		0.777			
I can achieve my exercise goals	0.186	0.210	**0.631**	0.149		0.734			
I have sought information on exercise[£]	0.175	0.178	**0.486**	0.132					
I can seek different exercise alternatives	0.322	0.258	**0.367**	0.229			0.602		
I have found an agreeable way to exercise	0.246	0.379	**0.433**	0.333			0.751		
People close to me support my PA	0.111	0.192	0.240	**0.681**				0.908	
People close to me have a high regard for PA	0.134	0.138	0.087	**0.832**				0.706	
I am able to exercise when I am tired	0.160	**0.649**	0.217	0.149					0.710
I am able to exercise when I am bad tempered	0.138	**0.744**	0.139	0.154					0.752
I am able to exercise when I am busy	0.110	**0.641**	0.256	0.076					0.696
I am able to exercise although people close to me do not regard PA highly	0.195	**0.538**	0.182	0.253					0.657
I am able to restart exercise after an inactive period	0.143	**0.443**	0.192	0.316					0.565
I believe that by being active I can encourage PA by people close to me[2]	0.194	0.252	0.187	**0.423**					

#=Excluded after Explorative factor analysis (EFA) due to low factor loading (<0.40) or equal lodgings in several factors. £=Excluded from Confirmatory factor analysis (CFA) due to poor fit in the model. $= Model fit: χ^2(df)=<0.001 (94), CFI/TLI=0.94/0.93, RMSEA=0.05, SRMR=0.052.

APPENDIX 2

TABLE 2A Bivariate correlations of study variables of follow-up participants (n=102).

	Pro_P11	Pro_E11	Bar_E11	Bar_P11	Bar_E14	Bar_P14	Pro_E14	Pro_P14	Kno11	Skills11	Sos11	SE11	Goals11	Skills14	Sos14	SE14	Goals14	Kno14	PA11
Pro_int11	1																		
Pro_ext11	,480**	1																	
Bar_ext11	,036	,113	1																
Bar_int11	,124	,041	,370**	1															
Bar_ext14	,134	-,007	,313**	,247*	1														
Bar_int14	-,024	,112	,185	,430**	,270**	1													
Pro_ext14	,287**	,333**	-,023	,025	,014	,046	1												
Pro_int14	,341**	,243*	-,133	,038	-,269**	-,053	,253*	1											
Kno11	,118	,072	-,149	,063	,027	,073	,130	,122	1										
Skills11	,171	,129	-,201*	-,227*	-,147	-,121	,260**	,182	,388**	1									
Sos11	,289**	,218*	-,229*	-,145	-,309**	-,014	,124	,163	,179	,474**	1								
SE11	,075	,025	-,259**	-,417**	-,168	-,248*	,099	,184	,279**	,624**	,347**	1							
Goals11	,166	,186	-,143	-,223*	-,086	-,060	,111	,244*	,492**	,458**	,260**	,439**	1						
Skills14	,271**	,291**	-,193	,004	-,211*	-,138	,342**	,407**	,369**	,390**	,397**	,324**	,304**	1					
Sos14	,156	,126	-,223*	-,055	-,262**	-,111	,236*	,325**	,246*	,400**	,424**	,378**	,235*	,666**	1				
SE14	,082	,037	-,125	-,188	-,121	-,293**	,197*	,407**	,235*	,352**	,250*	,507**	,236*	,499**	,547**	1			
Goals14	,188	,142	,018	-,088	-,094	-,195	,269**	,386**	,306**	,284**	,119	,326**	,423**	,464**	,469**	,643**	1		
Kno14	,086	,196*	-,060	,021	,035	-,007	,178	,112	,620**	,170	,100	,201*	,277**	,296**	,296**	,298**	,274**	1	
PA 2011	,171	,317**	-,119	-,363**	-,039	-,142	,195	,217*	-,058	,317**	,173	,306**	,193	,239*	,348**	,409**	,313**	,058	1
PA 2014	,194	,240*	-,123	-,195	-,233*	-,247*	,219*	,271**	,061	,210*	,104	,252*	,219*	,276**	,275**	,433**	,430**	-,051	,462**

**. Correlation significant at the 0.01 level (2-tailed). *. Correlation significant at the 0.05 level (2-tailed).
Pro=promoters, Bar=barriers, E=external, P=personal, kno=knowledge, Skills=skills, SE=self-efficacy, Goals=goals, Sos =social support, PA=physical activity

APPENDIX 3

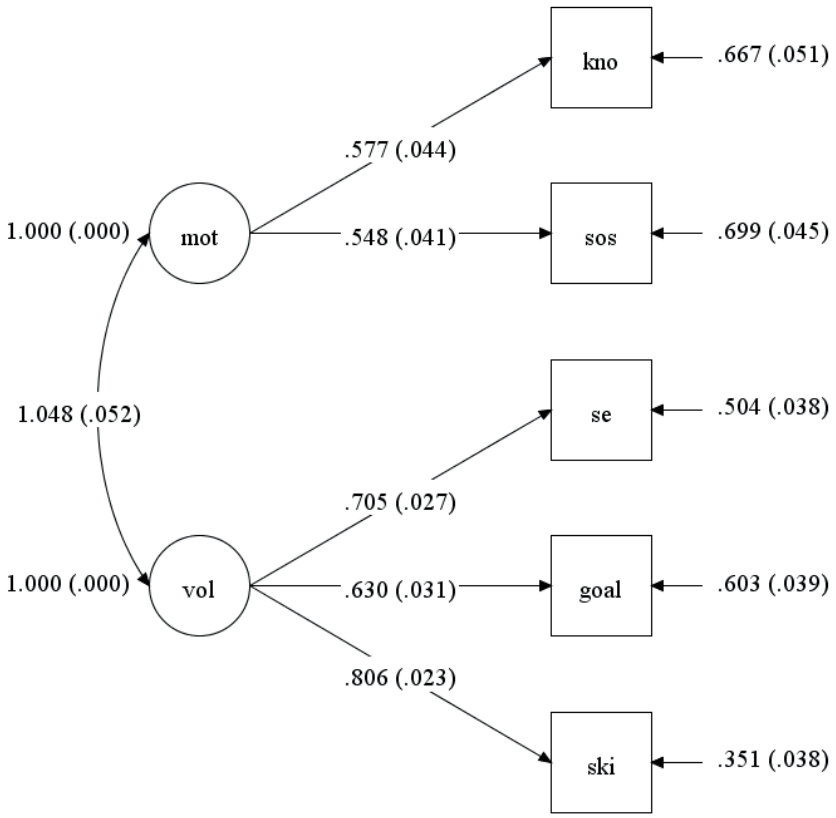

FIGURE 1A Confirmatory factor analysis and model fit for motivational (mot) and volitional (vol) factors. Fit indices: $\chi 2(df)= 4.456$, $p=0.348$, CFI=0.99, TLI=0.99, RMSEA=0.01.

APPENDIX 4

Health behavior questionnaire 2011

1. **Kuinka usein kuljette työmatkanne kävellen, pyörällä tai muilla ruumiillista liikuntaa vaativilla tavoilla?** (How often do you move to work by feet, bike or other physically active way?)

1. 5 kertaa viikossa tai useammin (5 times in a week or more)
2. 4 kertaa viikossa (4 times/wk)
3. 3 kertaa viikossa (3 times/wk)
4. 2 kertaa viikossa (2 times/wk)
5. Kerran viikossa (once in a week)
6. Harvemmin tai en koskaan (seldom or never)

2. **Kuinka monta minuuttia kävelette, pyöräilette tai kuljette muilla ruumiillista liikuntaa vaativilla tavoilla työmatkoillanne? Huom. tarkoittaa meno- ja tulomatkaan yhteensä käytettyä aikaa.** (How much time do you spent to commuting to and from work? Note the total time used to the both directions)

1. En ole työssä tai työ on kotona (Not at work or working at home)
2. Kuljen työmatkan kokonaan moottoriajoneuvolla (I travel to work by motor vehicles)
3. Alle 15 minuuttia päivässä (less than 15 min/day)
4. 15 – 30 minuuttia päivässä (15-30 min/day)
5. 30 – 60 minuuttia päivässä (30-60 min/day)
6. Yli tunnin päivässä (more than 1 h/day)

3. **Kuinka usein harrastatte vapaa-ajallanne <u>lihaskuntoa kehittävää liikuntaa</u> (esim. kuntopiiri tai kuntosaliharjoittelu)?** (How often do you engage in strength enhancing physical activities (e.g. gym training, circuit training)?)

1. 4 kertaa viikossa tai useammin (4 times in a week or more)
2. 3 kertaa viikossa (3 times/wk)
3. 2 kertaa viikossa (2 times/wk)
4. Kerran viikossa (once in a week)
5. 2–3 kertaa kuukaudessa (2-3 times/month)
6. Muutaman kerran vuodessa tai harvemmin (a few times/year or seldom)
7. En voi vamman tai sairauden vuoksi harrastaa liikuntaa (I can't exercise due to health reasons)

4. **Millainen on mielestänne nykyinen fyysinen kuntonne?** (How do you perceive your current physical fitness?)

1. Erittäin hyvä (very good)
2. Melko hyvä (fairly good)
3. Keskinkertainen (moderate)
4. Melko huono (fairly poor)
5. Erittäin huono (very poor)

5. **Oletteko lisännyt liikkumista/liikunnan harrastamista viimeksi kuluneen vuoden aikana?** (Have you increased your physical activity during the past year?)

1. En ole, enkä aio lisätä lähiaikoina (I haven't and I do not have intention to increase)
2. En ole, mutta aion lisätä lähiaikoina (I haven't but I intend to increase)
3. Olen yrittänyt lisätä (I have tried to increase)

4. Olen selvästi lisännyt (I have increased remarkably)
5. Olen jo aiemmin liikkunut paljon (I have been physically active for a long time)

6. Kuinka paljon seuraavat asiat <u>edistävät</u> liikuntaharrastustanne? Valitkaa jokaisesta kohdasta yksi tilannettanne parhaiten kuvaava vaihtoehto ympäröimällä sitä vastaava numero (1-5). (How much do the following factors promote your physical activity? Please choose the alternative that best corresponds to your situation)

	erittäin paljon (very much)	**melko paljon** (fairly much)	**melko vähän** (fairly little)	**erittäin vähän tai ei lainkaan** (fairly little or not at all)	**en osaa sanoa** (I do not know)
Viihtyisä ympäristö (pleasant environment	1	2	3	4	5
Hyvät liikuntapaikat (good exercise facilities)	1	2	3	4	5
Virkistys, rentoutuminen (refreshment, relaxation)	1	2	3	4	5
Terveyden ylläpitäminen (health promotion)	1	2	3	4	5
Fyysisen kunnon kehittäminen (improving fitness)	1	2	3	4	5
Liikunnan vaikutukset ulkonäköön (improving outlook)	1	2	3	4	5
Painon hallinta (weight management)	1	2	3	4	5
Ystävät, liikuntaryhmä tms. (friends, group etc.)	1	2	3	4	5
Muu, mikä?_____ (other reason)	1	2	3	4	5

7. **Kuinka paljon seuraavat asiat <u>rajoittavat</u> liikuntaharrastustanne? Valitkaa jokaisesta kohdasta yksi tilannettanne parhaiten kuvaava vaihtoehto ympäröimällä sitä vastaava numero (1-5).** (How much do the following factors hinder your physical activity? Please choose the alternative that best corresponds to your situation)

	erittäin paljon (very much)	**melko paljon** (fairly much)	**melko vähän** (fairly little)	**erittäin vähän tai ei lainkaan** (fairly little or not at all)	**en osaa sanoa** (I do not know)
Väsymys (tiredness)	1	2	3	4	5
Motivaation puute (lack of motivation)	1	2	3	4	5
Taloudelliset tekijät (economical factors)	1	2	3	4	5
Työkiireet (busy at work)	1	2	3	4	5
Perhe-elämän vaatimukset (family reasons)	1	2	3	4	5
Terveydentila (health status)	1	2	3	4	5
Sopivan liikuntakumppanin/-ryhmän puute (lack of appropriate friend or group)	1	2	3	4	5
Liikuntapaikkojen puute (lack of exercise facilities)	1	2	3	4	5
Sää (weather)	1	2	3	4	5
Liikunta ei ole turvallista (exercise is mot safe)	1	2	3	4	5
Muu, mikä?_____ (other reason)	1	2	3	4	5

8. **Missä määrin seuraavat väittämät vastaavat mielipidettänne tai käyttäytymistänne? Valitkaa jokaisen väittämän kohdalta yksi mielipidettänne parhaiten kuvaava vaihtoehto ympäröimällä sitä vastaava numero (1-5).** (How well do the following statements corresponds to your opinion or behavior? Please choose the alternative that best suits to you.)

	täysin samaa mieltä (totally agree)	**jokseenkin samaa mieltä** (somewhat agree)	**jokseenkin eri mieltä** (somewhat disagree)	**täysin eri mieltä** (totally disagree)	**en osaa sanoa** (I don't know)
Tiedän liikunnan terveyshyödyt (I know the health benefits of PA)	1	2	3	4	5
Tiedän, kuinka usein minun tulisi liikkua (I know how often I should exercise)	1	2	3	4	5
Tiedän, kuinka monta tuntia viikossa minun tulisi liikkua (I know how many hours in a week I should exercise)	1	2	3	4	5
Tiedän, millaisella teholla minun tulisi liikkua (I know the intensity at which I should exercise	1	2	3	4	5
Tiedän, mistä voin saada tukea liikunnan harrastamiseen (I know where I can get social support for exercise)	1	2	3	4	5
Pidän liikunnan harrastamista tärkeänä (I have high regard for PA)	1	2	3	4	5
Liikuntataitoni ovat hyvät (I have good exercise skills)	1	2	3	4	5
Liikun riittävästi (I engage in PA sufficiently)	1	2	3	4	5
Minulla on hyvät mahdollisuudet harrastaa liikuntaa (I have good possibilities to exercise)	1	2	3	4	5
Olen asettanut liikuntaa koskevia tavoitteita (I have set goals for exercise)	1	2	3	4	5
Uskon, että pystyn saavuttamaan liikuntaa koskevat tavoitteeni (I believe that I can achieve my exercise goals)	1	2	3	4	5
Olen etsinyt liikuntaan liittyvää tietoa (esim. lehdistä, Internetistä, terveysalan ammattilaisilta)	1	2	3	4	5

(I have sought information on exercise)					
Osaan hakea erilaisia vaihtoehtoja liikunnan harrastusmahdollisuuksista (I can seek exercise alternatives)	1	2	3	4	5
Olen löytänyt itselleni mieluisan tavan harrastaa liikuntaa (I have found an agreeable way to exercise)	1	2	3	4	5
Lähipiirini tukee minua liikunnan harrastamisessa (People close to me support my PA)	1	2	3	4	5
Lähipiirini pitää liikunnan harrastamista tärkeänä (People close to me have a high regard for PA)	1	2	3	4	5
Pystyn harrastamaan liikuntaa ollessani väsynyt (I am able to exercise when I am tired)	1	2	3	4	5
Pystyn harrastamaan liikuntaa ollessani huonolla tuulella (I am able to exercise when I am bad tempered)	1	2	3	4	5
Pystyn harrastamaan liikuntaa ollessani kiireinen (I am able to exercise when I am busy)	1	2	3	4	5
Pystyn harrastamaan liikuntaa, vaikka ihmiset ympärilläni eivät pitäisi sitä tärkeänä (I am able to exercise although people close to me do not regard highly PA)	1	2	3	4	5
Pystyn aloittamaan liikunnan harrastamisen uudelleen, vaikka liikuntaharrastus olisi ollut jonkin aikaa tauolla (I am able to restart exercise after an inactive period)	1	2	3	4	5
Uskon, että harrastamalla liikuntaa, voin edistää myös lähipiirini kuuluvien fyysistä aktiivisuutta (I believe that by being active I can contribute to PA by people close to me)	1	2	3	4	5

RUOKAILUTOTTUMUKSET (Eating habits)

9. **Millaiset ovat tämänhetkiset ruokailutottumuksenne?** (How are your current eating habits?)

	Kyllä	**En**
Käytättekö ruoanvalmistuksessa ja leivonnassa pääasiassa margariinia tai öljyä (Do you use mainly vegetable fats when cooking?)	1	0
Käytättekö leivällä pääasiassa margariinia? (Do you use mainly vegetable spread on the bread?)	1	0
Käytättekö leivällä yleensä vähärasvaisia leikkeleitä (rasvaa alle 4 %)? (Do you use mainly low-fat cold cuts (fat less than 4 %)?	1	0
Käytättekö leivällä yleensä vähärasvaisia juustoja (rasvaa alle 20 %)? (Do you use mainly low-fat cheese (fat less than 20 %)?	1	0
Käytättekö pääasiassa vähärasvaisia maitotuotteita? (Do you use mainly low-fat dairy products?)	1	0
Syöttekö kalaa vähintään kaksi kertaa viikossa? (Do you eat fish at least twice a week?)	1	0
Käytättekö päivittäin ruista tai täysjyväviljatuotteita? (Do you eat daily whole grain?)	1	0
Käytättekö päivittäin kasviksia, marjoja tai hedelmiä? (Do you eat daily fresh vegetables, berries or fruits?)	1	0
Lisäättekö yleensä ruokiin suolaa, ketsuppia tai soijakastiketta? Do you have a habit to add salt or salty spices (e.g. ketchup, soya sauce) to food?	1	0
Onko ruokailurytminne säännöllinen (pääruoat, välipalat)? (Do you have regular meal times?)	1	0
Harrastatteko lähes päivittäin herkuttelua tai napostelua aterioiden välillä? (esim. makeisia, keksejä, juustoa, makkaraa, sipsejä tms.) (Do you have a habit of snacking daily or almost daily between meals (e.g. sweet, cookies, cheese, sausage, chips etc)?)	1	0
Syöttekö useamman kerran viikossa valmisruokia / pikaruokia? (Do you eat fast food several times in a week?)	1	0
Käytättekö ruokajuomana pääasiassa vettä tai vähärasvaista maitoa / piimää? (Do you drink mainly water/low-fat milk or sour milk with meals?)	1	0
Käytättekö ruokajuomana sokeroituja mehuja, virvoitusjuomia tai kotikaljaa? (Do you drink sugar-sweetened juice, soft drinks or home beer with meals?)	1	0
Käytättekö janojuomana sokeroituja mehuja, virvoitusjuomia tai energiajuomia? ((Do you drink sugar-sweetened juice, soft drinks or energy drink to thirst?)	1	0

10. Oletteko muuttanut ruokailutottumuksianne viimeksi kuluneen vuoden aikana? (Have you changed your eating habits during the past year?)

1. En ole, enkä aio muuttaa lähiaikoina (I haven't and I don't intend to change)
2. En ole, mutta aion muuttaa lähiaikoina (I haven't but I intend to change)
3. Olen yrittänyt muuttaa (I have tried to change)
4. Olen muuttanut muutamin osin (I have slightly changed)
5. Olen selvästi muuttanut (I have changed remarkably)

11. Mitä mieltä olette painostanne? Oletteko mielestänne
(What do you think about your current weight?)

1. Selvästi ylipainoinen (Clearly overweight)
2. Hieman ylipainoinen (Slightly overweight)
3. Sopivan painoinen (At suitable weight)
4. Hieman tai selvästi alipainoinen (Underweight)

12. Haluatteko pudottaa painoanne?
(Do you want to lose your weight?)

1. En (No)
2. Kyllä (Yes)

13. Tiedättekö, mitä liikuntasuosituksilla tarkoitetaan? (Do you know what is meant by physical activity recommendations?)

1. tiedän hyvin (I know well)
2. tiedän osittain (I have some knowledge)
3. olen kuullut, mutta en muista (I have heard but can't remember)
4. en tiedä (I do not know)

14. Tiedättekö, mitä lautasmalilla tarkoitetaan? (Do you know what is meant by food plat model?)

1. tiedän hyvin (I know well)
2. tiedän osittain (I have some knowledge)
3. olen kuullut, mutta en muista (I have heard but can't remember)
4. en tiedä (I do not know)

15. Työtilanne
(Employment status)

1. Vakinainen työsuhde (Full time contract)
2. Määräaikainen työsuhde (Part time contract)
3. Työelämän ulkopuolella (mm. työtön, opiskelija, eläkkeellä)
4. (Not at work (e.g. unemployed, student, retired)

16. Siviilisääty (Marital status)

1. Naimisissa tai avoliitossa (married or cohabiting)
2. Naimaton (single)
3. Asumuserossa tai eronnut (divorced)
4. Leski (widowed)

17 Koulutus (Education)

1. Kansa- tai peruskoulu (primary school)
2. Ylioppilas (high school)
3. Ammattitutkinto (vocational school)
4. Alempi korkeakoulututkinto (Lower degree in university, bachelor degree)
5. Ylempi korkeakoulututkinto (Higher degree in university, master degree)

ORIGINAL PUBLICATIONS

I

A CROSS-SECTIONAL STUDY OF LOW PHYSICAL FITNESS, SELF-RATED FITNESS AND PSYCHOSOCIAL FACTORS IN A SAMPLE OF FINNISH 18- TO 64-YEAR-OLD MEN

by

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BMC Public Health

RESEARCH ARTICLE Open Access

A cross-sectional study of low physical fitness, self-rated fitness and psychosocial factors in a sample of Finnish 18- to 64-year-old men

Karoliina S Kaasalainen[1*], Kirsti Kasila[1†], Jari Villberg[1†], Jyrki Komulainen[2†] and Marita Poskiparta[1†]

Abstract

Background: The biological risk factors of inactivity and poor cardiorespiratory fitness are well established. However, risk groups are hard to reach and they may have misperceptions of their need for change. This study explored self-ratings of physical fitness (PF) and the relationship between objectively estimated physical fitness (PFI) and psychosocial factors among Finnish men of working-age.

Methods: Cross-sectional data on 899 Finnish men (aged 18–64) were collected in 2011. Health- related physical fitness was evaluated with a physical fitness index calculated from the results of selected fitness tests. The men were subsequently classified into three groups: low, moderate and high PFI. Psychosocial factors and self-rated fitness were elicited in the questionnaire. The data were analysed with crosstabulations, chi square-test and logistic regression analysis.

Results: One-fifth of the participants had low PFI. Forty-five per cent of the low-fit middle-aged (35–49 years) men self-reported poor PF, while 80 per cent of the younger (18–34 years) low-fit men self-reported moderate or good PF. The health benefits and recommended dose of physical activity were well known in all the PFI categories. The low-fit men were health conscious, but lacked adequate exercise skills, self-efficacy and social support. However, logistic regressions revealed that, in the younger men, likelihood of better knowledge was not related to higher PFI. Among the 50-to-64-year-old men, high PFI was not associated with a higher social support.

Conclusions: Poor exercise skills, self-efficacy and social support were related to low PFI. Physical activity promotion for low-fit men should take into account age differences in the relationship between psychosocial factors and physical fitness. Thus, new and effective ways to establish social support and motivation for physical activity among low-fit men in all working-age groups are needed. Further research is also warranted on whether estimation of PFI could be used as a practical health counselling tool.

Keywords: Physical fitness, Physical activity, Motivation, Psychosocial factors, Middle-aged, Men

Background

The health risks of inactivity, poor cardiorespiratory fitness and obesity are well established [1-4]. Only one-half of working-aged (18–64 years) men in Europe are sufficiently active [5] and up to 70 are overweight or obese [6]. Both poor cardiorespiratory fitness and abdominal obesity are associated with elevated risk for metabolic diseases and mortality among men [7]. Physical activity (PA) and a healthy diet are predictors of good physical fitness and favourable body composition. Health-related physical fitness (PF) describes an individual's aerobic capacity, skeletal muscle strength and body composition [8]. The decreasing trend in PA and increasing obesity among working-aged men are public health issues [5]. Finnish studies have also expressed concern about poor cardiorespiratory fitness in young and working-aged men [9,10]. Although only 10 per cent of working-aged Finnish men have rated their PF as poor in population-based survey [11], the overall size of the low fitness population may be greater. People tend to overestimate their PA, while many

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studies have recruited participants from a motivated and physically active population [12,13].

To date, only a few physical activity interventions have been targeted at inactive men and most of these programmes have had poor reachability and only short-term effects [12,14]. Men are aware of the health benefits of adequate PA, but knowledge is a poor motivator for changes in health behaviour. Misperceptions of one's own risk may be one explanation for the low interest in attending PA interventions. In previous studies up to 60 per cent of inactive people have overestimated their level of PA [13,15,16]. Physical fitness testing and individualized feedback have been used in health counselling in order to increase awareness of current PF and motivation for health behaviour changes [17-19]. However, comprehensive fitness tests have not improved counselling outcomes [17-19]. The results suggests that PF tests and feedback are not likely to contribute to the desired behaviour change process if individuals are already well aware of their current PF status or lack the confidence to implement the target behavioural change [18]. Hence, the reasons for low PF and inactivity do not reside in knowledge alone.

Most of people have the intention to be physically active, but less than a half of all attempts to maintain regular PA are successful [20]. Psychosocial factors, including knowledge, attitudes, intention, motivation social support and self-efficacy, affect PA adoption and maintenance [21,22]. Recent studies have concluded that although intention predicts PA, the latter can be also based on habitual and non-intentional behaviour [4,21,23-26]. A more evident moderator of behavioural change is self-efficacy, which is also included in most of the health behaviour theories [26]. Self-efficacy is a personal belief in one's ability to engage in a desired behaviour [27]. The successful adoption of regular PA is argued to be influenced by an improvement in self-efficacy and reduction in the perceived barriers [22]. Barriers to PA can be environmental, and hence to some extent modifiable (e.g. social support, lack of exercise facilities), or individual and less likely to be modifiable (e.g. poor skills, lack of motivation) [28-30]. Modifiable and non-modifiable factors both have an influence on individuals' enjoyment of physical activities and exercise. Genetics is a central non-modifiable factor determining PF, although PA history and health behaviour also have a considerable impact on PF [21].

Further understanding of the psychosocial factors that determine the adoption and maintenance of PA among low fitness men is needed. The aims in this study were to examine: 1) the relationship between self-rated physical fitness and objectively estimated physical fitness (PFI) and 2) the relationship between a low PFI and selected psychosocial factors.

Methods

Sample and study design

The study sample comprised 899 Finnish men who participated in a health promotion campaign, "The Adventures of Joe Finn", during September 2011. The campaign was held in the market squares of 15 Finnish municipalities and was organized by the Fit for Life Program. The campaign offered all participants PF tests free of charge and personal feedback on the test results. The tests were conducted in a mobile test lab by trained personnel. Completion of all tests took about 15 minutes per participant. The inclusion criteria in to the study were gender (male), age (18–64) and completion both fitness tests and the health behaviour questionnaire. Participation in the study was voluntary and all participants gave their written consent. The study was approved by the University of Jyväskylä Ethical Committee.

Physical fitness index

The fitness tests included hand grip strength (Saehan dynamometer), the Polar Fitness Test (Polar Electro, Kempele, Finland) and a body composition analysis (InBody 720- analyser). To our knowledge, this is the first time that this combination of fitness tests has been used to evaluate health-related PF. These fitness tests were chosen, as the aim of the campaign was to encourage sedentary men to participate in the tests and help them to become familiar with their PF. Exercise tests demanding strenuous physical effort were not deemed suitable for health counselling purposes. Previous studies suggest that hand grip-strength, Polar Fitness Test and body composition analysis by bioelectrical impedance (BIA) are feasible tests for population-based studies and the results correlate strongly with other assessment methods [1,31].

Hand grip strength describes the general fitness of the skeletal muscles and also predicts functional ability and risk for chronic diseases in the last years of life [32]. Hand grip strength was measured with a Saehan dynamometer and the results were compared with age and gender specific reference values. The references were based on fitness test data on working-aged Finnish men collected by the LIKES Research Center for Sport and Health Sciences between the years 2007-2011 [33].

Aerobic fitness was measured with the Polar Fitness Test, which predicts a person's aerobic capacity (VO_2max) [34]. Estimation of VO_2max was based on resting heart rate, heart rate variability, gender, age, height, body weight and self-reported level of long-term physical activity. The resulting value was compared to international reference standards of aerobic capacity for gender and age group, and the individual was subsequently assigned to one of the fitness categories, which ranged from 1 to 7 [35]. Although VO_2max was assessed

indirectly, the Polar Fitness Test has been shown to be a reliable test of aerobic fitness in population-based studies [36]. The mean error between the Polar Fitness Test and laboratory-measured maximal oxygen uptake has varied between 6.5 and 8.2 per cent [37].

Body composition was measured by using an InBody 720 analyser. The body composition analysis estimates body weight, percentage of total body fat (fat%), visceral fat area (VFA) (cm^2) and skeletal muscle mass (SMM) (kg/m). VFA describes abdominal obesity, which has been associated with increased risk for mortality and metabolic diseases [2,7]. Obese individuals with good PF have had less internal fat than obese and unfit individuals [1,38]. SSM describes fat-free mass, which has positive associations with functional ability and energy metabolism [39]. In comparison to the other body composition assessment methods (e.g. DEXA and MRI), the BIA has reasonable validity [31].

The final physical fitness index (PFI) described health-related fitness with a numeric scale. The PFI was computed from the results of the following fitness test variables: estimated aerobic capacity (VO_2max), hang grip strength (kg/kg), percentage of total body fat (fat%), SSM (kg/m) and VFA (cm^2). All the test results were converted to standardized points and then weighted with the following equations: Aerobic fitness (VO_2max), points = 0,5 × [10 × (ml/kg/min - (−0,2835 × age + 50,307)) / 30], body fat (%), points = 0,1 × [− (10 × fat% - (0,143 × age + 15,264))/ 24], VFA (cm^2), points = 0,15 × [− (10 × (cm2 - (1,326 × age + 56,031))) / 140], Hand grip strength (kg/kg), points = 0,15 × [10 × (kg/kg − (−0,036 × age + 22,33)) / 10], SSM (kg/m), points = 0,1 × [10 × (kg/m - (−0,0037 × age + 0,83)) / 0,5]. The final PFI ranges from ′-5, +5′, where < −3 = very poor, < −1 = poor, < +1 = acceptable, < +3 = good and > +3 = very good PF. For the statistical analyses, the PFI was recoded into low PF (PFI ≤ −1), moderate PF (PFI <1) and high PFI (PFI ≥ 1) classes.

Self-rated physical fitness and sufficiency of physical activity

Self-rated PF was elicited with the question "What do you think about your current level of physical fitness?" The response alternatives were given on a 5-point scale (1 = very good…5 = very poor). For the statistical analyses, self-rated PF was recoded into three classes (good, moderate and poor). Furthermore, perceived sufficiency of PA was elicited with the statement "I am sufficiently physically active". The response alternatives were given on a 5-point scale (1 = totally agree…4 = totally disagree, 5 = I don't know). The responses were assigned to one of three classes (1 = agree, 2 = disagree and 0 = I don't know). The categories were dichotomised for the statistical analyses into two classes (1 = agree, 2 = disagree or I don't know).

Health, physical activity and readiness for physical activity change

General health status was elicited in the questionnaire by reference to a list of chronic diseases [11]. Participants self-evaluated their level of PA, which was later assigned to one of 4 categories (1 = over 5 h/week (wk), 2 =3-5 h/wk, 3 = 1-3 h/wk and 4 = 1 or 0 h/wk). The classification was constructed on the basis of the answers given on the Polar Fitness Test background form. The PA assessment included descriptions of the frequency, duration and intensity of PA, including both conditioning and non-conditioning PA. Commuting activity to work and frequency of gym/strength training were also elicited in the health behaviour questionnaire. Readiness for PA change was elicited with the question "Have you increased your level of PA during the past year?" (1 = No, and I have no intention to increase it, 2 = No, but I intend to increase it in the near future, 3 = I have tried to increase it, 4 = I have increased it considerably, and 5 = I have been physically active on regular basis").

Psychosocial factors

The health behaviour questionnaire included 19 statements (Cronbach's alfa 0.90) on psychosocial factors (Table 1). The items concerned knowledge on the health benefits of PA, perceived PA skills, goal setting, social support and self-efficacy. The psychosocial items were selected on the basis of previous studies [40-43]. Participants were asked to assess how well the statements matched their situation. The original response alternatives were given on a 5-point scale (1 = totally agree, 2 = somewhat agree, 3 = somewhat disagree, 4 = totally disagree 5 = I don't know). The responses were subsequently assigned to three classes (1 = agree, 2 = disagree and 0 = I don't know). The categories were dichotomised for the statistical analyses into two classes (1 = agree, 2 = disagree or I do not know). In the further analysis, the psychosocial items were divided into five subdimensions (knowledge, skills, goal setting, social support and self-efficacy). Those who agreed with all the score-related items formed the high-score group.

Statistical analyses

Data were analysed using SPSS for Windows 18.0. Basic descriptive data frequencies and cross-tabulation with chi square-test were calculated for demographics (education, marital status, employment, age, BMI, chronic diseases), physical activity (total PA level, gym training and commuting activity) and the psychosocial variables. Bivariate and multivariate logistic regressions were used to test associations between the psychosocial variables and PFI in three age categories (18–34, 35–49 and 50–64). Main effects of the psychosocial variables were analysed

Table 1 Scale of psychosocial factors and associations with physical fitness index

	Low (n = 172) (%)	Moderate (n = 386) (%)	High (n = 341) (%)	p[1]
Knowledge (Chronbach's α = 0.80)				
I know health benefits of PA	95	98	97	0.201
I know how often I should exercise	90	94	95	0.165
I know how many hours in a week I should exercise	85	86	90	0.115
I know the intensity at which I should exercise	76	77	83	0.042
I know where I can get social support for exercise	59	72	77	<0.001
Skills (Chronbach's α = 0.71)				
I have sought information on exercise	52	63	75	<0.001
I can seek exercise alternatives	75	85	90	<0.001
I have found an agreeable way to exercise	67	85	95	<0.001
I have good exercise skills	63	82	93	<0.001
Goal setting (Chronbach's α = 0.76)				
I have set goals for exercise	50	64	78	<0.001
I can achieve my exercise goals	61	77	86	<0.001
Self-efficacy (Chronbach's α = 0.80)				
I am able to exercise when I am tired	51	55	76	<0.001
I am able to exercise when I am bad tempered	62	78	86	<0.001
I am able to exercise when I am busy	38	52	67	<0.001
I am able to exercise although people close to me do not regard highly PA	71	87	90	<0.001
I am able to restart exercise after an inactive period	80	88	95	<0.001
Social support (Chronbach's α =0.75)				
People close to me support my PA	70	82	88	<0.001
People close to me have a high regard for PA	75	87	90	<0.001
I believe that by being active I can contribute to PA by people close to me	75	82	88	0.001

p[1] = significance tested by chi square-test.

in logistic regression analyses. The psychosocial variables were entered in the models first individually and subsequently by the stepwise method. Only statistically significant results of the stepwise models were reported. The results of the logistic regression analyses are presented as odds ratios (OR) and 95% confidence intervals (CI). Low-fit men were used as a reference group in all models.

Results

The respondents' (N = 899) mean age was 43.9 (SD = 12.7). The majority of the study participants were employed (69%) and married or cohabiting (66%). Nineteen per cent of the men were located in the low-fitness class (low-fit), 42 per cent in the moderate fitness class (mod-fit) and 38 per cent in the high fitness class (high-fit). The low-fit men were less educated and they reported more diseases than the high-fit men. Almost all the low-fit men were overweight or obese, and one-fifth engaged in physical activities at least three hours per week (Table 2). Also among the low-fit men, one-fifth reported that they had either increased PA during the past year or were permanently active.

When self-reported and measured PFI were compared in the different age-groups, poor PF was most frequently reported by the middle-aged men. Almost 80 per cent of the low-fit men in the youngest group self-estimated moderate or good PF. The youngest low-fit men also the most often reported engaging sufficiently in PA (Table 3). One-third (29%) of the youngest low-fit men self-reported less than one hour of PA per week, while among the middle-aged and oldest group the corresponding percentages were 50 and 41.

Psychosocial factors and physical fitness

The health benefits and recommended dose of PA were well known. However, 40 per cent of the low-fit men did not know where to obtain social support (Table 1). Only half of the low-fit men reported seeking information on exercise or setting exercise goals. The low-fit men were also less confident than mod- and high-fit men of their ability to be physically active in different life situations.

Table 2 Associations between Physical Fitness Index, demographics and Physical Activity behaviour

	Low PFI (N = 172)	Moderate PFI (N = 386)	High PFI (N = 341)	Total (N = 899)	p^1
	f (%)	f (%)	f (%)	f (%)	(X^2)
Age					
18-34	48 (27.9)	103 (26.7)	106 (31.1)	257 (28.6)	ns
35-49	65 (37.8)	140 (36.3)	120 (35.2)	325 (36.2)	
50-64	59 (34.3)	143 (37.0)	115 (33.7)	325 (36.2)	
Education					
Low (–9 year)	16 (9.8)	37 (10.2)	29 (8.8)	82 (9.6)	0.003
Medium (9–12 year)	88 (53.7)	202 (56.0)	140 (42.9)	430 (50.5)	(16.4)
High (12- year)	60 (36.6)	123 (33.8)	88 (48.3)	213 (39.9)	
Chronic diseases					
No or not reported	129 (75.0)	309 (80.9)	292 (85.9)	731(81.8)	0.009
at least one	43 (25.0)	73 (18.9)	48 (14.1)	164(18.2)	(9.4)
BMI					
<25	14 (8.1)	130 (33.8)	231 (67.7)	375 (41.8)	<0.001
25-29,9	60 (34.9)	215 (57.2)	109 (32.0)	386 (43.0)	(389.5)
≥30	98 (57.0)	38 (9.9)	1 (0.3)	137 (15.3)	
Activity level					
<1 h/week	70 (40.7)	68 (17.6)	1 (0.3)	139 (15.6)	<0.001
1-3 h/week	71 (41.3)	224 (58.0)	115 (33.7)	410 (45.4)	(251.6)
>3 h/week	31 (18.0)	94 (24.4)	225 (66.0)	350 (38.9)	
Frequency of strength training					
at least 3 times/wk	32 (18.5)	116 (30.4)	146 (42.9)	294 (32.8)	<0.001
1-2 times/wk	55 (31.6)	139 (36.4)	129 (37.9)	323 (36.1)	(45.4)
less than once a week	86 (49.7)	127 (33.2)	65 (19.1)	278 (31.1)	
Commuting to work by walking or cycling/ week					
≤ 1 h /wk	143 (83.1)	284 (73.6)	192 (56.3)	619 (68.9)	<0.001
> 1 h/wk	29 (16.9)	102 (26.4)	149 (43.7)	280 (31.1)	(44.7)
Motivational readiness					
No intention to increase PA	8 (4.7)	42 (11.0)	58 (17.2)	108 (12.1)	<0.001
Intention to increase PA	56 (32.6)	91 (23.9)	41 (12.1)	188 (21.1)	(114.1)
Tried to increase PA	75 (43.6)	146 (38.3)	89 (26.3)	310 (34.8)	
Increased PA during the past year	30 (17.4)	69 (18.1)	62 (18.3)	161 (18.1)	
PA on regular basis	3 (1.7)	33 (8.7)	88 (26.0)	124 (13.9)	

F = frequencies,% = percentage, p^1 = significance tested by chi square-test, X^2 = chi square, ns = no significant.

The results of the logistic regression analyses revealed several age-specific differences in the odd ratios for high scores in the psychosocial variables (Table 4). In both logistic regression models, the results showed that, in the youngest group, the moderate-fit men were more likely to have a higher knowledge score than the low-fit men. Although the youngest moderate-fit men did not report better skills than their low-fit peers, among the middle-aged and the oldest groups the likelihood of having good skills was higher in the moderate and high PFI classes. Also in the stepwise model, the ORs for a high score in skills across ages 35–64 remained statistically significant between the low and high-fit men.

The moderate-fit younger men scored higher in goal setting than their youngest low-fit counterparts, while among the middle-aged and older men only the high-fit were likely to have a high goal-score. In the stepwise model, goals showed no statistically significant association with high PFI in any age group. There were self-efficacy differences between the low- and high-fit men in the youngest group and differences in all the PFI categories in the middle-age and oldest groups. Moderate

Table 3 Percentages of Self-rated physical fitness and sufficient physical activity in different PFI-categories and age groups

	Low (n = 172)	Moderate (n = 386)	High (n = 341)	p
Self-rated PF	**f (%)**	**f (%)**	**f (%)**	**(X^2)**
Age 18-34				
good	6 (12.5)	45 (43.7)	81 (76.4)	<0.001
moderate	31 (64.6)	47 (45.6)	22 (20.8)	60.4
poor	11 (22.9)	11 (10.7)	3 (2.8)	
Age 35-49				
good	3 (4.6)	29 (20.7)	86 (71.7)	<0.001
moderate	33 (50.8)	97 (69.3)	33 (27.5)	153.2
poor	29 (44.6)	14 (10.0)	1 (0.8)	
Age 50-64				
good	8 (13.6)	38 (26.6)	76 (66.1)	<0.001
moderate	28 (47.5)	89 (62.2)	37 (32.2)	91.9
poor	23 (39.0)	16 (11.2)	2 (1.7)	
I engage sufficiently in PA				
18-34	18 (37.5)	56 (54.4)	84 (79.2)	<0.001
35-49	13 (20.0)	64 (45.7)	98 (81.7)	<0.001
50-64	11 (18.6)	71 (49.7)	98 (85.2)	<0.001

F = frequencies,% = percentage, p = significance tested by chi square-test, X^2 = chi square.

Table 4 Odds ratios (OR) for selected psychosocial factors across different fitness categories and age groups

	Low	Moderate (model 1)	Moderate (model 2)	High (model 1)	High (model 2)
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Knowledge					
18-34	1.00	2.84 (1.40-5.76)*	2.59 (1.25-5.36)*	1.84 (0.92-3.69)	ns
35-49	1.00	1.52 (0.84-2.74)	ns	2.58 (1.39-4.80)*	ns
50-64	1.00	1.66 (0.90-3.05)	ns	3.07 (1.58-5.95)*	ns
Skills					
18-34	1.00	1.95 (0.98-3.91)	ns	2.72 (1.35-5.49)*	ns
35-49	1.00	2.19 (1.17-4.07)*	ns	7.39 (83.36-14.53)**	5.35 (2.34-10.85)**
50-64	1.00	2.49 (1.23-5.00)*	2.49 (1.23-5.00)*	6.15 (2.98-12.68)**	6.15 (2.98-12.68)**
Goal setting					
18-34	1.00	2.51 (1.40-5.06)*	ns	3.46 (1.69-7.08)*	ns
35-49	1.00	1.48 (0.82-2.68)	ns	4.55 (2.37-8.73)**	ns
50-64	1.00	1.66 (0.90-3.06)	ns	3.44 (1.78-6.65)**	ns
Self-efficacy					
18-34	1.00	1.52 (0.73-3.10)	ns	3.22 (1.56-6.64)**	2.36 (1.10-5.09)*
35-49	1.00	1.97 (1.01-3.85)*	ns	3.83 (2.44-9.56)**	2.90 (1.40-6.00)**
50-64	1.00	2.48 (1.15-5.31)*	ns	4.04 (1.87-8.76)*	ns
Social support					
18-34	1.00	2.51 (1.22-5.15)*	2.22 (1.04-4.74)*	3.64 (1.72-7.69)*	2.74 (1.25-5.98)*
35-49	1.00	1.86 (1.02-3.37)*	ns	3.55 (1.86-6.79)**	ns
50-64	1.00	1.70 (0.80-3.23)	ns	1.90 (0.97-3.71)	ns

*p < 0.05, **p < 0.001, OR = odds ratio, CI = confidence interval, ns = no significant, Model 1 = ORs for single psychosocial scores, Model 2 = stepwise model for psychosocial scores.

fitness was not related to better self-efficacy in the youngest group. The youngest men in the moderate and high PFI groups were likely to score well on social support, but no statistically significant differences between the PFI categories were found in the oldest group.

Discussion

Results indicated that the majority of the low-fit men who participated in this study were health conscious and had intentions to increase their PA. However, there were age-group differences in self-rated PF and psychosocial factors. A greater proportion of the middle-aged (35–49 years) low-fit men self-reported poor fitness than either their younger (18–34 years) or older (50–64 years) counterparts. A half of the middle-aged low-fit men were inactive. Age differences were also found when psychosocial scores were compared with scores in the other PFI categories. Low fitness was related to lower scores in skills, goal setting and self-efficacy, regardless of age. However, knowledge was not related to high PFI in the youngest group and social support was not related to better PFI in the men aged 50–64.

Self-estimated physical fitness

Previous studies have found that 50–60 per cent of the inactive population overestimate their PA [13,16,44]. In this study, almost 80 per cent of the young low-fit men reported moderate or good PF. A recent study reported that PA overestimators tended to compare their activity level to people who were even more sedentary than themselves [15]. Similarly, low-fitness men may use a downward comparison with more unfit people. However, in this study, the proportion of PF overestimators should be interpreted with caution. Self-rated fitness was compared with PFI, which has not been established as a measure of PF in previous studies. Thus, PFI may be fairly accurate measure for men aged 35–49, but underestimate PF in younger or older men.

The percentage of men aged 35–64, who self-estimated sufficient PA, was almost the same as the percentage who reported at least 3 hours PA per week. Although overestimation may be an obstacle to PA change [13,15,44], the present results suggest that most low-fit men have a realistic perception of their need to increase their PA. Nevertheless the possibility remains that, among the low-fit population, a sedentary lifestyle is the norm, blurring a clear perception of what constitutes sufficient PA or good PF [15]. Rhodes & Dean (2009) pointed out that inactivity is a heterogeneous phenomenon [45]. Sedentary behaviour may be as intentional as is participation in PA [45]. They suggest that rather than trying to advise sedentary people to increase their PA, it may be more fruitful to recommend them to plan how to cut down on sedentary time [45].

Psychosocial factors

Good PA knowledge was related to moderate fitness in the youngest men. This may reflect different values and attitudes to PA among young men. Both sedentary behaviour and regular PA training may be habitual and related to the social environment. Berge et al. (2012) found that young men were more likely to engage in PA over 3.5 h/week, when their significant others had positive attitudes to healthy behaviours [46]. Social support was also higher in the youngest moderate and high-fit men than low-fit men. Moderately fit young men may have a greater tendency to cite health benefits and feeling refreshed as reasons for their engagement in PA than those who are either sedentary or athletic. The moderate-fit youngest men were also more likely to have set themselves exercise goals than their low-fit peers. This result indicates that moderately-fit young men invest effort in planning their engagement in PA, which also serves to underline the importance of social and environmental support in promoting PA.

Previous studies suggest that poor exercise skills may lead to negative experiences of PA, reduced self-efficacy and withdrawal from intended exercise activities [47]. Self- efficacy is the largest determinant to PA, and it is related both to the ability to overcome barriers and the confidence to engage in PA behaviour itself [26]. However, in the youngest low-fit age group, skills and self-efficacy tended to differentiate only the low- and high-fit, but not low- and moderate-fit men. Skills and self-efficacy are important long-term predictors for PA maintenance [26,48,49], and therefore genetics may have a stronger role in determining low PF than long-term PA in young adults. The likelihood of adopting PA habits increases if one has good motor skills for exercise activities or a genetic predisposition to good aerobic capacity and muscular strength [50,51]. The influence of PA history, overweight and chronic diseases broadens the gap between the fit and unfit during middle-age and the later working years [2,48].

Social support is a key factor for successful PA change [14]. However, social support was not related to better PFI in the oldest men. A recent review also concluded that social support is not a determinant of PA [21]. The present results suggest that social support appears to have more impact on PA in younger than older men. Lack of self-efficacy, motivation or PA skills may be more notable obstacles to engagement in PA in the later than earlier working years, and hence related to poor PA history. Previous research indicates that a positive social environment increases self-efficacy towards behaviour and mediates PA changes [12,16]. Social factors have been emphasized as an important component of PA programs for middle-aged men [12]. However, the specific form of social support should be targeted to low and moderately fit men differently.

Overall, the low-fit men were mostly overweight, perceived their exercise skills as poor, and were not very confident of their ability to achieve their exercise goals. A previous review concluded that intervention methods like action planning, self-monitoring and social support can increase self-efficacy and mediate PA change in a non-obese population [52]. However, in an obese population, effective intervention techniques may lie more in action itself. It has been suggested that planning does not promote PA if one's confidence in actualizing the behaviour is low [47]. Compared to other health behaviour changes, regular PA requires more time and also, to some extent, special skills [23,26]. Good physical fitness may be related to one sort of physical activity capital that promotes engagement in PA and provides the ability to obtain social support from the environment [42]. While easy access to exercise groups and good sport facilities could be enough to increase PA in moderately-fit men, low-fit men may need more individual counseling, social support and PA alternatives that are perceived as agreeable and fun. Further research is needed to determine whether the PFI used here could form one component of a practical tool-kit in health counselling.

Strengths and limitations

This study has limitations that restrict the generalizability of the findings. First, the participants were working-aged men who voluntarily engaged in the testing events. It is probable, therefore, that the study did not include men with the lowest fitness status. Unfit and inactive populations do not usually engage in PF studies owing to the challenging nature of the fitness tests used and lack of motivation [12]. However, the present data were obtained in public events that were free of charge and the fitness tests were easy to perform. Notwithstanding, the data were restricted to motivated men, as only 16 per cent of the participants were sedentary. Second, the study was cross-sectional in nature. Generation and age cohort differences in PA patterns and attitudes may influence the differences in the results for PF and the psychosocial factors.

Third, psychosocial factors were assessed by using constructs drawn from several health behaviour theories (e.g. the theory of planned behaviour and the Transtheorethical model) [22,25,26]. Rhodes & Nigg (2011) proposed that simply picking and choosing constructs from theories and models without making a full attempt to validate a theory may lead to problems in advancing PA research [26]. However, Glanz & Bishop suggested that the strongest interventions may be built from multiple theories [22]. The psychosocial measures used in this study had been validated or piloted in previous studies [40-43] among the target population, which strengthens the reliability of the results.

The fourth limitation concerns self-reported variables. For the psychosocial factors and physical activity, self-evaluations have had satisfactory validity [25,53]. Self-reported PF correlates moderately with objectively measured PF, although the most inactive groups tend to overestimate their PF [54]. It is recommended that other assessment methods be used together with self-reports [54]. This study included both evaluation of PF with objective fitness tests and self-rated PF. Physical fitness was used as an outcome measure instead of PA, because it has been suggested that PF may more accurately describe peoples' general tendency to PA than self-reported PA [55]. However, chronic diseases or genetics may be the primary reasons for low PF, and not inactivity [3,21,50].

Assessing peoples' PA in free-living conditions is challenging. Therefore, PF is a better predictor of health status than PA. PF was assessed in the present study with a PFI that comprised several dimensions of health-related fitness. The PFI did not indicate functional ability alone, but also risk for adverse health conditions. The PFI described PF (aerobic capacity and skeletal muscle strength) and indicated risk factors for functional disability and chronic diseases (fat% and VFA). However, this was the first time that this PFI has been used for research purposes. The reference values of the PFI tests were adjusted for the population of Finnish middle-aged men, which restricts its use in other populations. Further research should examine the validity of the present PFI in different age groups and on different fitness levels.

Conclusions

Poor exercise skills, self-efficacy and social support were related to low PFI. Physical activity promotion for low-fit men should take into account age differences in the relationship between psychosocial factors and physical fitness. Thus, new and effective ways to establish social support and motivation for physical activity among low-fit men in all working-age groups are needed. Further research is also warranted on whether estimation of PFI could be used as a practical health counselling tool.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

KSK analysed the data and wrote the manuscript. JK, KK and MP contributed to the study design, data collection and critical review of draft manuscripts. JV assisted with the statistical analysis, interpretation of data and critical review of draft manuscripts. All the authors read and approved the final manuscript.

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II

PSYCHOMETRIC PROPERTIES OF A SHORT MEASURE FOR PSYCHOSOCIAL FACTORS AND ASSOCIATIONS WITH PHASE OF PHYSICAL ACTIVITY CHANGE AMONG FINNISH WORKING-AGED MEN

by

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III

READINESS FOR HEALTH BEHAVIOR CHANGES AMONG LOW FITNESS MEN IN A FINNISH HEALTH PROMOTION CAMPAIGN

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IV

CHANGES IN PSYCHOSOCIAL FACTORS AND PHYSICAL ACTIVITY AMONG FINNISH WORKING-AGED MEN IN THE ADVENTURES OF JOE FINN CAMPAIGN

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